Rufford Small Grants Project One-Year Report

Title: Partnering with Private Landowners to Expand Native Tree Nurseries and Restore Tropical Rainforests in India's Western Ghats Biodiversity Hotspot

Principal Investigator: Anand Osuri

Report date: 17th October 2024

Report duration: 1 Oct 2023 to 30 Sep 2024

Background

Restoring tropical forests at scale is a global conservation and climate priority, but progress is impeded by inadequate nursery resources and knowledge gaps on appropriate and cost-effective restoration methods. Our project engages with this challenge in the Western Ghats of India, a global biodiversity hotspot and major centre of coffee production. Shade-grown coffee farms are known to harbor a wide variety of native tree species including rare and threatened species, but their potential as sources of native tree seeds for restoration nurseries is underrecognized. Our project explores opportunities for partnering with coffee farmers to initiate rescue and rehabilitation of restoration-priority seeds and seedlings from coffee farms, expand restoration nurseries to increase the capacity for housing rescued species, and design and implement ecological restoration in nearby secondary (abandoned coffee farms) and degraded forests. In doing so, we aim to strengthen capacity for, broaden local support and engagement with, high-quality ecological restoration, while reducing seed extraction pressures on remnant forests.

Objectives

- 1. Evaluate native-shade coffee farms as potential seed sources of threatened and endemic tree species.
- 2. Pilot partnerships with coffee farmers for setting up restoration nurseries.
- 3. Identify appropriate species and methods for ecologically restoring degraded and secondary rainforests in the region.

Progress made

Native trees on coffee farms

We sampled vegetation plots (150 m x 20 m) to document the diversity and abundance of adult and juvenile trees on coffee farms and nearby rainforests. We sampled 25 transects in total, comprising 18 (5.4 ha) each in two varieties of coffee: arabica and robusta, and seven transects (2.1 ha) in the rainforest site. Sampling was completed in April 2024, and the data are presently being analysed.

To examine to potential of different shade-tree species in coffee to attract seed-dispersing birds and mammals, and thus act as focal points for seed and seedling rescue, we have established and are monitoring seed-fall traps under three categories of shade trees, namely, Ficuses, non-ficus fleshy-fruited species, and non-fleshy-fruited species. Seed-fall traps were set up under 15 individual trees of each category across five coffee farms at the beginning of the overall peak fruiting season in April 2024, and are being monitored twice monthly until the end of October 2024. The data will be analyzed soon thereafter.



Clockwise from top-left: A canopy of native trees on a shade coffee farm in the Western Ghats. Team members Vedika Dutta, Manu M, and Vijay Karthick measure adult trees, inventory seedlings and saplings, and install mesh traps to record seed dispersal.

Nursery partnerships

Guided by the studies described above, we initiated seed and seedling rescue efforts in partnership with three coffee farms. Our teams mark and monitor target native, threatened, and/or endemic species on these farms, and make periodic visits to collect seeds under or close to fruiting adults. In the late monsoon (Aug-Sep) of 2024, we also initiated rescue of naturally regenerating wild seedlings (wildlings) of target species before they succumbed to weeding operations on coffee farms. A five-day pilot effort on two farms rescued over 3000 wildlings of nearly 50 native tree species, highlighting that this approach has great potential. Simultaneously, we initiated a collaboration with a coffee grower and nursery entrepreneur to establish a native plant nursery to house seeds and seedlings rescued from coffee, as well as other species needed for restoration (with co-funding from other sources). This nursery, which has a capacity to hold around 50,000 plants, is presently stocked with over 9,000 seedlings spanning over 50 native tree species. We are in talks to initiate two more such nurseries at other locations in the project landscape over the next six to nine months.



Clockwise from top-left: Seeds of *Artocarpus hirsutus* – a tree species endemic to the Western Ghats – collected by the nursery team from a coffee farm. Team member Dushyantha rescuing a wildlife from a coffee farm. Views of the partner nursery that was established in 2024, and NCF's restoration nursery (estd. 2022), both of which house seeds and seedlings rescued from coffee farms.

Restoration research

Coffee is a mammal-dispersed shade-tolerant plant that is capable of persisting and proliferating in secondary forest understories many decades after cessation of active cultivation. We have initiated a number of studies that explore the status, dynamics, and need for restoration in post-coffee secondary forests using field studies and literature syntheses. The literature synthesis aims to collate information on ecosystem dynamics in post-coffee secondary forests and identify key knowledge gaps. In the field, we are conducting research on habitat use and diets of frugivorous mammals to examine in post-coffee secondary forests to examine whether and how coffee alters seed dispersal native tree species, and conducting experiments to assess the presence and importance of soil-, microclimate-, and competition-mediated pathways in

influencing natural regeneration in post-coffee secondary forests. We have also initiated restoration trials involving coffee removal and direct seeding of late-successional native tree species. Data collection is nearing completion for all studies, and scientific manuscripts will be prepared over the next six months.



Clockwise from top-left: Team members Abhirami C and Kiran S sample a vegetation plot in a post-coffee secondary forest, record microclimate conditions, and initiate a direct seeding trial in coffee-removal plots. Brown palm civets are important consumers and dispersers of coffee.

Pending activities

1. Continuation and expansion of activities related to plant rescue from coffee farms and nursery partnerships. We will increase the numbers of trees and farms that are systematically monitored and targeted for seed and seedling rescue, and aim to establish two new nursery partnerships, over the next nine months.

- 2. Preparation of outreach material including short videos that aim to build awareness and appreciation of threatened and endemic rainforest tree species of the region, and promote their use in local restoration efforts and as shade trees on coffee farms.
- 3. Completion of pending research projects and submission of their respective manuscripts to international peer-reviewed scientific journals.