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MULTIFUNCTIONAL LANDSCAPES

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Field visit and workshop report:

Defining the problem domain and identifying possible entry point for experiential learning intervention to support lantana management and landscape restoration in Mandla, Madhya Pradesh, India

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About Multifunctional Landscapes: Multifunctional Landscapes is a CGIAR Science Program that aims to enhance the resilience, productivity, and sustainability of agricultural landscapes by integrating diverse land uses, ecosystem services, and livelihood strategies. The initiative supports evidence-based policies and innovations that balance food production with climate adaptation, biodiversity conservation, and social inclusion. By collaborating with local communities, governments, and partners, it promotes landscape level approaches to managing natural resources for long-term ecological and economic benefits. Learn more here: https://www.cgiar.org/initiative/multifunctional-landscapes

Contents

Field visit and workshop report: Defining the problem domain and identifying possible entry point for experiential learning intervention to support lantana management and landscape restoration in Mandla, Madhya Pradesh, India

Introduction

The management of *Lantana camara*, an invasive plant species, is a major challenge across India. Its rapid spread across forests and adjoining agricultural lands has negatively affected biodiversity, reduced the availability of non-timber forest products (NTFPs), and rendered areas of agricultural land uncultivable. Invasive species management has become a national priority, and is reflected in goals in India's Strategic Plan for Biodiversity, as the unchecked growth of Lantana affects landscapes across the country. In the Mandla District, in Madhya Pradesh, Lantana has decreased wildlife habitats and reduced fodder availability by replacing native grasses. This affects food security and livelihoods in the area, with disproportionate impacts on women who are responsible for collecting NTFPs, fuelwood and fodder from forests. As Lantana encroaches further, women must travel longer distances and spend more time gathering forest resources, which increases risk of human or wildlife attacks. Current by-laws in place promote collective action for eradication of Lantana and evidence shows that community-based management of Lantana can lead to positive social and ecological outcomes.[1]

To support community-based landscape restoration and invasive species management in Mandla, the Foundation for Ecological Security (FES), the International Food Policy Research Institute (IFPRI), and the Environment & Livelihoods Modeling (ELM) Lab at the Cornell University aim to co-develop and pilot an experiential learning intervention using computer-based game. Designed well, experiential learning games allows learning all around – we learn about resource decision-making through observing game play, and participants learn how their choices as a community sharing these resources can lead to patterns of solution or failure.

During December 8-12, 2025, team members from the three groups met in Mandla. The goals of the week-long visit include 1) understanding and defining the issue domain, 2) identifying possible entry points for an experiential learning intervention to support lantana management and landscape restoration in Mandla, Madhya Pradesh, India, and 3) brainstorming game structure and game purpose within the issue of lantana management applicable to Mandla and beyond. Toward these goals, the team carried out three activities: 1) village site visits, 2) stakeholder consultation, and 3) introductory game training sessions and design discussion.

Village visits

The team visited four villages in the Bichiya and Niwas block of Mandla. In Niwas, the two selected villages were mohapani and Khamriya. In Bichiya, the two selected villages were Attariya and Barkheda. These villages were selected because lantana removal interventions have been implemented there. While Khamariya and Barkheda continue to maintain the restored sites, Mohapani and Attariya have not sustained maintenance of the restoration areas. Drawing on the different experience of the villages, we can use the lessons learned to inform the experiential learning invention development.

The main takeaways of the visits include:

1. Villages broadly agree that lantana removal by itself is not difficult, but maintaining cleared land is the real challenge. In all villages visited, initial removal happened through collective effort, volunteering, or external push. The difference in outcomes emerged only after removal, when daily monitoring and restraint were required.
2. In communities where maintenance is a weak point, reported reasons included labour fatigue, competing livelihood priorities, and lack of collective action. People are willing to work for a one-off two-three days, but lantana maintenance requires repeated effort, removing regrowth, guarding patches, controlling grazing, which is seen as physically demanding and time-consuming. Youth migration reduces available labour, leaving older people and women to manage tasks that are heavy and continuous. Strong community governance capacity is needed to come up mechanism to overcome these constraints.
3. In villages doing better, communities emphasise clear local rules and enforcement, along with motivation. Practices such as fines for cutting trees, restrictions on grazing, rotational guarding, women-led forest groups, and conditional access to forest benefits are actively mentioned. Where such rules are absent or loosely followed, lantana reappears quickly through neglected corners and open grazing.

[1] Lalai, Dhwani, Shivangi Anand, Ishan Agarwal, Chetan Agarwal, Manohar Pawar, and Nishtha Relan. 2023. *Restoration and Enhanced Governance of Commons through Community-Based Adaptive Management of Invasive Species*.

4. Communities note that benefits from maintenance are delayed, while costs are immediate. Grass regeneration, NTFPs, edible plants, and reduced wildlife conflict take time to become visible. In villages where people do not see quick returns, interest in upkeep declines, even though the long-term benefits are well understood.
5. Another commonly cited reason is conflict beyond village control, especially with adjoining villages. Even where one village maintains discipline, unregulated access by outsiders, cutting trees, grazing livestock, or disturbing cleared patches, discourages sustained effort and weakens collective resolve.
6. Overall, villagers frame successful maintenance not as a question of awareness or ecological understanding, but as a matter of collective discipline, enforceable norms, and shared accountability. Where social monitoring is strong and participation is tied to rights and benefits, cleared landscapes are maintained lantana free. Where responsibility becomes diffuse, lantana gradually returns despite having been removed earlier.

At a broader level, the lantana problem exposes a structural mismatch between short-term collective action and long-term ecological discipline. Removal is dramatic and visible; maintenance is slow, repetitive, and socially demanding. Without incentives that reward patience and penalise free riding, restored landscapes slip back into infestation. Successful maintenance, therefore, reflects not ecological superiority but institutional and governance maturity and capacity: the ability of a community to align everyday behaviour with long-term forest outcomes.

Stakeholder consultation

Building on the first stakeholder workshop on lantana management organized by FES in May, 2025, when a “lantana free landscape” vision was declared, the objectives of this follow up workshop are to discuss key challenges faced by different stakeholders, share lessons from experiments and solutions, and identify key actors, their current behaviors, and the changes needed to advance that vision. Around 43 participants, including 32 women participated in the stakeholder sessions.

The session brought together elected panchayat representatives, community leaders, CSOs, Multi Actor Platforms, NGO representatives, research institutes, and frontline mobilisers to share experiences from large-scale lantana removal in the landscape and discuss why past efforts stalled. The challenges identified are the following: (a) technical & ecological reality: Lantana must be uprooted (not burned/chopped), followed by active post-removal restoration and 2–3 years of maintenance; (b) Governance & markets: fragmentation of land governance (revenue/forest/panchayat), weak tenure clarity, lack of established markets for lantana products, and one-time funding models that neglect follow-up maintenance.

The group agreed scaling requires coordinated action across Forest Dept, Panchayats, MGNREGA, CSOs, research institutes and communities via a Multi-Actor Platform and by embedding lantana work into GPDP / MGNREGA with phased funding and clear NOC/permission pathways. The session identified the key stakeholders, the current behaviour and the changes required.

Stakeholder consultation highlighted multi-dimensional benefits of lantana management previously identified in FES reporting (including management of human-wildlife conflict, and improvement of non-timber forest product expansion), as well as the low levels of maintenance effort required following initial strong campaigns of lantana removal. Additional highlights included the function of overharvesting non-timber forest products in enabling lantana growth, and the function of cropping or grazing in suppressing it.

Game design discussions

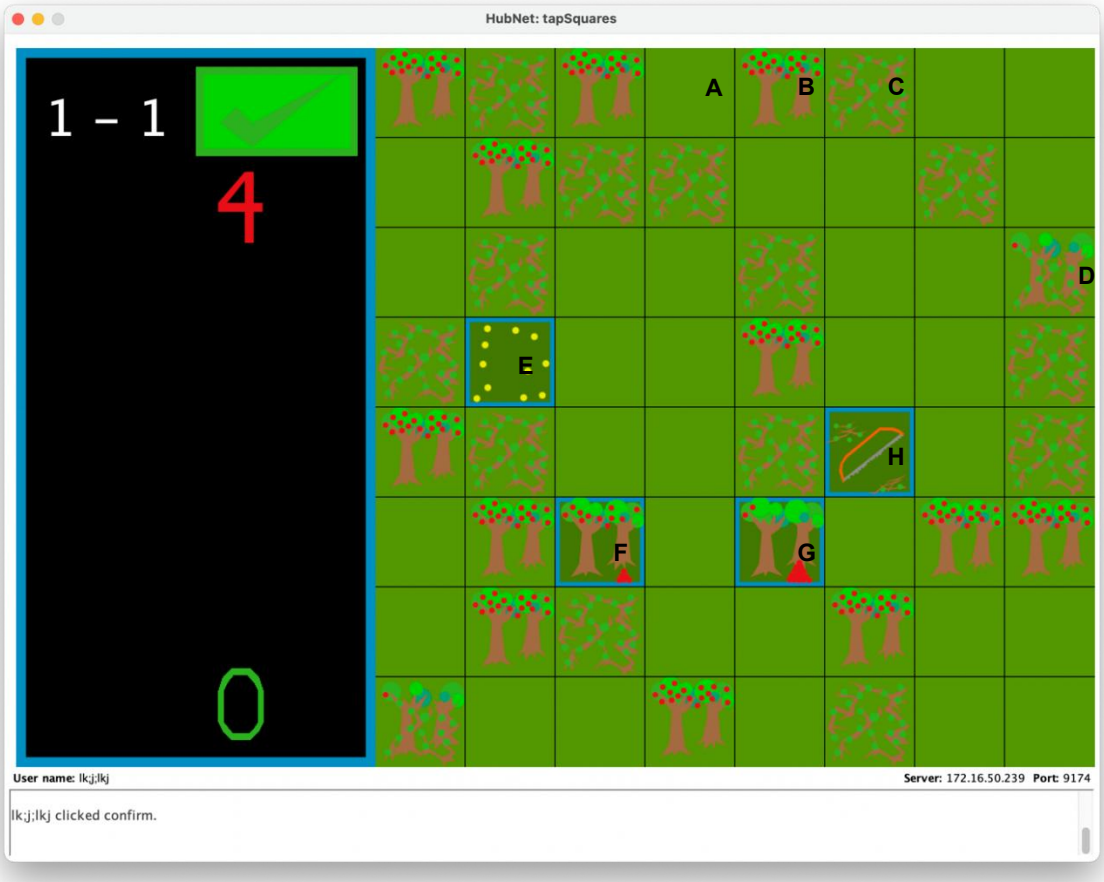
Game design discussions focused on the collective action problem of managing lantana at two scales. First, efforts to manage lantana within villages may fail where villagers are not motivated to contribute, leading to a problem of free-riding. Participants noted that while communities recognize the ecological and livelihood benefits of lantana removal, they also expect tangible economic returns. In communities where lantana is actively being managed, households earn income from non-timber forest products and the cleared land is used for grazing, highlighting the existing benefits. Communities also suggested additional potential uses for lantana, including construction materials, biopesticides, and biochar, and emphasized that economic incentives could further encourage participation in lantana management.

Second, issues of lantana growth are relevant in some areas between villages, with spillover to the villages themselves. Actions taken by villagers in these areas are not necessarily well-coordinated, and participants highlighted that coordination is complicated by land disputes and conflicts across governance levels, including the Panchayat, Revenue Department, and Forest Department. A game may serve the possible role of demonstrating the benefits of inter-village communication and coordination around the challenge of shared land use and lantana management.

At both of these scales, participants identified the NetLogo-based approach as a valuable tool to capture features of both problem scales, and recognized a draft game prepared in advance as a useful starting point for iterative refinement in advance of a pilot activity.

Draft game structure - Invasive species game

For the more local scale collective action problem, the following draft design has been prepared – a landscape that is composed of grid squares, that may be empty (A), have forest (B), have invasive species (C), or have both forest and invasive species (D).



Before the land use phases of the game begin, players may first identify 'village' land, available only to those in their shared village, before then identifying 'private' land, available only to the person who owns it. **Each of these phases ends once all players have clicked the green 'Confirm' (checkmark) button.**

In each land use round, players have an endowment of 20[1] units to use (red number at upper left). These units may be spent in the following ways:

Action	Example in figure	Cost[2]	Benefits[3]	Notes
Seed	E	3	5	Only on empty land
Harvest – light	F	3	5	Only on forest without invasive
Harvest – heavy	G	5	10	
Restore	H	5	0	Removes invasive species, making land available

Each round ends, and all choices become final, when the players have clicked the Confirm (checkmark) button. In between each land use phase, two information screens are shown:

1) Summary of points earned across the landscape, with each number shown in the color of the player who earned it

2) Summary of total points earned by each player and each village

Each information screen is cleared once all players have clicked Confirm.

Next steps

Based on the visit outcomes, ELM Lab will share draft game with user instructions and rules, as well as basic introduction to game parameter files, with FES team. FES team will test draft game and discuss, suggesting revisions to ELM Lab and IFPRI through email and or online meetings conducted over January and February of 2026. ELM Lab will refine game design based on this input and prepare a draft games training protocol for FES to apply during pilot activity beginning in March 2026 or later.

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