

Final Evaluation Report

Your Details	
Full Name	Abhijit Dey
Project Title	Mahua tree, the 'Kalpavriksh' of Indian deciduous forests causes of its decline and way ahead for conservation and sustainability in Chota Nagpur Plateau, India
Application ID	37924-1
Date of this Report	05 Dec 2023

1. Indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

Objective	Not achieved	Partially achieved	Fully achieved	Comments
Identify primary factors that influence seed harvesting decision				
Check if seed harvesting impacts seed dispersion. If yes, how				
Investigate the role of bats as primary seed dispersers				<p>Human-elephant conflict is a common problem in the study area. And sampling for this has to happen at night which is risky. Locals didn't approve me that.</p> <p>Permitted to observe only trees that were closer to villages, and not far away.</p>
Identify the demographic pattern of mahua trees and suitable land cover for their regeneration				
Conduct awareness campaigns to inform the locals/harvesters about the findings and discuss steps ahead				
Chalk out a mahua monitoring/conservation plan with the stakeholders				<p>Due to factors outside the scope of the current project, local participation in this objective was lukewarm (detailed at point no. 3, last para).</p> <p>However, communication with the forest officials was fruitful (elaborated at #2a).</p>
Communicating the findings				<p>I consider this as 'partially achieved' because this is an ongoing process.</p> <p>Achievements of and targets for this objective are detailed at point no. 6</p>

2. Describe the three most important outcomes of your project.

a). Mahua Demography changes with land cover (LC).

The population pattern of mahua trees changes with LC. The majority of the trees are found in and around the villages and mostly adult trees are observed here. Trees of younger size class are relatively low throughout the landscape. Density of mahua trees reduces as one moves away from a village. However, occurrence of younger trees increases in areas away from villages.

These provide crucial information from the management perspective, that, the younger trees are less than adult trees. When we shared this information with the local forest officials, they took note of it and planned to include mahua saplings for upcoming afforestation programs. Local communities also agreed to plant mahua saplings in the village commons.

b). Harvesting mechanism reduces seed availability for regeneration. Awareness generation is the first step towards resolution.

At first glance, it appears that the harvesting mechanism is straightforward and non-intrusive (handpicking seeds that fallen on the ground) and doesn't impact regeneration. But an in-depth inquiry reveals harvesters also pluck the fruits directly from the trees by using a bamboo pole with an anchor attached to it. This affects fecundity of the tree for the next fruiting season as it breaks the branches, may lead to overharvest and impacts fruit availability for dispersion. However, we couldn't quantify the degree of this impact yet. By using the empirical data obtained, we are building up mathematical models to estimate the same. So, it cannot be concluded that harvesting could be the reason for the mahua population decline. But it impacts indeed.

These findings concerning the harvesting technique (along with the mahua demographic pattern) were discussed with the villagers and harvesters in the awareness campaigns. They acknowledged the problem. And in the discussion, it was decided that the harvesters would refrain from directly plucking the fruits from the tree, so that the dispersion remains undisturbed. And also, mahua plantation programs were discussed. But we are afraid that if there is enough leadership within the community to implement the same. Other than this, the community members are also worried with another pressing problem related to mahua trees (discussed at point no. 3, last para) that is convoluting the 'harvesting and regeneration' issue. However, the problem is in front of everyone now. A few individuals came forward to not to follow the plucking practices and also planting/protecting new mahua saplings.

c). Scarcity of fruit bats impacts dispersion

Fruit bats, as identified in relevant scientific literature, are the primary seed dispersers of mahua trees. But during fieldwork, we found, the frequency of bats visiting a fruiting mahua tree is small. Though the sampling effort was reduced due to human-elephant conflict, the findings are indicative of the fact that the number of bats is much fewer than expected. Encountering fewer bats tells us that regeneration of mahua is also affected by the lack of dispersers.

The overarching objective of the project was to identify the main causes of the mahua population decline in the study area and find a solution. We found that there isn't a single factor that is causing the decline, but interaction between multiple factors is causing the decline. Identifying these factors is the first step for appreciating the socio-ecology of mahua and conserving the same in this landscape.

More details about the findings, analysis, methodology, etc. will be covered in upcoming planned publications.

3. Explain any unforeseen difficulties that arose during the project and how these were tackled.

Quite a few unexpected difficulties arose during the project. We have been able to handle most of them and learnt important lessons.

During the fieldwork, I realised that it would be important to estimate how much seed a single tree of a particular size can produce. For this, 'seed traps' were needed to be installed for at least 10 trees of different sizes. But this would involve more resource persons in the field and a good amount of funds (around £430). I requested the RSG committee for a reallocation of funds to execute the same that they approved. I also hired an intern to help during this phase of fieldwork.

As soon as we installed the seed traps, cattle, especially the goats started damaging it repeatedly. We realised that the material (a particular type of net) we were using was ineffective in deterring them. We reinstalled the seed traps quickly using bamboo this time. Thankfully, the problem happened for a few days when fruiting just started and for three to four trees, not for all.

Human-elephant conflict is a common problem in the study area. During the fieldwork, it spiked suddenly. Since bat monitoring had to happen at night, we couldn't do this exercise as expected. My local guides and well-wishing villagers didn't approve of me going away from the village late at night. After a lot of persuasion, they permitted me to observe only trees that were closer to their village, and not far away. I intended to do a comparison between harvested (where fruits are removed from the tree) vs unharvested trees. However, due to this obstacle, the comparison between harvested and unharvested trees remains inconclusive.

While conducting the socio-economic survey, villagers reported that the price of mahua flowers is dropping in this region. And this is a serious concern for them as flower collection is an important livelihood for them. And they requested me (as the team leader) to do something to solve this issue. This was outside the scope of my work. But I tried to guide them with whatever limited knowledge I had. I hope to execute some implementable action in the coming days to try to deal with this problem.

4. Describe the involvement of local communities and how they have benefited from the project.

Local communities were involved in all phases of the work – right from the beginning (since I started the pilot work) till finding a doable solution. Be it conducting socio-economic surveys, accompanying them during seed harvesting (participant observation), or executing the 'seed-trapping' exercise – they allowed me in their sphere and participated enthusiastically. They were aware of the purpose of the project.

Any tangible immediate benefit of the project is yet to be realised here. As per the project plan, long-term benefit is expected to be obtained. They acknowledged and approved this. During the outreach events, a few individuals came forward and committed to the cause of planting/protecting mahua trees in their own capacity. The same is expected from the forest department. This will have an overall positive impact on the biodiversity that they rely on. Having said that they of course expect me to get back there and continue the work. I consider this project as the first step and more should and can be done.

5. Are there any plans to continue this work?

Yes, I am keen to continue and expand the work. Mahua, 'the Tree of Life' needs more attention – research and implementation – both. Our understanding of the mahua tree is very limited due to a lack of research work. Implementation is the need of the hour as it can generate quick benefits for local communities.

Though my work is centred around mahua seeds, locals these days are more concerned about mahua flowers – the most important resource derived from this tree. During the fieldwork, I found that the mahua economy is crashing in the study area due to a sudden drop in the price of the mahua flowers. I elaborated the problem and explored probable solutions in an article recently published in Mongabay-India. In the coming days, if no steps are taken to revive the local mahua economy, it will wreak havoc on the mahua population and the local biodiversity.

So, I plan to continue to research the socio-ecological questions about the mahua population and its seeds. And to expand the work to incorporate implementable actions concerning mahua flowers as well as seeds to revive the economy.

6. How do you plan to share the results of your work with others?

I divided the audience of this work into three categories – local stakeholders (villagers, harvesters, and forest personnel), the relevant research community, and the general audience. I started sharing the results of this work.

Awareness activities were conducted to inform the results of the work to the community members. A meeting was held with the forest personnel to suggest management practices that can be exercised by them such as planting and protecting mahua saplings in 'transition' land cover.

I presented the findings of this work within ATREE (my institution) and in two conferences – CILS, India 2023 and FLARE, Kenya 2023. And two journal papers are at the nascent stage.

To reach the general audience, writing popular articles is an effective way. One popular article based on my fieldwork experience has been published in Mongabay-India (also mentioned in the previous section). I will inform the foundation once it's on the web. Another is published at Down-To-Earth, talking about mahua with a larger perspective to get the general audience's attention. Though both the articles have been possible thanks to this project and helped to gather people's attention towards mahua, the results of the project were not the point of concern here. I have plans to develop separate articles informing the results.

7. Looking ahead, what do you feel are the important next steps?

I'd like to start answering this question from the point I ended in question no. 5.

- Implement actions that can revive the local mahua economy, will increase the price of the flowers.
- Mobilise harvesters to form harvesters' groups and harvest seeds collectively (with reference to section 2b).
- Try to estimate the impact of seed harvesting practices on seed dispersion (with reference to section 2b).
- Popularise mahua as a whole. Mahua has a potential non-tribal market to tap into that can revive the mahua economy. Popularisation of mahua is the first step towards that (this is my intention behind preparing popular articles).

8. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did the Foundation receive any publicity during the course of your work?

Yes, the logo was used on multiple occasions and the Foundation received publicity. It was present in the banner and pamphlet used during outreach events. I kept the logo in the poster and in the presentation that I presented at the conferences.

The communication team of ATREE also thanked the foundation when I received the grant on ATREE's social media pages. I also expressed my gratitude for the foundation in my LinkedIn profile.

9. Provide a full list of all the members of your team and their role in the project.

Joydeep Chakraborty – Joydeep is my field assistant, who assisted me for the entire duration of the fieldwork and participated in all field activities. His ideas, skills, and most importantly his familiarity with this landscape and the people turned out to be invaluable for the project.

Alokto Banerjee – Alokto helped me as an intern for three months. He joined the team before the fruiting season and shared our workload during the fruiting season. Though he stayed for a short period of time, his contribution made a mark on the project's success.

Nimai Kumar and Mongol Ghatual – Nimai and Mongol are my local field guides. True gems they are! Nimai (41yrs), a non-tribal and Mongol (50yrs), a tribal – share similar backgrounds. Both of them are first-generation learners of their family and this region. Their in-field skills, scientific temperament, knowledge about local flora and fauna, and interest in the work made the work possible and successful.

Dr Rajkamal Goswami – Dr Rajkamal is versed in social science-based research methods. He brings his vast experience in designing methods, and survey questionnaires. He provided timely input while executing the fieldwork to fine-tune the methodology. He is helping in analysing the data now.

Dr Priyadarsanan Dharma Rajan – Being my PhD supervisor Dr Priyadarsanan kept a keen eye on the project. Not only his academic guidance, but his moral support also helped me to stand difficult field situations. He is now guiding me to design journal papers out of the work done.

NOTE: I'd like to mention here that in my application, I had Dhoniram Murmu as my local assistant. But unfortunately, he was not available when the project started. Thankfully, I came in contact with Nimai Kumar and Mongol Ghatual who fulfilled the purpose.

I also had Kasturi Saha, a bat expert on the team while applying. She also couldn't take her time out to engage with the project. Retrospect I feel that her absence didn't impact the work because bat monitoring was anyway got affected due to the threat of elephants.

10. Any other comments?

In connection to the outreach events, I'd like to highlight a few points that came as learning.

- Inviting a local resource person worked better as they were aware of the situation, of the people. They were able to connect more effectively with the villagers/harvesters.
- Accompanying the RPs gave me a further chance to connect with the villagers.
- Sensing that the presence of male attendees may hinder female attendees' participation in the discussion, we had one all-female outreach event. And it worked. This was an important lesson.
- Events/activities that are conducted in a well-defined setup may work as a barrier for naive villagers. I learnt this quite unexpectedly. For one of the events, the time and venue were changed abruptly due to unavoidable circumstances. The RP invited to this event also couldn't make it because of this change. We feared fewer participants for this outreach. But it

turned out to be the most spontaneous one. The venue was a village common under the canopy of a tamarind tree where villagers gather regularly for casual interaction, spending leisure hours. When we were preparing to start, there were a handful of people. But by the time, a few minutes spent, it was full. Their appearance was telling that they didn't think twice or hesitate to take part in the event. I guess the sheer familiarity of the place attracted more people – men, and women alike.

Below are a few images showing glimpses of the events.

