

Creating foundation and taking coordinated actions for biodiversity conservation: Achievements and lessons from Jalthal



Creating foundation and taking coordinated actions for biodiversity conservation: Achievements and lessons from Jalthal

Upgrading community forest management in Nepal: Enhancing biodiversity and livelihoods

Darwin Initiative Project (Ref. 26-022)

Suggested citation:

Sharma LN, Bhattarai M., Adhikari B. 2023. *Creating foundation and taking coordinated actions for biodiversity conservation: Achievements and lessons from Jalthal*. ForestAction Nepal, Kathmandu

Design by: Sanjeeb Bir Bajracharya

Photographs: Lila Nath Sharma

Front cover: Flowering twig of *Sterculia villosa* (Elephant rope tree)

ForestAction Nepal

May 2023

The Project

Nepal's Community Forestry (CF) programme is considered successful in halting deforestation and forest degradation, increasing forest cover, restoring degraded hill slopes, and bringing socio-economic benefits to rural people. Currently, more than 22,000 Community Forest User Groups (CFUGs) manage over 2 million hectares (ha) of forests across the country. Despite these achievements, regulatory instruments, management plans, and institutional practices focus narrowly on a few timber species. Consequently, CF management is heavily skewed towards extractive use, and the value of biodiversity and ecosystem services are largely ignored. There is a lack of concrete effort to mainstream biodiversity in CFs.

Since 2019, ForestAction Nepal is working with the CFUGs to restore forest and conserve biodiversity in Jalthal, Jhapa. Jalthal forest is a 6100 ha remnant moist tropical forest with diverse ecosystems. It is a biodiversity 'hotspot' 'with several threatened flora and fauna. The forest is managed by 22 CFUGs and is an important livelihood source for over 80,000 local people including some indigenous groups-*Meche, Santhal and Rajbanshi*.

The biodiversity rich forest with high social and livelihood significance has been subjected to multiple threats, which include the spread of Invasive Alien Plant Species (IAPS), timber-focused management, biomass extraction pressure, lack of awareness on the importance of biodiversity, unplanned development, and human-elephant conflict.

ForestAction Nepal has implemented a project funded by the Darwin Initiative, UK in Jalthal, which has taken Jalthal forest as a model forest system to develop strategies to promote biodiversity and livelihood while addressing site-specific threats to biodiversity. The work was primarily based on participatory action research and implemented between 2019 July to March 2023.

The project aimed to mainstream biodiversity conservation in Nepal's community forests through the demonstration of model strategies at the site level, and capacity building coupled with national-level policy dialogues. Following were the specific objectives of the project: a) Prepare a detail profile of the biodiversity of Jalthal forest, b) Demonstrate models of forest restoration through IAPS management, c) Improve forest condition and conserve forest biodiversity through sustainable forest management, and d) Develop practical models of integrating biodiversity and livelihoods through forest-based enterprises.

This report provides an overview of key interventions and major achievements of the project.

Project approach for forest restoration and biodiversity conservation

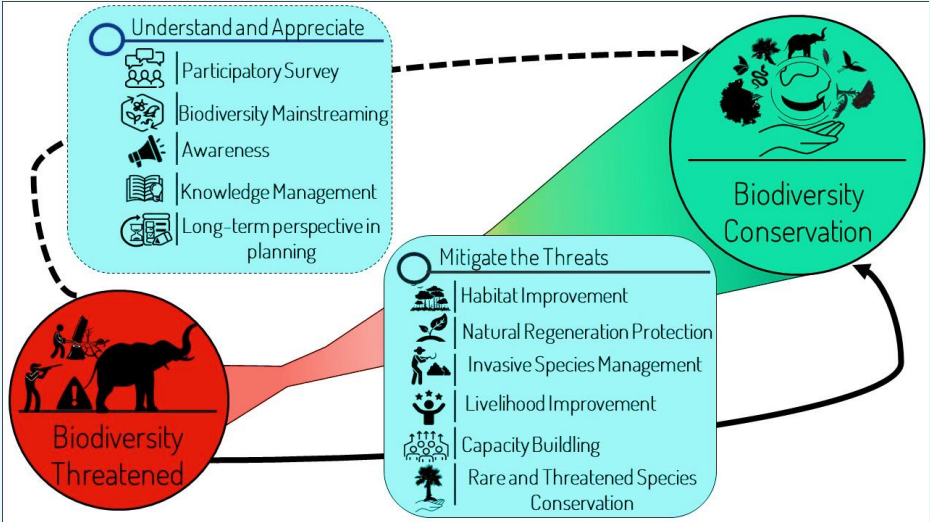


Figure 1: Schematic diagram showing the project’s approaches to address threats to forest biodiversity.

A. Exploring biodiversity for mainstreaming and conservation

The project has prepared a comprehensive biodiversity profile of the Jalthal forest based on first-hand data. It covers all groups of vertebrates, butterflies, and all life forms of flowering plants and ferns. These biological data along with data on forest ecosystem services have demonstrated the extraordinary richness of the Jalthal forest. These data form a solid foundation for mainstreaming biodiversity in the community forests policies and plans.



Photograph 1: Discussion about a plant during forest survey

A1 Comprehensive profiling of Jalthal biodiversity

Effective conservation of biodiversity builds on comprehensive biodiversity data. Co-creation of biodiversity knowledge with local people further enhances local ownership on conservation. Realising this, we conducted biodiversity profiling of Jalthal forest involving local communities and subject experts.

The biodiversity profile of Jalthal forest has provided the most up-to-date scientific information on the status of various facets (Richness, rarity, threats etc) of forest biodiversity. The methods used include systematic ecological sampling, taxonomic inventories and forest transect walks with local people. Over a dozen of subject experts and more than 150 local people were directly engaged in the process. The profile has identified key features of the forest biodiversity. Primary data at this depth, probably, is the first of its kind recorded for any forest patch of Nepal (Sharma et al. 2023).



Photograph 2: Team members engaged in survey in the forest

A2 Highlighting Jalthal forest as natural museum of trees

Taxonomic survey revealed that Jalthal forest is one of the richest sites in terms of floral diversity in Nepal. So far, no account of such rich diversity is reported from any comparable forest in Nepal's lowlands. The forest has as high as nearly 600 species of plants including ferns (Fig. 2). The floristic survey revealed that Jalthal forest can be labelled as a natural museum of trees of Nepal as it holds disproportionately high tree diversity. The forest has 0.1% of Nepal's forest area but is home to over 25% of Nepal's 600 tree species. Similarly, the floristic survey also demonstrated the phytogeographical significance of the forest, with a predominance of Indo-Chinese-Malayan (SE Asian-Malayan) tree species. The project has also visualized iconic tree Latahar (*Artocarpus chama*) and vulnerable species *Thakal* (*Cycas pectinata*).

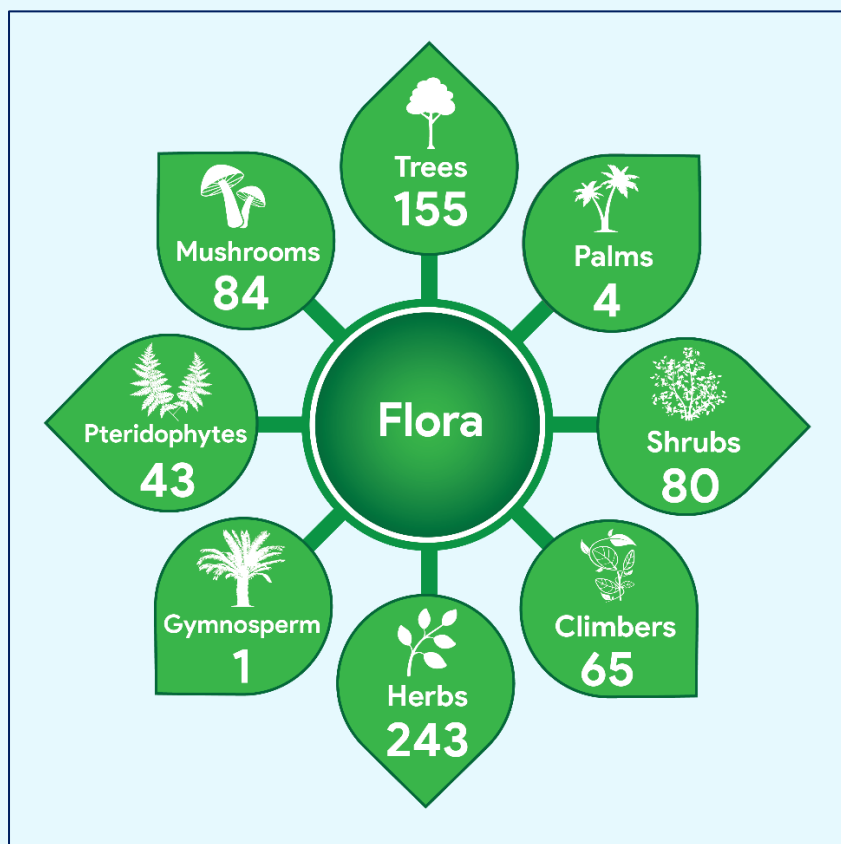


Figure 2: Number of plant species in different life forms in Jalthal

A3 Enriching Nepalese flora

The project has made an important contribution to the flora of Nepal data. Altogether, 20 species of flowering plants, including eight tree species, were reported as new records for the flora of Nepal. Several of them are already published (*Drypetes assamica*, *Harpullia arborea* and *Acronychia pedunculata*) in peer reviewed journals, and some are in the pipeline for publication. More than 600 herbarium specimens are deposited in national herbaria: Tribhuvan University Central Herbarium (TUCH) and (National Herbarium and Plant Laboratories (KATH). Images of these herbarium specimens along with high quality field images of plants and plant parts are freely accessible through Flora of Nepal website (<http://www.floraofnepal.org/data/specimens>).



Photograph 3. Fruiting twig of *Harpullia arborea*- a new record for Flora of Nepal, published in the Journal of Japanese Botany (Poudel et al. 2021)

A4 Faunal survey

Jalthal forest is also home diverse animals (Fig. 3). The project recorded 14 species of amphibians, 32 species of reptiles, 230 species of birds and 27 species of mammals. Besides this, the project has documented 43 species of fish from the wetlands of Jalthal and its surroundings. Similarly, 157 species of butterflies have also been recorded in the forest. The forest also serves as habitat for several threatened species, such as the Critically Endangered Chinese pangolin (*Manis pentadactyla*), Elongated tortoise (*Indotestudo elongata*) and Endangered Asiatic elephant (*Elephas maximus*).

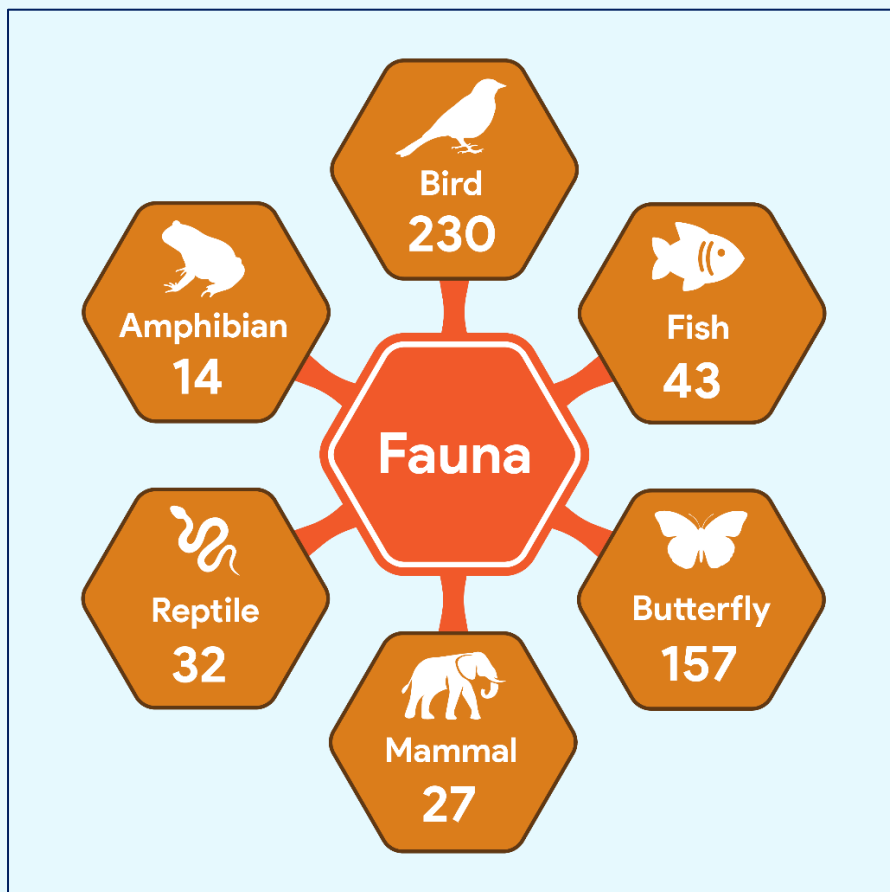


Fig. 3. Different faunal group surveyed and number of species recorded in Jalthal

A5 Assessment of forest ecosystem services

The project carried out an assessment of ecosystem services, primarily provisioning, in Jalthal forest. The survey revealed that Jalthal is a perfect example of a multipurpose forest. The high diversity of flora and diversity of ecosystems is the basis of myriad of provisioning ecosystem services. Like any other forest, timber, firewood, and fodder are the most common products. Besides these, the forest is the source of many wild foods like fruits, leafy vegetables, edible tubers, and delicious mushrooms. The forest has a high diversity of fodder and edible fruit tree/shrub species (Fig. 4). Further, a considerable number of species have medicinal and cultural values. In addition to plant-based products, fish and molluscs found in the wetlands of Jalthal are vital sources of sustenance for the locals.



Figure 4. Various provisioning services and number of plant species used by local communities.

B. Invasive Alien Plant Species (IAPS): Managing the threats to Jalthal biodiversity

IAPS are among the major threats to biodiversity across scales and have already caused tremendous economic and ecological loss in agriculture, forests and pastures. Jalthal forest is also threatened by the increasing dominance of IAPS. The project identified the cost-efficient, and simple yet effective approaches to managing IAPS to secure biodiversity and restore forest.



Photograph 4: Mat of *Mikania micrantha* in Pathbhara kalika CF

B1 Early detection and rapid response to newly reported toxic weed

Mimosa diplotricha, a noxious weed of neo-tropical origin, was introduced in Nepal during the mid-nineties, primarily to reclaim soil and control soil erosion along riverbanks (unpublished project data). Since then, the weed has rapidly spread to the eastern Nepal, especially in fallow lands, roadsides, degraded forests, along water courses, and croplands. It is toxic to animals, and has already caused big loss of livestock. For over two decades, it remained unknown to scientists and forest managers. The project identified the species and reported it for the first time in Nepal (Sharma et al. 2020). Given the economic and ecological damage associated with its spread, the Project has initiated an early detection and rapid response (EDRR) approach to control the weed. Awareness in regard to the challenges faced due to the spread of the invasive species and campaigns for its removal have been launched in collaboration with various stakeholders.



Photograph 5: Mimosa awareness and removal in September 2021 along Netra Marga, Jalthal

B2 Ecologically informed invasive species management

A key reason for the ineffectiveness of conventional methods of IAPS management in Nepal is the failure to incorporate species' biological and ecological attributes into management actions. The project has developed and introduced a novel approach to IAPS management considering the ecology of the site, the phenological calendar and growing season of invading species. The new approach focuses on minimising the tradeoff between economic input and ecological outputs (Sharma et al. 2023). The strategy is to allow maximum growth of native seedlings and suppress the growth of invasive species. Realising the growth dynamics of both native and invading species, and cost of removal, we have introduced 'natural regeneration rescue' (Sharma et al 2023) and switched bush cleaning practices. This is an important methodological innovation advanced by the project.

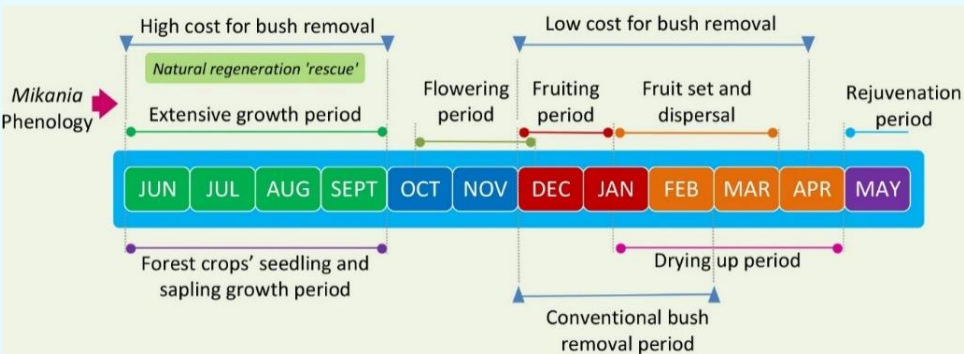


Figure 5 : Phenological calendar of *Mikania micrantha* and management activities in different seasons

B3 Transforming conventional management of *Mikania micrantha*

Mikania micrantha is one among the 100 worst invasive species in the world. It has also been identified as the most troublesome invasive species in Jalthal. It is a fast-growing perennial with efficient reproduction, and has abundant seed production and effective seed dispersal mechanisms. It forms a dense mat on the ground vegetation and mid-canopy. It hinders the growth of seedlings and saplings of native species, sometimes even kills them. Moreover, it reduces the availability of forest resources and creates problem in accessing forest.

In Jalthal forest and beyond, conventional methods of managing such species have not been effective and therefore require methodological innovations. The project has piloted some new approaches (Table 1) for effective management of IAPS mainly *Mikania*.

Table 1: Comparison of conventional and project’s recent piloting practices

Management activities	Conventional	New approaches
Bush cleaning timing	Carried out mainly during the winter season (Nov-Feb)	Mainly during summer, cleaning in winter is carried out on a small scale to control the seed dispersal of invasive species as well as to reduce the fuel load in the forest
Species target during removal	All species in general, including seedlings of native tree and shrub species	Specific, targeted to invasive species
Nature of activity	Sporadic and discrete	Well organised with a broader framework and long-term outcome
Plantation	Common after bush removal, in Jalthal exotic species dominated plantation	Reduced effort for plantation, no exotic plantation, in case of plantation only native species
Natural regeneration	Not prioritised and not protected	Highly prioritised, protected and nurtured
Forest restoration	Not planned	Planned as a major objective of forest restoration

Adapted from Sharma et al. (2023)

C. Towards resilience: Promoting natural restoration

The government often prioritise and invest in plantation, including exotic species in natural forest, as its major strategy for forest restoration. In addition, restoration activities are organised as isolated events in space and time. However, these strategies have high tradeoffs. The project has supported CFUGs towards long-term and ecologically informed forest restoration through principles of sustainable forest management.



Photograph 6: Discussion about forest restoration and Mikania management in Pathibhara Kalika CF

C1 Integrated site management

Jalthal forest is degraded due to invasion by several IAPS, notably *Mikania micrantha* (Pyangri lahara), *Chromolaena odorata* (Seto Banmara/Tite) and *Lantana camara* (Kaande Banmara). These have emerged as a burden to forest management. Poor planning, ineffective control strategies, and sporadic and discrete interventions have mostly failed the local efforts to control and manage these species. The project has introduced integrated site management which consists of selection of degraded sites, participatory planning, invasive species removal, use of removed biomass, active management of IAPS removed area, protection and nurturing of natural regeneration, repeated weeding and even plantation if necessary. This integrated approach has both ecological and socio-economic benefits.

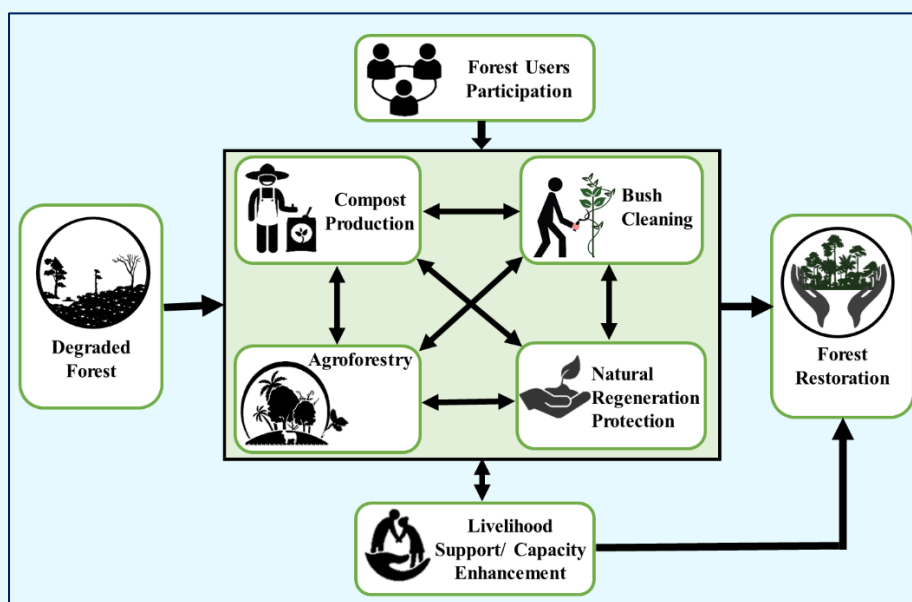


Figure 5: Schematic representation of various activities under integrated site management (Bhattarai and Sharma, 2022)

C2 Natural regeneration rescue and protection

Protection of existing natural regeneration is the most effective method for maintaining the original forest composition and achieving forest restoration in degraded landscapes. However, in Jalthal and beyond, plantation has been considered as a dominant method of forest restoration. Jalthal forest has tremendous potential for natural regeneration. Protection of the natural regeneration of native species is the most sustainable, socially acceptable, ecologically sound and cost-effective method for increasing tree density and cover (Sahrma et al 2023). This method simultaneously controls *M. micrantha* on one hand and restores the forest on the other. Repeated clearing of Mikania bushes that have trapped or tangled seedlings and saplings is the best practice to protect natural regeneration (Sharma et al 2023).

So far project has supported CFUGs in rescuing and nurturing over 100,000 seedlings belonging to 60 species of trees and sub-trees from a cumulative 500 ha of forest.



Photograph 7: CFUG member rescuing a sapling tangled by *Mikania*

C3 Agroforestry: Towards multipurpose forestry

Learning from local experience of forest restoration and use, the project started looking for cost-effective and ecologically sound methods to restore the degraded forest patch. Agroforestry was identified as a restoration strategy through the active involvement of local people. Earlier attempts through the cultivation of Citronella and Broom grass neither benefited locals nor promoted forest restoration. The project introduced turmeric as an efficient crop for intercropping in degraded forest.

Early results of agroforestry piloting in Pathibhara Kalika CF has clearly shown that agroforestry is a plausible and most practical strategy to control *Mikania* and nurture saplings. Locals benefited through turmeric cultivation and the forest benefited by suppressing *Mikania* and growth of tree saplings. In an area of 0.5 ha, over 700 naturally regenerated saplings of 14 tree species, including 470 *Neolamarckia cadamba* (Kadam) saplings have been grown. Some of the Kadam saplings have grown to a height of above 4 meters within a year.



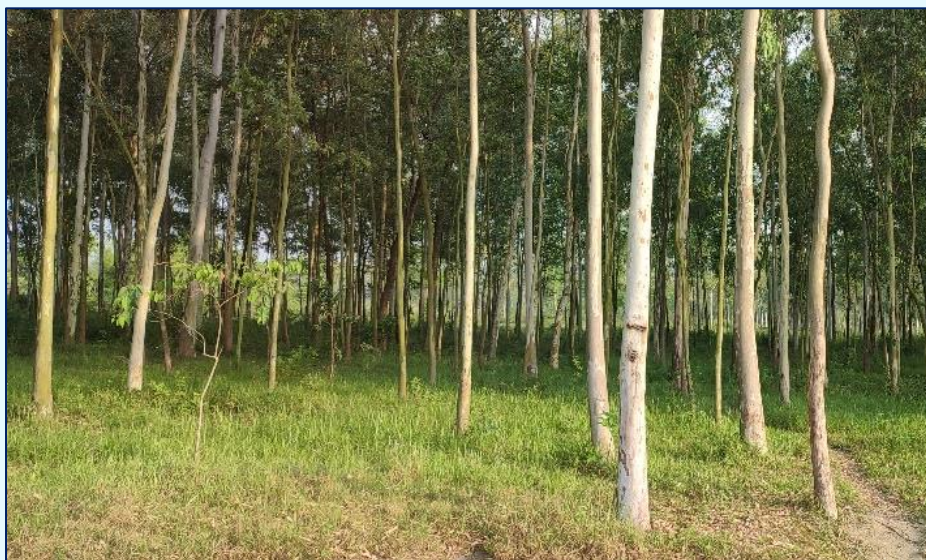
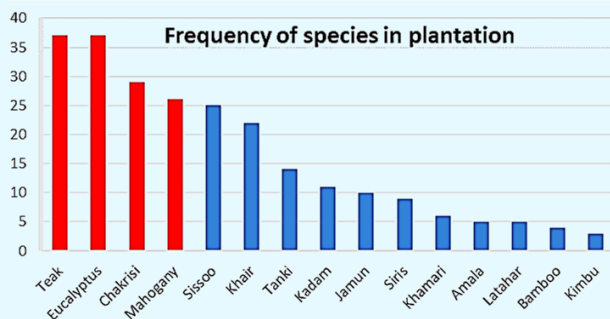
Photograph 8: A farmer standing below a naturally regenerated sapling in his turmeric plot at Pathibhara Kalika CF

C4 Paradigm shift in plantation: Exotic to native

Plantation is a routine activity of the Government of Nepal, CFUGs and NGOs/INGOs. Every year, millions of seedlings are planted in Nepal. In Jalthal forest, during last one decades, several thousands of seedlings are planted in over 50 different locations.

In retrospect, plantation in Jalthal forest is dominated by exotic species. Among the planted species first four common species are exotic: Eucalyptus, Teak, Mahogany and Chickrassy. These are the dominant species in government and community-managed nurseries.

The project has discouraged exotic plantations in natural forests and promoted native species. Recently DFO (District Forest Office) and CFUGs have increasingly switched to native ones.



Photograph 9: Eucalyptus plantation in Jalthal (below) and Graph showing frequency of tree species in plantation (Above)

D. Knowledge products and conservation outreach

The project has carried out diverse activities towards income generation of the poor, awareness raising among local people and capacity building of stakeholders.



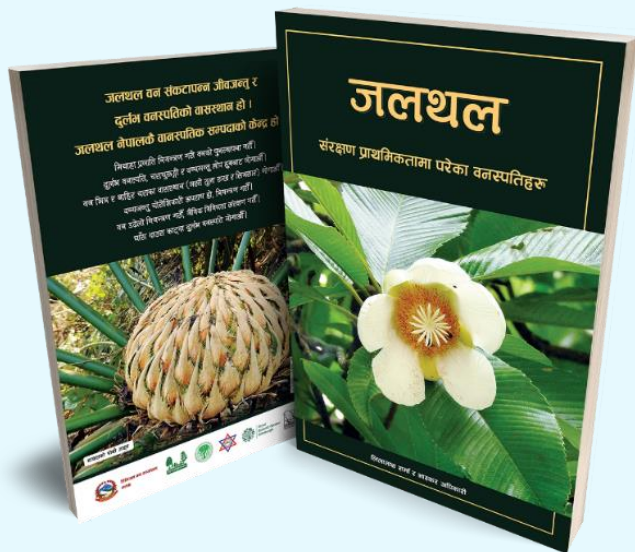
Photograph 10: Local people in a forest management training at Dipjyoti CF

D1 Species prioritisation for conservation

While the project considers overall biodiversity conservation, some of the species need specific and immediate action. The project has identified locally prioritised species for conservation in a participatory way through organising four workshops, and analysis of the ecological data.

The workshops were combined with forest transect walks and group work. In the group work, local people prioritised species using multiple criteria (Abundance in the forest, population status and trend, pressure (threats) on the species, local importance, ecological role etc). The list was revised and complemented by expert knowledge. So far 20 species have been prioritised and a booklet on those species has been published in the Nepali language (Sharma and Adhikari 2021). The booklet introduces the prioritised species and presents the species' status in the Jalthal forest. The publication can be accessed at

<https://forestaction.org/wp-content/uploads/2021/12/Plant-species-prioritised-for-conservation.pdf>



Photograph 11: Booklet on species prioritised for conservation

D2 Communicating with stakeholders: Towards garnering wider support

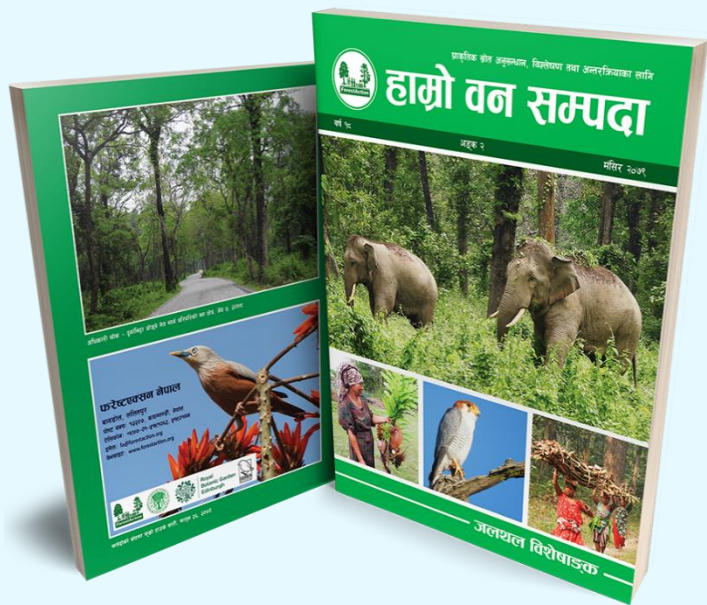
The team primarily worked with CFUGs, who are the primary beneficiaries of the project. However, a wide range of stakeholders' appreciation and support was crucial for effective conservation and sustainable management of forest biodiversity. Realising this, the project has adopted a strategy to reach out to local people and CFUGs through awareness events and communication materials in the Nepali language. Posters (2, Cycas and birds), Calander (1), booklets (2), leaflets (4), newspaper articles (10) have been published in Nepali language and widely distributed in project sites and beyond.



Photograph 12: Some publications for awareness and conservation education

D3 Special issue of Hamro Ban sampada

Hamro Ban Sampada (Our Forest Resources) is a regular Nepali language publication of ForestAction Nepal. This is a kind of intermediate between a journal and a popular magazine, targeted at local people. The project has contributed to a special issue of this publication. The publication highlighted the ecological, social and cultural dimensions of Jalthal forest. The special issue consists of 16 articles of which 12 articles have been led and contributed by local people. The ninety six page document also consists of over 50 colored photographs highlighting the forest biodiversity and projects conservation activities. The publication can be accessed at <https://forestaction.org/publications/2079-18-2-special-issue-on-jalthal/>



Photograph 13 : Front and back cover of Nepali journal, Hamro Ban Sampada

D4 Capacity building of stakeholders

The project has organised several workshops, meetings and training for the capacity enhancement of diverse stakeholders. Capacity-building activities focused on both conceptual and technical issues of biodiversity conservation in community forests. Such trainings prioritised biodiversity integration in community forest management plans. Over 1200 people (table 2) benefited from capacity building activities in the project sites and beyond.

As a result, CFUGs in Jalthal have integrated biodiversity into their CFOPs. Lessons learned from Jalthal have been shared with various stakeholders including policymakers across scales. This capacity-building and result-sharing workshops in the long run are crucial for biodiversity mainstreaming in CFs.

Table 2: Capacity-building activities and beneficiaries (*number in parenthesis represent women participant).

Name of activity	People benefited*	Target audience
CFOP training	110 (45)	CFUG members
Biodiversity training	75 (32)	CFUG leaders
Invasive species management training	150 (50)	Forest users (5 events)
Species prioritisation workshops	50 (20)	Forest users (4 events)
Forest survey	150	Local youths
CFOP biodiversity training	17	Forest technicians
Student training through thesis	7 (2)	BSc (2), MSc (5)
Other workshops/meetings	800 (200)	Inception meetings, sharing workshops



Photograph 14: participants of biodiversity conservation training in Durgabhitta CF

D5 Linking conservation with livelihoods

Supporting forest-dependent women and other disadvantaged groups of people would consequently benefit forest restoration and biodiversity conservation. In order to reinforce conservation activities in the forest, the project has supported small-scale and women-led income generating activities.

In Jalthal, chicken, pig, and goat farming are important sources of cash income for poor households. The project has provided mother goats to 80 women members of poor households of three CFs. These women have started getting cash returns from these activities. Similarly, the project has also supported a women's group practicing the traditional weaving of clothes. Improved weaving tools were provided to increase the efficiency and working conditions of those women. Upon using improved tools, these women have already generated over one million rupees, a substantial increment compared to traditional tools.



Photograph 15: Women with goats in Abhimukteswar CF

Project in Numbers

Table 3: Summary table of project outputs/outcomes

S no	Activity	Achievements
1	Bush removed area (Ha)	500 ha (cumulative)
2	Number of trainings organised and beneficiaries	6 events (150 participants)
3	Number of workshops/ meetings organised	15 events (1000 participants)
4	Number of tree Species rescued in Mikania invaded area	60
5	Number of tree seedlings recovered, nurtured and conserved in invaded area	over 100,000
6	Wetland habitat improved	5 (Main focus in Jhilka Pokhari)
6	Plantation	10000 (Fodder for elephants)
7	Journal articles	6 (5 published, 1 in press)
8	Video documentary	1
9	Thesis supported	7 (MSc-5, BSc-2)
10	Leaflets	4 (Nepali)
11	Posters	2 (Nepali)
12	Booklets	2 (Nepali)
13	Newspaper article	10 (8 Nepali, 2 English)
14	Blogs in English	5 (English)
15	Infographics	2 (Nepali/English)
16	Book	1 (Nepali, 96 pages and 16 articles)
17	Discussion paper	2
18	Number of women benefited from Goat keeping/agroforestry	80/100
19	Number of women benefited from hand weaving	7

Project results/Impacts in words

Invasive species, Mikania (Pyangri lahara), was there in the forest for several years, but we hardly noticed its presence. After ForestAction Nepal's program, I see it everywhere in the forest. Now I feel like this is the most common species and a forest fringe. Hari Limbu at his residence talking with Lila Nath Sharma and Muna Bhattarai.

I had no idea how long we would continue with the futile effort of controlling this Pyangri lahara. After seeing the outcomes of our collaborative effort on the project, I am convinced we can control it with a new management strategy. We don't need to try new things but rather improve the existing ones. Chiranjibi Paudel, Ex chair of Pathibhara Kalika CF, talking in a meeting about IAPS management

In the past we were not aware of invasive species and our activities were limited to slashing only. After understanding the way to treat the weed, we are now concentrating on Mikania control. Dhanraj Gurgung, Chairman of Durgabhitta CF.

We made a mistake by planting exotic species like Teak, Eucalyptus, Chikrasi. These are not useful. Now we have realised the regeneration potential of native species. Now we will plant only native species. Shanta Lal Meche of Chaukibiran CF

We realise that we have plenty of seedlings in the forest so we are now concentrating on the protection and nurturing of the existing regeneration rather than going for the lengthy and costly process of plantation. Chiranjibi Paudel of Pathibhara Kalika CF.

Goat keeping is an important source of income for my family. The project provided me a mother goat, which has given birth to three newborn male goats, one of which I have already sold at a good price. I am expecting more income from the mother goat. Dambar Kumari Pariyar, Beneficiary of Female Goat distribution in Rankali CF.

It was a great pleasure to learn about the plants and vegetation of such a diverse tropical forest. The project provided a network of diverse experts, which helped me enrich my knowledge of plants. Working in Jalthal forest was the best experience I ever had. Yogendra Bikram Poudel, A recipient of MSc thesis support from the project.

Lesson learnt and recommendations

- Income generation and livelihood-related interventions should be designed after careful analysis of local situation. While we have achieved as expected in agroforestry and goat keeping, our intervention in fishery for income generation, admittedly, is a failure. It does not mean fishery is not an income-generation activity but our preparation was not sufficient to achieve the expected results.
- We have carried out several activities for biodiversity conservation and forest management at local level. When local practices are reinforced by national and sub-national policies, local efforts would be scaled out and will be sustainable.
- Biodiversity conservation is priority action for CFs, however, CF management is often narrow and focused on timber. The project has undertaken several activities to mainstream biodiversity. Changing the mindset of diverse stakeholders for changed action is a multiscale, , multi-stakeholder and time taking process.
- The current management activities of CF are discrete and unorganised. The project has prioritised placing these isolated activities under a broader framework of forest restoration and biodiversity conservation and demonstrated such models. Bringing these activities under the programme of regulating agencies, for eg DFO, would ensure sustainability.
- Invasive species management activities should be prioritised by governments in light of decades of ecosystem restoration and other national priorities including NBSAP and NDC. However, invasive species management is an overlooked issue in forest management practices.
- Forest Act, 2019 has a mandatory provision for investing CFs income in forest conservation. However, in practice, forest conservation activity is narrowly framed as plantation. Honest implementation of the provision of the forest act would support biodiversity conservation and forest restoration.

Key milestones in a nutshell

- **Comprehensive biodiversity profiling:** For the first time, for any defined forest area, with first-hand data, the project has prepared a comprehensive biodiversity profile of the forest. It covers all groups of vertebrates, butterflies and all life forms of flowering plants and ferns.
- **Enriching floristic database:** Project has reported 20 species including eight tree species to be new to Nepal flora. Besides this, nearly 600 species of plants, including over 40 petridophytes, are listed from the forest. The figure is highest for any lowland forest of Nepal.
- **Transforming management of invasive species:** Invasive species are a burden, and local effort to control is not working. Project has introduced a new management approach for better ecological and economic outcomes. A new approach uses ecological attributes of both invading species and resident communities. Bush removal used to be only in winter, but now occurs during monsoon season.
- **Shifting from exotic to native and plantation to natural regeneration:** Plantation of exotic species used to be common and now stakeholders agree not to plant exotic species. Locals now understand forest has unbelievable natural regeneration potential. DFOs, CFUGs and stakeholders have appreciated and promoted natural regeneration in recent years.
- **Integrating biodiversity in CF:** Biodiversity provisions in CF operation plan appear to be weaker, if not absent. With the project facilitation, most of the CFUGs in Jalthal have incorporated biodiversity management in their periodic plans and activities.
- **Agroforestry for forest restoration:** The project has demonstrated an efficient model of agroforestry to control invasive species and restore forests while benefiting local people from agroforestry.

Projects major publication

- Budhathoki A, Gautam AP and Mandal RA 2023. Spatial analysis of forest cover and quality dynamics of Jalthal forest in the Jhapa district, Nepal, Scandinavian Journal of Forest Research, 38(3) 144-153.
- Sharma LN, Bhattarai M, Adhikari B and Shrestha BB. 2023. *A framework for ecologically informed invasive species management and forest restoration: methodological innovation and insights from Jalthal forest*. ForestAction Nepal technical note 2. ForestAction Nepal, Kathmandu (in press).
- Sharma LN, Subba A, Poudel YB. 2023. *Jalthal Biodiversity Profile*. ForestAction Nepal, Kathmandu (In press).
- Bhattarai M, Sharma LN, Khatiwada S, Pun Magar R, 2022. *Hamro Ban Sampada*, 18(2): 96 pp. ForestAction Nepal, Kathmandu
- Poudel, YB., Adhikari, B., Sharma, LN. & Rajbhandary, S. 2021. *Harpullia arborea (Sapindaceae): A New Record of a Tree Species for the Flora of Nepal*. J. Jpn. Bot. 96(6): 338-340
- Sharma LN, Tamang SR, Poudel YB, Subba A, Timsina S, Adhikari B, Shrestha H, Gautam AP, Kandel DR, Watson MF, Paudel NS. *Biodiversity Beyond Protected Areas: Gaps and Opportunities in Community Forest*. Journal of Forest and Livelihood. 2021 Dec;20:1.
- Sharma LN, Poudel Y and Adhikari B. (2021). *Drypetes assamica (Putranjivaceae): A New Record of a Tree Species for the Flora of Nepal*. Journal of Plant Resources, 9(1): 1-3.
- Sharma, L.N., Adhikari, B., Bist, M.R., Shrestha, B.B. 2020. *Mimosa diplotricha (Fabaceae): A New Report of Invasive Weed from Eastern Tarai of Nepal*. J. Pl. Res. 18(1): 1-5.
- Sharma, L.N. & Adhikari, B. 2021. *Jalthal: Plant species prioritised for conservation*. ForestAction Nepal. Kathmandu, Nepal.

Project Implementation team

Project leader: Dr. Naya Sharma Paudel

Project Coordinator: Dr. Lila Nath Sharma

Co-PI: Dr Mark Watson (RBGE, UK), Dr Ambika Prasad Gautam (KAFCOL)

Field officers: Sanjaya Raj Tamanag, Muna Bhattarai, Rabindra Pun Magar

Local facilitator: Debika Adhikari, Tika Ram Ban, Lalita Rajbanshi

For further correspondence:

lilanathsharma@gmail.com, fa@forestaction.org

Acknowledgement

Prof. Bharat Babu Shrestha has been acknowledged for providing valuable suggestions to design the invasive species management related activities. Yogendra Bikram Poudel and Ayush Gautam helped us while preparing this text.

Natural regeneration rescue



Trunk and female cone of *Cycas Pectinata* before and after removing *Mikania* Photograph-
Bhaskar Adhikari

Conventional methods of bush removal (jhadi safai, which involves invasive species as well) routinely remove bushes during winter season and involves uprooting or slashing of bushes. This turns out to be ineffective to control bushes, specially *Mikania micrantha*, as it fails to embrace ecology of invading species. The project has switched bush removal time to summer to capitalize potential growth of tree seedling and saplings. However, bush cleaning in summer is costly and labor demanding. In addition, complete uprooting is not necessary and is often futile. The project has therefore suggested 'natural regeneration rescue' as simple yet effective method which involves repeated removal of bushes-- that has tangled native tree seedlings and saplings-- so that they will get chance to grow during monsoon season and suppress invasive species by creating shade. Project has prioritized nurturing natural regeneration over plantation, as an ecological approach of forest restoration.



Royal
Botanic Garden
Edinburgh

