



Usufruct of Mahua (*Madhuca longifolia* var. *latifolia* Roxb. A. Chev.) Resources for Livelihood Enrichment of Local Communities

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Abstract

The present study was carried out during April, 2015–June, 2016 at Navsari Agricultural University, Gujarat, to draw the information about the preference of mahua by the communities in the Gujarat state through Participatory Rural Appraisal (PRA) methodology. Indian butter tree (*Madhuca longifolia* var. *latifolia*) is one of the most important timber and Non-Wood Forest Products (NWFPs) especially flower, fruits and seeds have a major role in the rural economy in tropical India. Since long, local communities and forest dwellers have been using mahua resources for food, medicine, forage and many other domestic purposes. Study quantified the collection of mahua resources, utilization pattern as well as extent and challenges involved in marketing. Paper also highlighted the importance of these native resources in the rural livelihood and level of domestic usage of mahua. Results pointed out that people were more concerned about the self sustenance rather than gaining profit out of this. In the season, entire family members were fully engaged in mahua collection irrespective of age or gender, especially during the lean period that created the employment in real sense and helped to reduce the migration from rural to urban area in some extent. There were lots of efforts initiated from Government to provide a fair price for mahua resources. However, despite Government efforts still there is no stable market price at local level. Silvicultural, technological and policy interventions are highly needed in the sustainable management of this valuable species to enhance the rural livelihood.

Keywords: Forest resource, livelihood, mahua, sustainable management, utilization

1. Introduction

Many rural communities that depend on nearby forests are responsible for the management and conservation on ground zero. These forests provide them benefit from timber and non-timber forest resources, and also create job opportunities for rural communities. Non-Wood Forest Products (NWFPs) play an important role in sustainable livelihood of the tribes living in forest fringes. If knowingly or unknowingly mishandling of products happens resulting in unsustainable utilization, neighbouring communities suffer most from resource degradation. There are numerous edible NWFPs available in tropical forests of India in the form of fruits, flowers, shoots, tubers, mushroom etc. Among these, Indian butter tree or popularly known as mahua (*Madhuca longifolia* var. *latifolia* Roxb. A. Chev.) is one of the most important NTFP, having a major role in the nutrition and economy of tribal communities. Large numbers of mahua trees are found in northern, central

and southern part of peninsular India (Patel and Naik, 2010). According to India State of Forest Report (Anonymous, 2017b), at country level, it was ranked ninth with growing stock of 1.62% based on total volume and 1.22% based on total stem in the forest area. Interestingly, mahua ranked third (Anonymous, 2023) in terms of growing stock (85.23M m³) having 4.37% of total growing stock of tree outside forest (TOF). Mahua can be seen both in forest and non-forest areas (like revenue, community and agricultural land) in Gujarat state. Tree has religious and aesthetic value in the ethos of many tribal communities of the state. Local communities engaged in the collection of various mahua resources like flowers, fruits and seeds. Our field observations shows that it is one of the very important livelihood options and income generating source for the people living near the mahua forest. The flowers are edible and highly rich source of sucrose, protein, vitamins, carbohydrate minerals, enzymes and organic acids and



micronutrients (Ahirwar et al., 2020). Mahua flowers are abundantly rich in sugar, therefore, there exist a significant potential of utilizing mahua flowers for the production of alcoholic beverages (Gupta et al., 2024). However, mahua flowers are either consumed fresh, cooked or fried in different parts of the country apart from alcoholic usage (Bakhara et al., 2016; Parmar et al., 2022). The tribal people use these products irrespective of their age and gender. Mahua being a very versatile tree is a good source of food, fodder, medicine, energy, nutrition and income for the dependent dwellers. Systematic information regarding collection pattern of mahua wild resources its prototypes and utilization extent is lacking. Without knowing these dependency and collection /harvest patterns it will be difficult to framework the management plan for the resources like mahua in which is entirely collected from wild. Ecological services of the species are equally important as it provide food and shelter to wildlife as well. The flowers and fruits are very important summer food for many species of birds and animals (Anonymous, 2017a). Animal like giant flying squirrel is highly dependent on this tree species for its survival. Tall heightened mahua trees are reported as the most important for roosting, nesting of raptors and grey hornbill. In order to manage the resource in harmonious manner the details of current utilization patterns are very much essential. Keeping the importance of common property resource management needs in view, the study was designed to generate data on collection and utilization pattern of mahua in the resource rich areas. Such studies generally helpful to forest resource managers, rural development practitioners, and administrator and policy makers for utilize potential of forestry for forest protection, community strengthening and economic development (Anup, 2017). The study is unique which could able to document the information about the collection prototype of the native tropical tree based resource like mahua produces by the indigenous communities living in and around the forested landscapes of Gujarat. Current study exclusively showed the product wise utilization potential as well as their importance in the livelihood enhancement of the local people was highlighted.

2. Materials and Methods

The present study was carried out during April, 2015–June, 2016 at Navsari Agricultural University, Gujarat in thirteen natural mahua populations distributed in three different zones of Gujarat viz., Central zone, South-eastern zone and Southern zone, following the classification made by Gujarat Ecological Education and Research (GEER) Foundation, Gandhinagar and Gujarat Forest Department for their use in conservation, assessment and management plan studies. Details of physical and geographical descriptions are mentioned in Table 1 and locations of selected villages used in the study are depicted in Figure 1. In order to document the collection prototype and utilization pattern of mahua resources, 13 locations were visited and all the information was documented

Table 1: Biogeography of three zones selected for study

Zone No.	Name of the zone	Name of the districts	Biogeography
	Central zone of Gujarat	Anand, Chhotaudepur, Dahod, Mahisagar, Panchmahal and Vadodara	Satpuda, Aravali, Semi Arid Gujarat, Rajputana and Coastal Plains
II	South-east zone of Gujarat	Bharuch, narmada, Surat and Tapi	Western Ghats, Satpuda, Gujarat, Rajputana and Coastal Plains
III	South zone of Gujarat	Navsari, Valsad and the Dangs	Western Ghats and Coastal Plains

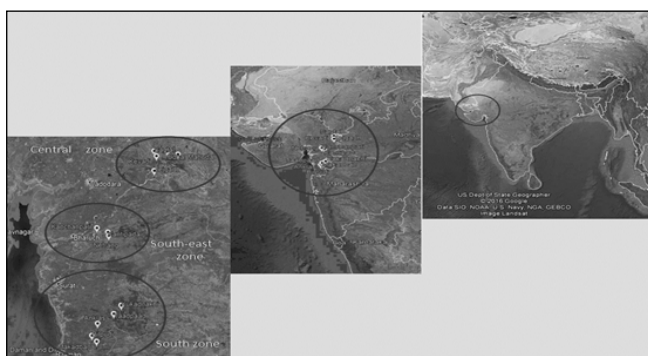


Figure 1: Map showing the study locations

adopting Participatory Rural Appraisal (PRA) method. In brief, methodology consisted of interactive session in the way of learning from rural people, directly on the site, as well as face-to-face, gaining from local physical, technical and social knowledge (Chambers, 1995). Information was collected by interviewing the people of age group between 40 to 60 years including women respondents in each village (195 respondents) using stratified random sampling technique. These respondents depend on mahua products for their livelihood and food supplements especially in lean period. Information regarding collection prototypes and utilization pattern was gathered from household in each study area by informal meetings, discussion with family members, apparent observation and with semi-structured questionnaire. This questionnaire enquired about the information regarding season of collection of flower, fruit and seeds as well as quantity of collection etc. All data collected through questionnaire were processed and tabulated. Total values or mean values for respective parameters were calculated and results were interpreted.

3. Results and Discussion

The people of study locations used to collect mahua flowers and seeds predominantly. Most of the local people collect

the flower and fruit from wild trees while few have the trees in their agricultural or malki land. Few families in the Chhotaudepur district of Gujarat state enjoying the family rights over the mahua trees. The erstwhile king of Chhotaudepur had allotted mahua trees to the families and those trees became the property of these families. Collection

Table 2: Quantification of utilization pattern of mahua resources

Parts of mahua	Utilization pattern	Respondents (%)
Flower	Direct consumption	56
	Value added products [Local sweet dishes]	20
	Fermented product	100
	For sale	44
Fruit	Direct consumption	16
	Other products [As vegetable]	12
	For sale	00
Seed	Oil extraction for domestic use	92
	Other products: [cake left after the oil extraction is used as a fertilizer, cattle and fish feed]	24
	For sale	56

Table 3: Quantity of different mahua resources collected day⁻¹ by the local people

Parts collected	Minimum (kg)	Maximum (kg)	Mean (kg)
Flower	15	50	31.50±11.94
Fruit	02	05	03.33±1.33
Seed	05	20	10.50±4.81

prototypes were also documented during the study (Table 2 and 3). Collection of mahua flowers amounting to an average of 31.50 kg day⁻¹ during the season (collection day⁻¹ from 15 to 50 kg). Comparatively the fruit collection reported to be 3.33 kg day⁻¹. The collection of seed was less as compared to flower which was about 10.50 kg day⁻¹. Based on the survey, it was observed that 96% of the respondents expressed that they collect mahua flowers. Only 24% people collect fruits and 88% collect seeds (Figure 2). Further, 56% people use flower for direct consumption mainly after drying. There were few (20%), who utilize the flower for making some value added products like local sweet dishes. Cent per cent respondents gave the information that, they use fermented products of mahua flower (Table 2). Some people (44%) said that flowers

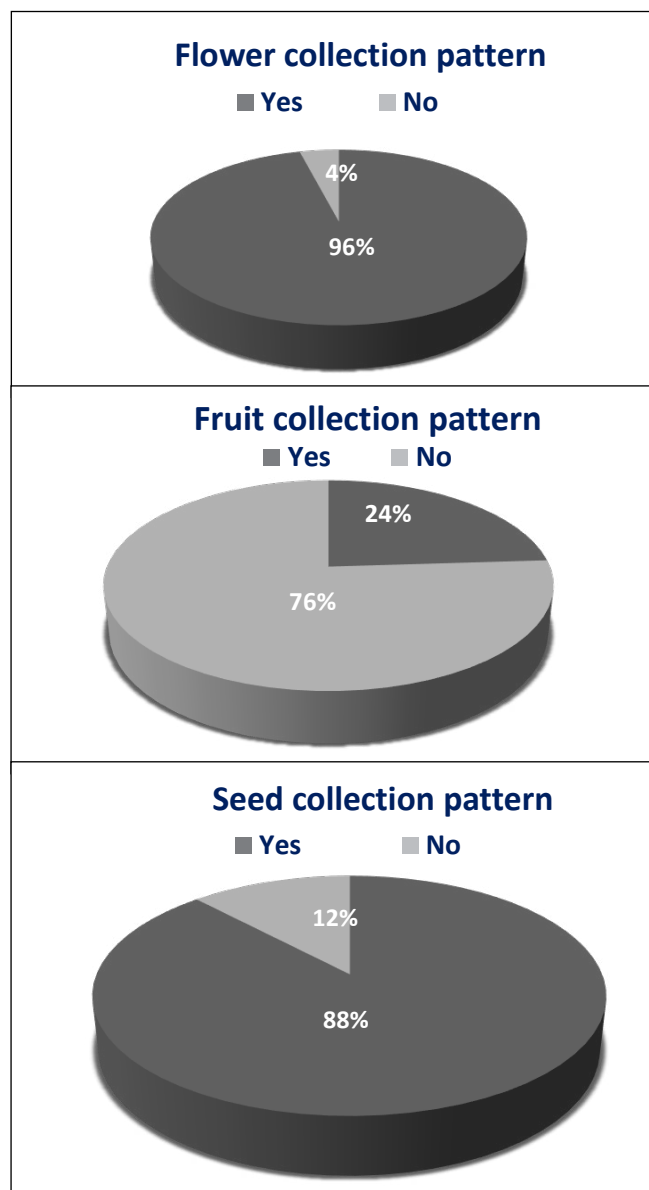


Figure 2: Per cent Share of mahua resources collection by the local people

left after the domestic requirement are sold either under barter system with localshop keepers or to the local vendors. In spite of sweet, tasty and nutritive value of the fruits, the local people did not showed interest in utilizing it to its full potential. Survey revealed that only 16% people eat fruit directly. Nearly 12% told that, it is utilized for local vegetable recipes. Mahua fruits don't have any market value. The seed kernel yields the important mahua oil or butter. It was found that 92% people used seed for oil extraction mainly for their domestic usage. Still mahua was the chief source of edible cooking oil for rural people and sometimes also used for lightening the lamps. Good share of people (56%) used to get extra income by the sale of additional seeds (Table 2). Other products like cake left after the oil extraction used as

Table 4: Information about marketing and livelihood issues related to mahua

Marketing and livelihood issues	Price of flower varied from INR 25–40 per kg depending on the season, yield and market demand Price of seeds ranged from INR 15–20 per kg depending on the season, yield, size and market demand Sale of mahua flowers and seeds would help generate extra income for the family GSFDC has fixed the collection price for the flower (INR 1900 per ton) and seeds (INR 1600 per kg)* Local people sometimes exchange the products of mahua for purchasing the items required for the day to day life with shopkeepers. They could save the money in this way and that could be used for health and other requirements Cooking oil extracted from mahua helped to save the edible oil budget for the family Family members generally engaged in mahua collection especially during the lean period help to create the employment in real sense and effectively reduces the activity of local gambling
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Note: *price mentioned was during the study period

a fertilizer, cattle and fish feed (24%). The shells of the seeds used to control the weeds in agricultural fields and common lands. There were issues expressed related to marketing difficulties, livelihood support and other challenges faced by the rural communities which are compiled in table 4.

Among various mahua resources, flowers played a vital role in domestic need and sale purpose. In spite of being a rich source of nutrition and readily available wild edible flower, it was not reported as very popular as food supplement. Very little quantity of flower reported to be consumed raw, cooked or fried in different parts of India (Patel and Naik, 2010). Most popular usage of flower observed was to prepare fermented product. Mahua wine is favourite drink in all tribal societies and used during festivals, marriages and other rites and rituals and also used in medicine (Patil et al., 2004). There were many issues expressed by the respondents which have an impact on the collection of flowers and its trade at local level. Flower collection period of mahua generally extended from February to April. In most of the cases, collectors were interested in mahua flowers for self consumption and barter trade. In Gujarat, there are many districts in which the collection of mahua products are important alternate livelihood activity for the local communities where people used to get the cash benefits in addition to summer food stuff. The pattern of collection directly has an impact on the price fixation during marketing. Due to the unhygienic, conventional way of collection, very low market price being offered to the original collector. Mahua flowers collected from the forest floor mixed with mud, litter and many other impurities. It resulted into low price for actual flower collectors. Such collection methods resulted in declined flower quality, which eventually fetched low price. On the other hand collectors generally not look forward to very high price, because of the wild collection. They themselves not considering the challenges involved in the collection process and think that, it's an additional income without any cultivation cost.

Data base generated regarding value added products in the present study are also in conformity with the previous literatures (Patel and Naik, 2010; Sunita and Sarojini, 2013) where mahua flowers reported to be used in preparation of cake, jam, jelly, juice, sauce, confectioneries. As per survey results, fruits were not widely used; however, unripe fruits rarely used as vegetable and children rarely consume ripen fruits. But in Odisha state, tribes extensively uses mahua fruits as vegetable (Sunita and Sarojini, 2013). The consumption of mahua fruits might have reduced due to the easy availability of other market products in many of the tribal areas too in recent years. Other possible reason might be the high dependency of bats, giant flying squirrel and many birds on the fruits of mahua which, they picked up from trees in the semi ripen stage itself.

People in Gujarat mostly utilize mahua seed for extraction edible oil. Similar usages have also been reported from different parts of the country, especially in Odisha, Chhattisgarh and Maharashtra (Sunita and Sarojini, 2013). It was widely reported that, mahua oil has potential use in biodiesel production. It was reported that mahua oil could easily be used as biodiesel, which would be extremely useful in coming years because of lack of fossil fuels (Kumar et al., 2017) and it save the country's crores of rupees in foreign exchange. Interestingly, our observation showed that none of the respondents mentioned about use of this in biodiesel production. This could be due to use of oil for routine cooking as well as preparation of oil butter. Earlier researchers reported about the use of mahua oil in skin care, manufacture of soap or detergents, candles as well as vegetable butter (Orwa et al., 2009; Owoabi et al., 2007). Domestication of mahua trees with the help of suitable agroforestry models could help to increase the productivity and further be utilized for production of biodiesel. Some scientific inputs/technological intervention really needed for purification of seed oil in terms of colour, odour, taste and other ingredients for edible purpose or refinery process for commercialisation of mahua oil that provide livelihood security.



Local people mainly utilize mahua products for bonafide domestic purpose. They interested in selling of the products (flower and seeds both) only after meeting the domestic demand. Mostly the trading takes place at local level as the vendors used purchase it from their home or else collectors/ producers procured from nearby weekly market. Only few people sold it to Gujarat State Forest Development Corporation (GSFDC) or to the agents appointed by GSFDC at local level. GSFDC has been appointed as the sole agent of Government to purchase, sell and transport mahua in the Gujarat State (Anonymous, 2018). It facilitated the trade of mahua and further the profits paid to Village Panchayats. Sale of mahua flowers and seeds would help people to generate extra income for the family. People sometimes exchange the mahua products for purchasing the daily need groceries with shopkeepers. Cooking oil extracted from mahua seeds helped many families to save the edible oil budget for the family. It was observed that, family members were fully engaged in mahua collection irrespective of age or gender, especially during the lean period that created the employment in real sense and helped to reduce the migration from rural area to some extent. However, despite Government efforts still there is no stable market price at local level. Price for mahua too much fluctuating and mainly decided by local vendors.

4. Conclusion

The outcomes cast a light on the collection and utilization aspects of mahua in the rural areas of Gujarat. Flowers and seeds were preferred product by the indigenous community members for domestic usage and sale purposes. Native NWFP species like mahua played very crucial role in the livelihood improvement of the local communities. Therefore, considering the tremendous utilization potentials of mahua resources in the study area as well as the tropical forest areas across the country, technological and policy interventions are need of the day to utilize the mahua products to full of its extent without harming the health of natural ecosystem.

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