Developing a Strategy for Forest Based Livelihoods in Central India through Assessment of Major NTFP's

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Acronyms

NTFPs : Non-timber Forest Products

MFPs : Minor Forest Products

PESA : Panchayats (Extension to the Scheduled Areas) Act

FAO : Food and Agriculture Organization

FSI : Forest Survey of India

MoEF : Ministry of Environment and Forest

NFP : National Forest Policy

FRA : Forest Right Act

LAMPS : Large Agriculture Multipurpose Societies

PACS : Poorest Areas Civil Society

TRIFED : Tribal Co-operative Marketing Development Federation of India

NGOs : Non-governmental Organization

IVI : Importance Value Index

SWOT : Strength Weakness Opportunity Threat

CFTRI : Central Food Technological Research Institute

INR : Indian National Rupees

CBE : Coca Butter Equivalent

CGMFPFED : Chhattisgarh State Minor Forest Produce Co-operative Federation Ltd

PFA : Prevention of Food Adulteration Act

MGNREGA : Mahatma Gandhi National Rural Employment Guarantee Act

ILRI : Indian Lac Research Institute

MSP : Minimum Support Price

PFA : Prevention of Food Adulteration

FFA : Free Fatty Acid

PRADAN : Professional Assistance for Development Action

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Chapter 1

NTFP status with special reference to central India

1.1 Background

The past few decade have observed a rapid increase of interest in non-timber forest products (NTFPs) among scientists, conversationalists and development organizations, due to the fact that the NTFPs make substantial contribution to the livelihoods to a huge part of population in India **(Chandrasekharan, 1994, FAO 1991).**

The contribution that NTFPs make to sustainable development by fulfilling monetary demands of the forest dependent communities and by enhancing the value of forest resources provides a reason for conservation and is widely acknowledged by researchers across the globe. Consequently, commercialisation of NTFPs is generally considered as a mechanism by which forest conservation and development objectives can be attained concomitantly **(Neumann and Hirsch, 2000).**

There are over 170,000 villages situated around and inside forests in India **(FSI, 1999)** and they have their close affinities with forests. Many of these villages have marginal land holdings with low productivity and scarcity of water. Thus a large population of these villages depends on forests for their daily needs and forest is an integral part of their culture. Wildlife intrusion is high and dairying is not very remunerative due to high transport costs **(Kausal and Melkani, 2005)**. It is estimated that more than 275 million people in India depend upon NTFP for at least part of their subsistence and cash livelihoods **(Malhotra & Bhattacharya, 2010, Bhattacharya and Hayat, 2009)** the business turnover is estimated to be in tune of 6000 crores (Rs 60 billion) per year. This dependency is particularly intense for half of India's 89 million tribal people, the most disadvantaged section of society, who live in forest fringe areas. According to an estimate the NTFP sector alone is able to create about 10 million workdays annually in the country. **(Planning Commission, 2011)** NTFPs contribute upto 60 percent of the cash income of tribal communities in Karnataka **(Uma Shankar et al, 2000)**, and various studies indicate a similar dependence in other states **(MoEF, 1998)**. What accentuates the importance of NTFPs is the fact that their collection often complements agriculture based livelihoods, as it is largely carried out during the "dry season" **(Lele et al, 2010)**.

1.2 Nomenclature and definition

Non timer forest products or minor forest products (MFPs), are often used to categorize everything the forest provides other than timber. The term 'non-timber forest products' (NTFPs) and similar terms like 'minor forest products'(MFPs), have emerged as umbrella expressions for the vast array of both animal and plant resources other than timber. The definition of Non Timber Forest Products has been a matter of great debate ever since the term was first coined. The areas of dispute include woody plant products and forest ecosystem services such as carbon sequestration, nutrient cycling and amelioration of water flows (FAO, 1999).

The most widely accepted definitions include:

- **"Any product other than timber, dependent on a forest environment" (Arnold and Ruiz-Perez, 2001)**
- **"Non-timber Forest products (NTFP) consist of goods of biological origin other than wood, derived from forests, other woodland and trees outside forests" (FAO 1999)**

1.3 Classification

Based on origin and recognition NTFP may be arranged broadly following classes:

- Plant fruits, seeds, and nuts.
- Plant exudes-latex, resin, and nectar.
- Plant parts-stem, leaf, root, bark, apical buds, flowers, mushrooms, orchids, etc.

The tropical and sub-tropical forests of central India have great floral wealth. As such, these areas are a storehouse of a wide variety of valuable NTFPs, and substantially contribute to the village economy of central India. Many important products are categorized under following use-based groups:

- Fibers, Flosses and Coir.
- Grasses, Bamboos and Canes.
- Distillation and Extraction Products including oil yielding grasses
- Tans and Dyes.
- Exudes-Gums, Resins, Oleoresins, Rubber, Latex, Lac, Silk, ete.
- Medicinal Plants, Drugs, Poisons.
- Edible Products.
- Miscellaneous, Pesticides, Orchids, Insects

Tasar cocoons and new born moth

1.4. Legal understanding with NTFPs:

The subject 'Forests' comes under the 'Concurrent List' of Indian Constitution which means it is a subject under the dual control of Central and State Government, where state forestry units control and manage the forests within the constraints of a National Forest Policy. The Indian Forest Policies were traditionally largely directed towards timber production (1988) and 'Reserve Forests' were and often are managed for timber, fuel-wood and bamboo production. Although NTFPs have been part of Indian forest policies and act for more than five decades, due recognition however came with the commencement of Community Forestry in India in 1980s but it was totally structured around minor timbers and fuel-woods (Nesmith, 1991). Later a defined guideline for NTFPs was issued under the National Forest Policy 1988. Since then, various policy dialogues, movements have carried out in the recognition of NTFPs as an integral part of local/tribal livelihoods in India.

Prior to National Forest Policy (NFP), 1988, NTFPs were popularly known as Minor Forest Products (MFPs) and the focus was on Tendu leaves (Bidi Patta or leaves of Diospyros melanoxylon) and few other products. Besides the economic value, the non-economic value of NTFP for the forest dwellers is more important since quite a good number of such products do not enter into the market and are primarily consumed at local level with a little value addition. NTFPs are a part of the socio-cultural life of tribal people who mainly maintain a symbolic relationship with the forest and forest based products. More particularly the reliance of tribal's on NTFP becomes very high owing to the uncertain nature of agricultural yields, for both food securities during seasonal shortages as well as for household medicine and income needs. Non-timber forest products (NTFPs) are an important source of livelihoods for more than 100 million people in rural India. Apart from meeting the subsistence and cash income needs of the forest dependent communities, NTFPs also support large number of small to large-scale enterprises engaged in processing and/or trading of NTFP based value added products especially in food, medicine, aromatics and pharmaceutical sectors. This is evident from the fact that NTFPs contribute to a major

portion of revenue for the Forest Departments in many states, for instance, between 72-86 % of the revenue for Orissa Forest Department came from NTFPs in last five years. The total value of NTFP removals from Indian forest was more than Rs. 800 Crore as per FAO's Global Forest Resources Assessment 2005.

1.5 Nationalization

The policy of nationalization suggests "no one other than those permitted by the government or the State government itself can trade in that product. The rest of the trade taking place becomes illegal". However, nationalization of NTFPs have been overruled by the Forest Rights Act (FRA), 2006 ((2, i) "Minor forest produce includes all non timber forest produce as plant origin including bamboo, brush wood, stumps, cane, tussar, cocoons, honey, wax, lac, tendu or kendu leaves, medicinal plants and herbs, roots tubers and the like". Similarly, Panchayats (Extension to the Scheduled Areas) Act (PESA), 1996 states "complete ownership of minor forest produce to the community/ Gram Sabha". Even though FRA and PESA Act have been formalized the state governments have kept certain valuable NTFP's under their control as the state government does not want to lose the huge revenue associated with these NTFP's. Contradicting Acts such as Indian Forest Act, 1927 and the draconian Wildlife Protection Act, 1972 have allowed the state governments to continue their dominance over the NTFP's. The list of NTFP's nationalized vary from one state to another. For example: sal seeds which is non nationalized commodity in Jharkhand is a nationalized commodity in Chhattisgarh, whereas Tendu/Kendu leaves still remains a nationalized commodity in most of the states[1].

1.6 Context:

The Planning Commission's Working Group on Forests & Natural Resource Management, 2011 recognizes NTFP as one of the largest unorganized and neglected sectors in India since pre industrial times. About 68% of the export in the forestry sector comes from NTFP (Planning commission, 2011), however due to traditional approaches of forest management the focus has largely been on timber neglecting the role of NTFPs. Absence of a central policy approach, prevalence of contradictory legal definitions has also created hurdles in the growth of the NTFP sector. To cite an example, Bamboo is defined as a 'minor forest produce' in the Forest Rights Act, 2006 whereas the Indian Forest Act, 1927 treats it at par with timber. PESA, 1996 gives ownership rights to local communities over Minor Forest Product's (MFPs) whereas the regime created under Wildlife Protection Act doesn't. The working group of planning commission has listed 21 NTFPs for enterprise development in Central India zone.

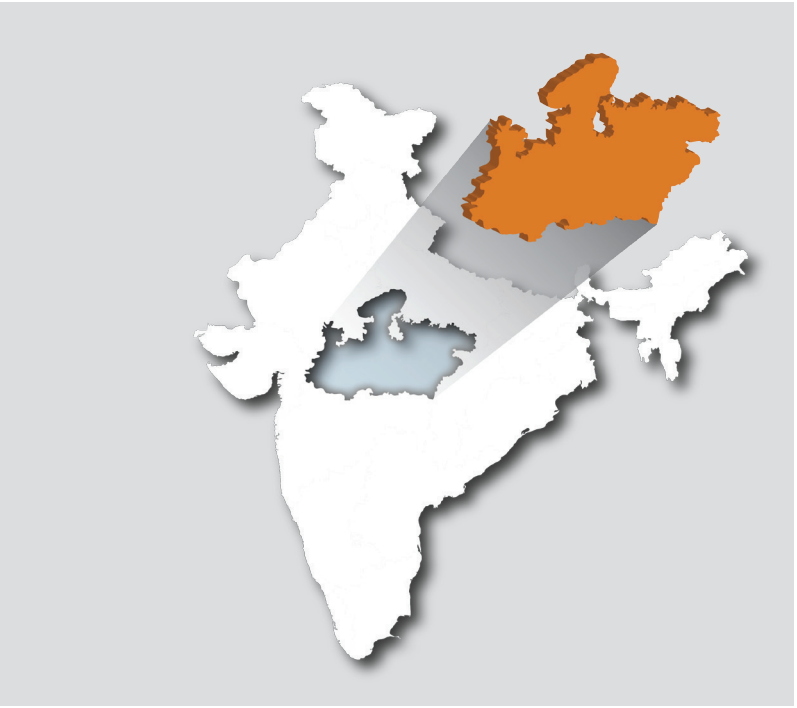
The present exercise is to screen outpotential NTFPs in the state of Jharkhand based on the recommendations of planning commission working group, resource inventory and local preference. Monographs and case studies of selected NTFPs have also been presented.

[1] Detailed documents on each state have been prepared by Banajata (http://www.banajata.org/)

Chapter 2

NTFP policies of Madhya Pradesh, Chhattisgarh and Jharkhand

2.1 Madhya Pradesh



• The major objectives of the NTFP policy of the state of Madhya Pradesh (MP) are to ensure proper and timely payments to the primary collectors and enhance revenue of the state.

• In 1964, the Madhya Pradesh Kendu/ Tendu Patta Adhiniyam took over the trade of Kendu/Tendu leaves thereby, nationalizing the trade of the commodity.

• In the year 1969, under the Madhya Pradesh Van Upaj (other than timber) Adhiniyam, created state monopoly over other NTFP's

• The MP State Trading Cooperative Federation (MPSTCF) was created in 1984 with the aim to maximize returns to the primary collectors.

• **Large Agriculture Multipurpose Societies (LAMPS) and Poorest Areas Civil Society (PACS)** were entrusted the task of Tendu/kedu leaf collection.

• In 1988 a three tier cooperative system was evolved for more intense expansion of the trade.

• The 73rd amendment in the constitution, transferred power to the Panchayati Raj Institutions.

• Under the Panchayat Extension to the Schedule Areas Act (PESA) 1996, the ownership of NTFPs was transferred to the Panchayats.

• MP was the first state to transfer ownership rights of all non- nationalized products to the local people.

• **Tendu/Kendu leaves, sal seeds[2], Terminalia chebulaand Gums** are nationalized in Madhya Pradesh. The rights to trade nationalized NTFPs rests with state government.

• Collection of NTFP's to be done through non destructive harvesting.

• Procurement of NTFP's is done by Madhya Pradesh Minor Forest Cooperative Federation for all nationalized NTFP's however procurement of non- nationalized NTFP's is also done although the state does not have monopoly rights.

• The price fixation for nationalized NTFPs is done by the state government through a committee formed under the chairmanship of Minister, Ministry of Environment and Forests (MoEF).

• The sale of NTFPs is done by Madhya Pradesh Minor Forest Cooperative Federation by inviting tenders or through auctions.

• Benefit sharing

- 50% directly to the primary collector
- 20% for the development of Madhya Pradesh Minor Forest Cooperative Federation and regeneration of forests
- Rest for infrastructure development and cash payments

The government provides minimum support price (MSP) for some non nationalized NTFP's along with group insurance for primary collectors. Through creation of people's protected areas (PPAs) the state aims for in-situ conservation of biodiversity. The primary visions of the state government include:

- Construction of more go downs in interior areas for storage, thereby reducing losses incurred due to spoilage and deterioration of quality

- Establishment of processing centers in rural areas with arrangement of primary processing of major NTFP's

- Provision of credit on easier terms to primary collectors

- Subsidy on interest for loans to societies and individuals

[2] Collection of sal seeds is banned in the state since 2006 owing to the poor regeneration of sal

2.2 Chhattisgarh

With a resolution dated 22nd October 2001 the state of Chhattisgarh created its own forest policy, The NTFP policy largely remained same (NTFP policy of Madhya Pradesh) with the following exceptions.

• Procurement to be done by Chhattisgarh State Minor forest produce (Trading and Development) Cooperative Federation Limited

• In Naxal affected regions the state government invites tenders through advance sale of units.

• In Naxal affected areas the agent who purchases the units does the procurement.

• Benefit sharing mechanism for nationalized products

- 70% to the primary collectors of which 50% in cash and 20% in rice
- 15% in development of basic facilities
- 15% in development of forests and the NTFP's

The state acknowledges the role of NTFP in livelihoods of tribal communities. The state aims to promote value addition and processing of NTFP's at local level rather than exporting it in unprocessed form. The state also aims to take measures for sustainable harvesting and long term conservation of NTFPs and ensue ownership rights to the local communities.

2.3 Jharkhand

The rules and regulations of the erstwhile state of Bihar are still in practice in the state of Jharkhand, however the only NTFP nationalized in the state after the division is Tendu/ Kedu leaf.

• Tendu/Kedu leaf was nationalized by Bihar Kendu patta (Control of Trade) Act , 1973. The production from each unit was standardized in terms of standard bags of 50,000 leaves.

• Sal seeds, Mahua, Karanj, Kusum seed and flowers were nationalized by Government Order in 1977 and 1978. Later in 1980, Palas, Aonla, Harra and Behera were also added in the list of nationalized products.

• The Bihar Forest Produce (regulation and Trade) Act, 1984 was passed to legalize the trade of nationalized NTFPs.

• In 1987, the Bihar state Forest development and cooperation was entrusted the task of trading Tendu/Kedu leaves owing to the boycott of traders lobby to purchase Kendu leaves.

• In 1994, except for Tendu/Kedu leaves, Sal seeds, Mahua seeds and Harra nut the other nationalized NTFPs were de-notified.

• The Jharkhand Forest development cooperation has been appointed as the sole agent for procurement of nationalized NTFPs.

• For Tendu/Kedu leaves the government issues a notification to appoint an advisory committee for a period of one year (1st July to June 30th) for price fixation. The members should not be more than nine of which one member should be a trader and two from scheduled tribes and one Beedi manufacturer.

• The price fixation is done by a committee of not less than nine and not more than thirteen members consisting of traders, primary collectors, one Scheduled caste one schedule tribe and two nominated government officials. The committee would be headed by forest minister.

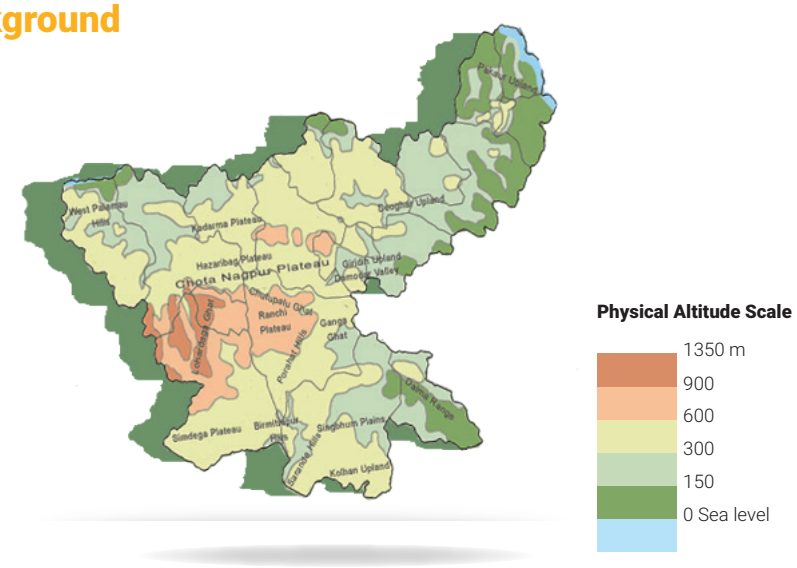
- Benefit sharing

- The revenue generated is used for meeting out the expenses of the forest department and profit goes to the government. As per the new resolution of Jharkhand, profit from the sale of the left over forest produce will be given the Village Samiti (VS) in form of development funds.

Chapter 3

NTFP Potential in Jharkhand

3.1 Brief Background



The state of **Jharkhand** lies in the eastern part of India spreading over an area of **44,413 km²**. The Population of Jharkhand according to the 2011 census stands at about 32 million, making it the **13th** most populated state in India. The state makes up about **3.5%** of the country's population a figure which was about **3%** during the last census in 2001. The state is spread over an area of about **79000 sq. km**. one of the smaller states in the country in terms of area. The state has a growth rate of about **22%** which slightly exceeds the national growth rate of about **17%**. The sex ratio in Jharkhand is about **940**. Of the total population of Jharkhand state, around **75.95 %** live in the villages of rural areas 26.34% population of which is tribal (Ministry of Tribal Affairs, 2012). 35 lakhs families are below poverty line out of the total no of about **69 lakhs** households. Total net sown area is only **28%** of geographical area of the state due to hilly terrain. Total irrigated area is only 1**2.77%** of net sown area and the rain is very undependable (Jharkhand 12th Five year plan).

3.2 Forests

Jharkhand is among the most mineral rich states in the country, with rich reserves in the Chotanagpur plateau. Jharkhand has a tropical climate with annual average rainfall of about 900mm. The temperature varies between 4OC to 47OC. The forest cover in the state is 22,977Km² which is 28% of the total geographical area. In terms of forest canopy density classes the state has 2,590 Km² area under very dense forest, 9,917 Km² area under moderately dense forest and 10,470 Km2 area under open forests (Fig 1)

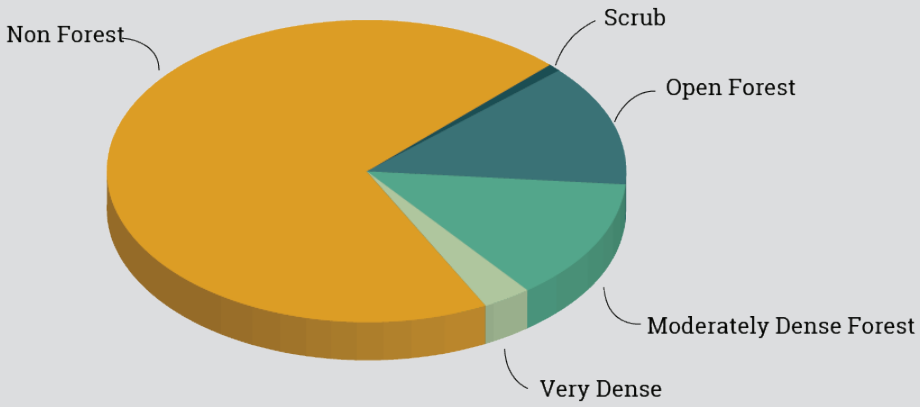


Fig 1. Status of Forest Land Use in Jharkhand

As per Forest survey of India with reference to Champion and Seth Classification the state has five forest types which belong to two forest type groups, viz. Tropical Moist Deciduous and Tropical Dry Deciduous (Fig 2).

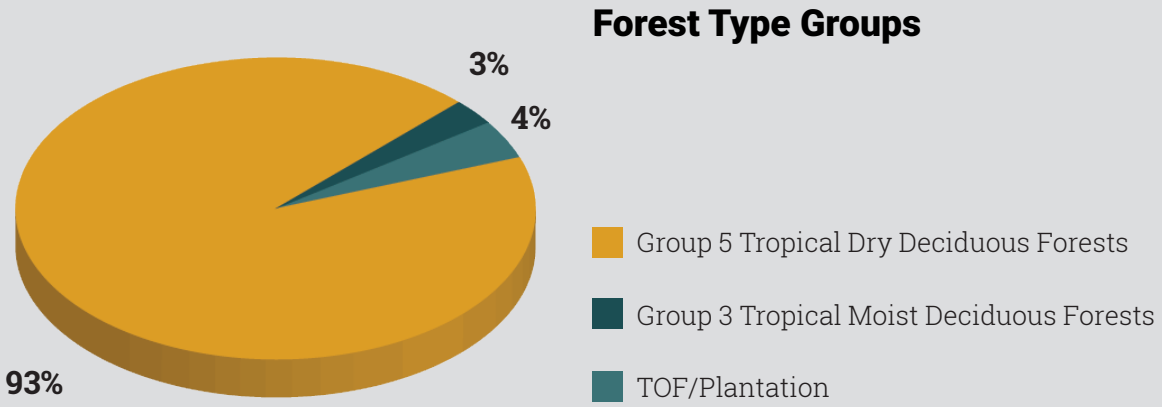


Fig 2. Forest Type Groups in Jharkhand

3.3 Tribes

Jharkhand is an important State from the viewpoint of tribal population in India. Around 35 Scheduled Tribes live in Jharkhand, viz:

- **Primitives Tribes** Asur, Birhor, Birajia, Korba, Mal Paharia, Sauriya Paharia, Sabar, or Hill Kharia and Parahiya.

- **Other Tribes** Biga, Banjara, Bathudi, Bedia, Bhumij, Binjhia, Chero, Chik Baraik, Gond, Gorait, Ho, Karmali, Khadia, Kharwar, Khond, Kisan, Kora, Lohra, Mahali, Munda, Oraon and Santhal.

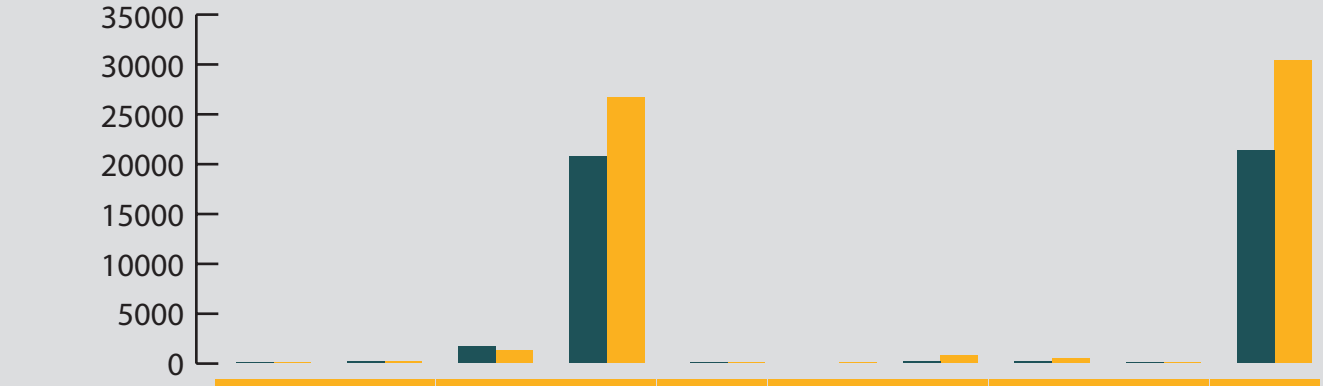
Santhals are not only among the main tribes of Jharkhand but also of India. One of the divisions in the state has been aptly named as Santhal Pargana. From the viewpoint of population, Oraon and Munda are placed at 2nd and 3rd position. Tribal population of Jharkhand is concentrated mainly in Chhotanagpur plateau (Ranchi, Hazaribag, Giridih, Palamau, Dhanbad, Bokaro, and Singhbhum, districts) and Santhal Parganas.

Major NTFP's found in the state

S.N.	Name
1.	Tassar, Lac Kendu leaf*, Tamarind, Sal seed*, Mahua flower, Amla/Aonla, Chironji, Harranut, Kusum, Karanj, Behera

*Nationalized

As per Government figures, the Indian states, having the major NTFP resources exploited and traded during the last 3 years (2007-08 to 2009-10) are Madhya Pradesh, Chhattisgarh and Andhra Pradesh as shown below, The scale value of Jharkhand was 114.23 lakhs (Fig 3)



	Orissa	West Bengal	Andhra pradesh	Madhya pradesh	Karna taka	Jharkhand	Gujrat	Maha rashtra	Rajasthan	Chhatis garh
Sale value in lakhs 2008-09	30.5	192.0	1624.9	20861.8	107.7		516.8	126.5	67.3	21424.8
Sale value in lakhs 2008-09	24.6	186.3	1285.0	26799.6	148.8	114.2	758.4	448.7	29.6	30478.4

(Source: TRIFED report, September 2010)

Fig 3. Sale Values of NTFP's for different Indian states

3.4 Status of Potential NTFPs in Jharkhand

Jharkhand literally means 'forest region' where forests play a central role in the economic, cultural and socio-political systems and the lives of a majority of the people revolve around forests. Forest based livelihoods mainly revolve around collection, processing and utilization/selling of various NTFPs throughout the year along with some seasonal subsistence from agriculture in the forest fringe areas. Livelihood enhancement interventions for any of these communities, thus has to begin with an understanding of the types, amounts, availability and processing/storage/marketing methods of the major NTFPs in their region. Different NTFPs have different issues/constraints and market

dynamics associated with different geographical locations in the state. It becomes imperative to analyze NTFP related issues not only at the state/regional level, but also at micro-level i.e. at village/cluster levels to get a clear understanding of the issues, the value chain and the potential for commercialization and income enhancement. In most of the tribal/rural areas of Jharkhand NTFPs are important for cash demands and domestic use for atleast 4-5 months in a year.

Present report is based on a primary study conducted by Centre for Ecology Development and Research (CEDAR) in three villages in different districts of Jharkhand viz. Sahritola in Dumka district, Padampur in West Singhbhum district and Hakkadua in Khunti district. The criteria for selection of villages was based on geographical variability, type of forest and the presence of partner NGO's. All the studied villages are culturally different and are home of different tribal communities. Brief description of the studied villages are given below

Sahritola is 35 km from headquarter of district Dumka and 15 km from local trade centre, Kathikund. The village community is constituted with the dominance of 'Santhal' tribes and very few families belong to non-tribe community.

Padampur is located 45 km from Chaibasa, the district headquarter of West Singhbhum district. The village community largely comprise of 'Ho' tribe. The nearest market/hat bazaar for the villages is Hatgamhria which is 20 km from the village. There are three major trade centers in the vicinity of the village namely, Chaibasa, Hatgamharia and Jhinkpani.

Hakkaduwa is located 35 km from the district headquarters 'Khunti' and 65 km away from state capital Ranchi. Majority of the population belong to tribe community 'Munda'

Table 1. Detail of Studied Villages

Village	Block	District	Division	Dominant Community	Elevation	Coordinates	Total HH
Saharitola	Kathikund	Dumka	Santhal Pargana	"Santhal"	180	N 24°24' E 87°23'	65
Padampur	Tonto	West Singhbhum	South Chhotanagpur	"Ho"	431	N 22°21' E 85°41'	102
Hakkaduwa	Khunti	Khunti	Kolhan	"Munda"	570	N 23006' E 85026'	150

Survey and Data collection

Under present study, data was collected through household surveys, trader surveys, focus group discussions and collation of secondary data. Surveys were conducted with the sampling intensity of 15 percent. Structured Questionnaires were used to capture the primary information from forest village communities and small traders. The questions were grouped into following categories i.e. production/collection, processing, storage, value addition, price, transport and sale. By and large the focus of the survey was confined to:

(a) Volume available for each NTFP,

(b) HH income enhancement through NTFP commercialization,

(c) Share of NTFPs in HH income and

(d) Major barriers associated with collection/production, processing/storage and trade of NTFPs.

The surveys were conducted by visiting each village and every fourth household. Interviews with group of collectors (including men and women separately and together) were used for this purpose, along with other more participatory research methods. **(Survey format attached in Annexure-I)** Besides, the household survey, small traders associated with concerned villages was also contacted for survey **(Format given in Annexure-II)**.

Market rates and market-chain was further cross verified through visiting local traditional markets (locally called Hat) near sample villages. Secondary informations were gathered from various reports and consultation with expert organizations and local NGOs. Tree resources in the villages were also investigated by direct inventory and a rapid assessment of tree resources was also carried out in nearby forest areas by placing quadrats of 10X10m size. In each quadrat, every tree individual 10 cm or greater circumference at breast height (1.3 m) was counted species-wise. Forest surveys were carried out in two opposite directions of the villages to minimize the auto correlation and obtain maximum composition following **(Misra, 1968)**.

Data Analysis

Data was computed and analyzed in qualitative and quantitative manner and represented for each quantitative aspect. Tabulation and presentation of data was carried out to arrive at a clear picture of the dynamics surrounding potential NTFPs in the selected villages. Market report for each prioritized NTFP in each selected area was also recorded. The basic marketing chain for each product, from primary collectors to identify markets was

also analyzed using quantitative data supported by qualitative observations.

NTFP resource assessment within the village was carried out by making a checklist of tree species within the village and all the individuals were categorized into three categories i. e. Large (L), Small (S) and Regenerating (R). Trees less than 1m height were considered as regenerating, whereas all the flowering/fruiting individuals considered as large tree. The stage between large and regeneration considered as small tree. Tree individuals (greater than 10 cm or greater circumference at breast height) were recorded species-wise under forest sampling which was carried out by placing quadrats in dependent forest area of each village. Each species recorded in the sampling was analyzed for different phytosociological parameters i.e. Density, Frequency, Abundance and Importance Value Index (IVI) by using appropriate indices.

3.5 Primary Survey findings

NTFP Collection

The dependence of sample households for subsistence and sale was considerable and enveloping across studied villages. The NTFPs collected by sample households in the study areas were categorized into: a) NTFP for consumption only, b) NTFP for sale only and c) NTFP for both consumption and sale. Maximum number of NTFPs were recorded in Padampur (25) followed by Sahritola (22) and Hakkadua (19). The numbers of NTFPs solely collected for sale are very few; (4) in Sahritola, (3) in Padampur and (3) in Hakkadua. Maximum numbers of NTFPs were consumed at household level. 6-7 commodities were collected for purpose, consumption and sale. Maximum number (7) of high volume products are recorded in Hakkadua whereas in Saharitola and Padampur, 6 products show high volume.

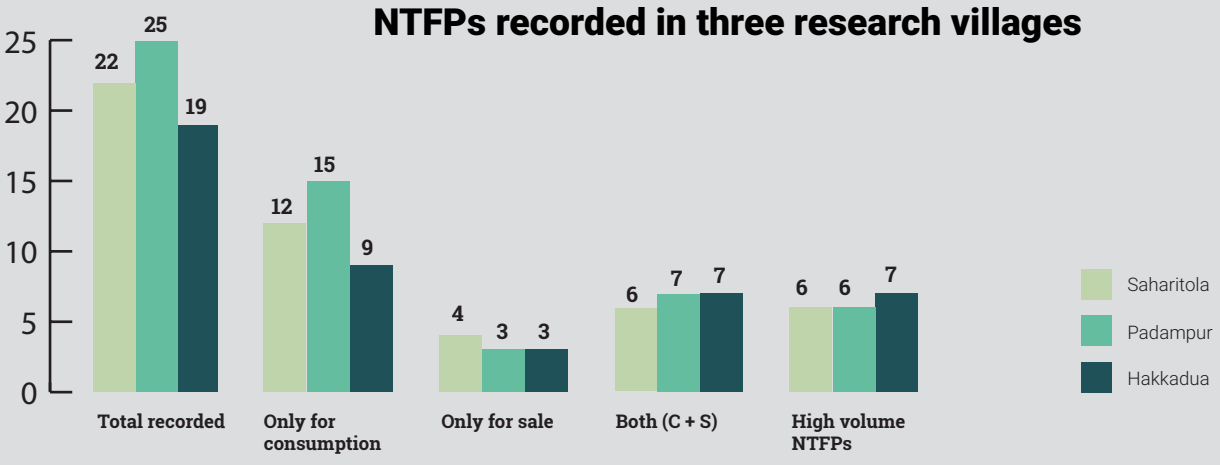


Figure 4: NTFPs collection in three research villages

Household Income

As far as the household income is concerned, it ranges from approximately 20,000 Rs. $hh^{-1}yr^{-1}$ in Padampur to 40,000 Rs. $hh^{-1}yr^{-1}$ in Sahritola. Maximum portion of household income comes from NTFPs in Saharitola and Padampur whereas maximum income in Hakkaduwa village generated through off-farm activities (labour/MNREGA) followed by NTFPs and salary/pension. (**Table 2**)

Table 2: Income (Rs. hh-1yr-1) generated through different activities including NTFP in studied villages

	NTFP	Agriculture	Off-farm activities	Animal husbandry	Salary and pension	Total
Saharitola	19818	3625	2400	1063	12250	39155
Padampur	11447	1500	5300	780	500	19527
Hakkadua	6718	0	7600	200	6000	20518

Contribution of cash income from different activities in different villages exhibited in **Figure 5**. Highest income proportion through NTFP's were recorded from Padampur (59%) followed by Saharitola (51%) and Hakkadua (33%). In Hakkaduwa, highest (37%) share of income comes from off-farm activities. Salary and Pension in Sahritola (31%), off-farm activities in Padampur (27%) **(Figure 2)**

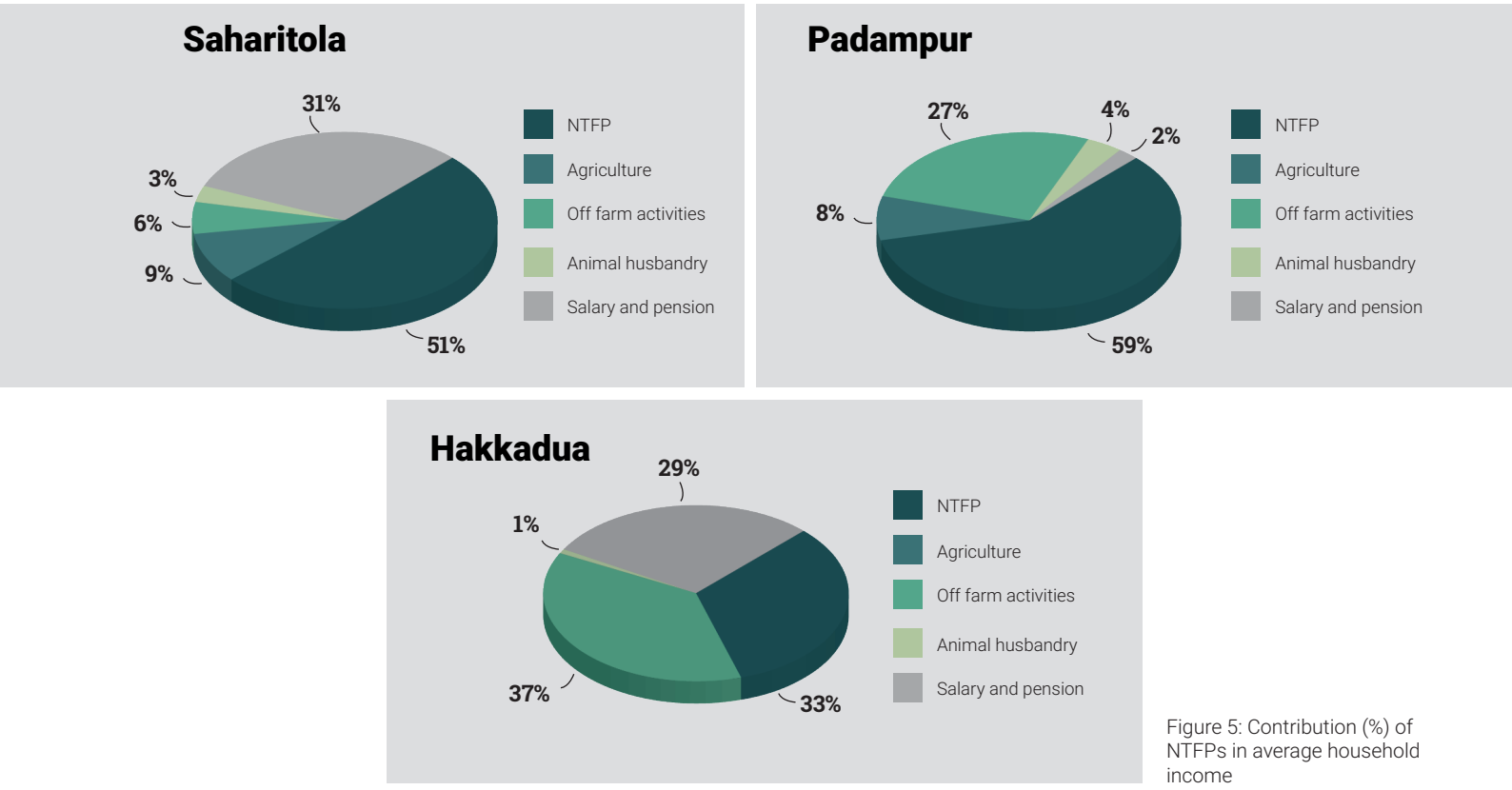


Figure 5: Contribution (%) of NTFPs in average household income

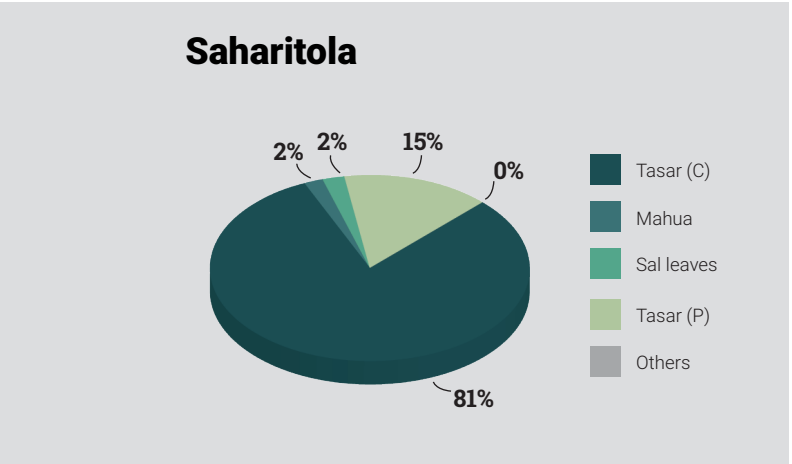
Income from potential NTFPs was also investigated in all three studied villages. Highest proportion of NTFPs household income was received from commercial Tasar (15,913 $HH^{-1}yr^{-1}$) in Sahritola, Mahua (3,940 $hh^{-1}yr^{-1}$) in Padampur and Lac (4,950 $HH^{-1}yr^{-1}$) in Hakkaduwa. Mahua is the only commodity emerged as potential NTFP in all three studied villages. (Table 3)

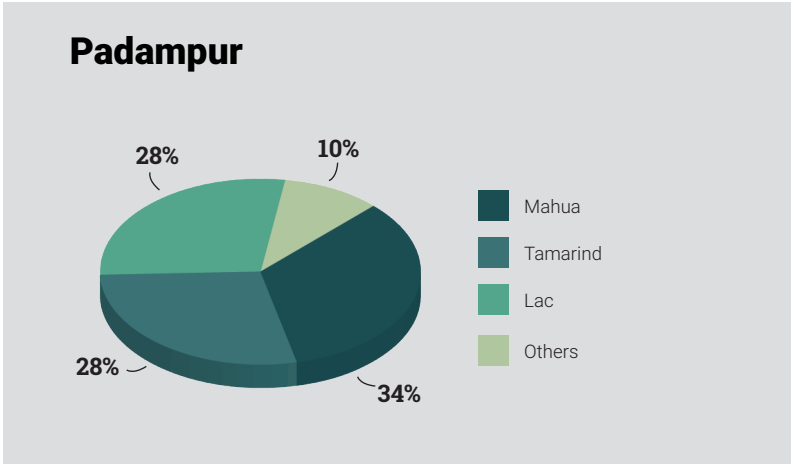
Table 3: Income (Rs. $hh^{-1}yr^{-1}$) generated through NTFPs collected/produced in studied villages

Species	Unit	Saharitola			Padampur			Hakkaduwa		
		Yield (HH^{-1} yr^{-1})	Sale price (Rs)	Income (Rs)	Yield (HH^{-1} yr^{-1})	Sale price (Rs)	Income (Rs)	Yield (HH^{-1} yr^{-1})	Sale price (Rs)	Income (Rs)
Tasar (C)	Goti	8375	1.9	15913	-	-	-	-	-	-
Mahua	Kg	21	20	420	197	20	3940	35.5	22	781
Tamarind	Kg	-	-	-	168	19	3192	20	18	360
Lac	Kg	-	-	-	7	450	3150	11	450	4950
Karanj	Kg	-	-	-	-	-		45	13	585
Sal leaves	bundle	175	2.5	437.5	-	-	-			
Tasar (P)	Goti	5000	0.6	3000	-	-	-			

C- Commercial, P- Pierced

If we compare the income proportion of different NTFPs, 81% of total income generated from the NTFPs comes from the Tasar cultivation and allied NTFP commodities in Saharitola. Mahua emerged biggest income contributor (34%) in Padampur. Whereas, Lac contributed around 74% of income in Hakkaduwa. Contribution of others/lesser volume NTFPs is (10%) in Padampur. **(Figure 6)**





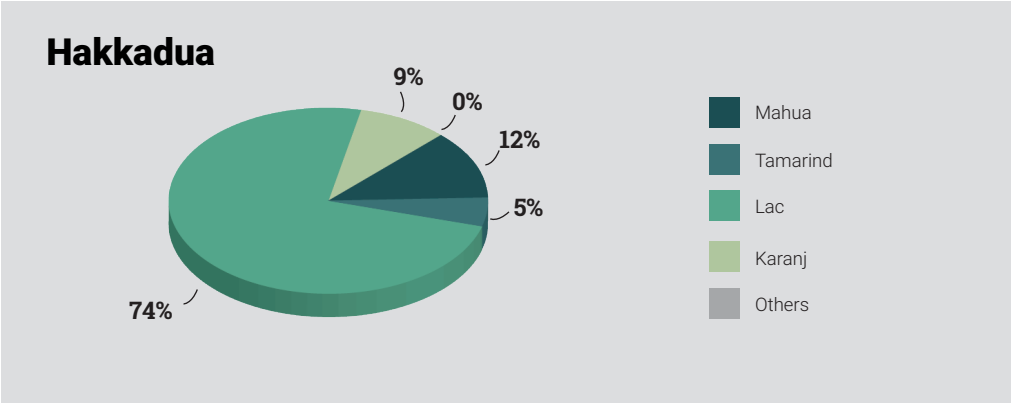


Figure 6: Contribution (%) of potential NTFPs

Time season for collection of NTFPs

People of Sahritola invest around 135 days yr^{-1} in collection of NTFP's followed by Hakkaduwa (133 days yr^{-1}) and Padampur (98 days yr^{-1}). It might be due to well-organized system due to presence of NGO interventions on of Tasar and Lac in Saharitola and Hakkaduwa respectively. Average time spent under NTFP's commercial activities is 5.09, 4.02 and 4.04 hours per day in Saharitola, Padampur and Hakkaduwa respectively. All the villages are forest fringe villages, on an average 2.54, 2.11 and 2.34 Km trips are made in a day for the collection of NTFPs in Saharitola, Padampur and Hakkaduwa respectively. In most of the cases, two people from a household go for collection and often in groups comprising other villagers. Average number of NTFPs collected by the household was highest (5.40) in Hakkaduwa followed by Padampur (4.90) and Saharitola (2.87). **(Table 4)**

Table 4: Days involved, time taken, distance covered for collection of NTFPs in studied villages

Village	Days involved in collection($year^{-1}$)	Time consumed in collection/commercial activities ($hrs\ day^{-1}$)	Distance covered ($Km\ day^{-1}$)	Person involved in collection	Number of NTFPs collected(HH^{-1})
Saharitola	135	5.09	2.54	1.57	2.87
Padampur	98	4.02	2.11	1.76	4.90
Hakkadua	133	4.04	2.34	1.68	5.40

3.6 Prioritization of NTFPs

In the process of identification of potential NTFPs for future development, we did not consider Tasar as the systems are developed and well managed by PRADAN. We used following parameters for prioritization of the species.

1. NTFP income share of the species
2. Resource availability of the species

The pie diagram shows that Lac is adding maximum (42.4%) to the income obtained from NTFPs, followed by Mahua (28.99%), Tamarind (18.85%) and Karanj (3.14%). **(Figure 7)**

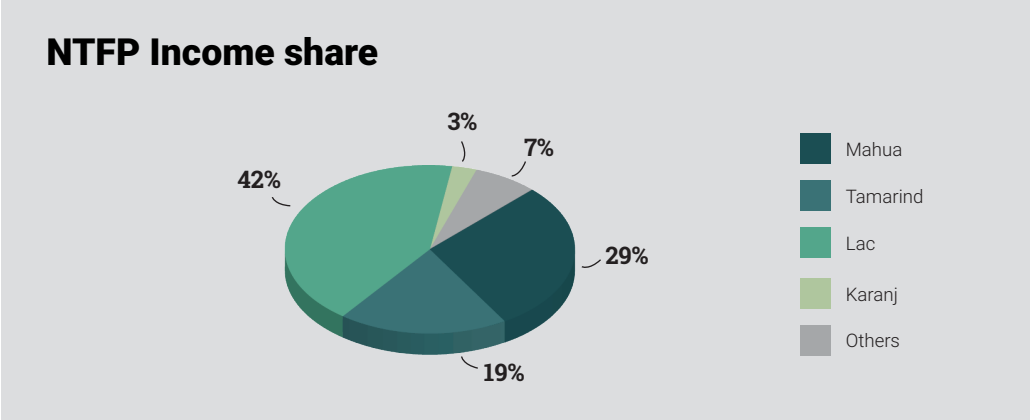


Figure 7: Average income share of different NTFPs in three studied villages

We further investigated the resource potential of various NTFPs present in the village by doing tree resource inventory within the villages and found that Mahua, Palas-Ber (host of Lac), and Imli were the potential resources present in the study area villages. **(Figure 8)**

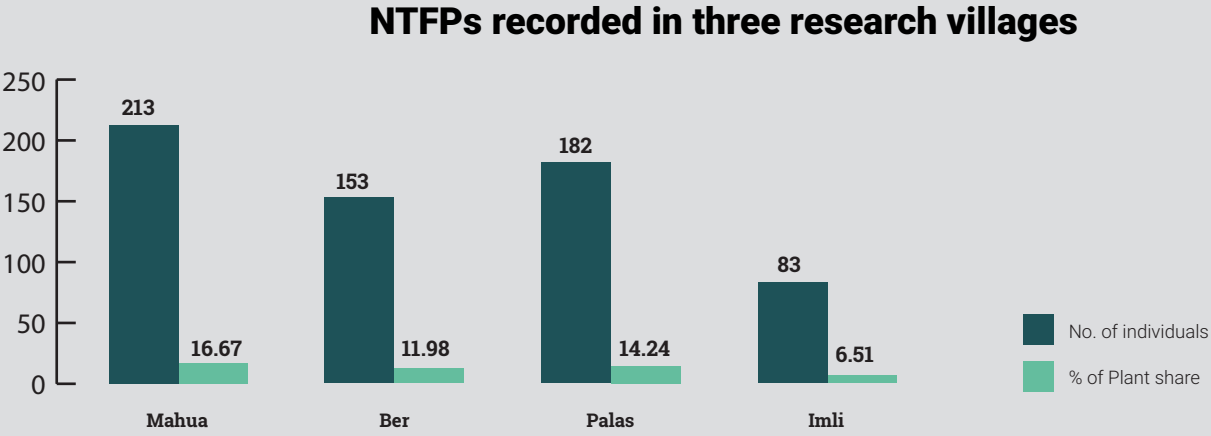


Figure 8: Average potential NTFP resources in three studied villages

Thus we identified Mahua, Lac and Tamarind which adds significantly to household income and have also potential resource availability.

3.8 Profile of Potential NTFPs

3.7.1 Mahua (Madhuca indica)

MAHUA **(Madhuca indica)** is a medium to large size tree often referred as "**Tree of the Poor**" as it is a major source of food and seasonal income in tribal regions. The species is mostly distributed in Eastern Uttar Pradesh, Chhattisgarh, Maharashtra, Bihar,

Jharkhand, Odisha and Andhra Pradesh. **Madhuca longifolia** is largely distributed in South India and in the evergreen forest of Western Ghats. Some of the Mahua species grows in Western Ghats and also found in Himalayan regions. The tree is usually found scattered in pastures and cultivated fields in central India and is extensively cultivated near villages.

Major uses of Mahua

The nutraceutical properties of mahua flowers are well known and also better as compared to other food items. It is predominantly used for making liquor. Seeds of mahua are used for extraction of oils, which is further used for many purposes such as making soaps, bio-fuel and whereas oil cakes and leaves are used as a nutritious feed for cattle.

Mahua flowers' trade in local haat

Field observations

- The collection of mahua flower takes place during April-May whereas the collection of seed carried out in May-June. The collection covers around 35 days (15% of total man-days invested in NTFPs activities) in a year. Collection of the flowers carrying out in morning session between 6-10 AM as flowers fall generally in early morning hours.

- There are no storage and value addition practices available at village level. Villagers hold mahua flowers for 5-7 days (approximately 1-2 days for drying). Storage for longer periods lead to oozing of sap, fungus attacks, and bitter taste.

- In Padampur and Hakkaduwa collectors go to nearby traditional market (Haatia) for sale, however, small traders (Mahajan) also visit the villages for collection. Small traders of Padampur use mini trucks to transport of mahua from the village to haatia while collectors and small traders of Saharitola and Hakkaduwa using bicycle for transport purpose. The transport cost varies with the distance (for a 100 km trip traders pay around 15-18 Rs $qntl^{-1}$).

- Very little awareness about the market price of Mahua is available with the villagers.

- Big traders dry the mahua flower to ensure minimum wastage due to rotting during storage. 4-6 % loss has been suggested in terms of weight in the process of drying.

- Stored mahua stock is sold during January/February when rate is the highest.

- Small traders cover 18 to 20 villages to collect mahua and primary trade is being practiced within 15-20 km distance. There are 30-40 small traders (<50 Qntl yr^{-1} volume) and 5-10 big traders (>50 Qntl yr^{-1} volume) present in each primary trade center.

- On an average mahua contributes 19% of the total income from NTFPs and allied activities (34 % in Padampur wheras 12% in Hakkaduwa and 2% in Saharitola).

- Primary trade centers for mahua are Kahikund (Saharitola), Jhikpani (Padampur) and Maranghada (Hakkaduwa). Small traders obtain about Rs 100-200 $qntl^{-1}$ profit from mahua flower. The margin of profit is highest at the node of haat trader.

- Most of the mahua flower used in making alcohol while extraction of oil from mahua seed is not practiced. Traditional liquor prepared from the mahua flower is generally used for self consumption but villagers also sell it in bottles @ of Rs. 50-60 $litre^{-1}$.

Value chain of Mahua

Mahua is the key NTFP in Jharkhand. Present study revealed a share 29% of NTFP income generated through mahua. The tree has its cultural and aesthetic values in tribal culture and therefore conserved by the villagers. The tree is often found in the farm, community land and in forests. Most of the trees occurring near the settlements are recognized as being associated to a family but the trees in the forest are common property resources.

In most of the cases immediate sale of mahua is being practiced among tribal people for instant cash requirements (termed as 'distress selling') during the low activity months. In the winter months February, Mahua is bought back by the villagers for domestic use at prices higher than they have sold. **(Figure 9)**

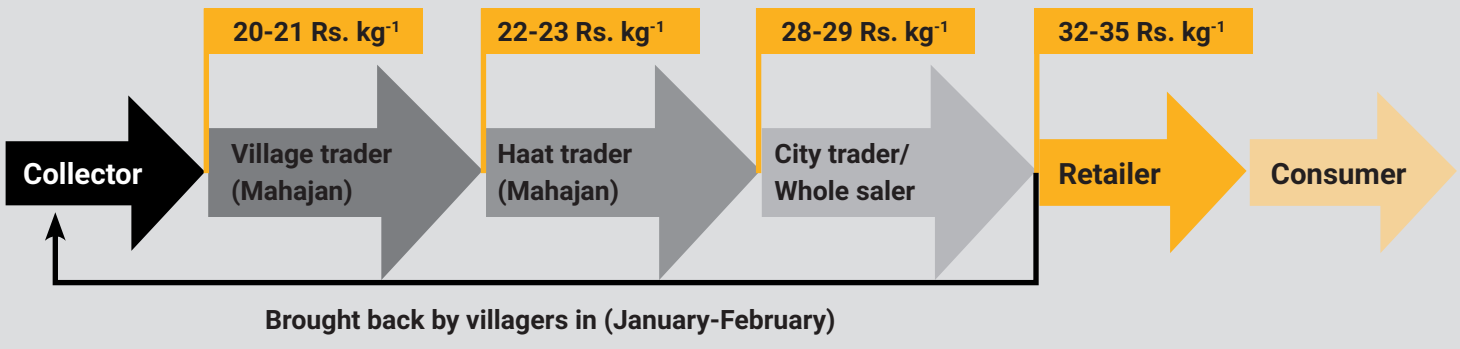


Figure 9. Market-Chain Analysis and margin of benefits at different nodes

SWOT Analysis

Strengths	Weaknesses	Opportunities	Threats
Plenty of Resource Availability	Lack of storage facility within villages	Profitable market mechanism like market linkage and collective marketing	Over harvesting my lead to regeneration and reduce yield
Good share in tribal household income	Lack of proper drying/quality improvement	In-situ and ex-situ conservation	Considered as an intoxicant and therefore storage and transport regulated
High social value hence conserved	Distress selling	Promotion of entrepreneurship through value addition activities and formation of SHGs	Abandonment of mahua collection practice due to low economic returns
High demand in domestic maket	Low priority at policy and planning level	High value products could be developed by further value addition	
High production	Slow growing tree species		

3.7.2 Tamarind (Tamarindus indica)

Tamarind (**Tamarindus indica**), locally called **'Imli'** is distributed throughout of Indian States and Madhya Pradesh, Andhra Pradesh, Uttar Pradesh, Karnataka, Tamil Nadu and Orissa are the major producer states of tamarind in India. There is a long history of using tamarind in Indian cooking. Tamarind has a long self life because of high acidity, around 90%. While most of the tamarind fruits are consumed in domestic market, a part of the quantity is exported. Jharkhand is one of the major producers of tamarind because of abundant resource availability. Most of the tamarind traded from the Jharkhand and from southern Indian states; Andhra Pradesh, Tamilnadu.

Major uses of Tamarind

Tamarind has various uses. The pulp of tamarind has sweet-sour-spicy flavor and extensively used for flavoring. Fruits may be eaten raw but sometime prepared as flavoring agent in various beverages. It is widely used as preservative and flavoring in deserts and

dishes, preparation of pickles, and juice. Along with this, tamarind seed powder is also used to produce starch, cattle feed, paint, gum and plywood industry.

Field observations

- Collection of the tamarind is generally carried out in the months of February and March and some time upto April.

- Most frequently used harvesting practice is to climb the tree and shake or beat the tree to break the pods. Generally male members of the collector family climb up the tree while the others are involved in collection of the fallen pods from the ground. Collectors spend 1-2 days to harvest a single tree.

- After collection de-shelling process starts, in which people remove shell of the pulp by beating with a sticks. De-shelling generally carried out after half to one day of sun-drying.

- Tamarind is generally traded through village traders or in local markets. Either collector goes to the haatia for sale or village level trader directly collects it from the villages.

- Prices of tamarind are not fixed and largely influenced by the production of the crop and market trends. The prices are usually decided by big traders. Prices of tamarind also fluctuate with production of tomato, people of nearby areas and West Bengal often used tamarind as a substitute of tomato.

- The sale price of tamarind is about 18-19 Rs Kg-1 at primary collectors level and it increased gradually with the nodes of market chain.

- Average HH collection in three studied villages was 63.5 kg hh-1yr-1 with 19% (Rs 1199 hh-1yr-1) share from the income obtained from NTFPs. Maximum contribution was recorded in Padampur followed by Hakkaduwa and least in Saharitola village.

Value chain

Tamarind is sold to market both raw and seedless. However, the practice of selling raw tamarind prevalent in the studied villages, the practice of drying was also observed largely to enhance the self life before selling. The studied lack processing practices of tamarind, de-seeding of tamarind at household level and makes it more consumer-friendly. (Figure 10)

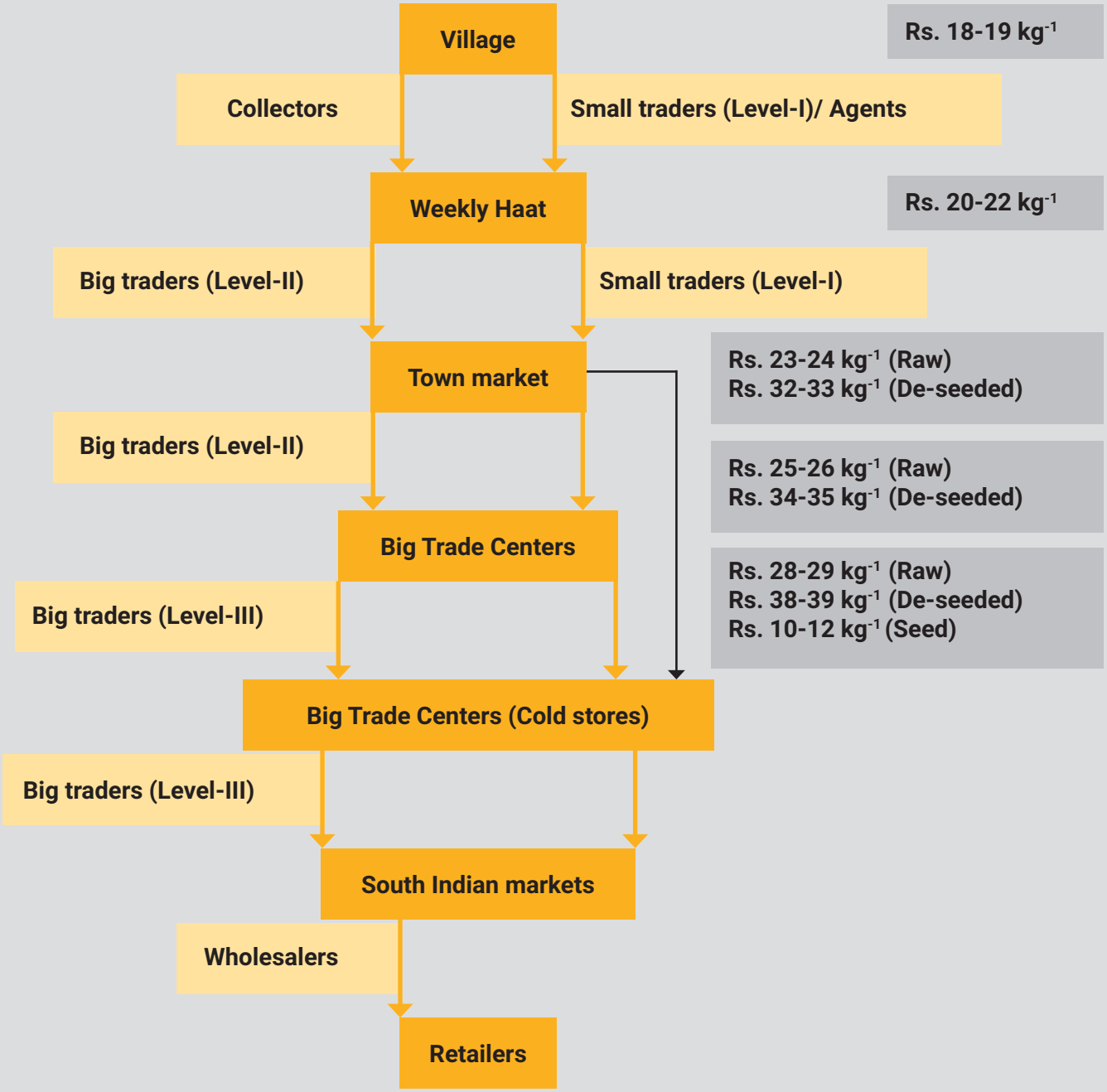


Figure 10. Basic value Chain analysis of Tamarind

SWOT Analysis

Strengths	Weaknesses	Opportunities	Threats
Well distributed resource	Quality not up to mark	Sensitization of people for conservation and sustainable harvesting	Unsustainable harvesting may lead to decline in regeneration
High market demand particularly in South India as well as overseas	Cumbersome collection process	Strengthen processing practices which can enhance profit at collector level	Lopping of branches creating additional stress on tress
Large scale production	Storage issue leads to instant selling at low prices	Formation of cooperative system with cluster approach	Un-predictable market and low returns may create disinterest among primary collectors
Widely used in Indian cooking	Overharvesting	Several value addition possibilities	
		High export potential	

As Mahua, unsustainable harvesting is a problem in Tamarind, almost at the seed pods are extracted unsustainably from the tree, hence natural regeneration hardly takes place.

3.8.1 Lac

Lac is a natural resin secreted by an insect known as **Kerria lacca** (Kerr.) which thrives on the tender twigs of specific host trees, viz. Palas, Dhak (**Butea monosperma**), Ber (**Zizyphus mauritiana**), kusum (**Schleichera oleosa**), semialata (**Flemingia semialata**) **Ficus sp**., etc. In India, lac cultivation is widely practiced in the states of Jharkhand, West Bengal, Chhattisgarh, Madhya Pradesh, Orissa, Maharashtra and parts of Uttar Pradesh, Andhra Pradesh, Gujrat. India is the largest producer of lac in the world, accounting for about 50%– 60% of the total world lac production and about 57% of total lac produced from the state Jharkhand. Lac basically yields three useful materials: resin, dye and wax. Resin is commonly known as lac found in market as shellac or seedlac or button lac. Pruning of host trees, method of inoculation, application of pesticides, forecast of larval emergence and crop harvesting are the major activities in lac cultivation. Pruning of trees are done at 6 and 12 months interval before inoculation of lac insect for Palas and Kusum plant, respectively.

Indian lac insect is known to have two distinct strains 'Kusmi' and 'Rangeeni'. The Kusmi strain is grown on Kusum trees. Crops of Kusmi broodlac are (i) Jethwi (June/July) and (ii) Aghani (Jan. /Feb.). The Ranginee strain thrives on host plants like Palas, Ber and

semialata also has two crops; Katki (Oct. /Nov.) and (ii) Baisakhi (June/July). The kusmi strain is more valuable but less extensively cultivated because of fewer occurrences of kusum trees.

Major uses of Lac

Lac resin being natural, biodegradable and nontoxic, finds applications in food, textiles, and pharmaceutical industries in addition to surface-coating, electrical, and other fields. It is used either in the form of solution in some solvent or as mixture with other substances. Lac finds a wide variety of application in paint, electrical, automobile, cosmetic, adhesive, leather, wood finishing and other industries. Earlier about half of the total output was consumed in gramophone industry. Several other products are produced from the lac i.e. Dyes, Bangles, Varnishes, Paints, Polices, Jewelry, Toys and Handicraft.

Field observations

- Lac cycle starts from pruning of host trees followed by inoculation of lac in host plants
- Inoculation of lac is generally carried out by stick lac and these sticks are removed after 20-25 days. This removed lac is called Phunky lac which assures highest price
- Application of the pesticides is carried out after 40-50 days of inoculation and depends on host plant and environment
- About 42% of income generated through NTFPs comes from Lac and the proportion of income rises up-to 74% in Hakkaduwa village
- PRADAN has taken steps for promoting lac as an enterprise especially in Khunti area.
- Producer level prices vary from Rs. 350-450 per kg for Rangeeni and Rs. 450-550 per kg for Kusmi.
- People generally cultivate Rangeeni lac due to availability of brood lac and abundance of host plants
- Premature harvesting is a common practice for instant cash requirements

Value chain of Lac

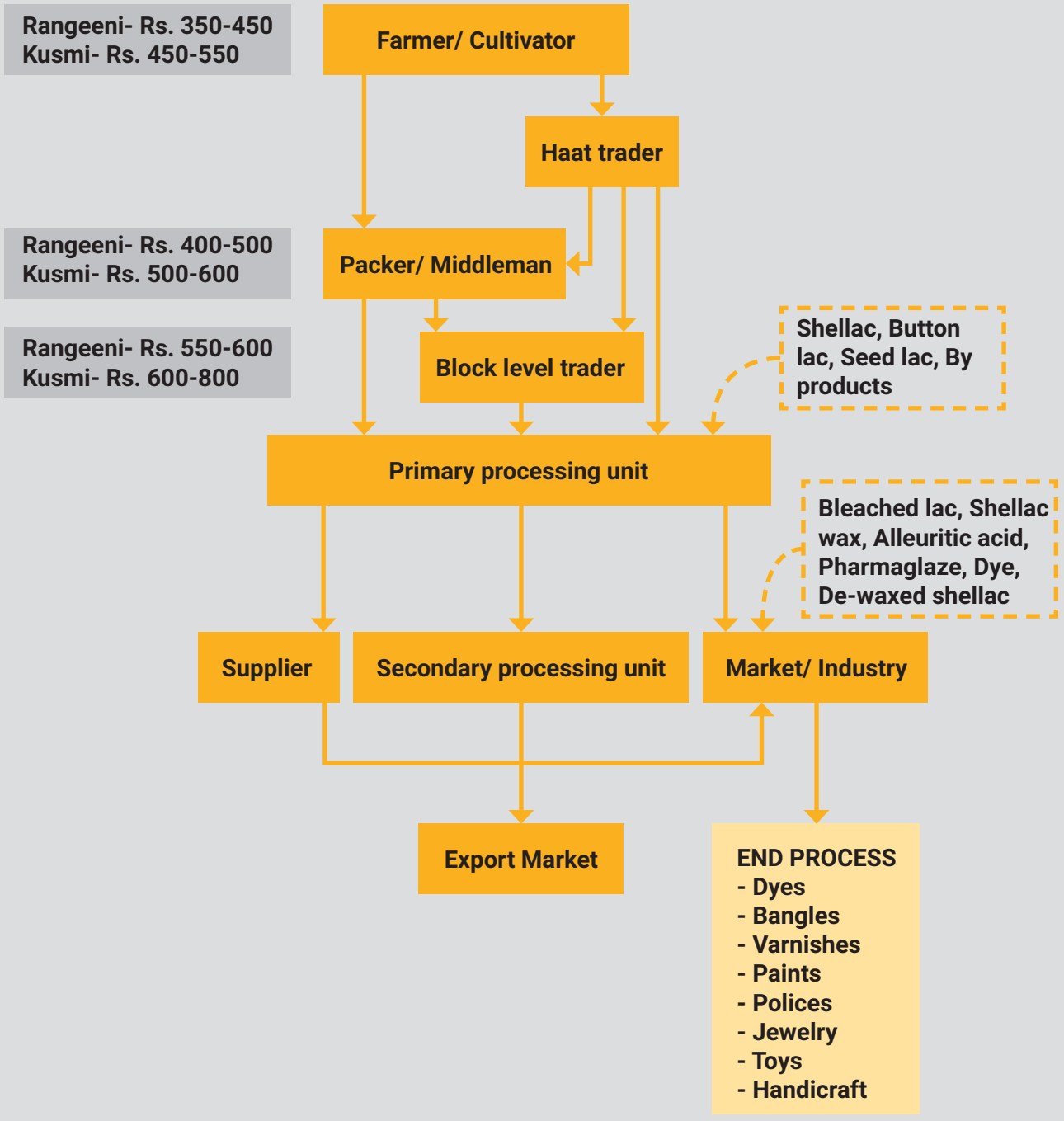


Figure 11. Basic value chain of Lac

SWOT Analysis

Strengths	Weaknesses	Opportunities	Threats
Supportive climatic conditions especially temperature	Lack of seed (brood lac) material	Additional income besides agriculture and daily wages	Excessive pruning declines yield
Increasing market demand and strong export market	Early/premature harvesting for instant money lowered the yield	Plantation of host plants also provide several intangible benefits	Continuous cultivation on same host plant often damages host plants
Active participation of women in lac commercialization	Low bargaining capacity of cultivators restrict them for maximum gain	Abundant resource availability of host plants	Natural/unidentified infection
Technical support of NGOs like PRADAN	Lacking training on pest control management	Introduction of new host plants like semialata **(Flemingia semialata)**	A shortage of supply and high Lac export prices have reduced market uptake and encouraged substitutes
High income generating activity	Climate risks - temperature, hailstone, rainfall and prolonged fog	Potential of cultivating seed lac (brood lac) within villages	
	No insurance facilities available in case of failure	Opportunity for increased production, processing and collective marketing through cooperative approach	

Chapter 4

Monographs and Case studies on Selected NTFPs

4.1 Madhuca indica (Mahua)

Vernacular Name	: **Mahua, Mhula, Mohwra**
English Name	: **Butter tree**
Trade Name	: **Mahua**
Family	: **Sapotaceae**
Genus	: **Madhuca**
Species	: **Indica**
Parts Used	: **Flower, seeds**

General Description

MAHUA (Madhuca indica) is a fast growing evergreen, spreading branches and large rounded crown tree attains height upto 20 meters. Bark of the tree is grey to black with vertical cracks, exfoliating in thin scales. Leaves are clustered near the ends of branches, elliptic or elliptic-oblong, 7.5- 23 cm x 3.8-11.5 cm, coriacious, pubescent when young, almost glabrous when mature. Flowers are in dense fascicles near ends of branches, many, small; calyx coriacious; corolla tubular, fleshy, cream-colored, about 1.5 cm long, scented, caduceus. There are two species of Mahua which are widely distributed have distinct characters i.e var. **indica** is deciduous (Feb-April) whereas var. **longifolia** is evergreen, leaves of var. longifolia are linear-lanceolate, those of var, indica elliptic or elliptic-oblong. The tree is often referred as "**Tree of the Poor**" as it is major source of food and seasonal income for the tribals.

Fruits are ovoid, fleshy, turning yellowish green when ripe, 3-5 cm long, with prominent distal beak, 6 loci in ovary but usually only developing 1-4 seeds. Fruits ripen in May-July and tree begins to bear fruits at the age of 8-15 years and continues to do so for about 60 years. The tree shows pronounced periodicity with good seed years once or twice in every three years. 100-200 kg fruit per tree can be produced in cultivated areas whereas 20-50 kg fruit per tree can be collected from forest areas.

Seeds are large, 3-4 cm long with moderately hard, elliptical, flattened on one or two sides, brown and shining when mature. Seed weight collected from different sources is 420-670 seeds/kg.

Flowers appear from March to May just before the new leaves flush. It takes about 32-35 days for complete development of visible flower bud to anthesis but flowering varies with the local conditions. Flowering shows a temporal sequence, starting from top portion to the lower branches and also from the more illuminated part to the shaded part of the tree. The plant produces abundant pollen which is shed in clouds when the flowers are disturbed. The freshly dehisced pollen is sticky and becomes viable only after 2 days when dry. Pollination generally occurs through bats (anemophilic) but at times also through predators like monkeys, squirrels and birds. Although the predators help in the dispersal of pollen grains they do not actually transfer pollen grains to the stigma. The elongated style projects out of the flower and beyond the reach of self-pollen and ensures better exposure of stigma to air currents.

Distribution

Mahua is a multipurpose, deciduous tree of dry land areas and native of India. It is mostly grows on wasteland in Northern and Central part of India where generally tropical and subtropical climate prevails. The species is mostly distributed in Eastern Uttar Pradesh, Chhattisgarh, Maharashtra, Bihar, Jharkhand, Odisha and Andhra Pradesh. Madhuca longifolia is largely distributed in South India and in the evergreen forest of Western Ghats. The trees are usually found scattered in pastures and cultivated fields in central India and are extensively cultivated in the vicinity of villages.

Climate and Soil

Mahua prefers tropical and sub tropical climate and withstand drought admirably. Mahua grows up to an altitude of 1200m above mean sea level ranging the temperature between 2-46˚C and mean annual rainfall ranging from 550-1500 mm annually. The mean relative humidity in its natural habitat varies from about 40– 80 % in January and from 80-90% in July. It grows on a variety of soils but prefers sandy soil, shallow-boulder soil and thrive in the Deccan plateau but grows well on alluvial soil in the Indo-Gangetic plain. It is also found in Sal forests and can grow on stiff clay and calcareous soils also. The tree is not affected by excessive monsoon rains and is found growing well on water logged or low-lying clay soils. It has an ability to withstand severe droughts.

Regeneration

The tree reproduces through seed and coppice. The seeds germinate after a good shower of monsoon rains. The seeds which get covered under the soil, germinate better and seedlings establish themselves well while those lying exposed are either attacked by insects or fungus, or their emerging radicles dry up before getting a hold in the soil. Sometimes seedlings get suppressed and killed by tall weeds and grasses. Forest fires, trampling, and browsing by animals also cause heavy mortality to the seedlings. The growth of seedlings from seeds is slow and except in the open seedling regeneration

is quite scanty. The old leaves of mahua are shed from February to April and the trees are often leafless at the time of flowering in the months of March-April. Flowers are in dense clusters at the end of the branches with long pedicels and fleshy corolla. The corolla falls before or with the appearance of new leaves. About 10 year old tree starts flowering and continues to do so for about 60 years in the Northern Gangetic plain where as in Central India tree starts bearing only after 20 years. The mode of pollination in Mahua is anemophilic. The mature fruit fall period is between May-July in North India and August September in South India. The rate of seed setting in Mahua is very low. The fruit development occurs simultaneously along with vegetative bud sprouting. The vegetative sink dominates thereby resulting in the abscission of developing fruit. Coppice regeneration is more reliable.

Cultivation

The trees can be raised by direct sowing or planting out nursery-raised seedlings, the former method is pre-ferred as the seedling develop long and delicate taproot that is difficult to handle during pricking or transplanting. Germination is hypogeal. In direct sowing seeds are sown in 1.5-2.5 cm depth of soil during June-July in well-prepared lines or patches. Nursery-raised seedlings are pricked out into deep containers (bamboo baskets, earthen pots or polythene bags) one month after germination. It can be successfully raised with agricultural crops like pulses and Lucerne with 9m spacing. Regular watering is necessary. The species prefers the pit size of 60 cm^3 with the spacing of 7m × 7m. However, pit size of 30 cm^3 or 45 cm^3 can also be used depending on the nature and thickness of the soil. Generally planting is done during July-September and farmyard manure is applied before planting.

Irrigation

Depends upon the situation of rains, however the planted area should be thoroughly irrigated and in early days of planting at the interval of 5 to 6 days. Basin system of irrigation which has uniform distribution of water should be used for young plantations. For fully grown trees, strip or bed system should be followed. Irrigation should not be given during dormancy or leaf fall period and flowering (March-April). Irrigation after fruit set (May) is important for retention and development of fruits. Normally irrigation is not required for well grown-up trees.

Nutrient

Dose of 10 kg farmyard manure, 100g N_2, 50g P_2O_5 and 75g K_2O plant should be given to one year old plant. It should be increased every year in same proportion up to 10 years. Fully grown trees require 100 kg farmyard manure, 1 Kg N_2, 0.5 Kg K_2O Farmyard manure should be applied during July – August. Half dose of N_2 and full dose of P_2O_5 and K_2O should be applied in July; remaining half dose of N_2 should be applied by end of August under

rain fed conditions. Manure and mixture of fertilizer should be spread under canopy of plants and incorporated in soil. Light interculture is required to keep plantation weed-free. Green mannuring is useful if planted on poor soils. Intercropping with vegetables like bottle guard, lady's finger, cucumber and ridge guard may be followed in inter spaces up to 6-8 years.

Harvesting

Maturity standards in different genotypes of Mahua under different conditions were observed that fruit growth was faster initially and slowed down towards maturity. Titratable acidity increases during initial period of fruit development and then declins. Fruits are ready for harvest by 3rd week of May to 3rd week of June. Seeds are taken out from ripe fruits. They are shelled within a week otherwise they germinate. Once seeds are germinated, they become unfit for oil extraction. Kernels obtained after shelling should be dried up to moisture content of 6% because seeds containing more 7-8% moisture are liable to fungal attack. Dried Kernels can be utilized for extraction of oil. Kernels can be packed in gunny bags and stored for a year.

Yield of Mahua flowers depends mainly on the size of the tree, site conditions, age etc and obtained in terms of flowers and seeds. Creamy colour fleshy corolla (flowers) falls in early hours of morning. Yields may vary from 5 kg to about 200 kg per tree depending upon the size and age of the tree. The average yield of kernel is 60-80 Kg/year. It is observed that the yield increases by age. Studies on the assessment of productivity of Mahua trees have revealed that fruit production is higher in trees of higher girth class. Seasonality in the yield of Mahua flowers apart from other factors also appear to be correlated with rainfall. However, more detailed studies are required to reach to a conclusion. Total yield of Mahua flowers in the country is estimated to be of the order of about fifteen lakh to twenty lakh tonnes. There is a tremendous scope of increasing this production by raising Mahua plantations either pure or in mixture under different edaphic conditions.

Uses

Edible: Mahua flowers are a rich source of sugar, vitamins and calcium and offer wholesome nourishment when boiled with rice. Efforts are on to encourage the consumption of Mahua flowers in its processed form in urban areas. From the nutritional point of view these flowers, are richer than maize in carbohydrates, protein, minerals and vitamins. The flowers are considered as good food as well as tonic and demulcent. In view of their high sugar content and absence of any toxic effects, the flowers of Mahua are traditionally eaten by tribals and for other rural people. The fruits are eaten raw. On distillation they give yellow oil. The seeds also give quality oil which is yellow in colour which is used in the preparation of soaps, particularly laundry soap. In some rural areas, it is also used for cooking. Refined oil finds use in the manufacture of lubricating greases

and fatty alcohols. It is also useful in treatment of rheumatism and skin diseases. Mahua oil is used in medicine as emollient, and headaches and also good laxative in habitual constipation, piles and hemorrhoids.

Alcohol: Alcohol yield is about 340 litres/tonnes of dried flower. Fruit pulp may also be used for alcohol production. One tonne of dry fruit yield 110 litres of absolute alcohol. Seed cake with cow-dung yields biogas and fertilizers.

Wood as small timber: The wood is hard, heavy, strong but liable to split. It is used for building purposes, furniture, tannery, sports goods, musical instruments, oil and sugar presses, ship building, agricultural implements, carving, etc. Wood is close and straight grained, very flexible and durable and difficult to saw. Bark yields tannin (17%) which is used for dyeing.

Leaves: Mahua leaves are of nutritive value for cattle. The trees are lopped for fodder in Madhya Pradesh, Maharashtra, Orissa and Uttar Pradesh. Flowers and fruits can also be fed to cattle's. The leaves are also used for making cups and plates on which food is served during festival days by tribal and poor villagers.

Fuel wood: Wood is hard and heavy, good fuel wood, calorific value of sapwood range between 4,890-4,978 k cals/kg and of heart-wood is 5,005-5,224 k cals per kilograms. Flowers yield alcohol which can be used as engine fuel.

Cake as manure: The cake is unfit as animal feed but used as manure either alone or mixed with other cakes and ammonium sulphate. Saponins free cake could be useful as feed, but needs supplementation with suitable protein. It also possesses insecticidal and pesticide properties similar to the neem cake. It is used in lawns and golf greens as a fertilizer and pesticide. The smoke of Mahua cake is believed to drive away snakes and insects. Tribal of Bihar, Orissa and West Bengal used Mahua cake for drugging fish to catch them. It is also used in snake bite treatment.

Economic value

According to a study conducted by the Indian Institute of Forest Management (IIFM), annual yield of Mahua flower is approximate 15,00,000 quintals per year. The prices of Mahua flowers vary year to year and even during the same year. General prices of Mahua flowers remainRs. 1,300-1,500 per quintal but during the off season their price may increase upto Rs. 2,200-2,500 per quintal (IIFM). The use of Mahua in the tribal part of the country rarely provides trading of Mahua flowers and it is mainly traded among tribals. The flower can be used for various purposes and could be developed as enterprise for the local people with the help of government. The seed of Mahua tree is known for

its oil yielding capacity and research has been carried out to utilize it as a source of energy. Seeds are also used for manufacturing soaps. The annual production of Mahua seeds according to IIFM is 10,85,300 quintals per year and the prices varies 1,000-1,500 per quintal. The wood is also used for making furniture; door frames, etc.

Threats and Conservation

Mahua individuals are distributed mostly in non-forestlands reflects a picture of destructive harvesting due to various domestic uses. The skewed distribution of the species along with complete loss of certain age classes (Sutar, 2003) and complete removal of Mahua seeds has resulted into low regeneration. There are several causes of disturbance in mahua (Sutar 2003): failure of seedlings establishment because of dense canopy, extensive forest fire[3] during the summer, grazing pressure by cattle and fungus attack, increased anthropogenic pressure vs slow growth and establishment of seedlings and lopping pressure on the species.

4.2 Tamarindus indica L. (Tamarind)

Vernacular Name	: **Imli**
English Name	: **Tamarind**
Trade Name	: **Tamarind**
Family	: **Fabaceae**
Genus	: **Tamarindus L.**
Species	: **indica**
Parts Used	: **Pods, Fruit**

General Description

Tamarind is a large tree upto 20m height. It is an evergreen tree with an exceptionally beautiful spreading crown, and is cultivated throughout country, except in the Himalayas and western dry regions. **(Rao et al 1999)** It has high resistance to wind. The bark is dark-gray.

Pods are cinnamon-brown or grayish-brown and tender-skinned with green, highly acidic flesh with soft, whitish and under-developed seeds. As they mature, the pods fill out and the juicy, acidulous pulp turns brown or reddish-brown. The skin becomes a brittle, easily cracked shell and the pulp dehydrates naturally to a sticky paste enclosed by a few coarse strands of fiber. Seeds are hard, glossy-brown and each is enclosed in a parchment like membrane. Fruit is an indehiscent legume, sometimes called a pod, 12 to 15 cm (3 to 6 inches) in length, with a hard, brown shell **(Doughari, 2006)**.

[3] Forest fire occurs in the wild due to various reasons. Lighting fire to get clean forest floor for easy collection of Mahula flowers, to augment the Kendu leaf (beedi leaves) production, hunting wild animals etc.

Distribution

Tamarind is native to tropical Africa, where it grows in wild. It has been so long ago introduced into India that it has often been reported as indigenous **(Morton, 1987)**. In India, it is chiefly grown in Madhya Pradesh, Andhra Pradesh, Tamil Nadu, and Karnataka and also found in central Indian States. Tamarind trees are usually found scattered in pastures and cultivated fields and are extensively cultivated in fringe area of villages.

Climate and Soil

Tamarind is not very exacting in its soil requirements. It can grow well in any kind of soil provided there is sufficient moisture in the soil. If tamarind plants are grown in dry sandy and salty soils, they require frequent irrigation during the initial stage of their establishment. They should be irrigated at an interval of 10-15 days, especially in summer, till they are 5 to 6 years old. A compost of fibrous loam and sand suits the tamarind plants. It prefers warm climate and grows well in semi-arid tropical and sub-tropical regions. It also grows well in monsoon dominated regions with good drainage. It is very sensitive to frost and fruits do not ripe in cold climate. Tamarind trees are found growing naturally up to an elevation of 500 m from mean sea level.

Regeneration

Tamarind seeds remain viable for months and germinate in a week after planting. In the past, propagation has been customarily by seed sown in position, with thorny branches protecting the young seedlings. Recently nurseries have been used to grow seedlings. Owing to its commercial potential there has been a great deal of interest in vegetative propagation of selected varieties. The tree can be grown easily from cuttings, or by shield-budding, side-veneer grafting, or air-layering

Cultivation

Seed propagation involves the collection, preparation and direct planting of the seed into soil/compost. This method is very simple, however the quality of the new offspring cannot be guaranteed (not true-to-type) and the time taken for the tree to reach bearing age is usually longer than for trees propagated using vegetative methods. **Vegetative propagation** involves the growth of the new tree from a shoot, bud or cutting of a mature, 'good quality' or 'plus' tree. This guarantees the quality of the new tree. The best time to begin propagation depends on the local climate, water availability and method of propagation. Seed propagation is limited by the fruiting time of the mature and healthy trees from which the seeds are to be collected. Vegetative propagation, on the other hand, does not have the same limitation. Scions (shoot/buds) can be obtained throughout the year; however collection is dependent on the stage of tree growth of the mother plant. Regardless of which propagation method is used, it is essential to select a tree with good

qualities, referred to above as 'plus' tree, from which to collect either seeds or vegetative material.
(http://www.cropsforthefuture.org/publication/Manuals/tamarind%20manual.pdf)

Harvesting
Tamarinds may be left on the tree for as long as for 6 months after maturity so that the moisture content will be reduced to 20% or lower. Fruits for immediate processing are often harvested by pulling the pod away from the stalk which is left with the long, longitudinal fibers attached. In India, harvesters may merely shake the branches to cause mature fruits to fall and they leave the remainder to fall naturally when ripe. To keep the fruit intact for marketing, the stalks must be clipped from the branches so that minimal damage the shell takes place.

Yield
A mature tree may annually produce 330 to 500 lbs (150-225 kg) of fruits, of which the pulp may constitute 30 to 55%, the shells and fiber, 11 to 30 %, and the seeds, 33 to 40%.
(http://www.tamarindfruit.com/harvest.php?MENU=4)

Uses
From the fruits of the tamarind tree comes the sticky acidic pulp that has been used as a food ingredient for thousands of years. In India, the fruit pulp of tamarind is also eaten raw and sweetened with sugar. **(Lotschert et al 1994)** Tamarind pulp is used as a raw material for the manufacture of several industrial products, such as Tamarind Juice Concentrate, Tamarind Pulp Powder, tartaric acid, pectin, tartarates, and alcohol. **(CFTRI, 1982)** Earlier the pulp was traded widely leading to the extensive use and cultivation of the tamarind, which in turn has resulted in the widespread tropical distribution of this species. The edible fruits, and especially the pulp, can be eaten raw or used as an ingredient in curries, pickles, confectionery and in fermented drinks. The seeds can be eaten raw or cooked. Tamarind wood is used as timber, firewood and for charcoal. Other uses of the species include medicines, dyes and for planting as an ornamental.
(http://www.kew.org/plants-fungi/Tamarindus-indica.htm).

Tamarind Kernel Powder (TKP) produced from the seeds is another commercial product and is often reported in commercial digests. **(Mathur and Mathur, 2001)**

Economic Value
In a study conducted in Maharashtra, **Joshua et al, (2006)** evaluated the cost of establishment of 40 tamarind grafts per hectare of land is INR 6,100. The expenditure on maintenance, according to respondents, is about INR 2,300 in the second year. It declines

gradually and stabilizes in the fifth year at INR 1,000. The first commercial harvest of about 5 kg became available in most farms when the trees were six years old. At maturity (12-15 years) the yields are expected to rise as high as yield 100 kg or more. **(Joshua et al, 2006)**

Food Value per 100 g of Edible Portion

	Pulp (ripe)	Leaves (young)	Flowers
Calories	115		
Moisture	28.2-52 g	70.5 g	80 g
Protein	3.10 g	5.8 g	0.45 g
Fat	0.1 g	2.1 g	1.54 g
Fiber	5.6 g	1.9 g	1.5 g
Carbohydrates	67.4 g	18.2 g	
Invert Sugars	30-41 g		
Ash	2.9 g	1.5 g	0.72 g
Calcium	35-170 mg	101 mg	35.5 mg
Magnesium		71 mg	
Phosphorus	54-110 mg	140 mg	45.6 mg
Iron	1.3-10.9 mg	5.2 mg	1.5 mg
Copper		2.09 mg	
Chlorine		94 mg	
Sulfur		63 mg	
Sodium	24 mg		
Potassium	375 mg		
Vitamin A	15 I.U.	250 mcg	0.31 mg
Thiamine	0.16 mg	0.24 mg	0.072 mg
Riboflavin	0.07 mg	0.17 mg	0.148 mg
Niacin	0.6-0.7 mg	4.1 mg	1.14 mg
Ascorbic Acid	0.7-3.0 mg	3.0 mg	13.8 mg
Oxalic Acid		196 mg	
Tartaric Acid	8-23.8 mg		
Oxalic Acid	trace only		

Source: http://www.hort.purdue.edu/newcrop/morton/tamarind.html

Threats and Conservation

The most serious pests of the tamarind are scale insects (**Aonidiella orientalis, Aspidiotus destructor and Saisetia oleae**), mealy-bugs (**Nipaecoccus viridis and Planococcus lilacinus**), and a borer (**Pachymerus gonagra**). Stored fruit is commonly infested whereas larvae of the groundnut bruchid beetle are serious pests that attack the fruit and seed in India. In some seasons, fruit borers may inflict serious damage to maturing fruits causing a great reduction in marketable yield. Diseases which have been reported from India

include: leaf spot, powdery mildews, a sooty mould, stem disease, root and wood rot, stem canker, a bark parasite and a bacterial leaf-spot.
[http://www.worldagroforestry.org/sea/products/afdbases/af/asp/SpeciesInfo.asp?SpID=1589]

Un-sustainable harvesting especially lopping of branches creates additional stress on trees which ultimately may leads to decline in regeneration of the species.

4.3 LAC: Kerria lacca (Kerr, 1782)

Kingdom	: **Animalia**
Phylum	: **Arthopoda**
Class	: **Insect**
Order	: **Hemiptera**
Super family	: **Coccoidea**
Family	: **Kerriidae**
Genus	: **Kerria**
Species	: **lacca**
Vernacular name	: **Lakh**

General Information

Lac is a natural resin secreted by an insect known as Kerria lacca (**Kerr**.) which thrives on the tender twigs of specific host trees, viz. Palas-Dhak (**Butea monosperma**), Ber (**Zizyphus mauritiana**), Kusum (**Schleichera oleosa**), **Ficus sp**., etc. The total numbers of lac insect species reported from the world are 87 under nine genera, of which 19 species belonging to two genera are found in India (**Sharma et al 1999**). The la insects are very small in size and attach themselves in great numbers to plants. The mouth part of these insects is piercing and sucking type. Lac resin being natural, biodegradable and nontoxic, finds applications in food, textiles, and pharmaceutical industries in addition to surface-coating, electrical, and other fields. It provides immense employment opportunities in the country (**Sharma et al 2006**).

Distribution

Lac insects are found distributed in South-East Asian countries mainly in India, Myanmar, Thailand, Malaya and China. Among these, India and China are main areas in the world. India has prime position I relation to lac production. In India, lac cultivation is widely practiced in the states of Jharkhand, West Bengal, Chhattisgarh, Madhya Pradesh, Orissa, Maharashtra and parts of Uttar Pradesh, Andhra Pradesh and Gujarat. Over 90% of Indian

lac produced comes from the states of Bihar, Jharkhand, West Bengal, Madhya Pradesh, Chhattisgarh, Eastern Maharashtra and northern Orissa. Some pockets of lac cultivation also exist in Andhra Pradesh, Punjab, Rajasthan, Gujarat, and Mirzapur and Sonebhdra districts of Uttar Pradesh.

Climate

A hot and moderate dry climate is necessary for successful lac culture whereas extremes of dry and wet weathers are injurious to production.

The Host Plants

The Lac insects thrives on twigs of certain plant species for sucking plant sap. These plants are called host plants. There are 113 varieties of Lac host plants reported from India and out of these the most common are:

- Palas :Butea monosperma
- Ber :Zizyphus spp
- Kusum :Schleichera oleosa
- Khair :Acacia catechu
- Babul :Acacia Arabica
- Akashmani :Acacia auriculiformis
- Sal (mysore) :Shorea talura
- Arhar :Cajanus cajan
- Dhaman :Grewia tiliaefolia
- Siris :Albizzia lebbek
- Semilata :Flemingia semialata
- Bargad :Ficus benghalensis
- Peepal :Ficus religiosa

Of these host plants, Palas, Kusum, Ber and Khair are of major importance, while **Flemingia semialata** is emerging as a potential host species in central India. It is also important to mention that the quality of lac is directly related to the host plant and to the strain of lac insects. The industrial parameters consider the kusumi lac to be the most useful one and this therefore fetches higher price in market Flemingia semialata has also been identified as well as established as a good kusumi lac hosts on plantation basis. **Ziziphus spp** (in Jharkhand) is also being grown for enhancing the kusumi lac cultivation.

Cultivation

Indian lac insect is known to have two distinct strains 'Kusumi' and 'Rangeeni'. The Kusumi strain is grown on Kusum trees. Crops of Kusumi broodlac are (i) Jethwi (June/ July) and (ii) Aghani (Jan. /Feb.). The Ranginee strain thrives on host plants like Palas,

Ber and semialata also has two crops; Katki (Oct. /Nov.) and (ii) Baisakhi (June/July). The kusumi strain is more valuable but less extensively cultivated because of fewer occurrences of kusum trees.Two distinct strains 'Kusumi' and 'Rangeeni' widely present in India.

The Kusumi strain is grown on Kusum or on other alternate host plants using Kusumi broodlac and the crops are (i) Jethwi (June/July) and (ii) Aghani (Jan. /Feb.). The Ranging strain thrives on host plants like Palas and it has also two crops; they are (i) Katki (Oct. /Nov.) and (ii) Baisakhi (June/July). Pruning of host trees and method of inoculation (Kumar et al., 2002; Sharma, 2007 and Sharma et al., 2007), and application of pesticides, forecast of larval emergence and crop harvesting (Sharma and Jaiswal, 2002) were done in time. Pruning of trees were done 6 and 12 months before inoculation of lac insect for both Palas and Kusum plant, respectively. There is on an average a price difference of atleast 40 – 60 % (if not more) between the two varieties. These depend on the resin content and also on the colour of the product that comes out from the raw materials.

Yield of the lac is much depends on the locality factors and host-plants. Two crops a year may be obtained one ("Baishakhi" or summer crop) taking about 4 months between May to August and another ("Katiki" or winter crop) taking 4 months from October to January. Some trees e.g. Kusum, bears a good crop only every second or third year. The annual yield of stick-lac per year per tree may be only 1 to 1.5 kg or as much as 8-16 kg in case of well maintained trees. In the central provinces of India, an average of 340 kg per hectare is said to be often obtained from "Palas" Butea trees; taking into consideration of 280 to 300 trees per hectare. Prices fluctuate considerably, the best grades commanding quite a high price in the market. (Chandy, 2000)

Producer level prices vary from 350-450 for Rangeeni and 450-550 for Kusumi which has been observed in primary study carried out by CEDAR, Dehradun.

Life cycle of the Insect

The whole life cycle of lac insect takes about six months and consists of four different stages- egg, nymph, pupa and adult. The female lays around 200-500 eggs with fully developed embryo. Eggs hatch within few hours and emergence of crawler nymphs take place. Next five weeks are crucial because at this important stage nymphs crawl on the branches and it would be important to take out the twigs at this stage and tie them to the branches. At this stage, both male and female nymphs live on the sap of the trees at a rate of 200-300 insects per square inch. **[http://www.cgsird.gov.in/Lac%20-Version%20-2.pdf]** Later they settled down and start sucking saps. After a day or so, they start secreting resin from the glands distributed under the cuticle throughout the body, except mouth parts, breathing spiracles and anus. This resin is semi-solid and hardens on exposure to air into

a protective covering. The nymphs molts thrice inside the cells before reaching maturity. The nymphs molts thrice inside the cells before reaching maturity. The duration of each of this in-star is dependent on several factors, viz. temperature, humidity and the host plant on which it preys. Any variation in mean temperature, humidity is likely to affect the production process. Both male and female larvae become sexually mature in about eight weeks. Male undergoes a complete metamorphosis and the adult male is winged and walks over the females and fertilized them. The female remains fixed to he twigs and slowly increased its size after fertilization to accommodate their eggs. The lac resin also gets secreted at a faster rate, and a continuous layer grows into one body. After about fourteen weeks, the female shrinks in size allowing light to pass into the cell and the space for the eggs. About this time, two yellow spots appear at the rear end of the cell. The spots enlarge and become orange coloured. When this happens, the female has deposited a large number of eggs in the space called 'Ovisac'. The ovisac appears orange due to the crimson fluid also called the lac dye. Once this is noticed one can surely be ready as this stage indicates that the eggs are to hatch in a week time. When the egg hatches, the larvae emerge and the whole process begins all over again.

Different form of Lac

Stick lac

The lac encrustations is separated by knife or broken off with finger from the twig of host plants

Seed lac

The stick lac, after grinding and washing

Shellac

The manufactured product prepared from stick lac after washing and melting, which takes the form of yellow colored flakes

Button lac

After melting process, lac is dropped on a zinc sheet and allowed to spread out into round discs of about 3" diameter and 1/4" thickness

Garnet lac

It is prepared form inferior seed lac or kiri by the solvent extraction process. It is dark in colour and comparatively free from wax

Bleached lac

It is a refined product obtained by chemical treatment. It is prepared by dissolving

shellac or seed lac in Sodium carbonate solution, bleaching the solution with Sodium hypochlorite and precipitating the resin with sulphuric acid. Bleached lac deteriorates quickly and should be used within 2-3 months of manufacture

Uses

Lac resin being natural, biodegradable and nontoxic, finds applications in food, textiles, and pharmaceutical industries in addition to surface-coating, electrical, and other fields. It is used either in the form of solution in some solvent or as mixture with other substances. Lac finds a wide variety of application in paint, electrical, automobile, cosmetic, adhesive, leather, wood finishing and other industries. Earlier about half of the total output was consumed in gramophone industry. Several other products are produced from the lac i.e. Dyes, Bangles, Varnishes, Paints, Polices, Jewelry, Toys and Handicraft.

Threats and conservation

India has about 200 million lac host trees (Paul et al 2013) and excessive and continues pruning often damages host plant and declines yield therefore, plant health and conservation is one of the big issue in lac cultivation. Many parasitic species lay eggs on the body of lac insects. The grubs on hatching feed on the lac insects and mature adults emerge from the lac cell by cutting circular holes. The damage due to parasites is usually 5-10 percent. Main predators are two moths, Eublemma anabilis, and Holocera pulverea, and three species of Chrysopa (Lacewings). The caterpillars of two moths tunnel through and eat away lac encrustations as well as insects, whereas larvae of Chrysopa sp. suck the body fluids of lac insects. The damage is about 40 per cent. Some insect are indirectly beneficial to lac cultivation in a way, that they keep off the parasites enemy insects. Some ants act as body guard for lac insect. Beneficial insects mostly belong to the group of Chaleids, braconoids, ichneumtids and bethylids. These parasitize, the eggs or larvae of Eublemma anabalis and Holocera pulverea. (Chandy, 2000)

Promotion of scientific approaches in lac cultivation is an assured ecological approach for economic development. To maintain sustainability, always avoid cultivation of early and late varieties of lac in the same locality. Scrapping of lac should be done immediately after harvesting whereas always ensure killing of larvae and pupae of the pests by burning, fumigating or using chemicals. A 60-80 mesh wire gauge baskets should be used during encasing of brood lac for inoculation in order to check the larvae of insect enemies.

4.4 Case study: Potential of Sal Seeds for Enterprise Development in Central India

Introduction

Sal (**Shorea robusta Gaertn. f.**) is an important timber species spread across 10 million ha in India (**Chitale and Behera, 2012**) covering approximately 14% of the total forest area of the country. Broadly, sal's natural range lies between the longitudes of 75° and 95° E and the latitudes of 20° to 32° N. Within this range, the distribution is controlled firstly by climate and then by edaphic factors (**Gautam and Devoe, 2004**). The spread of Sal forest ranges from Uttarakhand in the north up to Andhra Pradesh in the south and Tripura in the east; covering Himachal Pradesh,Haryana, Uttar Pradesh (UP), Bihar, West Bengal, Odisha, Madhya Pradesh, Chhattisgarh, Maharashtra, Jharkhand, Sikkim, Assam and Meghalaya **(Chitale and Behera, 2012; Champion and Seth, 1968)** (Fig 12). A Sal forest apart from providing timber provides fuelwood and fodder, seeds for oil and tannin and gum from bark. It forms a key component for a diverse range of products including oil, soap and coca butter equivalent (CBE) in chocolate manufacturing purposes. Around 30 millions of forest dwellers, mostly tribal people, depend on the seeds, leaves and resins from Sal trees for their livelihood in Central India **(Patnaik, 2009)**.

Fig 12. Map showing distribution of sal (After Troup, 1921. Rev 1980) adopted from Tewari 1995

Sal is a moderate seeder, having an average seed year every two years and a good seed year every 3-5 years **(Luna 2005, Champion and Seth, 1968)**. The seed ripens from third week of May to first week of July, following the commencement of monsoon in different regions. Seeds production varies from year to year and tree to tree. Winged sal seed production per tree varies from 2 kilograms to 35 kilograms **(Tewari, 1995)**. Number of seeds in one kilogram varies from 516-to 531. **(Luna, 2005; Tewari, 1995)**.

The Planning Commission's Working Group on Forests & Natural Resource Management, 2011 has recommended Sal seed as potential NTFP for enterprise development in Central India along with 20 other NTFPs. In this case study the state of Chattisgarh is considered to access the feasibility of Sal seeds as a potential economic enterprise for the rural/tribal population, the major reason for choosing Chhattisgarh was largely due to the availability of data on wage and sale of sal seeds since the inception of the state. Data on sal seeds for other central Indian states with sal domination is hard to come by (Jharkhand and Orissa). Madhya Pradesh has induced ban on collection of sal seeds since 2006 to promote

natural regeneration of sal in the state, hence the data availability is only from 2001- 2006.

The total geographical area of the state of Chattisgarh is 135,195 km^2 which constitutes 4.1 percent of the land area in country. The total population of the state is 25.54 million **(Census, 2011)** which constitutes about 2.11% of the total population of the country. The rural and urban population of the state is 76.7 percent and 23.2 percent respectively **(FSI, 2011)**. The forest cover of the state based on interpretation of satellite data of Oct 2008- January 2009 is 55,674 km^2 of which 24,245 km^2 forest is under sal domination **(FDGoC, 2013)**. Sal seed is a nationalized[4] commodity in the state of Chhattisgarh and Madhya Pradesh, whereas, in other central Indian states (Jharkhand and Orissa) it is a non-nationalized commodity.

Government data on Wage and Sale of Sal seeds

As per the data of Chhattisgarh Minor Forest Produce Cooperative Federation Ltd (CGMFPFED) from 2001-2012, Rs 289.86 carores were paid as collection wages and Rs. 205.77 carores was the sale value of sal seeds incurring a loss of rupees 84.09 carores in past twelve years. The collection wages were higher than the sale value of the commodity in Chhattisgarh in 5 out of 12 (2003, 2004, 2005, 2009, and 2012) years. These years show high losses in the sale value of the produce **(Fig 13)**. During 2001- 2006 the government of Madhya Pradesh the wages paid and the sale valve of sal seeds are exactly in par (Fig 14). This may be one of the reasons for incurring ban on sal seed collection from the state, as huge amount of government resource is used in procurement and sale of seeds, while no profit was incurred from the commodity. Rather than de-notifying the commodity the forest department veiled it behind the poor regeneration in sal forest. However, Odisha government created an impression that sal seeds are losing demand and therefore left the commodity in the hands of gram panchayats under PESA rules 1996 to determine the fate and price of collectors **(Mahopatra and Patnaik, 2004)**.

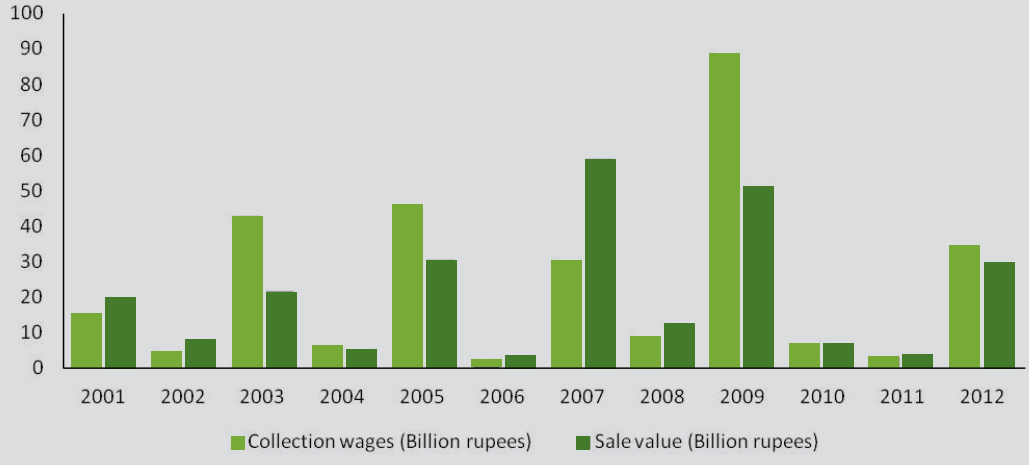


Fig 13. Collection wages and Sale value of Sal seeds in Chattisgarh

(source: Chattisgarh Minor Forest Produce Cooperative Federation Ltd)

[4]"no one other than those permitted by the government or the State government itself can trade in that product. The rest of the trade taking place becomes all illegal". However, nationalization of NTFP's have been overruled by the Forest Rights Act (FRA), 2006 ((2, i) "Minor forest produce includes all non timber forest produce as plant origin including bamboo, brush wood, stumps, cane, tussar, cocoons, honey, wax, lac, tendu or kendu leaves, medicinal plants and herbs, roots tubers and the like". Similarly, Panchayats (Extension to the Scheduled Areas) Act (PESA), 1996 states "complete ownership of minor forest produce to the community/ Gram Sabha"

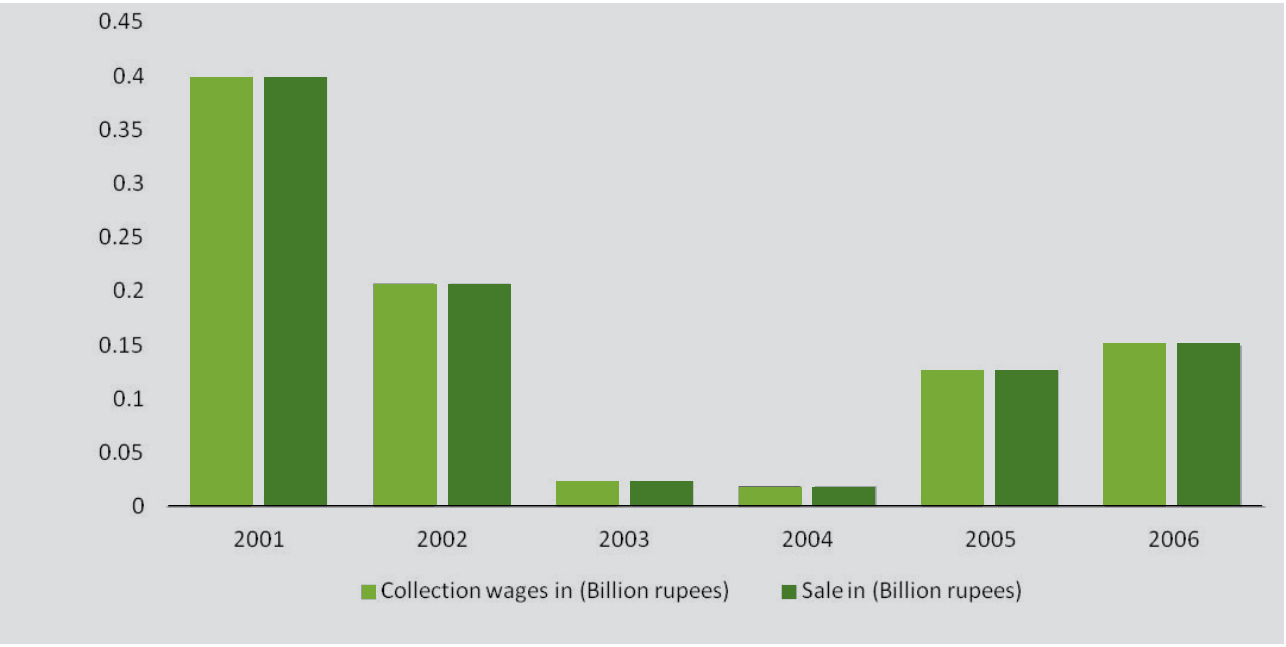


Fig 14.
Collection wages and Sale value of Sal seeds in Madhya Pradesh

(source: M P. State Minor Forest Produce Co-op. Ltd)

From a closer scrutiny of **(Fig.13)** one can categorise the number of low seed collection years, moderate seed collection years and good seed collection years depending on the collection wages paid. As per data of the forest department we have categorized a good seed collection year (> 50 carore rupees paid as wages) a moderate seed year (25-50 carore rupees paid as wages) and a low seed year (< 25 carore rupees paid as wages). Accordingly, in past 12 years there has been 1 good seed collection year (2009), 4, moderate seed collection years (2003, 2005, 2007 and 2012) and 7 low seed collection years (2001, 2002, 2004, 2006, 2008, 2010and 2011). Using common logic that seed collection is directly proportional to the seed production one can assume that a low seed production year is followed by a moderate seed production year while a good seed year is followed by two low seed production years. As for the sale value is concerned, the sale value of the commodity is high in low seed production/ collection years except for the year 2004. While in moderate and good seed years production years the sale value is lower than the wages paid except in 2007. The sale value of sal seeds has not exceed beyond 59.09 carores (2007) in past twelve years whereas, the collection wages given has gone as high as 88.64 (2009) carores. The percentage loss incurred by the Chhattisgarh government was as high as 96.1 percent in 2003 and maximum profit was 48 percent in 2007 **(Fig 15)**.

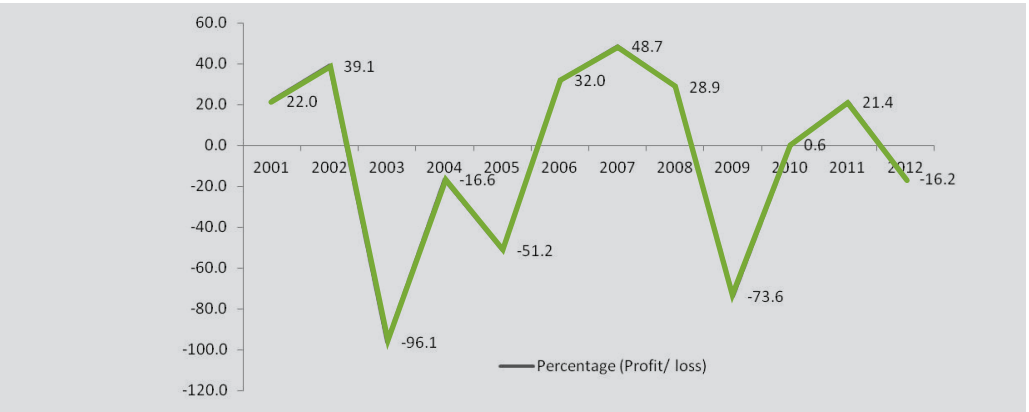


Fig 15.
Year wise profit and loss incurred by the state government in past 12 years

Low returns from sal seed can also be attributed to the procurement of sal seeds collected from the neighboring states like Odisha and Jharkhand where sal seed is a non nationalized commodity and from Madhya Pradesh where the collection is totally banned

Production and diminishing demand

The area of sal forest is approximately 44% (24,245 km^2) of the forest cover in the state. The density of an average sal forest for trees above the age of 20 years 589 trees ha^{-1} derived from **(Luna 2005)** which is equal to 126.6 carore trees in the Chhattisgarh alone. The seed production per tree varies from 35 kg to 2 kg. Using these values the potential of sal seed production is derived which is equal to 49.9 MT of sal seed in a good seed year and 2.8 MT of sal seed in a low seed year. However, it is unwise to assess the potential of sal seeds based on production alone. It is better judged with the population involved in the collection of the commodity. Only 17.7 percent (45.2 lakh) of the state's total population is rural. On an average an individual can collect 6-8 kg of sal seeds per day. Even if take a conservative figure of 2.8 MT it is far beyond the capacity of the entire rural/tribal population to collect such massive volume of seeds in a year. Moreover, the collection is cumbersome and the collection wage for one kg of sal seed is only 5 rupees (stagnant for last 4 years); the primary collectors get much less than 5 rupees per kg as the seeds are sold to the government contractors or middlemen at a lesser price. The actual income to the primary collector is less than 25 rupees a day, much below the standard labor wage prescribed by the government. Hence, only a limited number of individuals from remote areas far from welfare schemes engaged in the activity.

Until, recent times, the best quality of sale oil were exported to developed countries in Europe and North America, where it was used as a substitute of coca butter. The rise and fall in prices is associated with the availability of cheaper substitutes of coca butter and difficulty in adhering to the strict quality specifications posed by the European countries. Low free fatty acid (FFA), below 3.5 % is prescribed by chocolate companies (Patnaik and Mahopatra, undated). Due to huge time gap between collection procurement and pesticide use during storage makes it undesirable for chocolate industries to procure sal oil from India. Cadbury industry in United Kingdom tried to use sal seeds produced from India directly into chocolate making, but found that the seeds from India did not match the quality specifications prescribed by Cadbury. Hindustan lever, also took lead in solving the problems associated with seeds but the silica plant installed to refine sal oil was so expensive that the product became unviable in the international market. Moreover, the Prevention of food Adulteration (PFA) Rules, 1954 restricts the use of sal fat in number of edible products in India.

Collection and ecological repercussions

Soon after the Mahua and Tendu collection is over the sal seeds start falling on the ground and collection takes place largely from the first week of May to first week of July providing income to forest dwellers in the lean months during which the agriculture and other activities are restricted. As discussed earlier, collection of sal seeds is a tedious job and involves burning down of the understory to facilitate collection. Natural regeneration of sal has always been poor due to short viability of seeds and the dependence on monsoon rains **(Troup, 1980; Tewai 1995)** in recent years the problem has assumed serious magnitudes. There are evidences to indicate that collection of sal seeds is causing seed deficit for natural regeneration in certain localities **(Luna, 2005)** furthermore, trampling of seedlings and human induced fires for collection of seeds cause mortality of established seedlings. Moreover, human induced fires may reduce the soil moisture content a key factor that influences the distribution of sal in India, with more than 90% certainty. **Chitale and Behera (2012)** have predicted the distribution of sal shift from northern and eastern India. While **Singh and Singh, 2013** have emphasized that weather patterns induced by climate change will further reduce the regeneration in sal forest.

Chapter 5

Conclusion and Recommendations

Although, the contribution of NTFPs in rural livelihoods and income generation have received widespread attention over the years, the NTFP sector has remained unorganised and underdeveloped in the country. Contradicting policies, undefined ownership rights and inconsistent legal provisions across the states in India are some of the issues related to the measured development of NTFP subsector in over the years. One such example is bamboo, as per FRA, 2006 it is a minor forest produce; but Indian Forest Act, 1927 treats it at par with timber **(Planning commission 2011)**. Another example is Mahua, many states have de-notified mahua from the list of nationalised products giving freedom to the local people for collection and

trade, but the Excise policy of the government curtails this freedom. Monopoly of states over several important NTFPs has remained unchanged even after the Panchayats (Extension to the Scheduled Areas) Act (PESA), 1996 and the de-notification of NTFPs under the Forest Rights Act (FRA), 2006.

The neglect of NTFPs under the timber centric management of the forest department has kept the NTFP sector suppressed in majority of states in India. Diversion of land use for non forestry purposes and unsustainable harvesting of NTFPs have lead to sharp decline of the existing resource. Uncertain market (except for tendu leaves and bamboo), lack of skill among the primary collectors in value addition cause the primary suppliers lose a substantial part of the possible income. Inadequate capacity of authorised agencies to successfully manage the trade affairs combined with unfavorable domestic policy further pose problems to the development of NTFP sector in India. For example: sal seed butter which can be used in Europe in chocolate making is restricted under the Prevention of Food Adulteration (PFA) Rules, 1954 for edible purposes in India. Apart from these there is a dearth of information on harvesting levels or techniques of NTFPs from the forests. The little that exists is sketchy and differing and does not lead to convincing results. By and large the understanding of the levels of harvest, sustainable harvesting techniques and propagation of economically valuable NTFPs are inadequate. NTFP collection (legal/ illegal) exists at significant scale in India, but very few estimates are available on the quantities or value of NTFPs being traded most estimates that do exist are only for the commodities under the jurisdiction of the state governments. Primary collectors often provide vague information on NTFP's owing to the fear of being reported to the authorities.

The NTFPs based enterprise development can help promote sustainable resource use and improving the livelihoods of poor local communities in India. In the central Indian states the NTFP sector is afflicted by a number of issues that restrain local communities from effectively gaining from its forest rich resources. Lack of awareness, capacities and stringent government policies and laws, over exploitation of certain NTFP's for short term benefits are some of the problems associated with NTFP's in central India. Apart from these the ever growing demand of market has also resulted in over exploitation of NTFP's, threatening the existence of many species in the region. Together with this the primary collectors are often oppressed by middlemen traders who dominate the often clandestine and disorganized yet strong network NTFP trade in the Central India.

Despite the wide recognition of the NTFPs sector in past few decades, there is a dearth of well defined policy linking local livelihoods of NTFP dependent communities with forest resources. Few studies on NTFP's that exist claim that capacity building of local communities and institutions and encouraging policies may provide continued monetary benefits to the primary collectors while conserving the important natural resources of the region. Similarly, the few community based enterprises that exists also face problems in sustaining these efforts largely due to lack of government interest, policy issues and absence of continued support from development organizations to link the NTFP with markets.

5.1 General Recommendations

- Development of sustainable harvesting protocols for economically important NTFP's though collaboration with scientific institutes/organisations and universities

  Very little is known about the sustainable harvesting of NTFP's. Some of the important species such as Sal, Chironji and Mahua are failing to regenerate because of excessive collection of seeds and fruits. Institutes such as, Institute of Forest Productivity, Ranchi Tropical forest Research Institute, Jabalpur have done considerable work on sustainable harvesting of important species. However the results of their finds are restricted to scientist journals/ books and of little use to forest managers/NGO's and primary collectors due to the technicality involved.

- State wise resource mapping and inventory using GIS and remote sensing in conjunction with ground truthing.

  As very little is known about the type about the number and type of NTFP's existing in a area, focus has largely been on the high volume products in the tropical forests, these forest also have some low volume high value products which have the potential to enhance the livelihood opportunities to the rural people if managed and sustainably harvested.

- Strengthening the capacities of Gram Sabhas and Panchayats to collectively manage NTFP's . Form forest user groups and build capacity to prevent control of resources by few people.

- De-notifying NTFP's has been seen as an important step towards recognizing rights and maximizing benefits to the local people. However the local people do not have the capacity to deal with scale and manage the sector on their own. . Moreover, the NTFP sector is largely driven by rich and powerful people who have gained some political clout. Proper benefit sharing mechanisms and safeguarding rights of primary collectors is imperative. If proper mechanisms are not put in place de-notifying will have little benefit as the power would just be transferred from the government to powerful groups., The primary collectors/ small traders are likely to remain neglected. Developing forward and backward linkages of existing trade involving financial institutions to promote community based micro-enterprises with clear benefit sharing mechanisms

- Help develop adequate infrastructure for storage and post harvesting facilities at local level to avoid distress selling

  Developing block/village level storage facilities to avoid distress selling especially in the case of perishable and disease vulnerable NTFP's

- Capacity building of primary collectors in value of commodities maximise returns to the collectors

  Training primary collectors in value addition of commodities to ensure better price, More often than not the commodities are sold raw to the contactors, value addition would ensure better returns to the primary collectors.

  Promoting the setting of fair and equitable policy for Minimum Support Price (MSP) for major

  NTFP's of each region. The role of government is required for ensuring minimum support price for certain commodities. For example a minimum support price is fixed by the government of Chattisgarh for sal seeds

- Welfare schemes such as MGNREGA should be used to combat the depleting resource base of NTFP in village commons and forest areas.

  Linking government schemes such as MGNREGA and now Green India Mission (GIM)

can be to combat the depleting NTFP resources. While providing employment to the local people and take advantage of international schemes such as REDD+ (Reduction Emissions from Deforestation and forest degradation) in future, enrichment planting of seeds and seedlings of important NTFP's should be promoted through these schemes.

5.2 Jharkhand Specific

The present study reveals a considerable dependence on NTFP's for subsistence of rural people in Jharkhand. As much as 48% of the total household income is generated through the sale of NTFPs in the villages studied. Moreover the majority of NTFPs provide an income in the lean months when agriculture and allied activities are minimal.

Suggested NTFP's for further attention by CINI

Planning Commission's Working Group on Forests & Natural Resource Management, 2011 21 NTFP's have been identified for enterprise development in Central India. On the basis of this report and resource availability in the studied villages we recommended three NTFP's for enterprise development in the studied villages of Jharkhand.

Extensive Plantation of Terminalia arjuna- a tasar host tree

Mahua

While the returns from cultivation of Tassar and Lac are high and provide returns almost round the year, Mahua has emerged as one of the important NTFP owing to the seasonality of the produce and also due to cultural significance and ranked topmost through this analysis for further interventions. Mahua provides the most crucial income during the summer and monsoon months when income generation possibilities are limited and substantial amount of time and upfront cost is required for agriculture. The villagers start facing acute poverty during the summer season, the agriculture yields of the previous year is exhausted by the commencement of summer. It is during the most deficient months that Mahua provides the most essential income to the rural population (Figure 16).

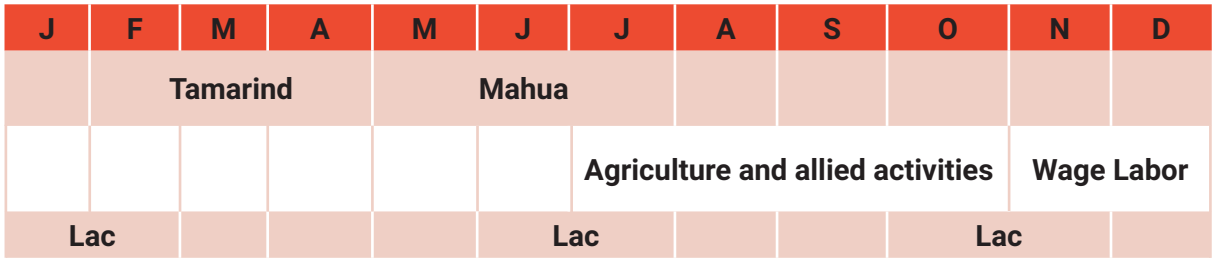


Figure 16. Seasonality of prioritized NTFP collection/harvesting

There are several interventions required to develop it as an enterprise which include

- Storage facility at village level as the flowers and seeds are prone to fungus infestation and to avoid distress selling and ensure better returns
- Capacity building of villagers for value addition
- Scientific harvesting techniques for sustainable productivity (organizations like Institute of Forest Productivity, Ranchi a sister concern of Forest Research Institute have conducted several studies on scientific harvesting techniques of Mahua)
- Policy interventions by the government to introduce Minimum Support Price (MSP) system to ensure definite returns

Tamarind

Owing to its great demand, multifarious uses and availability during the lean season, Tamarind is also an NTFP worth considering for CINI. . Tamarind provides income to the rural population from late winter to early spring. Tamarind revenues become available between the months of February and late April at a time when other incomes are not forthcoming. The income generated through the sale of Tamarind also acts as a cushion

during the summer months. Certain interventions required to develop the NTFP subsector includes

- Capacity building for Value addition of the commodity to avoid distress selling
- Develop scientific harvesting techniques for maximum yield and tree health
- Promotion of collective marketing system

Lac

Although Lac is the important NTFP of the state (Jharkhand is the leading producer of Lac) the above two NTFPs have been given priority over Lac due to following reason

- Considerable amount of scientific and promotional work has been conducted by PRADAN and nevertheless, Lac cannot be ignored as it provides substantial income to the villagers throughout the year. Lac is more or less a full time activity and resources need to be created every year and considerable amount of upfront cost is required for cultivation of Lac often not available with the villagers. The problem of procuring brood Lac was prevalent in all three villages undertaken in the study. Moreover, weather related crop failure is a common problem.

Interventions required in Lac include

- Regulation of premature harvesting for better returns
- Pest and disease control (Indian Lac Research Institute (ILRI), Ranchi can be approached
- Introduction of host plants like (Flemingia semialata) which has attained huge success in Chhattisgarh
- Promotion of village level brood Lac production

5.3 Sal Seed

Sal seed is losing proposition as an NTFP under the current scenario, both the government and community have little to gain from the commodity. The existing resource in all the central Indian states is high and sal seeds have a huge potential in the international market. Certain policy interventions and scientific knowledge can strengthen this NTFP subsector for an enterprise development in Central India. As of now no technology

is available for the local level processing of the sal seed, restricting the scope of the commodity for local level enterprise development. The traditional practices available with the local people are primitive to be used for enterprise development on a larger scale. Besides, unsustainable harvesting, delayed transportation and legal barriers in use of sal fat in food industry act as hurdles for sal seed based enterprise development.

If the sal seed is to develop as an economic enterprise in the Central Indian states as suggested by Planning

Commission's Working Group on Forests & Natural Resource Management, 2011, certain policy interventions would be required. PFA Rules, 1954 needs to be amended to include the use of sal fat/oil in edible products. Developing mechanisms to ensure quality of sal oil would enhance the trade possibilities with the counties in demand of sal oil. While capacity building processing at local level and infrastructure support for storage of sal seeds is also essential to engage more and more people in the enterprise. Ecological research to develop sustainable harvesting protocols and assisted regeneration is needed to ensure better regeneration of sal. Apart from these procurement mechanisms should be developed keeping in view maximizing returns to the tribal people and their welfare.

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