SGP The GEF Small Grants Programme

Nature Protects if She is Protected

सत्यमेव जयते

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Compendium of Case Studies

SGP OP7

A Compendium of Case Studies

RE-IMAGINING FUTURES
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GUWAHATI

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Creating Innovative Solutions for a Sustainable Future

COUNCIL FOR SOCIAL DEVELOPMENT

Compendium of Case Studies

SGP OP7

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TISS GUWAHATI

The Energy and Resources Institute
Creating Innovative Solutions for a Sustainable Future

Council for Social Development

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Foreword

At its core, a sustainable future is ultimately about people—their aspirations, their resilience, and their relationship with nature. At a time when the world remains far from achieving its climate and sustainability commitments, it is easy to focus solely on global targets and policy debates. The interconnected challenges—spanning climate change, inequality, biodiversity loss, and governance gaps—cannot be addressed in isolation. They demand long-term vision, inclusive participation, and values-driven approaches that place communities at the centre of change. True transformation begins within communities, where environmental challenges are lived realities and solutions emerge through collective efforts and local wisdom.

In this context, TERI, under the overall guidance of the Ministry of Environment, Forest and Climate Change and in association with the United Nations Development Programme is implementing the Small Grants Programme (SGP), which serves as a support system for locally led solutions that build climate resilience, conserve biodiversity, and promote sustainable livelihoods. Working across India's semi-arid heartlands, coastal zones, and the Northeast highlands, the SGP strengthens grassroots leadership to deliver both local and global environmental benefits.

At TERI, we support grassroots institutions through research, capacity building programmes, and partnerships to enable them to bring about meaningful impact. The SGP seeks to amplify local innovations and ensure that community-driven solutions inform broader development pathways in the country. When science, policy, and grassroots leadership converge, the potential for meaningful and lasting transformation multiplies.

The case studies in this Compendium reflect courage, collaboration, and commitment. They demonstrate how communities, when supported with trust and opportunity, become powerful stewards of their ecosystems and architects of their own futures.

As we present this volume at the World Sustainable Development Summit 2026, we reaffirm our commitment to scaling up locally grounded solutions that restore ecosystems, strengthen institutions, and secure dignified livelihoods for communities across India—recognizing that communities are not merely beneficiaries of change, but its true driving force.

Dr. Vibha Dhawan
Director General,
The Energy and Resources Institute

Foreword

Environmental impacts are accelerating across India. Climate change, biodiversity loss and land degradation are already affecting lives and livelihoods. Responding effectively requires solutions that are grounded in local realities and led by the communities most directly affected.

Since its inception at the Rio Earth Summit in 1992, the Global Environment Facility Small Grants Programme (GEF-SGP) has embodied the principle of thinking globally and acting locally. Operating in more than 135 countries, it has demonstrated that small-scale, community-driven initiatives can generate transformative environmental impact.

In India, the Seventh Operational Phase (OP7) of GEF-SGP continues this commitment, placing communities at the centre of environmental solutions.

This compendium of case studies presents the breadth of that work. Across the Northeast highlands, central semi-arid regions, and coastal landscapes, community-led projects are addressing interconnected challenges of climate change, biodiversity conservation, and land restoration. Together, these initiatives have restored over 8,000 hectares of degraded land and strengthened sustainable land-use practices across more than 17,000 hectares. They have also improved over 700 hectares of marine ecosystems and installed 0.67 MW of renewable energy capacity. More than 28,000 community members, over half of them women, have strengthened their capacities through training, knowledge exchange, and institutional support.

These outcomes are reflected in diverse local actions —from promoting human–elephant coexistence in Assam to restoring coastal ecosystems in Tamil Nadu; from expanding clean biogas solutions in Maharashtra to enabling solar-powered livelihoods for tribal women in Madhya Pradesh. Together, they demonstrate how environmental stewardship and livelihood security can advance hand in hand.

A clear lesson emerges: sustainable development is strongest when it is inclusive. When local institutions are supported and the participation of women and indigenous communities is prioritised, solutions become more resilient and enduring.

At UNDP India, we are proud to support this initiative. Our role has been both catalytic and collaborative—supporting grassroots innovators, strengthening institutional capacities, and connecting community action to policy frameworks and market platforms such as Green Haat and national knowledge fairs.

We commend the Ministry of Environment, Forest and Climate Change (MoEFCC) for its leadership, the Global Environment Facility (GEF) for its continued support and vision, and The Energy and Resources Institute (TERI) for its role as the implementing partner. We also extend our appreciation to civil society organisations and community leaders whose commitment has translated vision into measurable results. We hope this compendium encourages continued investment in locally led solutions that strengthen both nature and communities across India.

Dr. Angela Lusigi
Resident Representative
United Nations Development Programme (UNDP) India

Foreword

In India, the Small Grants Programme (SGP), launched in 1996, began as a series of promising community-led initiatives across diverse ecological regions. Over time, it has evolved into a focused, landscape-based approach that integrates environmental sustainability with social transformation and institutional strengthening. Under the Seventh Operational Phase (OP7), SGP-India represents a strategically aligned effort to enhance socio-ecological resilience in some of the country's most climate-vulnerable and underserved regions.

GEF-SGP India OP7 is implemented by the United Nations Development Programme (UNDP) in collaboration with the Ministry of Environment, Forest and Climate Change (MoEFCC), with TERI serving as the National Host Institution. In this role, TERI facilitates coordination across the Northeast highlands, central semi-arid regions, and coastal ecosystems—ensuring that local action is supported by knowledge systems, institutional partnerships, and policy alignment.

Currently supporting 71 grassroots-led projects, OP7 advances climate action, biodiversity conservation, land restoration, and sustainable livelihoods. The programme has restored over 8,000 hectares through plantations, natural regeneration, and soil and water conservation, while sustainable land-use practices now extend across more than 17,000 hectares. Marine ecosystems have been strengthened across 700 hectares, and 0.67 MW of renewable energy capacity has been installed. More than 28,000 community members—over half of them women—have benefited through capacity building, technology demonstration, and knowledge-sharing platforms, resulting in measurable improvements in local resilience and income security.

At TERI, we recognize that durable environmental outcomes require strong local institutions, inclusive governance, and strategic alliances between communities, civil society, and government. District-level coordination mechanisms have strengthened accountability and innovation, while community knowledge has remained central to project design and execution. Our role has been to enable convergence—bringing science, policy, and grassroots action into meaningful alignment to achieve scalable and sustained impact.

Gender mainstreaming is not an adjunct but a foundation of this approach. Women in rural, tribal, and coastal regions often face disproportionate climate risks, yet they are powerful agents of change. Through women-led organizations and gender-responsive planning, SGP-India OP7 supports women as leaders, entrepreneurs, and stewards of natural resources, ensuring equitable participation and long-term sustainability of outcomes.

This Compendium documents stories of resilience, partnership, and transformation. As we present it at the World Sustainable Development Summit 2026, we reaffirm our commitment to scaling locally grounded solutions that restore ecosystems, strengthen institutions, and secure dignified livelihoods for communities across India, while contributing meaningfully to national and global sustainability goals.

Dr. Dipankar Saharia
Senior Director – Social Transformation & Strategic Alliances
The Energy and Resources Institute

Foreword

The defining challenges of our time—environmental degradation, climate change, and food insecurity—are deeply interconnected. From rising global temperatures and erratic rainfall patterns to soil depletion and biodiversity loss, the evidence is unmistakable: our relationship with the natural world must be transformed. While international frameworks such as the United Nations initiatives and the Intergovernmental Panel on Climate Change assessments provide global direction, it is within communities that meaningful, lasting change truly begins.

Community led interventions under Small Grants Program represent one of the most powerful and practical approaches to environmental conservation and sustainable development. When local stakeholders—farmers, youth groups, women's associations, cooperatives, faith-based organizations, and indigenous leaders—are empowered with knowledge, resources, and participatory decision-making structures, they become stewards of their ecosystems. Their lived experience, traditional knowledge, and collective action can restore degraded lands, protect watersheds, preserve biodiversity, and build climate resilience.

The compendium of case studies covers various interventions like reforestation campaigns, agroforestry systems, renewable energy adoption, and waste management programs which reduce greenhouse gas emissions. Simultaneously, climate-smart agricultural practices—such as crop diversification, conservation tillage, water harvesting, and organic soil management—strengthen resilience against droughts, floods, and shifting growing seasons. These grassroots strategies align closely with global commitments like the Paris Agreement, demonstrating that global goals can only be achieved through local action.

Sustainable agriculture lies at the heart of this transformation. Communities that adopt regenerative farming practices not only enhance food security but also rebuild soil fertility, conserve water resources, and protect surrounding ecosystems. By integrating indigenous knowledge with scientific innovation, rural communities can transition from extractive systems to regenerative models that sustain both people and planet. In doing so, they contribute directly to broader development targets, including the United Nations Sustainable Development Goals.

This publication underscores the principle that environmental conservation is not solely a policy mandate or scientific pursuit—it is a social movement rooted in community ownership. Governments, development partners, and civil society must therefore prioritize participatory frameworks that amplify local voices and foster inclusive leadership. Sustainable change is most enduring when communities are not passive beneficiaries but active architects of solutions.

As we confront the urgency of climate change and environmental decline, the path forward is clear: empower communities, invest in sustainable agriculture, and cultivate a shared ethic of stewardship. The future of our planet depends not only on global agreements, but on the everyday actions of informed and united communities working toward a common vision of resilience, equity, and sustainability.

Manish Kumar Pandey
National Coordinator
SGP India

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Compendium of Case Studies of Cycle-1 of GEF-SGP-India OP7

Introduction

The Global Environment Facility's Small Grants Programme (GEF-SGP), born at the 1992 Rio Earth Summit, was founded on a simple but powerful belief: small, community-driven initiatives can generate global environmental benefits. Now operating in over 135 countries, the programme has repeatedly shown that when trust, resources, and knowledge reach the grassroots, extraordinary outcomes follow.

In India, the Seventh Operational Phase (OP7) carries this legacy forward with renewed energy. Under the guidance of the Ministry of Environment, Forest and Climate Change (MoEFCC), with support from UNDP India and national implementation by TERI, GEF-SGP-India OP7 has strengthened locally led solutions that build climate resilience, conserve biodiversity, and secure sustainable livelihoods.

Across semi-arid landscapes, fragile coasts, and the biodiverse Northeast, community institutions have revived degraded lands, regenerated marine ecosystems, expanded renewable energy access, and strengthened climate-smart agriculture. Over 8,000 hectares of degraded land have been restored, sustainable land-use practices expanded across 17,000 hectares, marine habitats improved, renewable energy installed, and more than 28,000 individuals—many of them women—empowered through training and collective action.

But numbers tell only part of the story.

This Compendium of Case Studies from the first cycle of OP7 brings together vivid accounts of change in motion. Each story reflects courage, creativity, and collaboration. Together, they demonstrate that environmental stewardship and livelihood security are not competing goals—they are mutually reinforcing pathways to resilience.

Launched at the World Sustainable Development Summit 2026, this volume is more than a record of achievements. It is an invitation—to policymakers, practitioners, researchers, and citizens—to look closely at what becomes possible when communities are recognized not as beneficiaries, but as leaders of change.

The lesson that emerges is clear and hopeful: sustainable development thrives when it is inclusive, participatory, and rooted in local wisdom. When women, indigenous groups, and grassroots institutions are empowered, solutions become stronger, fairer, and more enduring.

We hope these pages spark curiosity, inspire replication, and strengthen commitment to locally led action across India. Because within these case studies lies a powerful reminder—the future of sustainability is already taking shape, one community at a time.

AARANYAK

35 YEARS Aaranyak

Project Snapshot	
Project Title	**Community based integrated approach to facilitate Human Elephant Coexistence and Biodiversity Conservation in Udalguri, Assam**
Location	Udalguri, Assam
GEF SGP contribution	INR 39,81,208.00
In cash co-financing	INR 42,28,950.00
In kind co-financing	INR 13,77,328.00
Number of beneficiaries	288 HHs (60% women)
Project duration	June 2023 - July 2025
Initiatives	Human elephant co-existence through ecological restoration and livelihood generation.
Case Study 1	Community-Led Ecological Restoration and Human-Elephant Coexistence in the Bhabar Belt, Udalguri, Assam
Case Study 2	Community Led Forest Fire Mitigation and Restoration in Bhairabkunda Reserve Forest

Community-Led Ecological Restoration and Human-Elephant Coexistence in the Bhabar Belt, Udalguri, Assam

Background

The Bhabar belt of Udalguri district in Assam, a dry and rocky terrain bordering Bhutan, has traditionally been inhabited by farming and herding communities who coexisted with nature. However, this fragile landscape has been increasingly strained by ecological degradation, erratic climatic patterns, and frequent human-elephant conflict. The construction of solar fencing along the Bhutan border disrupted historic elephant corridors, forcing elephants to seek alternative routes through villages. This led to severe crop damage, destruction of homes, and a rise in human-wildlife confrontations.

Many families were displaced, leading to the fragmentation of social and agricultural systems. Recognizing the complex inter-linkages between conservation, livelihoods, and social resilience, the environmental NGO Aaranyak, with support from the Small Grant Programme, initiated a comprehensive strategy for restoration. This approach sought not only to mitigate human-elephant conflict but also to revive degraded land, enhance biodiversity, and rebuild community confidence.

Implementation

Aaranyak's approach, emphasized inclusive and locally adapted interventions. The project began by identifying key pressure points: soil degradation, fragmented habitats, crop losses, and community displacement. Responding to these, villagers received training in vermicomposting, enabling them to convert organic waste into nutrient-rich compost. This not only revived soil health but reduced dependence on costly chemical fertilizers. Homestead or ***baree*** gardens were developed to improve food security and nutrition, often incorporating intercropping and agroforestry principles. Seasonal and circular fencing, designed based on elephant movement

patterns, helped protect crops during peak migration periods. Aaranyak also spearheaded the restoration of 20 hectares of degraded forest to reopen elephant corridors. These ecological efforts were complemented by social interventions, including awareness campaigns using IEC tools, participatory planning workshops, and the formation of local stewardship groups. Special focus was placed on empowering women, who were trained to manage homestead nurseries and lead land restoration efforts. Over time, these multi-pronged strategies cultivated resilience, reduced human-wildlife friction, and rebuilt the community's confidence in coexisting with nature while securing livelihoods and conserving biodiversity.

Environmental Impact

The environmental gains from the Bhabar belt initiative have been tangible and transformative. The restoration of 20 hectares of degraded forest played a pivotal role in reviving historic elephant corridors, allowing safe passage for wildlife and reducing the frequency of crop raids in nearby villages. This habitat rehabilitation was marked by the return of native plant species, improved green cover, and the reappearance of birdlife and pollinators. Soil health, previously compromised by chemical inputs and overuse, improved significantly with the widespread adoption of organic vermicomposting. This practice enriched the land with natural nutrients, enhanced water retention, and

promoted healthy root systems. The ***baree*** homestead model, enhanced with intercropping and agroforestry, increased species diversity and ecological stability within human settlements. Seasonal fencing provided non-lethal deterrents to wildlife during critical periods, protecting both crops and animals. The overall landscape, once degraded and vulnerable, began to regenerate naturally. Microclimatic conditions improved, and the buffer between human habitation and wild habitat strengthened. These environmental shifts demonstrate how decentralized, community-led interventions can generate systemic ecological benefits, turning conflict-prone regions into resilient ecosystems capable of sustaining both biodiversity and rural livelihoods.

Socioeconomic Impact

The socioeconomic transformation driven by the project has had far-reaching effects across the Bhabar belt. The integration of the ***baree*** system

with modern agricultural practices revitalized rural livelihoods by boosting household-level food production and reducing reliance on market-purchased staples. Over 200 households, involving around 800 individuals saw tangible improvements in income stability, food security, and expenditure patterns. Vermicomposting, once unfamiliar to many, has become a cornerstone of sustainable farming. Farmers not only use the compost themselves but also sell excess produce, creating new revenue streams. The establishment of homestead nurseries has proven particularly impactful. Managed mostly by women, these nurseries provide saplings for agroforestry, ecological restoration, and government plantation schemes, thereby generating consistent income and new employment opportunities. Youth engagement in nursery management and sustainable agriculture has also curtailed migration, as young people now find purpose and economic security in their native villages. Reinvigorated farming practices have led to improved yields and diversified diets, enhancing household nutrition and health. By reducing dependency on external resources and fostering self-reliance, the project has strengthened community resilience, restored a sense of pride in traditional practices, and laid the groundwork for long-term rural prosperity.

Gender Mainstreaming

A standout feature of the initiative has been its success in mainstreaming gender into

conservation and development. Out of all the beneficiaries, 60% are women. Traditionally underrepresented in land management decisions, women in the Bhabar belt were given training and leadership roles in homestead nursery development, vermicomposting, and sustainable agriculture. These activities enabled them to contribute directly to household income and decision-making. The nurseries, in particular, became hubs of empowerment. Women were trained in plant propagation, pest control, and nursery management, transforming them into technical experts within their communities. A pioneering example was a woman who began producing over 1,400 kg of compost annually, inspiring widespread adoption of vermicomposting and positioning women as key agents of change. Participation in ecological restoration also elevated women's roles in community planning and environmental stewardship. The project also facilitated spaces for intergenerational knowledge exchange, where older women shared traditional practices

while youth contributed new ideas and tools. This equitable approach enhanced the project's effectiveness and sustainability by leveraging diverse perspectives. Gender mainstreaming in the Bhabar belt has not only uplifted women economically but also reshaped social norms, creating a more inclusive and resilient community framework.

Policy Impact

The grassroots success of the Bhabar belt project has started to resonate within policy circles. Local government bodies have taken note of the project's effective community-based nursery model, considering it for integration into broader reforestation and agroforestry initiatives. The high survival rate of saplings from these nurseries, managed with scientific rigor and traditional care, has prompted forestry departments to collaborate with community producers rather than rely solely on centralized procurement. Aaranyak's partnership with local authorities has also laid the foundation for incorporating conflict mitigation strategies into district-level wildlife and land management plans. These include the replication of seasonal fencing, promotion of vermicomposting, and community stewardship models. Moreover, the visibility and documented outcomes of the project have informed stakeholder consultations on sustainable rural development. Policymakers have begun recognizing the value of participatory planning and decentralized governance in achieving environmental and livelihood goals. As this model gains traction, it demonstrates how community initiatives can serve as catalysts for policy shifts, offering practical solutions rooted in local realities. This growing policy influence underscores the importance of embedding community voice and agency into broader conservation and rural development frameworks.

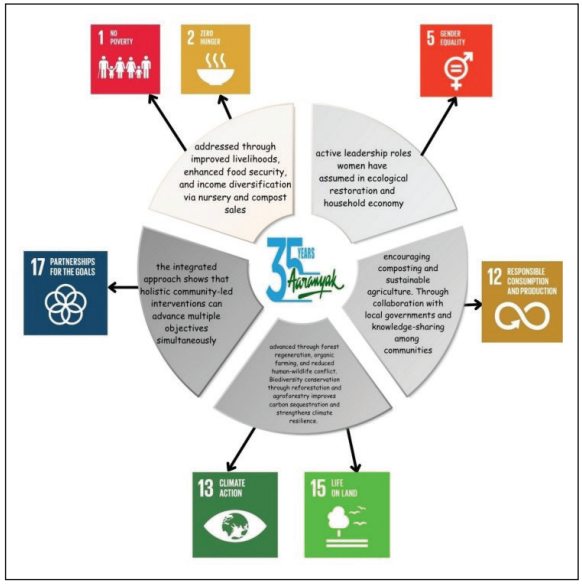
Sustainability

Sustainability in the Bhabar belt initiative is built on strong community ownership, context-specific practices, and ecological integration. By revitalizing traditional systems such as the ***baree*** model and introducing accessible innovations like vermicomposting and seasonal fencing, the project reduced reliance on external inputs

and fostered self-sufficiency. Knowledge transfer through hands-on training and peer learning has equipped community members with the skills needed to maintain and adapt practices over time. Ecological sustainability has been reinforced through biodiversity-rich homestead gardens, restored forest patches, and improved soil health, all of which enhance the region's ability to withstand climatic stresses. Economic sustainability is ensured through diversified income sources like nursery sales, organic produce, and compost marketing. Socially, the project has strengthened local institutions, particularly those led by women, creating long-term custodians of land and resources. The success of these interventions has inspired replication within nearby villages, indicating strong potential for horizontal scaling. Community-driven monitoring mechanisms have been introduced, ensuring accountability and timely troubleshooting. Altogether, the initiative's blend of traditional knowledge, scientific input, and local leadership ensures that its benefits are durable, adaptable, and rooted in the cultural and ecological fabric of the region.

Contribution to SDGS

- SDG 1 (No Poverty) and SDG 2 (Zero Hunger) are addressed through improved livelihoods, enhanced food security, and income diversification via nursery and compost sales.
- The emphasis on SDG 5 (Gender Equality) is evident in the active leadership roles women have assumed in ecological restoration and household economy.
- SDG 13 (Climate Action) and SDG 15 (Life on Land) are advanced through forest regeneration, organic farming, and reduced human-wildlife conflict.
- The project also promotes SDG 12 (Responsible Consumption and Production) by encouraging composting and sustainable agriculture. Through collaboration with local governments and knowledge-sharing among communities,
- The project supports SDG 17 (Partnerships for the Goals). Importantly, the integrated approach highlights the interdependence of these goals, showing that holistic



community-led interventions can advance multiple objectives simultaneously.

Replication and Upscaling

The interventions in the Bhabar belt present a replicable and scalable model for other forest-fringe and human-wildlife conflict regions. Their success lies in simplicity, affordability, and cultural resonance. The enhanced ***baree*** system, community nurseries, vermicomposting, and seasonal fencing require minimal infrastructure but yield significant ecological and socioeconomic returns. Documentation of best practices and training modules developed by Aaranyak offer a blueprint for replication. Collaborations with district administrations and forest departments pave the way for formal integration into development and conservation schemes. Moreover, cross-community exposure visits have already sparked interest in nearby regions facing similar challenges. Institutional support from the Small Grants Programme and technical mentorship by Aaranyak can facilitate horizontal scaling. To ensure effective upscaling, mechanisms such as peer learning networks, seed funding, and policy advocacy are essential. The adaptability of the model makes it suitable for varied ecological contexts across Northeast India and beyond. Replication efforts should maintain the core principles of community ownership, gender inclusion, and ecological integrity. With proper support, the Bhabar belt model can evolve into a regional strategy for sustainable rural development and biodiversity conservation.

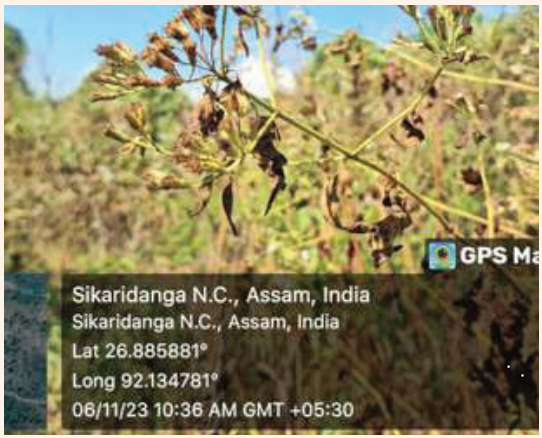
Lessons Learned

This case study from the Bhabar belt underscores several key lessons for sustainable development and conservation. First, integrating traditional knowledge systems like the ***baree*** with modern science enhances both ecological and social resilience. Community ownership emerged as a cornerstone of success, demonstrating that locally led initiatives foster long-term engagement and stewardship. The project also highlighted the importance of gender inclusion, showing that when women are empowered with resources and training, they drive transformative change. Another critical lesson was the value of conflict-sensitive design addressing human-elephant conflict required tailored, context-specific interventions rooted in local knowledge and data. Flexibility and iterative learning were vital, allowing strategies to evolve based on community feedback and ecological monitoring. The project revealed that ecological restoration can be a foundation for livelihood improvement, not an opposing goal. Finally, the initiative showed that small, low-cost solutions can yield outsized impacts when aligned with local culture and capacity. As rural communities worldwide grapple with the twin pressures of climate change and biodiversity loss, the Bhabar belt project offers a replicable, scalable, and deeply human model of hope, resilience, and renewal.

Community Led Forest Fire Mitigation and Restoration in Bhairabkunda Reserve Forest

Background

Bhairabkunda Reserve Forest (RF), located in the biodiverse but ecologically vulnerable region of Assam, India, has faced serious degradation over recent years. The forest has been increasingly threatened by recurring wildfires and the aggressive spread of invasive alien plant species, particularly *Parthenium hysterophorus*. These ecological threats have not only damaged the forest's biodiversity but also disrupted the livelihoods of forest dependent communities. Recognizing the urgent need for a comprehensive solution, a collaborative initiative was launched involving local villagers, women leaders, forest officials, NGO Aaranyak, and the UNDP GEF Small Grants Programme (SGP). The aim was to restore ecological balance through a participatory model that integrated scientific forest fire mitigation with community led restoration efforts. A key focus was placed on converting traditional fire lines into "green firebreaks" using fire-resistant and multifunctional plants. The initiative sought not just ecological revival but also socioeconomic upliftment and resilience building. With inclusive governance and shared responsibility, Bhairabkunda's model is now a beacon of how local knowledge, community ownership, and institutional support can revive ecosystems under threat.



Implementation

The forest restoration program was rolled out under the Joint Forest Management (JFM) framework. Key partners included Aaranyak, UNDP GEF SGP, local community groups, and government forest officials. The strategy adopted a dual approach prevention and restoration. The most innovative intervention was the creation of 25 hectares of green firebreaks fire lines that serve as buffers against wildfires while also being productive ecological zones. These fire lines, 20 to 25 feet

wide, were planted with fire resistant species such as Aloe Vera, Lemon, and Banyan, which also offer economic and medicinal benefits. These were maintained consistently for two consecutive years to ensure their long-term effectiveness. Alongside this, a systematic campaign was launched to identify and remove invasive alien species, primarily ***Parthenium hysterophorus***, which are highly flammable and ecologically harmful. Additionally, a comprehensive fire management plan was developed and disseminated through community training, enabling villagers to act swiftly during fire incidents. Restoration efforts also included replanting 10 hectares of degraded forestland with native species in 2024, with a broader goal to restore 100 hectares. The program blended scientific input with traditional ecological knowledge, empowering the community to take ownership of the initiative while receiving technical and logistical support from experts.

Environmental Impact

The initiative has significantly contributed to the ecological revival of Bhairabkunda RF. The green firebreaks have proven to be an effective barrier against both natural and anthropogenic fires, reducing fire incidents and minimizing damage to surrounding vegetation. The planted pollinators and biodiversity, creating microhabitats. The removal of ***Parthenium hysterophorus*** has led to increased ground-level

vegetation cover, reducing the risk of invasive species-induced flammability. The replanting of 10 hectares with native species marks a critical step in restoring ecosystem functionality, improving soil stability, and enhancing moisture retention. Long-term benefits include reduced carbon emissions from forest fires, improved air quality, and increased biodiversity. Moreover, the integrated fire management plan supports proactive surveillance and rapid response, further safeguarding the forest ecosystem. Over time, these measures are expected to regenerate the once-degraded landscape into a vibrant forest ecosystem that can support wildlife corridors, water retention, and climate resilience. The intervention serves as an example of how targeted ecological restoration, guided by community stewardship and science-based planning, can reverse environmental degradation and build climate-adaptive landscapes.

Socioeconomic Impact

The initiative has delivered substantial socioeconomic benefits for local communities. By converting fire-prone zones into productive green firebreaks, villagers now harvest aloe vera and lemon offering additional income streams and medicinal use. This multifunctional landscape enhances both safety and economic resilience. The reforestation and maintenance work generated employment, particularly for marginalized and landless groups who were engaged in planting, fire line preparation, and invasive species removal. The community-led model fostered a sense of ownership, reducing dependency on external actors and strengthening local governance. Increased forest cover also contributes to ecosystem services vital for agriculture, such as improved soil fertility and microclimate regulation. These services are essential for local subsistence farmers whose crops had been previously threatened by wildfires. Access to forest-based products, including fruits, fodder, and herbal plants, has improved, reinforcing food and medicinal security. Overall, the initiative has elevated community wellbeing by ensuring both livelihood support and ecological protection. It has demonstrated how conservation and development objectives can be harmonized, ensuring forests are viewed not as extractive resources but as shared assets that support long-term human and ecological health.

Gender Mainstreaming

Women have played a pivotal role in the success of the Bhairabkunda forest restoration model. From planning to implementation, women leaders were actively involved in decision-making through local forest management committees. Specific capacity-building sessions were organized to ensure women had the knowledge and tools to contribute meaningfully to fire mitigation and restoration activities. Their participation was especially prominent in fire line maintenance, nursery operations, and the cultivation of aloe vera and lemon plants that women traditionally use and understand. These tasks not only provided women with additional income opportunities but also boosted their visibility and agency in natural resource governance, traditionally a male-dominated domain. By integrating gender equity into the project design, the initiative helped shift community perceptions, recognizing women as critical stakeholders in conservation. Furthermore, many women became peer educators, leading awareness campaigns about fire prevention and invasive species control. Their involvement has led to more inclusive and responsive decision-making, ensuring that forest management aligns with diverse community needs. This gender-responsive approach is now being recognized as a critical enabler of sustainable forest governance and long-term resilience.

Policy Impact

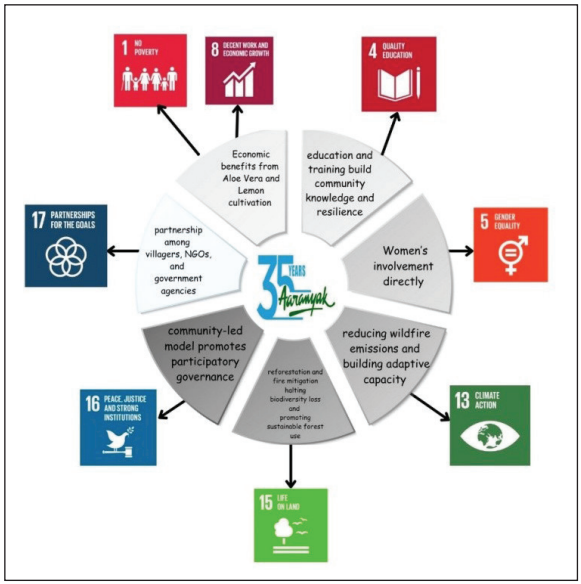
The success of Bhairabkunda's joint forest restoration initiative has influenced policy discourse at local and regional levels. The project's integrated approach blending fire mitigation, invasive species management, and community participation has been cited in district-level environmental planning sessions. It aligns with national guidelines under India's Green India Mission and State Action Plans on Climate Change, offering a field-tested model of climate-adaptive forest management. Forest officials have begun incorporating elements of the green firebreak concept into broader forest fire response plans. The inclusion of local communities and especially women in planning processes has sparked discussions on reforming Joint Forest Management (JFM) structures to be more inclusive and performance-driven. The detailed fire management plan created through this initiative is being used as a template in nearby forest divisions. Additionally, the project has demonstrated the value of integrating UNDP Small Grants Programme mechanisms into state-level ecological initiatives, promoting policy shifts towards funding grassroots climate resilience. By proving the effectiveness of community co-management, Bhairabkunda is not just restoring landscapes, it is reshaping the policy frameworks that govern them, creating a precedent for participatory forest governance in vulnerable ecosystems across India.

Sustainability

The Bhairabkunda initiative has embedded sustainability at multiple levels. Ecologically, the use of native and multifunctional species ensures long-term resilience to fire and invasive pressures. Community involvement has been central to the project's sustainability; villagers are not just participants but co-managers, trained in surveillance, early warning, and fire suppression. Annual maintenance of fire lines and periodic monitoring of invasive species are now part of routine community-led activities. Financial sustainability has also been considered income from aloe vera and lemon cultivation offers recurring economic incentives to maintain green firebreaks. Knowledge transfer, through training and community-to-community learning, has further strengthened local capacity to sustain gains. Institutions like Aaranyak continue to support monitoring, while forest officials have integrated many aspects into their operational plans. Moreover, the initiative's success has attracted attention from additional funders and stakeholders, creating opportunities for scaling. Importantly, by aligning with broader climate action frameworks, the project is well positioned to attract long-term support. Together, these components form a robust, locally owned system that is not only restoring a forest but is ensuring that the gains are protected, nurtured, and replicated for years to come.

Contribution to SDGS

- By reducing wildfire emissions and building adaptive capacity this project aligns with SDG 13 (Climate Action).
- Through reforestation and fire mitigation, it also supports SDG 15 (Life on Land) by halting biodiversity loss and promoting sustainable forest use.
- The economic benefits from Aloe Vera and Lemon cultivation align with SDG 1 (No Poverty) and SDG 8 (Decent Work and Economic Growth),
- Women's involvement directly supports SDG 5 (Gender Equality).



- The community-led model promotes SDG 16 (Peace, Justice, and Strong Institutions) through participatory governance.
- The education and training provided build community knowledge and resilience, contributing to SDG 4 (Quality Education).
- The partnership among villagers, NGOs, and government agencies exemplifies SDG 17 (Partnerships for the Goals).

Replication and Upscaling

The Bhairabkunda model offers strong potential for replication across other forest fringes facing similar ecological threats. Its key strengths community ownership, scientific backing, gender inclusion, and multifunctional firebreaks make it adaptable to diverse contexts. Already, forest departments in neighboring districts have expressed interest in adopting the green firebreak approach, recognizing its dual function

as a fire barrier and a livelihood generator. Aaranyak and UNDP are preparing knowledge toolkits and training modules to facilitate replication. The fire management plan is being translated into local languages and used as a learning resource in environmental education programs. For upscaling, partnerships with state forest departments, NGOs, and academic institutions are being explored. Integration with state-level afforestation programs, particularly under the Green India Mission and Compensatory Afforestation Fund Management and Planning Authority (CAMPA), can unlock funding and technical support. By embedding the model into existing policy frameworks and building on grassroots momentum, the Bhairabkunda approach can serve as a replicable blueprint across India and similar ecological landscapes globally. Its core message that empowered communities can restore forests while protecting livelihoods is universally applicable.

Lessons Learned

Several key lessons emerged from the Bhairabkunda initiative. First, ecological restoration must be locally driven community participation is not just beneficial, it's essential for long-term success. Second, fire prevention and restoration must go hand in hand; preventive infrastructure like green fire lines must be coupled with active restoration and invasive species removal to create resilient ecosystems. Third, gender equity enhances effectiveness. Women's leadership in fire line maintenance and plantation activities ensured broader buy-in and increased project sustainability. Fourth, multifunctionality boosts engagement plants like Aloe Vera and Lemon offered direct incentives for care and maintenance. Fifth, capacity building transforms passive beneficiaries into proactive stewards. Regular training, knowledge sharing, and field demonstrations built a confident community response mechanism. Lastly, integration with policy frameworks at the district and state level ensures continuity and potential for scale. The Bhairabkunda model underscores that holistic, inclusive approaches grounded in both science and traditional wisdom can reclaim degraded forests, improve livelihoods, and foster a deep sense of ecological stewardship.

Conclusion

Aaranyak's experience demonstrates that strategic planning, community participation, and adaptive management are key to overcoming ecological and social challenges. By blending biodiversity restoration with local empowerment, the project enhances resilience and ensures sustainability.

Challenges Faced During Project Implementation

Table 1: Key Challenges faced with associated impacts and actions taken by Aaranyak

Challenge	Impact	Strategy Considered
Fast regrowth of invasive plant species threatening ecological restoration efforts.	Reduced survival of native species and increased competition in restored areas, risking the project's ecological goals.	Regular deweeding and monitoring; training and engagement of Joint Forest Management Committees (JFMCs) and community members in controlling the spread.
High vulnerability of the project area to seasonal forest fires.	Potential large-scale destruction of restored habitats, threatening community safety and ecological outcomes.	Creation and maintenance of a 1 km fireline; community training on fire prevention and emergency response.
Inconsistent irrigation due to water scarcity and poor infrastructure.	Poor nursery growth, delays in planting schedules, and reduced agricultural productivity.	Installation of drip irrigation systems for efficient water use; establishment of a new electricity line to ensure reliable pumping.
Frequent elephant intrusions damaging nursery plantations	Loss of seedlings, disruption of activities, and increased vulnerability of community assets.	Bio-fencing and solar fencing to deter elephants; planting lemon borders as natural barriers.
Low fertility and poor water retention of soils in the project area.	Poor plant growth and reduced effectiveness of restoration efforts.	Application of vermicompost and organic soil inputs; raised planting beds to improve soil moisture retention
Difficulty in maintaining regular coordination with remote and inaccessible villages.	Delayed communication, weak participation, and reduced trust between communities and project staff.	Appointment of local youth as liaisons; regular village-level meetings to foster engagement and trust.

IAP Management

Before Intervention

After Intervention

Firelines

Before Intervention

Before Intervention

Community Nursery

Before Intervention

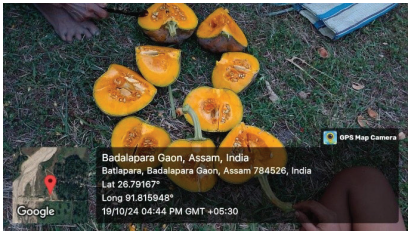

After Intervention



Homestead Garden

Before Intervention


Before Intervention

Green Valley Society

Project Snapshot	
Project Title	**Conservation of biodiversity in household plantations and livelihood generation in Dhubri district, Assam**
Implementing organisation	Green Valley Society
Location	Dhubri, Assam
GEF SGP contribution	Rs. 40,00000/-
In cash co-financing	Rs. 10,00000/-
In kind co-financing	-
Number of beneficiaries	1000
Total area of land restored	40 Ha
Project duration	June 2023 - July 2025
Key project components	» Forest restoration, » Fishery Development, » Community engagement and livelihoods
Case Study 1	Pond Development and Fishery Training
Case Study 2	Renewing Hope Through Areca: A Green Initiative in Jalikura, Dhubri

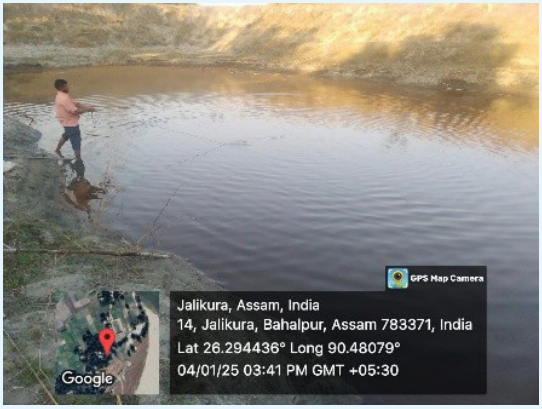
Pond Development and Fishery Training

Background

Green Valley Society (GVS), is based in Dhubri, Assam. The region of Dhubri, marked by frequent floods, low-income levels, and limited livelihood options, presented both a challenge and an opportunity for ecological interventions. Aquatic resources in the area remained underutilized, while recurring waterlogging rendered agricultural land unproductive. With this context, GVS initiated its Pond Development Program in 2023 as a pilot intervention. The concept was to utilize the naturally occurring low-lying lands prone to flooding by transforming them into scientifically managed ponds. GVS's goal was to integrate ecological conservation with livelihood generation while building local capacities for long-term management.

Implementation

The implementation of the GVS Pond Development Program was carried out in multiple phases over the span of one year. The first step involved community mobilization and site identification. GVS conducted participatory rural appraisals (PRAs) to select locations most suitable for pond development based on flood patterns, community interest, land ownership, and ecological viability. Next, GVS undertook technical planning, which included designing the ponds with proper slope, depth, and inlet/outlet points to ensure water retention and flow management. Earthworks were carried out using both manual labour (generating local employment) and limited mechanized support, ensuring minimal ecological disruption. Once ponds were excavated and stabilized, GVS collaborated with the Kalong Kapili Foundation to conduct a one-day fishery training session. This training emphasized natural interventions in fisheries, including native species stocking, organic feed alternatives, pond water



management, and disease prevention. The training ensured that communities could manage the ponds without reliance on expensive inputs.

Following the training, GVS distributed fish seedlings to beneficiaries. Each household or group managing a pond received a mix of carp species suited for local conditions. Monitoring systems were also established through village-level pond committees for maintenance and reporting. This community-centric, low-input implementation strategy ensured that the ponds were not just constructed but effectively utilized and maintained for long-term use.

Environmental Impact

The GVS pond development initiative significantly contributed to **environmental restoration and climate adaptation** in flood-prone Dhubri. Firstly, the development of ponds improved groundwater recharge by enhancing percolation during heavy rainfall, mitigating local flooding and water stagnation.

The ponds also served as micro-habitats that supported aquatic and semi-aquatic biodiversity. Native fish species, frogs, and wetland birds returned to areas where ponds were constructed, demonstrating a positive impact on local ecological balance. Additionally, the ponds provided natural breeding grounds, reducing pressure on rivers and overfished natural water bodies.

Crucially, the intervention promoted organic aquaculture practices. Training focused on avoiding chemical feed and synthetic additives, encouraging farmers to use farm waste, aquatic plants, and cow dung to fertilize ponds. This reduced chemical runoff and supported soil and water health across surrounding agricultural fields.

In areas where water hyacinth was prevalent, GVS trained communities to repurpose it into bio-compost and raft seedbeds, enhancing water quality and reducing invasive biomass.

By integrating nature-based solutions and traditional knowledge, the project contributed to ecosystem-based adaptation (EbA). In a region increasingly affected by climate variability, these ponds now act as climate buffers, ensuring water availability, food production, and biodiversity preservation.

Socioeconomic Impact

The socioeconomic benefits of the pond development project have been substantial. The primary impact has been in income generation through fish sales. Beneficiaries, many of whom had no prior source of regular income, began earning between ₹5,000–₹10,000 per cycle, depending on pond size and yield.

During the pond construction phase, local employment opportunities were created for both skilled and unskilled labour. This provided short-term cash income and engaged youth in productive activities. Moreover, the training programs led to capacity building and the development of new skill sets in fishery management, pond maintenance, and organic aquaculture. These skills are now being informally transferred within villages, creating a multiplier effect.

The initiative also strengthened community institutions, with pond committees formed for maintenance, conflict resolution, and equitable access. Social cohesion improved, especially in areas where multiple households shared pond management responsibilities.

Overall, the project created a low-risk, high-benefit livelihood model rooted in natural resource use, now viewed by many communities as a replicable and expandable strategy for rural development.

Gender Mainstreaming

A key focus of the GVS pond development program was to ensure active participation of women. Traditionally excluded from fisheries training and water resource management, women in Dhubri were encouraged to take on central roles in both pond management and training programs.

Specific women-only training sessions were held in collaboration with local self-help groups (SHGs), focusing on fish feeding, pond cleaning, and fingerling care tasks often naturally assumed by women within households.

GVS also facilitated access to microcredit through SHG-bank linkage models to support small-scale input costs like netting, feed, or tools. This enhanced women's control over productive resources and allowed them to make independent decisions related to fish sales and income use.

In many cases, pond management became a shared household responsibility, reducing the gender labour gap and improving intra-household decision-making dynamics.

Through these deliberate efforts, gender equality was promoted not just as a principle, but as a functional pillar of successful pond-based livelihoods. The initiative showed that when women are included and empowered, community resource management becomes more equitable and effective.

Policy Impact

The success of GVS's initiative has begun to attract the attention of local governance bodies and district-level departments. Panchayats in Dhubri, impressed by the self-sufficiency model, have initiated discussions on including pond development under MGNREGA convergence for future scalability.

Moreover, the district fishery department has recognized the model's alignment with Assam's Fishery Policy, especially its emphasis on decentralized, sustainable, and community-managed aquaculture.

At the state level, the Assam Rural Livelihoods Mission (ASRLM) has shown preliminary interest in exploring GVS's model for SHG-based aquaculture clusters, which could lead to institutional support for replication.

The intervention also influenced local climate adaptation strategies, with the ponds being proposed as natural infrastructure for flood resilience.

In essence, the GVS pond initiative has begun to shape policy narratives by showcasing that community-driven, ecologically sound, and low-cost models can deliver measurable impact and important learning for resource-scarce districts across Assam and the Northeast.

Sustainability

Sustainability was a cornerstone of the GVS pond development model, achieved through community ownership, ecological design, and low-cost inputs. Each pond was assigned to a user group responsible for ongoing maintenance, with local bylaws established for usage, cleaning, and profit-sharing. Training on natural fishery practices ensured that communities could manage ponds without relying on expensive feed, chemicals, or external inputs. This self-reliance was further enhanced by the promotion of local seed production, where fingerlings were raised by some farmers and redistributed within the village ecosystem.

Ecologically, the ponds were integrated into the landscape with minimal disruption. By utilizing flood-prone areas and avoiding permanent cement structures, the project preserved the natural hydrology of the region. Institutionally, sustainability was reinforced through community pond committees, partnerships

with NGOs, and emerging collaborations with government departments for scaling. Socially, the model-built trust and capacity within the community ensuring that even after the initial project cycle ended, beneficiaries had both the motivation and knowledge to continue.

In sum, the GVS pond development project proved that environmental resilience, economic empowerment, and social equity can be achieved sustainably when interventions are locally anchored and community-led.

Contribution to SDGS

» SDG 1 (No Poverty): By creating alternative livelihoods and boosting household incomes through fishery-based earnings.

» SDG 2 (Zero Hunger): Through enhanced food security and nutrition via local fish production.

» SDG 5 (Gender Equality): By promoting women's participation and access to aquaculture resources.

» SDG 6 (Clean Water and Sanitation): As ponds improved water retention and quality for secondary uses.

» SDG 13 (Climate Action): By acting as climate-resilient infrastructure in flood-prone regions.

» SDG 14 (Life Below Water): Through ecologically sound, chemical-free aquaculture supporting biodiversity.

» SDG 17 (Partnerships for the Goals) through collaboration with Kalong Kapili Foundation and alignment with local governance and state departments.

Replication and Upscaling

Following its success in Dhubri, GVS is now preparing a replication blueprint for neighboring districts in Assam. Key to replication is the simplicity and low cost of the model: natural pond excavation, community training, and sustainable stocking.

Requests from local NGOs and interest from district officials have prompted GVS to design a training-of-trainers (ToT) module and a Pond Development Manual in Assamese, which will be distributed in rural training centers.

Scaling is also being explored via MGNREGA-linked pond construction, with technical and monitoring support from GVS. In areas where SHGs are active, aquaculture clusters are being planned, where multiple women's groups can manage ponds collectively.

GVS aims to expand its work into Char areas and tea garden communities, which face similar livelihood vulnerabilities.

The success factors community ownership, minimal infrastructure, and ecological design make the model highly adaptable, even in other Northeastern states with similar geographies.

Lessons Learned

Several key lessons emerged from the GVS pond development initiative:

- Community buy-in is critical. Early and consistent engagement led to better ownership and maintenance.
- Small is scalable. Even micro-ponds of 10–15 decimal land made a difference and can be multiplied easily.
- Women's involvement improves outcomes. Gender inclusion strengthened decision-making, use, and benefits.
- Training must be practical. On-field sessions and demos worked better than classroom formats.

Above all, the project reinforced the idea that resilience lies in rootedness when communities are empowered to manage their own resources, with support but not dependency, development becomes both inclusive and lasting.

Renewing Hope Through Areca: A Green Initiative in Jalikura, Dhubri

Background

Jalikura, a small and largely agrarian village in Assam's Dhubri district, has faced years of environmental degradation, soil erosion, and declining agricultural productivity. The village lies in a region prone to climate vulnerabilities like flooding, deforestation, and land degradation. With a population dependent on traditional farming and limited livelihood alternatives, economic stagnation has made many households vulnerable, especially smallholder farmers and women. Recognizing the need for ecological restoration and economic revitalization, the Green Valley Society, a local NGO, initiated a community-based project under the Global Environment Facility's (GEF) Small Grants Programme - OP7. Supported by the Ministry of Environment, Forest and Climate Change (MoEFCC), UNDP, and TERI, the initiative aimed to create sustainable livelihoods through a nature-based solution planting areca nut (tamul) tree. In Assam and across Northeast India, areca nuts are embedded in cultural, religious, and economic life. The project sought to leverage this cultural familiarity while addressing environmental and socioeconomic challenges. What began as a simple tree-planting effort evolved into a multi-faceted development initiative that restored degraded landscapes, introduced green enterprise models, and brought renewed hope to the people of Jalikura. It stands as a testament to how deeply rooted traditions can intersect with modern sustainability efforts to produce long-lasting change.

Implementation

The implementation of the Jalikura areca initiative began with an inclusive planning

process involving local panchayat leaders, farmers, women's self-help groups, and youth. The first step involved identifying suitable community and private lands for planting areca nut trees. The Green Valley Society facilitated sapling procurement and organized community plantation drives. Training sessions were held to educate villagers on tree care, biodiversity benefits, and the importance of preserving their local environment. To ensure the project went beyond ecological restoration, a second component was introduced: establishing an areca leaf plate-making unit. The NGO procured a semi-automated machine that could process naturally fallen areca palm leaves into biodegradable plates and bowls. Villagers, particularly women, were trained in collecting, drying, and pressing the leaves into products.

Basic entrepreneurship training was also provided, covering quality control, pricing, packaging, and marketing. The finished products will cater to the growing eco-conscious consumer market. Regular community monitoring meetings, supported by field visits from MoEFCC and UNDP partners, helped maintain momentum. The dual strategy ecological and economic ensured strong local buy-in, encouraged collective ownership, and made the project a living model of sustainable rural development rooted in nature and tradition.

Environmental Impact

The environmental impact of the areca initiative in Jalikura has been profound and multifaceted. By planting hundreds of areca nut trees across the village, the project has restored degraded land and improved the overall health of the local ecosystem. Areca palms have deep roots that help bind soil, reducing erosion an ongoing issue in flood-prone Dhubri. The trees also enhance groundwater retention and improve soil fertility

over time by contributing organic matter. As the trees mature, they provide shade, shelter, and habitat for local bird and insect species, supporting biodiversity. The transformation of naturally shed areca leaves into useful products has eliminated the practice of burning leaf litter, which previously contributed to localized air pollution. By encouraging the use of biodegradable plates, the project also contributes to reducing the dependence on single-use plastics, in line with India's national push to phase out plastic pollution. Importantly, the community has developed a sense of environmental stewardship, regularly caring for the saplings and learning about the value of nature-based solutions. This behavioral shift from viewing nature as expendable to seeing it as a partner in prosperity may be one of the most lasting impacts of the initiative, planting seeds of conservation that could grow for generations.

Socioeconomic Impact

Economically, the initiative has created a new and sustainable source of livelihood for many households in Jalikura, particularly those traditionally excluded from income-generating opportunities. The areca leaf plate-making enterprise has enabled villagers to transform what was once agricultural waste into a valuable product with market demand. For many, this represents their first foray into entrepreneurial activity. Women who previously relied solely on subsistence farming or domestic labour will gain the opportunity to earn consistent incomes by participating in the collection, processing, and sale of biodegradable plates. This extra income supports household expenses, children's education, and savings. Men, too, benefit from tree cultivation and sales of areca nuts, which have high cultural and commercial value across the region. Additionally, the village as a whole experience a positive economic ripple effect from local shops, transport providers, and suppliers now engage with the emerging green enterprise. The initiative has also helped stem the tide of seasonal migration, as villagers can now access meaningful work close to home. Importantly, the new economic opportunities are embedded within an environmentally sustainable model, meaning the village can grow economically without compromising its ecological integrity. This alignment of livelihood and conservation demonstrates a holistic approach to rural development.

Gender Mainstreaming

Gender inclusion was not merely an add-on but a core principle of the areca initiative. Women in Jalikura, often excluded from formal employment and economic decision-making, were prioritized in the implementation strategy. The areca leaf plate-making unit created a direct avenue for women's participation, both as workers and as contributors to household income. From the beginning, women were involved in training sessions, enterprise planning, and machinery operations. The project specifically targeted women from marginalized backgrounds, women who were widows, landless workers, and members of self-help groups ensuring that economic opportunities reached those most in need. By earning regular income, these women have gained financial independence and a stronger voice in family and community affairs.

Additionally, their involvement has challenged traditional gender norms in the village, gradually reshaping perceptions about women's roles beyond domestic confines. Group-based work also fostered social solidarity and peer support, making the initiative more resilient. Female leadership began to emerge within the project's structure, inspiring other community women to explore entrepreneurship and environmental action. The integration of gender mainstreaming in such a grassroots initiative is a model for inclusive rural development. It proves that empowering women is not just a social good it significantly enhances the effectiveness and sustainability of community-based environmental efforts.

Policy Impact

The areca initiative in Jalikura aligns closely with several national and state-level policy priorities, enhancing its relevance and replicability. At the national level, India's Plastic Waste Management Rules and ban on single-use plastics underscore the need for biodegradable alternatives. By producing eco-friendly areca leaf plates, the project directly contributes to this mandate. It also supports the National Action Plan on Climate Change (NAPCC), particularly the missions focused on sustainable agriculture, forest cover enhancement, and livelihood diversification. Locally, the project complements Assam's policies aimed at promoting agroforestry, rural entrepreneurship,

and women's empowerment. By demonstrating a low-cost, scalable green livelihood model, the initiative provides a practical example that policymakers can use to inform future schemes under MGNREGA, the National Rural Livelihoods Mission (NRLM), and agro-based MSME programs. The project's success has attracted attention from district-level administrators and panchayat leaders, prompting discussions about integrating similar models into local development plans. It also fosters community-level awareness of environmental laws, climate policies, and the benefits of decentralized action. This grassroots-policy feedback loop ensures that communities are not just passive beneficiaries of environmental policy but active participants in shaping and implementing it. In this way, the Jalikura initiative bridges the gap between policy design and on-ground impact.

Sustainability

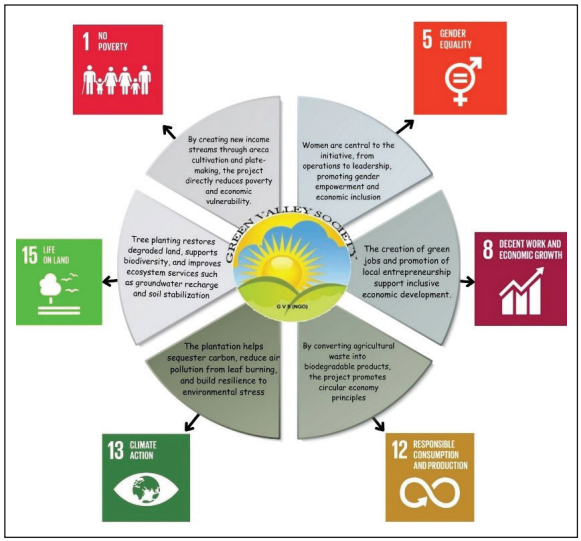
Sustainability is embedded at multiple levels within the Jalikura areca initiative environmental, economic, and social. Environmentally, the project uses nature-based solutions that require minimal external inputs. Areca nut trees are well-adapted to the local climate and soil, needing limited water or chemical inputs. Once mature, they continue to produce nuts and shed leaves for decades, providing long-term material for both ecological restoration and income generation. Economically, the areca leaf plate unit runs on

naturally available raw materials, significantly reducing production costs and dependence on external supply chains. The growing demand for biodegradable products ensures a viable market, and local value addition enhances profitability. Socially, the project has generated strong community ownership. Regular involvement of villagers in plantation and plate production has cultivated a sense of pride and accountability, leading to better care for both the environment and the enterprise. Skills training, especially for women, ensures that local human capital continues to grow. Additionally, the initiative has started forming cooperatives and linking with market actors to enhance long-term sustainability. By integrating ecological integrity, economic viability, and social inclusion, the project exemplifies a circular and self-sustaining rural development model that can continue to thrive with minimal external support.

Contribution to SDGS

The initiative contributes meaningfully to several of the United Nations Sustainable Development Goals (SDGs), demonstrating how localized action can advance global targets.

- SDG 1 (No Poverty): By creating new income streams through areca cultivation and plate-making, the project directly reduces poverty and economic vulnerability.
- SDG 5 (Gender Equality): Women are central to the initiative, from operations to leadership, promoting gender empowerment and economic inclusion.
- SDG 8 (Decent Work and Economic Growth): The creation of green jobs and promotion of local entrepreneurship support inclusive economic development.



- SDG 12 (Responsible Consumption and Production): By converting agricultural waste into biodegradable products, the project promotes circular economy principles.
- SDG 13 (Climate Action): The plantation helps sequester carbon, reduce air pollution from leaf burning, and build resilience to environmental stress.
- SDG 15 (Life on Land): Tree planting restores degraded land, supports biodiversity, and improves ecosystem services such as groundwater recharge and soil stabilization.

By aligning its goals and outcomes with multiple SDGs, the Jalikura areca initiative illustrates how integrated, community-led projects can serve as microcosms of sustainable development. It reinforces that rural communities can be active drivers of global environmental and social change when given the right tools and support.

Replication and Upscaling

The success of the areca initiative in Jalikura provides a replicable model for other villages across Assam and the broader Northeast region. Many communities in these areas share similar ecological conditions, cultural ties to areca nut usage, and economic challenges. The project's low entry barriers natural availability of raw materials, simple machinery, and basic training make it accessible and adaptable. NGOs, self-help groups, and local governments can easily

adopt the model with support from district administrations and existing development schemes such as the National Rural Livelihoods Mission (NRLM), Startup India, or state agroforestry programs.

To support upscaling, the Green Valley Society is documenting best practices and creating toolkits for other community-based organizations. Additionally, the initiative's integration with national goals around plastic substitution and rural development increases its eligibility for funding and technical support from both government and CSR channels. Market access remains a key factor for scale, so forming producer groups or cooperatives and building supply chains to urban eco-friendly product markets are crucial. Digital platforms and e-commerce can further expand reach. With the right partnerships and awareness, the areca model can evolve into a regional movement converting rural waste into wealth while restoring ecosystems and uplifting communities.

Lessons Learned

The Jalikura initiative offers several valuable lessons for community-based sustainable development. First, nature-based solutions can be both low-cost and high-impact when tailored to local contexts. The choice to plant areca nut trees a culturally familiar and ecologically suitable species made community acceptance easier and ensured long-term care. Second, integrating livelihood generation with environmental restoration creates a dual incentive model, where communities are motivated to protect nature because their incomes depend on it. Third, involving women not just as participants but as decision-makers significantly enhances project effectiveness, community resilience, and social cohesion.

Another key insight is the importance of knowledge transfer and training. Many villagers did not initially realize that fallen leaves could become valuable commodities. Providing skills, exposure, and market linkages unlocked their entrepreneurial potential. The project also showed that simple innovations like a leaf plate machine can have transformative effects when placed in the right hands. Regular community engagement, transparency in operations, and shared ownership emerged as pillars of sustainability. Finally, starting small and scaling gradually allowed for adaptation and learning at every step. The project reminds us that impactful change often begins with humble beginnings and grows through trust, tradition, and thoughtful innovation.

Global Bans Disrupt Socioeconomic Gains from Areca Leaf Enterprises

However, even as such grassroots innovations gain momentum, shifting global regulations can present unexpected hurdles that resonate all the way back to the communities driving these changes. The recent ban by the United States on the import of areca leaf plates, citing health concerns over naturally occurring toxins, strikes a troubling contrast to grassroots sustainability initiatives like the Green Valley Society project in Assam. On May 8, 2025, the U.S. Food and Drug Administration issued an import alert declaring dinnerware made from Areca catechu leaf sheaths unsafe for use, citing research showing that naturally occurring toxic alkaloids, including a known carcinogen, can migrate into food products.

The Green Valley Society's areca nut plantation and eco-plate enterprise had emerged as a powerful model of climate-resilient rural development restoring degraded lands, creating green livelihoods, and empowering women through biodegradable alternatives to plastic. However, the FDA's ruling now threatens to derail not just exports but also the economic lifeline for communities in Jalikura, Assam that transformed agricultural by products into eco-conscious income sources.

This controversy highlights a broader tension between global regulatory standards and local sustainability efforts, underlining the urgent need for scientific collaboration, innovation in safety compliance, and diversification into other approved biodegradable materials. The setback is a call to adapt and evolve balancing ecological ideals with the realities of international trade. While some industry stakeholders are mobilizing legal and scientific resistance, entrepreneurs in Shivamogga, Karnataka have pioneered a foodgrade antimicrobial lining that aims to block toxin migration and revive export potential despite a 1015% cost increase.

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Challenges Faced During Project Implementation

Table 2: Key Challenges faced with associated impacts and actions taken by GVS

Risk/Challenge	Impact	Strategy Considered
Unpredictable Weather	Delays in crop cycles and reduced resilience	Climate awareness sessions; seasonal adjustment of activities
Fragmented Land Holdings	Limited productivity and low profitability	Training on intercropping, organic farming, and efficient land-use practices
Low Literacy	Exclusion of illiterate/semi-literate members from training	Use of visual aids, pictorial content, and demonstrations
Unreliable Electricity Supply	Disruption of women's livelihood (leaf plate making)	Exploring solar energy; engaging government departments for long-term power solutions

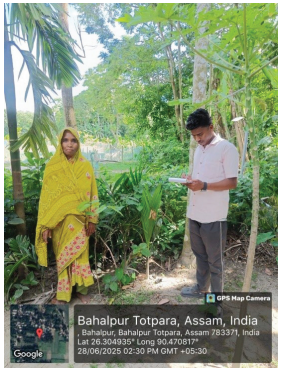
Conclusion

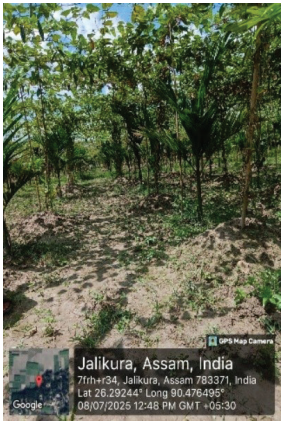
Green Valley Society's experience demonstrates how rural development projects can succeed through adaptability, innovation, and community participation. By addressing challenges ranging from environmental risks to literacy barriers and infrastructure gaps, GVS created a replicable model for sustainable rural development. Their proactive strategies not only solved immediate problems but also strengthened long-term resilience and community empowerment.

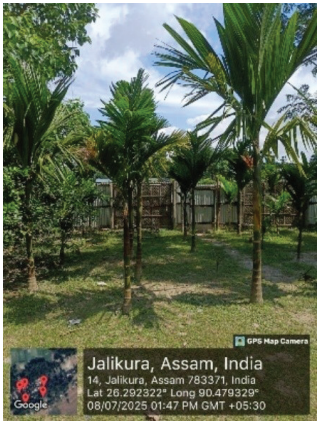
Plantation

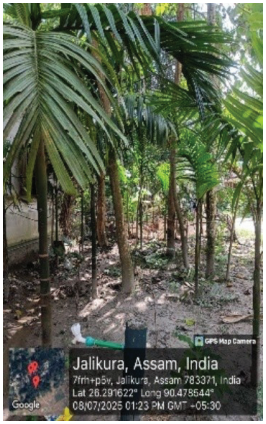
Before Intervention

After Intervention









Fishery

Before Intervention

After Intervention

Lotus Progressive Centre

Project Snapshot	
Project Title	**Promoting agro biodiversity based agricultural practices for generating sustainable income of resource poor farm families with special emphasis on conservation of agro-eco system**
Implementing organisation	Lotus Progressive Centre
Location	Nalbari, Assam
GEF SGP contribution	Rs. 39,33,000/-
In cash co-financing	Rs. 54,67,939/-
and in kind co-financing	535 farm families
Number of beneficiaries	(male – 270, Female – 265)
Total area of land impacted	600 Ha
Project duration	June 2023 - July 2025
Initiatives	» Eco-friendly farming practice » Community Garden and Kitchen Garden » Biodiversity register and seed banks » Food processing units » Indigenous livestock rearing
Case Study 1	Pheromone Trap and Yellow Sticky Card
Case Study 2	Goats, Growth, and Grassroots Change: Scaling Livelihoods through Scientific Goat Rearing
Case Study 3	Food Processing Unit
Case Study 4	Community Nursery and Homestead Garden
Case Study 5	Community-Led Conservation through Biodiversity Registers and Traditional Seed Banks in Assam
Case Study 6	Community-Led Transition to Natural Agricultural Inputs in Paddy and Vegetable Cultivation in Assam for Sustainable Soil and Crop Health

Pheromone Trap and Yellow Sticky Card

Background

Agricultural systems around the world face increasing pressure to reduce their reliance on chemical pesticides due to their adverse effects on human health, biodiversity, and environmental sustainability. In response, UNDP GEF SGP and Lotus Progressive Centre have supported initiatives that promote agroecological approaches to pest management. One such initiative is the training and dissemination of natural pest control tools such as pheromone traps and yellow sticky cards, which offer effective, non-chemical alternatives for controlling harmful insect populations in crop fields.

Pheromone traps are a biological control method that utilizes synthetic insect sex pheromones to attract and trap male insects most commonly moth species thus disrupting their mating cycle and reducing population growth. These traps specifically target pests such as ***Helicoverpa armigera*** (fruit borer), ***Spodoptera litura*** (tobacco caterpillar), and ***Leucinodesorbonalis*** (brinjal shoot and fruit borer). A lure containing the pheromone is placed inside a trap, which is positioned at crop height throughout the field. The attracted male pests enter the trap and are either immobilized or killed, depending on the trap design. By continuously reducing the number of mating males, the method offers a sustainable population control strategy that integrates seamlessly into Integrated Pest Management (IPM) programs.

Yellow sticky cards, on the other hand, are brightly coloured adhesive sheets that attract flying insect pests such as whiteflies, aphids, thrips, and leaf miners. The yellow colour is

highly attractive to these pests, and when they land on the surface, they become stuck and are unable to escape. These cards are especially useful for monitoring pest infestations, providing early warnings for outbreak risks, and reducing pest populations in a simple, low-cost, and chemical-free manner.

Together, these tools provide a foundation for more resilient, health-conscious, and environmentally responsible farming systems. Their simplicity, affordability, and effectiveness make them particularly suited for smallholder farmers, organic cultivators, and sustainable agriculture practitioners in both rural and peri-urban settings.

Implementation

1. Pheromone Traps

Installation: They are typically installed at crop canopy height to ensure maximum effectiveness in attracting insects. For optimal coverage and monitoring, a density of 10–15 traps per hectare is recommended, although this may vary depending on the crop type, field layout, and pest pressure.

Trap Components and Setup: Each trap consists of a plastic or funnel trap body and a pheromone lure, which contains species-specific synthetic sex pheromones. The lure is placed in a designated holder within the trap. The design of the trap allows attracted male insects to enter but prevents them from escaping.

Maintenance: Lures must be replaced every 3–4 weeks, to ensure consistent attractiveness. Traps should be checked regularly (at least weekly) to count the number of trapped insects. This data helps determine pest population trends and informs further pest management decisions. Lures should not be touched with bare hands to avoid contamination. Lures must be stored in cool, dry, airtight containers when not in use.

2. Yellow Sticky Cards

Installation: Yellow sticky cards are installed vertically using stakes, wires, or poles at canopy level or slightly above the crop. For effective pest attraction, 1–2 cards per 100 square meters are commonly used, and their number can be adjusted based on pest pressure.

Function and Operation: The bright yellow colour attracts flying insects, which then

become stuck to the non-drying adhesive on the surface of the card. This passive trapping method is especially valuable for early detection of pest infestations. Farmers can observe pest trends by tracking the number and types of insects caught on the cards.

Maintenance: Cards should be replaced or cleaned once the adhesive surface becomes full or dusty. For continuous monitoring, cards must be kept in place throughout the crop season and repositioned as needed based on crop growth.

Farmers are encouraged to install these tools early in the cropping season, before pest populations establish, to maximize control and monitoring efficiency.

Environmental Impact

Pheromone traps and yellow sticky cards offer eco-friendly alternatives to broad-spectrum chemical pesticides. These tools target specific pests without harming non-target species, significantly reducing the need for toxic chemical applications. As a result, they help lower pesticide runoff into soil and water, improve air quality, and reduce harmful residues on crops and in ecosystems. Unlike conventional insecticides, which often kill beneficial insects such as pollinators, decomposers, and natural predators, these methods are highly selective. Pheromone traps attract only targeted species using species-specific cues, while sticky cards primarily capture small flying pests with minimal impact on beneficial insects like bees, butterflies, and lady beetles. This selectivity supports healthy populations of essential organisms that contribute to pollination, pest control, and soil health. These tools also promote biodiversity by avoiding chemical disruptions to ecological food webs. They support soil microbial life, enhance plant-pollinator interactions, and maintain habitats for birds, reptiles, and amphibians that feed on pests. Finally, by reducing reliance on chemical pesticides, they help prevent resistance buildup in pest populations and avoid disrupting ecological balance. Pheromone traps disrupt mating cycles, while sticky cards monitor and manage early infestations, promoting sustainable and resilient agro-ecosystems.

Socioeconomic Impact

Pheromone traps and yellow sticky cards offer cost-effective alternatives to chemical pesticides, helping farmers reduce expenses on costly insecticides and repeated applications. By minimizing toxic exposure, they also lower healthcare costs and reduce illness-related work loss. Early pest detection prevents large-scale infestations, ensuring better yields and more stable incomes. These tools improve crop quality by producing chemical-free harvests that are safer for consumption and suitable for organic or premium markets, enhancing farmers' access to higher-value sales channels. Their use also supports local economic development. Manufacturing, assembling, and distributing traps and lures can create jobs and stimulate rural entrepreneurship. Agro-dealers and extension workers can provide installation and advisory services, while farmer groups can collaborate on bulk purchasing, training, and data sharing strengthening agricultural value chains and retaining economic benefits within communities. Health and safety improve significantly, especially for women and children often exposed to pesticides during fieldwork. Non-toxic pest control leads to safer farming environments and better quality of life. Finally, these simple, affordable tools promote equity by being accessible to smallholders, women, youth, and remote farmers. They require minimal training or investment, ensuring broader participation in sustainable agriculture practices.

Gender Mainstreaming

While these methods don't explicitly address gender, these low-risk, simple technologies are accessible to both men and women farmers. Their implementation can support women's participation in pest management and agroecological farming.

Policy Impact

Pheromone traps and yellow sticky cards align with Assam's push for organic and agroecological farming. They support the State Organic Mission, Zero Budget Natural Farming (ZBNF), and Paramparagat Krishi Vikas Yojana (PKVY) by reducing reliance on chemical inputs and promoting traditional, sustainable practices.

These tools also advance Integrated Pest Management (IPM) under the National Mission on Sustainable Agriculture (NMSA) and its state-level initiatives. Recognized as key IPM tools, they are effective in managing pests in crops like paddy, brinjal, and teamajor staples in Assam. Krishi Vigyan Kendras (KVKs) in districts like Jorhat and Dibrugarh have already demonstrated their effectiveness in horticulture.

Assam's Action Plan on Climate Change (SAPCC) emphasizes reducing agrochemical use to build resilience against erratic weather and pest outbreaks. Pheromone traps and sticky cards support this by offering safe, climate-resilient pest control suited to flood-prone and upland areas.

They also enhance food safety and export readiness of Assam's signature crops by helping meet residue standards under FSSAI and international norms. Their affordability and ease of use make them especially beneficial for women and marginal farmers, fitting seamlessly into SHG-led initiatives, ASRLM programs, and training efforts by KVKs and NGOs.

Sustainability

Pheromone traps and yellow sticky cards promote environmental sustainability by reducing dependence on synthetic pesticides. Their use minimizes soil and water contamination, protects beneficial insect populations, prevents pesticide resistance, and preserves ecological balance by supporting natural predator-prey dynamics. This helps maintain soil health, biodiversity, and the integrity of surrounding ecosystems. Economically, these tools are low-cost, reusable, and input-efficient ideal for smallholder and marginal farmers. They reduce expenses on chemical pesticides, lower market rejections due to residue issues, and stabilize yields through timely pest control. Their role in organic and high-value markets can boost farmer incomes and long-term profitability. Social sustainability is strengthened through safer working conditions, particularly for women and children who are more vulnerable to chemical exposure. These tools encourage observation-based decision-making, reducing dependency on agrochemical dealers, and foster community learning through SHG initiatives and Farmer Field Schools. They also promote intergenerational knowledge-sharing by blending traditional methods with ecological innovations. Institutionally, these tools align with government schemes on IPM, organic farming, and climate resilience. With support from extension services, FPOs, and SHGs, they can be mainstreamed into local farming systems. Finally, their compatibility with practices like intercropping, crop rotation, and composting makes them ideal for integrated and climate-smart agriculture.

Replication and Upscaling

Pheromone traps and yellow sticky cards have strong potential for grassroots replication. Smallholder farmers can adopt them using locally available materials along with commercial lures or cards. Their low cost and ease of use make them accessible, while FPOs and SHGs can facilitate bulk procurement, distribution, and training. Local micro-enterprises or home-based units can assemble these tools, generate rural employment and ensure availability. Their proven effectiveness across crops like rice, brinjal, chili, tomato, tea, and citrus allow wide use in both highland and lowland agroecosystems.

Upscaling depends on enabling factors such as hands-on training, field demonstrations, and institutional support. KVKs, Farmer Field

Schools, and NGOs play a key role in educating farmers on trap installation and monitoring. Government programs especially IPM, PKVY, and organic farming schemes can integrate these tools into input packages. Success stories from initiatives like APART have shown that visible results drive broader adoption.

Public-private partnerships can further scale impact. Agri-startups and local producers can reduce costs through mass production, while research institutions refine pheromone blends. Digital platforms can support pest tracking, data collection, and advisory services.

These tools are especially valuable in pest-prone and organic zones. With policy support, training, and community engagement, they can become a sustainable part of Assam's farming future.

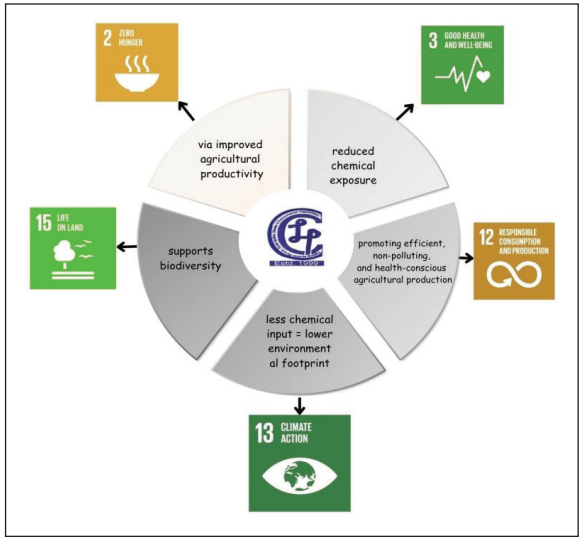
Lessons Learned

Effective pest control using pheromone traps and yellow sticky cards depends on regular monitoring. Farmers who consistently checked traps, counted pests, replaced lures, and adjusted placements made better decisions and reduced unnecessary pesticide use and costs.

Training is critical. Farmers trained by KVKs or NGOs showed higher adoption and correct usage, while untrained farmers often misused the tools or abandoned them due to poor results. Despite their simplicity, these tools benefit from support systems like demonstrations, visual aids, and group learning through Farmer Field Schools, which help build confidence and long-term use.

While affordable, sustained adoption depends on reliable access to quality lures and cards. Initiatives that linked SHGs or FPOs with local suppliers achieved better continuity and scale. Involving women in pest monitoring through SHGs improved field upkeep and tool usage, but many women remain underrepresented in training highlighting the need for gender-inclusive extension models.

The tools are most effective when integrated with other methods like biopesticides, neem sprays, intercropping, and trap crops as part of broader IPM strategies. Government support, through schemes like PKVY and IPM programs, accelerates scaling by adding credibility.



Contribution to SDGS

The practice supports several UN Sustainable Development Goals (SDGs), including:

- SDG 2: Zero Hunger (via improved agricultural productivity)
- SDG 3: Good Health and Well-being (reduced chemical exposure)
- SDG 12: Responsible Consumption and Production
- SDG 13: Climate Action (less chemical input = lower environmental footprint)
- SDG 15: Life on Land (supports biodiversity)

Goats, Growth, and Grassroots Change: Scaling Livelihoods through Scientific Goat Rearing

Background

Nal*bari* district in Assam, known for its agrarian economy, has long depended on small-scale, traditional goat rearing to support rural livelihoods. However, despite the adaptability of local goat breeds to the region's climate, productivity remained low due to poor feeding, inadequate shelter, weak breeding practices, and limited veterinary care. High mortality rates especially during the monsoon season meant that income from goat sales was unreliable and disconnected from broader markets. Recognizing both the challenges and the potential, the Lotus Progressive Centre introduced the Scientific Goat Rearing Initiative, in partnership with Self-Help Groups (SHGs) and Regional Rural Banks.

This initiative combined traditional knowledge with scientific livestock management and targeted women SHG members as key agents of change. By equipping them with skills in animal health, nutrition, breeding, housing, and sanitation, the program empowered rural women to transform goat rearing into a structured, income-generating enterprise. Microcredit support enabled them to expand herds and improve farm infrastructure, while technical training boosted productivity and reduced mortality. More than just an economic intervention, the initiative strengthened women's roles within households and communities, providing a resilient and scalable model of grassroots development. Over time, goat rearing became not only a livelihood, but a path to empowerment and sustainable rural progress.

Implementation

The initial phase of the Scientific Goat Rearing Initiative centered on identifying and mobilizing women. Lotus delivered practical training in goat health, nutrition, shelter design, breeding, and basic financial literacy. Conducted in the local language through live demonstrations on model farms, the sessions were made accessible and easy to retain. Beneficiaries also received materials such as fodder seed, feeding stands, and troughs.

A key innovation was the introduction of Chang Ghar raised bamboo shelters with GI sheet roofs. These elevated structures protected goats from monsoon-related waterlogging, reduced disease risk, and allowed better manure management. Households were also supported with indigenous goats (7–11 per household), breeding males, and improved germplasm to boost productivity while maintaining climate suitability.

To support capital needs, SHGs were linked to Regional Rural Banks, enabling women to secure loans ranging from ₹20,000 to ₹50,000. Ongoing veterinary care, peer learning, and marketing support ensured long-term viability. Successful farms became hubs of community learning, with shared breeding stock and knowledge reinforcing local networks and income diversification.

Environmental Impact

This initiative has delivered substantial environmental benefits by promoting sustainable livestock practices adapted to local ecological conditions. A major advancement was the adoption of ***Chang Ghar*** raised bamboo goat shelters which significantly reduced soil and water contamination. Traditional goat keeping often led to waste accumulation on ground-level sheds, contributing to unhygienic conditions and contamination of nearby water sources, especially during monsoons. The raised structures now allow for hygienic waste collection, reduce runoff, and minimize goats' exposure to wet, disease-prone soil, thereby improving sanitation and lowering risks of zoonotic infections.

An important innovation has been the productive use of goat manure as organic fertilizer. Women farmers now collect and sell manure to nearby farmers and fertilizer shops,

reducing dependence on chemical fertilizers and improving soil health. This practice not only contributes to organic farming but also creates a circular economy where livestock rearing and crop cultivation are mutually supportive.

The project also emphasizes the conservation of indigenous goat breeds, which are better suited to local climate, require less medical input, and help maintain genetic diversity. This biodiversity-conscious approach strengthens ecosystem resilience. Finally, goat rearing itself proves to be a climate-resilient livelihood, especially in the face of erratic rainfall and floods. Goats require fewer inputs, can survive on marginal resources, and thrive in local conditions making this initiative both environmentally sound and climate adaptive.

Socioeconomic Impact

Significant socioeconomic transformation to rural households in Nalbari, Assam especially among women from marginalized backgrounds was observed from this initiative. By introducing scientific rearing practices, the project enabled women to transition from informal animal husbandry to structured, income-generating enterprises. The most immediate benefit was enhanced household income, with women reporting annual earnings between Rs.25,000 and Rs. 1,00,000 from goat sales, manure, and breeding services. This steady income allowed for reinvestment in herd expansion and improved farm infrastructure. The initiative promoted self-employment and entrepreneurship, turning goat rearing into a viable business model. Many women involved family members in daily operations, creating intra-household employment. The growth of allied services such as veterinary care, feed supply, and manure sales further stimulated the local rural economy. Access to microcredit through Self-Help Groups (SHGs) and Regional Rural Banks was a key enabler. Loans ranging from Rs. 20,000 to Rs. 50,000 were used to purchase goats, build improved shelters, and buy inputs. High repayment rates reinforced the creditworthiness of SHGs and fostered financial inclusion among women. Importantly, goat rearing offered resilience to economic shocks, especially in a region vulnerable to seasonal flooding. Unlike crop farming, goatery required lower inputs and produced quicker returns, making it a stable and climate-resilient livelihood option.

Gender Mainstreaming

This initiative was designed as a transformative gender strategy that positioned women as active agents of change within their households and communities. Women were registered as farm owners, trained directly, and linked to microcredit systems in their own names, thereby promoting asset ownership and financial autonomy.

Training modules empowered women with technical skills in breeding, feeding, and animal health, alongside entrepreneurial competencies like pricing, record-keeping, and market navigation. As women began contributing significantly to household income, intra-family dynamics evolved. Husbands and sons began assisting in feeding, shelter construction, and marketing, recognizing the economic value of women's contributions. This created more equitable decision-making and shared responsibilities within households. Successful participants emerged as local role models, drawing attention from neighbouring women and even local officials.

Policy Impact

The initiative directly contributes to the objectives of major government missions such as the National Rural Livelihoods Mission (NRLM) by enabling women to build SHG-led enterprises; the National Livestock Mission (NLM) through improved goat productivity and reduced mortality; and the Atmanirbhar Bharat Abhiyan, by encouraging self-reliant rural entrepreneurship based on local resources.

By prioritizing women's ownership and control over livestock assets, the project addresses a major policy gap the economic invisibility of women farmers. It demonstrates how livestock projects can be designed with gender-intentional frameworks, support tailored training, and enhance women's access to formal credit and market systems.

The model's cost-effectiveness through the use of Chang Ghar shelters, local breeds, and SHG networks makes it highly replicable across Assam and the Northeast. It supports integration into state livelihood missions, District Development Plans, and climate resilience strategies under the Assam State Action Plan on Climate Change.

Sustainability

Economically, the initiative offers a reliable source of income to smallholder families with low initial investment. Beneficiaries generate revenue through the sale of live goats, manure, and breeding services, with goats reaching marketable age in 8–12 months. Social sustainability is supported through SHG-based implementation, which promotes peer learning, mutual accountability, and community ownership. Trained women now act as peer mentors, sharing knowledge informally and

encouraging wider adoption. Family participation ensures continuity, while successful participants inspire others as local champions.

On the environmental front, the project uses locally appropriate, low-impact practices. Indigenous breeds, bamboo-based *Chang Ghar* shelters, manure utilization as organic fertilizer, and stall-fed systems contribute to disease control, soil health, and reduced land degradation. These approaches align with eco-friendly and climate-resilient farming.

Capacity building has been central to the project's durability. Structured, hands-on training combined with continuous veterinary and extension support has empowered women to manage goat farms independently. Emerging trainer-leaders now share their knowledge with others, fostering community-based expertise.

The project also promotes financial sustainability through microcredit. Women accessed loans of Rs. 20,000–50,000 via SHGs and Regional Rural Banks, building strong credit histories and enabling scale-up. This success has improved SHG-bank relations and encouraged livestock-specific financial products.

Contribution to SDGS

The initiative supports several Sustainable Development Goals:

- SDG 1 (No Poverty): By enhancing household incomes.

- SDG 5 (Gender Equality): Through targeted empowerment of rural women.
- SDG 8 (Decent Work and Economic Growth): By promoting sustainable livelihoods.
- SDG 13 (Climate Action): Encouraging eco-friendly livestock farming.

REPLICATION AND UPSCALING

Scaling through SHG and cluster models offers immense potential. SHGs can evolve into producer groups or federations, facilitating bulk input procurement, better price negotiation, and uniform health services. Cluster-level goatery can also pave the way for a localized value chain. Engaging Panchayati Raj Institutions, NGOs, and development agencies as facilitators can accelerate this grassroots-led expansion.

Given its alignment with national schemes like NRLM, NLM, and MGNREGA, the initiative can be institutionalized through District and State Livelihood Action Plans, formalized training partnerships, and CSR adoption. This makes it a ready-to-deploy rural enterprise model.

Scalable training mechanisms are in place through community-based resource persons (CBRPs), satellite training farms, and mobile learning tools. Peer-led knowledge dissemination enhances cost-efficiency and long-term skill retention.

With strong and rising demand for goat products, market-driven expansion is viable. Establishing collection centers, linking farmers to urban markets, and introducing value-added products like goat milk or manure compost can enhance profitability.

Further scalability can be achieved through digital integration apps for herd tracking, SMS-based veterinary support, e-marketplaces, and online microloan platforms can boost operational efficiency.

LESSONS LEARNED

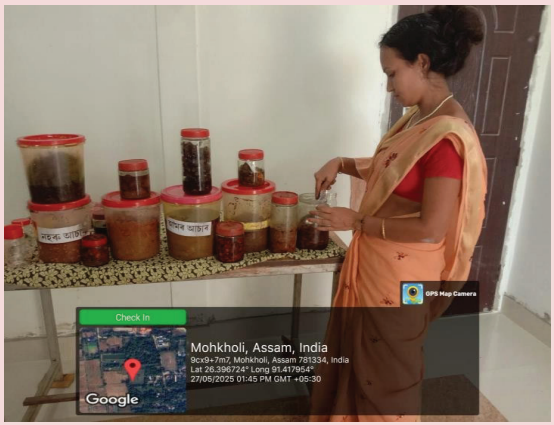
1. **Training is essential**: Capacity building in scientific goat rearing reduced mortality and improved productivity.
2. **Start small, scale smart**: Beginning with a small herd allowed women to gain confidence and manage risks effectively.
3. **Local breeds are better**: Indigenous goats were more resilient and better adapted to the local environment than exotic breeds.
4. **Simple infrastructure matters**: Raised bamboo sheds (*Chang Ghar*) improved hygiene, reduced disease, and supported better herd management.
5. **Women's ownership drives empowerment**: Giving women control over assets and income increased their confidence and social status.
6. **SHG support strengthens outcomes**: Self-Help Groups enabled collective learning, easier access to credit, and community accountability.
7. **Family involvement helps**: Support from husbands and sons enhanced workload sharing and long-term sustainability.
8. **Market linkage is crucial**: Facilitating access to buyers for live goats and manure improved profitability.
9. **Peer learning is powerful**: Successful participants became local trainers and role models, encouraging community adoption.
10. **Access to finance must be streamlined**: Timely, livestock-specific loans supported herd expansion and infrastructure investment.
11. **Follow-up ensures sustainability**: Regular monitoring and veterinary support-maintained momentum and built trust.

Food Processing Unit

Background

In the rural landscape of Assam, women have traditionally engaged in household-level food preparation, often making pickles, snacks, and spice mixes from locally available fruits, vegetables, and herbs. These efforts, however, rarely translated into economic gain due to lack of knowledge, access to markets, and formal training. Recognizing the untapped potential among these women, the Lotus Progressive Centre initiated a transformative intervention through its food processing and preservation training programs.

The initiative was designed to empower women in villages such as Bhadra, Ula*bari*, and Chandkuchi in Nal*bari* district by equipping them with technical skills in food processing, entrepreneurial knowledge, and exposure to packaging and marketing techniques. Many of these women were housewives with little or no prior experience in running a business. Through structured training sessions and continuous handholding support, they were able to transition from subsistence food producers to income-generating entrepreneurs.



The program emphasized the use of indigenous knowledge and local agricultural produce such as mangoes, olives, amara, ***outenga*** (elephant apple), gooseberry, banana flowers, and traditional herbs. Participants also explored value addition through mushroom cultivation, preparation of ayurvedic powders, and spice processing. Over time, these micro-enterprises not only contributed to their family income but also inspired a cultural shift in their communities towards recognizing the economic capabilities of women.

Today, many of these women have established small-scale units producing pickles, snacks, masalas, and health products. Their journey reflects the success of a grassroots model that leverages local resources, builds community capacity, and promotes women-led entrepreneurship in the food processing sector.

Implementation

The implementation of the food processing initiative by the Lotus Progressive Centre followed a multi-pronged approach. It began with the identification of potential women beneficiaries in rural villages who had a traditional interest or background in food preparation. This was followed by the organization of comprehensive training programs that covered theoretical and practical aspects of food preservation, hygiene, value addition, packaging, and business management.

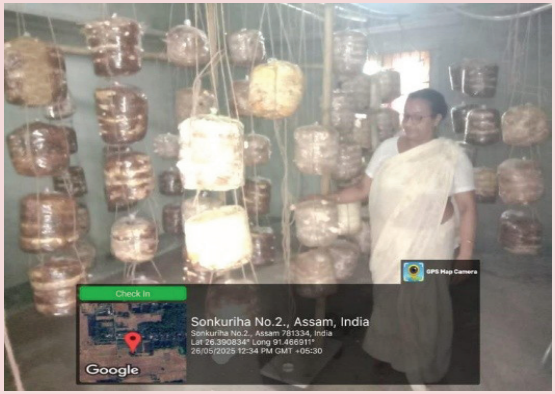
The training modules were hands-on and contextualized to the local food culture, enabling women to easily relate and adapt the techniques. Participants learned to process a wide variety of products including fruit pickles, dry spices, ayurvedic health powders, snacks such as pithas and laddus, and even dried mushrooms. Emphasis was placed on food safety, quality control, and preservation techniques to enhance product shelf-life.

In addition to skill-building, the Lotus Progressive Centre provided critical support in setting up home-based processing units by facilitating access to small equipment, packaging materials, and starter kits. Packaging included pouches (100 gm) and jars (200 gm. Marketing and branding support was provided by the Project Implementation Unit (PIU), which helped women develop packaging labels, pricing strategies, and market linkages through local fairs, exhibitions, and retail outlets.

Some of the women, were also supported in accessing bank loans to expand their operations. Moreover, follow-up mentoring, exposure visits, and the development of community resource persons ensured that the knowledge and motivation continued beyond the training period. This integrated approach allowed for the successful transformation of household skills into viable micro-enterprises that are now contributing to the rural economy.

Environmental Impact

The initiative promotes the use of locally sourced, seasonal fruits and vegetables, which significantly reduces transportation-related emissions and carbon footprints. Minimal waste is generated as by-products like turmeric and gooseberry are processed into ayurvedic items, ensuring efficient use of resources and reducing environmental burden. By encouraging the collection and use of



perishable or surplus produce from nearby farms and backyards, the program helps minimize food waste and spoilage.

Furthermore, most participants use organic and chemical-free inputs, particularly when producing ayurvedic powders and organic pickles, thus promoting eco-friendly practices in food processing. Minimal packaging waste is generated, as reusable glass jars and recyclable pouches are often utilized for marketing the products.

The integration of mushroom cultivation and use of medicinal herbs further emphasizes sustainable land use and biodiversity conservation. Overall, the initiative reflects a commitment to responsible consumption and production patterns, encouraging local, low-impact food systems and reducing the environmental strain associated with industrial-scale food processing.

Socioeconomic Impact

Participants, previously housewives with no steady income, now earn between Rs 2,000 to Rs 30,000 per month depending on scale and product variety. This steady income has contributed significantly to improved living standards, enabling families to invest in children's education, healthcare, and home improvements. In some cases, women have become the primary breadwinners, leading to a redefinition of gender roles within their households.

Beyond individual income, the initiative has created ripple effects across the community. It has fostered a culture of entrepreneurship, with many women forming informal self-help groups and cooperatives to share knowledge, pool resources, and collaborate in marketing. Increased economic activity in the villages has also supported local employment and services, creating a small but resilient rural economy.

Additionally, successful participants have become role models and mentors, inspiring other women to explore self-employment. The visibility of women's economic contributions has enhanced their social status and given them a stronger voice in community decision-making processes. Overall, the initiative has led to holistic socioeconomic upliftment, strengthening both household resilience and community development.

Gender Mainstreaming

The initiative targeted women as primary beneficiaries, recognizing their untapped potential and central role in food production and household management. By focusing on women's empowerment through capacity building, the program has actively worked to bridge gender gaps in economic participation.

Training sessions were designed to be inclusive and accessible, often conducted at times and locations convenient for women. This consideration ensured high participation rates and allowed women to balance their household responsibilities while gaining new skills. Women were also encouraged to make independent decisions regarding their enterprises, such as pricing, product design, and marketing strategies.

Moreover, the initiative created opportunities for leadership development. Participants launched successful ventures but also emerged as master trainers and peer mentors. This peer-led model has strengthened community ownership and enabled the diffusion of knowledge among wider groups of women. By supporting women in obtaining loans and managing financial resources, the initiative helped enhance their confidence and control over economic assets.

Policy Impact

The program aligns with multiple national and state-level policy frameworks aimed at empowering women, enhancing rural livelihoods, and promoting entrepreneurship. It supports the objectives of key government missions such as the National Rural Livelihoods Mission (NRLM), Startup India, and the Atmanirbhar Bharat Abhiyan by fostering grassroots entrepreneurship and skill development.

Through its focus on women-led enterprises, the initiative reinforces the goals of the Mahila Kisan Sashaktikaran Pariyojana (MKSP) and contributes

to the gender equality mandates outlined in the National Policy for Women. It also exemplifies the impact of convergence between training, financial inclusion, and enterprise promotion as advocated by the Ministry of Skill Development and Entrepreneurship.

The Lotus Progressive Centre's efforts have created models of successful microenterprises that could inform future policy designs, especially in promoting decentralized, low-cost, and sustainable livelihoods. Additionally, its community-centric, inclusive approach offers valuable lessons for scaling rural entrepreneurship under policy frameworks like the Prime Minister's Formalisation of Micro Food Processing Enterprises (PMFME) scheme.

By bridging skill gaps, enabling access to financial services, and promoting formal recognition of informal work, the initiative contributes meaningfully to the policy vision of inclusive and resilient rural development.

Sustainability

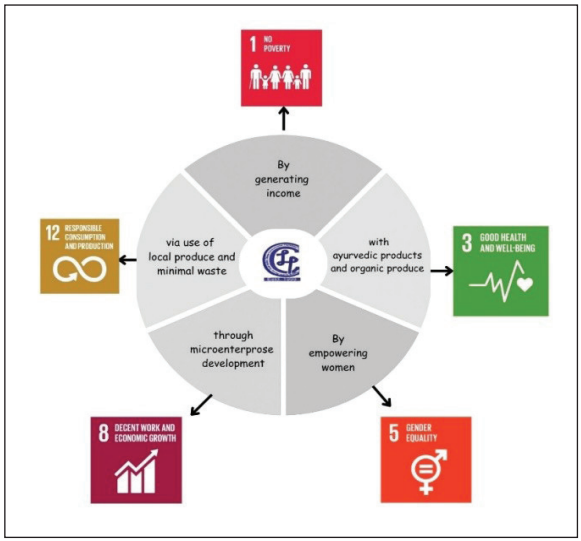
The sustainability of the initiative is rooted in its community-driven approach, low capital requirements, and reliance on locally available resources. The use of indigenous fruits, vegetables, and herbs reduces dependency on external supply chains, keeping input costs low and ensuring consistency in production. This localized sourcing also promotes environmental sustainability and community resilience.

Enterprises are built on traditional knowledge systems that align with organic and health-conscious consumer preferences, making the products more marketable and competitive in both local and urban markets. By incorporating ayurvedic and organic elements, the initiative taps into growing trends in wellness and natural health, further enhancing its sustainability.

Financial sustainability is promoted by linking women to credit institutions and by facilitating incremental growth of enterprises rather than high-risk large investments. In addition, the support for branding, market access, and digital platforms ensures long-term business viability. The model is adaptable and scalable, making it not only a sustainable livelihood solution for the original beneficiaries but also a replicable blueprint for similar regions.

Contribution to SDGS

- SDG 1 (No Poverty) – by generating income.
- SDG 5 (Gender Equality) – by empowering women.
- SDG 8 (Decent Work and Economic Growth) – through microenterprise development.
- SDG 12 (Responsible Consumption and Production) – via use of local produce and minimal waste.
- SDG 3 (Good Health and Well-being) – with ayurvedic products and organic produce.



Replication and Upscaling

Its success is built on universally accessible components: locally available raw materials, traditional knowledge, low-capital investment, and community-based training. These features make it suitable for adoption in regions with similar socio-economic and cultural profiles.

The initiative can be scaled through partnerships with government schemes, non-governmental organizations, and development agencies that promote livelihood generation and women's empowerment. Institutional support can enable structured replication by establishing regional hubs or resource centers that provide technical training, mentorship, and access to equipment.

One of the key enablers of upscaling is the development of community resource persons (CRPs) who can serve as trainers and ambassadors of the model. These CRPs can play a crucial role in peer-to-peer knowledge transfer, fostering self-reliance and accelerating community adoption.

By integrating digital literacy into training modules and establishing linkages with online marketplaces, the model can transcend local limitations and reach regional and national consumers. Products with improved packaging and branding can be introduced to wider markets, including e-commerce.

Policy alignment with schemes such as the PMFME, NRLM, and Skill India can support broader implementation through convergence of training, credit, infrastructure, and marketing. With the right support ecosystem, the model has the capacity to create thousands of microenterprises that are not only economically viable but also socially empowering and environmentally sustainable.

Lessons Learned

- **Training + Mentorship = Transformation**: Skill-building is essential, but ongoing mentoring and support are what enable long-term success. Participants thrived when they received follow-up guidance, exposure visits, and continuous motivation.
- **Start small, scale smart**: Beginning with household-level production allowed women to experiment and learn without

heavy financial risks. This gradual scaling built confidence and sustainable growth trajectories.

- **Local resources, global value**: Harnessing locally available ingredients and traditional recipes created products with unique cultural value. These not only resonated with local customers but also held promise in broader markets due to rising interest in organic, artisanal, and regional foods.
- **Financial access is key**: Easy and timely access to credit played a pivotal role in enterprise expansion. Linking women with banks and microfinance institutions helped them invest in quality packaging, equipment, and marketing.
- **Community-led replication is powerful**: Empowering successful participants to become peer mentors and trainers accelerated the spread of knowledge and fostered collective growth.
- **Institutional support enhances sustainability**: Integration with government schemes and local institutions ensured continuity and resource access, reinforcing the long-term viability of the model.
- **Market linkages and branding matter**: Even high-quality products need visibility and appeal. Support in packaging, branding, and market entry was essential to turning skills into profitable ventures.

Community Nursery and Homestead Garden

Background

The development of the community nursery was initiated as a strategic intervention to strengthen local agricultural systems and promote biodiversity. Implemented in collaboration with the Nabarun Agricultural Producer and Marketing Co-operative Society Ltd., Lotus Progressive centre and UNDP GEF SGP the initiative utilizes approximately one hectare of land. The site underwent significant groundwork including earth filling, levelling, fencing, and organic manuring to make it suitable for intensive nursery activities.

The nursery is designed not only as a production unit for seeds and seedlings but also as a demonstration and learning platform. It supports the cultivation of a wide variety of indigenous and local crops, including paddy, vegetables, fruits, and spices. The ultimate goal is to improve access to quality planting materials while building community capacity in sustainable farming practices.

Implementation

» Infrastructure Development

To provide a reliable and controlled environment for seedling production, two polyhouses were constructed within the nursery premises. These structures facilitate the cultivation of plants throughout the year, regardless of weather conditions. In addition, irrigation systems were installed to ensure consistent water supply, and the land was

prepared through earth filling, leveling, fencing, and organic manuring to optimize growing conditions.

» Organic Input Production

Recognizing the importance of soil health and sustainable agriculture, the nursery integrated bio-manure production systems. Vermicompost units and earthen pits were established to generate high-quality organic compost, which is used in nursery operations and serves as a model for farmers to replicate at the household level.

» Crop and Seedling Production

A diverse range of indigenous and locally-adapted crop varieties were cultivated, reflecting the nursery's focus on biodiversity conservation and food security. These include indigenous paddy varieties (five different types), spices such as black pepper, cardamom, clove, cinnamon, and hing, medicinal and nutritional plants like insulin plant, fruits including Assam lemon, guava, amla, imli, pomegranate, coconut, and litchi, broad range of vegetables (both seasonal and perennial). These seedlings were raised in sufficient quantities to supply farming households across the project area.

» Innovative Practices Demonstrated

To promote learning and adaptation of best practices, several innovative nursery techniques were implemented and showcased such as - raised beds for enhanced drainage and protection against flooding, supporting year-round nursery activities, floating beds to enable vegetable cultivation in low-lying or waterlogged areas, maximizing land use, biological pest control methods to minimize dependency on chemical pesticides and encourage ecological farming.

» Mother Plant Distribution

A unique feature of the project was the establishment of mother plants within the nursery. These mature, healthy specimens were carefully selected and propagated to serve as planting stock. Once established, they were distributed to individual homestead gardens, empowering households particularly women to grow and multiply these plants locally.

» Community Engagement

Over 500 farm families across project villages benefited from the regular distribution of seeds, seedlings, and planting materials. The nursery also functioned as a vibrant hub for education

and outreach. Students, government officials, and agricultural extension workers visited the facility to observe techniques, participate in trainings, and exchange knowledge. This reinforced the nursery's role as a community-based center for innovation and learning.

Environmental Impact

The community nursery has played a vital role in promoting environmental sustainability by integrating ecological principles into its operations. Through its design, practices, and community outreach, the initiative has delivered tangible environmental benefits across multiple dimensions:

» **Agrobiodiversity Conservation**

A cornerstone of the nursery's approach is the cultivation and distribution of indigenous and traditional crop varieties, many of which are underutilized or disappearing from mainstream agriculture. These include heritage paddy strains, local fruits, spices, and medicinal plants. By propagating and reintroducing these species into farming systems and homestead gardens, the nursery helps to preserve valuable plant genetic resources, enhancing ecosystem resilience and food system sustainability.

» **Reduced Chemical Usage**

The nursery emphasizes organic production techniques, including the use of vermicompost, biological pest management, and avoidance of synthetic fertilizers and pesticides. This not only protects soil and water quality but also supports beneficial insect populations and natural pollinators. The reduction in chemical inputs contributes to a healthier agricultural landscape and reduces environmental contamination.

» **Efficient Land Use and Marshy Land Restoration**

One of the most innovative features of the project is the demonstration of floating bed technology, which enables vegetable cultivation on otherwise unproductive or marshy land. These floating beds allow for the conversion of degraded or waterlogged areas into fertile production zones, improving land-use efficiency without requiring deforestation or harmful land conversion. This technique can be especially valuable in flood-prone or ecologically fragile regions.

» **Climate Resilience**

By focusing on locally adapted and climate-resilient crop varieties, the nursery enhances the

capacity of local farming systems to cope with extreme weather, erratic rainfall, and shifting growing seasons. Indigenous crops often possess natural resistance to pests, diseases, and environmental stressors, reducing farmers' vulnerability to climate shocks. These resilient varieties support long-term adaptation to climate change at the grassroots level.

Socioeconomic Impact

The community nursery has generated significant and lasting socioeconomic benefits for the participating villages. Through access to inputs, training, and shared infrastructure, the project has strengthened local livelihoods and enhanced the overall well-being of farm families. The main areas of impact include:

» **Cost Reduction**

One of the most immediate benefits to farmers has been the availability of locally produced**,** high-quality seeds and seedlings at no or minimal cost. This substantially reduces the need to purchase planting materials from distant or commercial suppliers, which can be costly and unreliable. By lowering the upfront investment required for each cropping season, the nursery helps farmers increase their profit margins and economic self-sufficiency.

» **Increased Income Opportunities**

The nursery supports the cultivation of a wide range of crops including vegetables, fruits, spices, and medicinal plants many of which are suited for off-season production or niche markets. This crop diversity enables year-round farming, improves food security, and creates multiple income streams. Surplus produce, especially from homestead gardens supported by distributed mother plants, can be sold in local markets, generating additional household revenue.

» **Skill Development**

Through demonstrations, farmer interactions, and exposure visits, the nursery has become a practical training ground. Farmers have gained hands-on experience in nursery management, organic input use, pest control, and modern propagation techniques such as raised and floating beds. These new skills increase individual productivity and open up opportunities for entrepreneurship, including the possibility of starting small-scale nurseries or input enterprises.

» **Community Cohesion**

The nursery serves as more than a production site it is also a community learning hub. By bringing together farmers, students, government officials, and technical experts, it fosters knowledge exchange and mutual support. This shared engagement has strengthened social networks, trust, and cooperation among villagers. Such cohesion is critical for the collective adoption of sustainable practices and ensures that the benefits of the project are widely distributed.

Gender Mainstreaming

The nursery project actively promotes gender inclusion and empowers women through:

- **Homestead Gardening**: The distribution of mother plants to women-led homestead gardens enhances their role in ensuring food security and supplementing household income.
- **Inclusive Training**: Women participate in training sessions, field visits, and demonstrations, helping bridge the gender gap in access to agricultural knowledge.
- **Recognition and Visibility**: Women's participation in sustainable agriculture is recognized and valued, encouraging broader community acceptance of their leadership.

Policy Impact

The success of the community nursery model offers several insights for policymakers:

- **Scalable Model for Rural Development**: The integration of nursery development with local co-operatives provides a replicable blueprint for agricultural extension programs.
- **Evidence-Based Advocacy**: Demonstration of indigenous crop viability and sustainable practices supports the case for integrating traditional knowledge into mainstream policies.
- **Decentralized Input System**: Promotes resilience by creating a localized system for seed and seedling distribution, reducing dependency on centralized supply chains.

Sustainability

Key factors contributing to the sustainability of the community nursery include:

- **Community Ownership**: Active involvement of local stakeholders ensures that the project remains rooted in local needs and capacities.
- **Eco-Friendly Practices**: The use of vermicompost and natural pest management fosters long-term soil fertility and ecosystem health.
- **Capacity Building**: Continued learning opportunities empower community

members to maintain and expand the initiative beyond the project's duration.

» **Homestead Integration**: Distribution of mother plants helps institutionalize the practice of home gardening, sustaining the impact at the household level.

Contribution to SDGS

» SDG 2: Zero Hunger Enhances local food security through improved access to nutrient-rich crops and planting materials.

» SDG 5: Gender Equality Empowers women through their active participation in homestead gardening and agricultural training.

» SDG 12: Responsible Consumption and Production Promotes organic farming and efficient resource use, minimizing waste and environmental harm.

» SDG 13: Climate Action Encourages cultivation of climate-resilient indigenous varieties and sustainable land use practices.

Replication and Upscaling

The community nursery model is highly replicable and scalable under the following conditions:

» **Local Partnerships**: Collaboration with local co-operatives or NGOs can replicate the institutional framework.

» **Policy Support**: Encouragement through agricultural extension schemes and subsidies can promote upscaling.

» **Community Training**: Knowledge transfer through field demonstrations and capacity building sessions enables adaptation in diverse regions.

» **Resource Availability**: Access to suitable land, initial infrastructure, and organic inputs are essential for successful replication.

Lessons Learned

» **Indigenous Crops Have High Potential**: Local varieties are well-adapted and preferred by farmers for their resilience and market value.

» **Integrated Learning Increases Impact**: Combining nursery development with

training and demonstration greatly enhances adoption of sustainable practices.

» **Mother Plant Distribution Strengthens Local Systems**: Homestead propagation ensures decentralized access to planting materials and boosts household food systems.

» **Community Engagement is Crucial**: Projects thrive when communities are fully engaged in planning, execution, and monitoring processes.

» **Continuous Support Ensures Longevity**: Ongoing technical guidance and inputs are vital to sustain interest and success in the long term.

Community-Led Conservation through Biodiversity Registers and Traditional Seed Banks in Assam

Background

Agriculture in Assam is more than a livelihood it is a way of life intertwined with cultural heritage and ecological wisdom. For generations, farming communities have cultivated and preserved a wide range of indigenous seed varieties suited to the region's varied agro-climatic zones, from flood-prone lowlands to terraced hills. These traditional seeds reflect deep knowledge of local conditions, resilience to climate extremes, and a commitment to sustainable farming. However, the rise of high-yielding varieties (HYVs), commercial seed systems, and chemically intensive agriculture has accelerated the loss of crop diversity. This shift has undermined food sovereignty, reduced ecological resilience, and marginalized traditional farming practices. In response, many local farmers are reviving and protecting their seed heritage through biodiversity registers and community-managed seed banks. These grassroots initiatives go beyond conservation they recognize farmers as custodians of ecological and genetic diversity. Biodiversity registers document indigenous knowledge, while seed banks ensure access to traditional varieties that are locally adapted and chemically independent. This community-led approach embodies principles of self-reliance, ecological stewardship, and collective responsibility. It offers a sustainable path forward, one rooted in local knowledge systems and driven by communities working together to preserve Assam's agricultural biodiversity for future generations.

Implementation

In a significant step towards ensuring agricultural sustainability and preserving agrobiodiversity, farmers across several villages in Nal*bari*, Assam with the help of Lotus Progressive Centre and UNDP GEF SGP, have come together to establish decentralized seed banks and community biodiversity registers (CBRs).

The decentralized seed banks maintain a wide array of indigenous paddy varieties, such as: Tulsi Joha – A fragrant rice known for its aroma and fine grains, Mainagiri – A traditional variety suited to local soil and climatic conditions Bonni, Boka, and Kalamdani – Varieties adapted to specific regional needs, including flood resistance and low input requirements.

Ranjit and Ranjit Sub-1- high-yielding modern paddy varieties, flood-tolerant and crucial for Assam's flood-prone regions. Beyond rice, the seed banks also include a diverse range of vegetable seeds and local spices, such as: Ridge gourd, pumpkin, cucumber, ash gourd, okra, papaya, spinach – Catering to household nutrition and market demand. Chilli, king chilli (bhut jolokia), garlic, turmeric, and coriander – Reflecting the culinary and medicinal richness of the region.

To ensure the effectiveness and sustainability of these seed banks, comprehensive support systems have been put in place:

» **Training on Scientific Seed Storage Techniques**: Farmers received hands-on training on best practices for seed selection, drying, cleaning, and storage. This included awareness of moisture control, pest prevention, and labelling to preserve seed viability for the next sowing season.

» **Distribution of Certified and Truthfully Labelled Seeds**: To build confidence in seed quality and traceability, certified

seeds (verified by agricultural agencies) and truthfully labelled seeds (produced by registered producers and conforming to minimum standards) were distributed. This ensures a mix of trusted traditional and improved genetic material in the seed banks.

» **Provision of Low-Cost Storage Solutions**: Access to affordable and efficient seed storage items has greatly enhanced the longevity and quality of stored seeds. These include: Wooden racks – For organized, ventilated storage. Topa and Duli – Traditional bamboo and earthen storage containers adapted to local contexts. IRRI Super Bags – Hermetic storage bags that prevent moisture and insect infestation, developed by the International Rice Research Institute.

Environmental Impact

Preserving indigenous seed varieties is vital for sustaining plant genetic diversity. These seeds have evolved over generations, adapting to Assam's varied soils, climates, and traditional farming practices. Their continued use ensures a rich genetic pool, which is essential for crop improvement, disease resistance, and long-term food security. They also help safeguard rare and endangered varieties that are often lost through commercial monoculture systems. Indigenous seeds support low-input farming systems, reducing the reliance on chemical fertilizers and pesticides. This not only lowers costs for farmers but also protects soil health and prevents water contamination. These varieties naturally promote soil fertility and pest resistance, contributing to more sustainable and eco-friendly agriculture. Many indigenous crops are highly resilient to climate stressors such as erratic rainfall, floods, and temperature fluctuations now increasingly common in Assam due to climate change. Their traits include drought and flood tolerance, pest resistance, and suitability to rain-fed, low-input conditions, making them ideal for climate-resilient agriculture. The cultivation of diverse indigenous crops ranging from cereals and pulses to vegetables and spices supports agro-ecological practices like crop rotation and intercropping. These methods improve soil structure, enhance nutrient cycling, and disrupt pest life cycles, contributing to a healthier, more balanced farming ecosystem.

Socioeconomic Impact

1. **Reduced Input Costs and Economic Self-Reliance:** Avoid recurring expenses

associated with purchasing commercial or hybrid seeds each planting season. Rely on locally adapted seeds that often require fewer agrochemicals, further reducing production costs.

2. **Strengthening Local Seed Economies:** The initiative encourages local production, storage, and distribution of seeds within communities. Creates opportunities for community-based seed entrepreneurs, particularly women and youth. Builds, where farmers have control over seed access, quality, and availability.
3. **Enhanced Food Security and Reduced Crop Failure Risk:** This resilience is especially critical in Assam, where floods, droughts, and other climate events are frequent and often disruptive to agriculture. Promotes mutual support and solidarity among farming households. Reduces the risk of total crop loss, as farmers can replant quickly with seeds from neighbors or seed banks.
4. **Crop Diversification and Economic Resilience:** The availability of a wide range of vegetables, spices, and indigenous grains encourages crop diversification. Opens up new market opportunities for high-demand local produce, such as aromatic rice (Tulsi Joha), king chilli (bhut jolokia), or heirloom vegetables. Farmers benefit from multiple income streams and are less vulnerable to market shocks or single-crop dependency.

Gender Mainstreaming

1. **Empowerment Through Capacity Building and Leadership:** Women have actively participated in Training programs on scientific seed storage, biodiversity documentation, and agroecological practices. Workshops and field schools that build their technical knowledge and confidence.
2. **Strengthening Women's Economic Role:** Participation in vegetable and spice cultivation such as chilli, turmeric, and coriander has increased their control over income, contributing to financial inclusion and economic agency.
3. **Social Equity and Community Resilience:** Integrating women into biodiversity management processes: Promotes inclusive governance and equitable benefit-sharing. Helps build social cohesion, as women often act as connectors across households and communities. Gender-diverse leadership tends to prioritize household resilience and community well-being.

Policy Impact

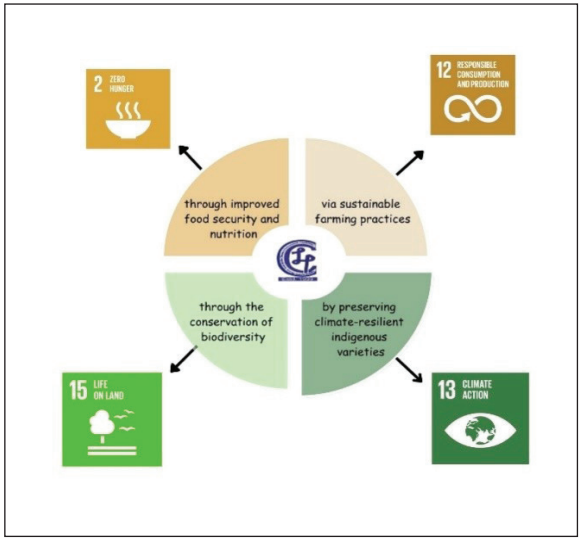
1. **Alignment with the Biological Diversity Act, 2002:** The initiative directly supports the objectives of the Biological Diversity Act, 2002, which aims to: Conserve biological

diversity, promote sustainable use of its components, and ensure fair and equitable sharing of benefits arising from the use of biological resources. By fostering in-situ conservation of indigenous crop varieties and promoting community-based documentation, the initiative reinforces the Act's focus on local-level biodiversity management and community stewardship. The farmers' role in conserving agrobiodiversity embodies the Act's principles of decentralized governance and people's participation in biodiversity conservation.

2. **Contribution to the People's Biodiversity Registers (PBRs):** The effort complements the People's Biodiversity Registers (PBRs) promoted by the National Biodiversity Authority (NBA)and State Biodiversity Boards. These registers are critical tools for: Documenting traditional knowledge and biological resources. Recognizing the rights and contributions of local communities. Through the creation and maintenance of community biodiversity registers, farmers are actively participating in the democratization of biodiversity knowledge, ensuring that indigenous agricultural wisdom and genetic resources are properly recorded and preserved.
3. **Alignment with National Missions:** The initiative indirectly supports national and international policy frameworks, including, The National Mission on Sustainable Agriculture (NMSA) under the National Action Plan on Climate Change (NAPCC), by promoting traditional, climate-smart crops and practices.

Sustainability

1. **Community-Based Knowledge as the Foundation:** At its core, the initiative is built on traditional agricultural knowledge, passed down through generations. This includes: Indigenous practices for seed selection, storage, and germination. Locally adapted farming techniques that respond to specific agro-climatic conditions. Culturally embedded norms of seed sharing, seasonal planning, and biodiversity stewardship.
2. **Low-Cost and Locally Sourced Infrastructure:** The physical infrastructure supporting the initiative is both affordable and locally appropriate, including: Wooden racks, topa, and duli traditional containers made from bamboo, clay, and local materials. IRRI Super Bags for moisture control and seed longevity. Simple but effective storage units constructed using community labour and locally available materials.
3. **Ecological and Economic Self-Sufficiency:** Because the initiative reduces dependence on commercial seeds and agrochemicals, and promotes diversified, resilient cropping systems. It inherently supports



economic self-reliance and environmental regeneration. Farmers are better able to: Sustain productivity in the face of climate shocks, maintain soil fertility and ecosystem balance, and improve livelihoods without degrading natural resources.

Contribution to SDGS

The initiative contributes to several Sustainable Development Goals:

- SDG 2: Zero Hunger – through improved food security and nutrition.
- SDG 12: Responsible Consumption and Production – via sustainable farming practices.
- SDG 13: Climate Action – by preserving climate-resilient indigenous varieties.
- SDG 15: Life on Land – through the conservation of biodiversity.

Replication and Upscaling

The community seed bank model is grounded in universal principles that apply across regions and cultures: community ownership of seed and biodiversity resources, reliance on indigenous knowledge for seed selection and storage, promotion of low-input, climate-resilient farming, and inclusive participation especially of women and local custodians of biodiversity. Effective scaling requires the involvement of key institutions. Local agricultural departments can provide technical support, linkages with research bodies, and integration into extension programs. NGOs play a vital role in mobilizing communities, offering training, and organizing seed fairs and exchanges. Panchayati Raj Institutions (PRIs) can identify farmer groups, allocate local development funds, and ensure grassroots support. Adaptation to local agro-ecological zones is essential. Crop choices and storage methods must align with regional conditions such as drought-tolerant millets in arid zones or salt-tolerant paddy in coastal areas. Cultural relevance and local language training further enhance effectiveness. Policy and financial alignment through NMSA, RKVY, PKVY, SBAPs, and climate or CSR funds can significantly accelerate replication. Finally, peer learning is a powerful driver: farmer-to-farmer mentoring, exposure visits, and model villages

create real-world proof and inspire adoption. Together, these strategies can embed seed banks as a core part of sustainable agriculture across diverse landscapes.

Lessons Learned

» **1. Community Knowledge Is a Valuable Asset**
Farmers' deep, experiential knowledge of local seeds, soils, pests, and climate patterns often surpasses formal scientific models in local accuracy. When this knowledge is integrated into project planning and implementation, the outcomes are not only technically effective but also culturally relevant and widely accepted. Blending traditional wisdom with scientific methods such as combining indigenous seed selection with modern storage techniques enhances innovation and practical impact.

» **2. Decentralization Strengthens Resilience**
Community-managed seed systems have shown clear advantages over centralized or market-dependent models. They respond better to local agro-climatic diversity, support crop portfolios suited to specific conditions, and reduce reliance on commercial seed companies. Local governance ensures faster decisions, stronger accountability, and greater inclusion especially of women and marginalized farmers. During climate shocks like floods or droughts, decentralized systems offer quicker recovery by providing immediate access to locally adapted seeds.

» **3. Training and Simple Tools Drive Change**
Capacity-building combined with affordable tools proved highly effective. Training on seed storage, documentation, and exchange built essential skills. The use of low-cost tools like IRRI super bags, wooden racks, and traditional containers (e.g., topa, duli) improved seed viability and productivity. This shows that impactful change is possible through knowledge transfer and strategic, low-cost support.

Community-Led Transition to Natural Agricultural Inputs in Paddy and Vegetable Cultivation in Assam for Sustainable Soil and Crop Health

Background

Assam's agriculture has historically been deeply rooted in traditional knowledge, yet in recent decades, chemical fertilizers and pesticides like Malathion powder and Indophil M45 have been commonly used to boost crop yields. While these inputs initially improved yields, they also began to degrade soil health, groundwater quality, and ecosystem balance, especially in paddy fields and vegetable-growing regions. Over time, these chemicals have led to soil degradation, pest resistance, reduced biodiversity, and rising health concerns among farming families. Recognizing the environmental and intergenerational risks of continued chemical use, a grassroots movement among farmers in Lower Assam emerged, promoting natural farming methods that restore soil fertility and reduce chemical dependency. Amid growing awareness, several farmer groups, with the support of local NGOs and self-help groups, began experimenting with natural, eco-friendly alternatives for seed, soil, and sapling treatment. These grassroots initiatives represent a community-led shift towards regenerative agriculture in Assam.

Implementation

Training and extension services were provided to local farmers to introduce eco-friendly and biodiversity-oriented farming. This included the use of bio-fertilizers and soil-enriching practices that required minimal chemical inputs.

Types of Bio-fertilizers Recommended:

- **Azotobacter** and **Azospirillum**: These help in nitrogen fixation and improve soil fertility.
- **Phosphate Solubilizing Bacteria (PSB)**: Improves phosphorus availability to plants.
- **Potash Mobilizing Bacteria (KMB)**: Makes potassium more available to crops.

This initiative is part of a project implemented by Lotus Progressive Centre in Morowa, Assam, under the support of UNDP GEF SGP TERI. The aim was to improve the livelihoods of resource-poor farm families while conserving the agro-ecosystem by promoting traditional and sustainable cultivation practices. These methods required low-cost, locally available inputs, making them highly accessible and replicable for smallholder farmers. The intervention was categorized into four treatment phases:

1. **Seed Treatment:**

» Inputs per 10 kg of seeds: 200g *Azotobacter* or *Azospirillum*, 200g phosphate-solubilizing biofertilizer, 800ml rice starch, and 100g lime.

» Seeds soaked in water, then coated with the mixture and dried before sowing.

» This improves seed germination and promotes in-field nitrogen and phosphorus production.

2. **Soil Treatment (per hectare):**

» 4 kg *Azotobacter/Azospirillum*, 6 kg phosphate biofertilizer, 100 kg vermicompost

» Ingredients are mixed with water and fermented for 48–72 hours, then ploughed into the soil.

» This approach rejuvenates soil health and supports beneficial microorganisms.

» Suitable for turmeric, ginger, and potato cultivation.

3. **Sapling Treatment (vegetables):**

» For crops like tomato, chilli, brinjal, cabbage: 1 kg *Azotobacter* and 1 kg phosphate biofertilizer in 10 litres of water.

» Saplings are dipped for 30 minutes, dried for 4–6 days, then planted (preferably in the evening).

» Promotes strong root establishment and nutrient generation.

4. **Paddy Sapling Treatment:**

» 500g *Azospirillum*, 500g phosphate biofertilizer, and 1–2 kg dry cow dung per hectare.

» Roots dipped overnight; transplantation the next evening to preserve microbial life.

» Requires only 500ml of the prepared mix per hectare.

Environmental Impact

The transition from chemical-intensive agriculture to natural farming in Assam has delivered

significant environmental benefits, fostering healthier ecosystems and climate resilience. Soil health has shown marked improvement through the use of biofertilizers like Azotobacter and phosphate-solubilizers, along with organic inputs such as cow dung and rice starch. This has boosted microbial activity and increased soil organic carbon, crucial for moisture retention in flood-prone regions. Agrochemical pollution has decreased substantially with the elimination of synthetic pesticides and fungicides. This has reduced runoff into local water bodies, protecting aquatic life and preserving biodiversity. In terms of climate resilience, natural farming promotes carbon sequestration by increasing organic matter in soils. Enhanced water retention in paddy fields also improves their tolerance to irregular rainfall and dry spells. Moreover, lower dependency on synthetic inputs reduces the overall carbon footprint. Waste utilization has also improved, with farmers adopting circular practices like vermicomposting using kitchen waste and crop residues. This closed-loop approach minimizes on-farm waste while enriching the soil. Together, these practices are not only restoring degraded lands but also enabling successful replanting of crops like turmeric and ginger, showcasing a sustainable path forward for Assam's agriculture.

Socioeconomic Impact

The adoption of natural farming practices in Assam has brought transformative socioeconomic benefits to rural communities, fostering financial stability, self-reliance, and inclusive development. Farmers reported a 30–50% reduction in input costs by replacing synthetic fertilizers and pesticides with locally made compost and biofertilizers. Increased profitability reduced seasonal borrowing and helped break debt cycles. Natural inputs improved crop resilience to erratic weather, especially in flood-prone areas, resulting in fewer crop losses and more consistent yields across seasons key to long-term income security. The shift created local employment through the production of bio-inputs and compost. Women and youth, especially through SHGs and FPOs, engaged in micro-enterprises supporting natural farming, diversifying household incomes. Training sessions built local knowledge on soil health, microbial management, and seed treatment. Farmers reduced reliance on external inputs, fostering community-based self-sufficiency. Some farmers achieved surplus yields in vegetables and paddy, with NGOs helping link them to markets seeking chemical-free produce, increasing profits. Marginal and landless farmers gained access to affordable inputs via community resource hubs. Women played key roles in input production and nursery management, increasing their economic participation and leadership. Improved soil fertility and structure have strengthened farmers' adaptability to climate and market shocks, laying the groundwork for sustainable rural growth.

Gender Mainstreaming

Women farmers were actively involved in the training sessions and played key roles in seed saving, composting, and vegetable cultivation. The project created opportunities for women to take leadership roles in agriculture, boosting their status and participation in decision-making within the family and community.

- Training programs empowered women with new knowledge in soil health and eco-farming.
- Promoted economic inclusion and leadership roles for rural women in agriculture.
- Preparing bio-inputs (compost, rice starch, lime mixture).
- Enhanced recognition of women's contributions to sustainable farming in community forums.
- Women's participation in biofertilizer preparation and seed treatment increased.

- Women-led self-help groups (SHGs) played a vital role in producing and distributing bio inputs.
- Women farmers involved in training and awareness campaigns promoting natural methods.

Policy Impact

Policy Influence Through Practice: Demonstrated benefits lower input costs, improved soil health, and greater climate resilience have attracted policy attention. NGOs played a key role by collecting data, sharing success stories, and connecting farmers with local officials. This engagement shifted early scepticism toward cautious endorsement.

Local Governance Recognition: At the panchayat and block levels, agriculture officers began promoting bio-inputs, particularly in flood-prone zones. Some panchayats informally passed resolutions supporting natural farming, and seasonal planning now includes natural input demonstrations.

Extension System Integration: Krishi Vigyan Kendras (KVKs) and extension staff incorporated biofertilizer training into farmer outreach. Demonstration plots became hands-on learning hubs, with NGOs co-developing training modules alongside KVKs.

Pathways for Scheme Alignment: The model aligns with national schemes like PKVY, MOVCDNER, and MGNREGS especially through biofertilizer units managed by SHGs.

Pilot Initiatives: Districts like Kamrup and Nal*bari* launched pilots, offering starter kits, youth training, and farmer participation in planning, signalling growing institutional commitment to natural farming.

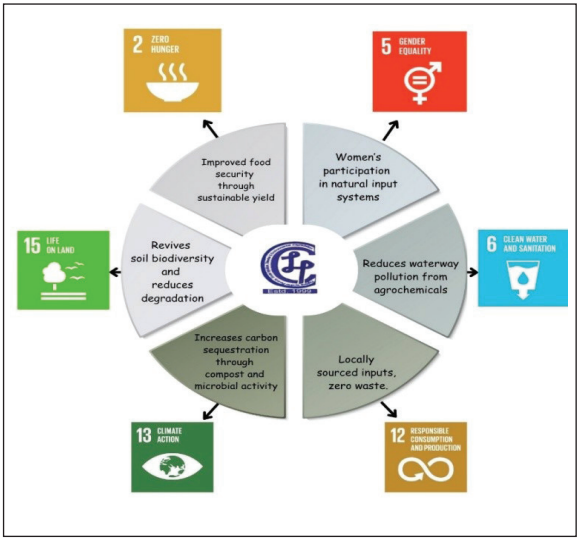
Sustainability

Sustainability was built into the project through capacity building, low-input techniques, and indigenous practices. Farmers learned to save their own seeds, produce compost, and use bio-fertilizers, reducing dependence on external inputs and promoting long-term ecological and economic sustainability.

- Supports climate-resilient agriculture with no chemical dependency.
- Long-term improvements in soil organic matter and fertility make farming more viable for future generations.
- Encourages community-based knowledge sharing, ensuring continuity and local ownership.
- The model relies on renewable, locally available inputs and community-driven knowledge systems.
- Avoids external chemical dependencies, promoting autonomy for smallholder farmers.

Contribution to SDGS

- SDG 2 (Zero Hunger) – Improved food security through sustainable yield.



- SDG 5 (Gender Equality) – Women's participation in natural input systems.
- SDG 12 (Responsible Consumption and Production) – Locally sourced inputs, zero waste.
- SDG 6 (Clean Water and Sanitation): Reduces waterway pollution from agrochemicals.
- SDG 13 (Climate Action): Increases carbon sequestration through compost and microbial activity.
- SDG 15 (Life on Land): Revives soil biodiversity and reduces degradation.

Replication and Up-scaling

Its low-cost, resource-efficient, and community-led approach makes it ideal for widespread adoption through both institutional and

grassroots pathways. The model has already expanded across 20+ village clusters in Kamrup and Nal*bari*, with farmer-led demonstration plots as key catalysts. The simplicity of inputs cow dung, rice starch, and indigenous biofertilizers makes it easy to adopt without significant infrastructure. Assam's varied agro-ecological zones including riverine belts, hill slopes, and lowland paddies are well-suited to this model due to rich biodiversity, traditional organic practices, and increasing climate vulnerabilities. Districts like Barpeta, Darrang, Goalpara, Morigaon, and Dhemaji show high replication potential with active SHGs and NGOs.

Scaling Pathways Identified:

- **KVKs and Extension Networks**: KVKs can facilitate scale-up through farmer training, field research, and integration with ATMA and state schemes.
- **Government Programs**: Schemes like APART and MOVCDNER can mainstream natural input use.
- **SHGs and FPOs**: These groups are producing and distributing bio-inputs, supported by NGOs.
- **Academic Support**: Assam Agricultural University is conducting trials to validate efficacy and develop localized, multilingual training materials using visual aids and field demonstrations.

Lessons Learned

Farmers adopted new methods more readily when they observed visible results on neighboring farms. Field demonstrations, exposure visits, and peer testimonials-built trust and enabled practical learning. NGOs found investing in local facilitators and farmer leaders crucial for long-term success.

- Applying biofertilizers and natural treatments in the evening was essential for microbial survival. Daytime heat and sunlight can destroy beneficial microbes, reducing their effectiveness.
- Successful early adopters became local champions, often motivating others through their own experience.
- Developing SHG-run compost pits, village-level production units, and FPO supply chains is necessary for scale-up and creates rural livelihoods.
- Initial scepticism gave way when farmers saw real improvements better root growth, pest resistance, and cost savings on demonstration plots.
- As adoption grows, bio-input supply must scale. Forecasting demand, bulk procurement, and integrating production into FPOs are key to meeting seasonal needs efficiently.

Challenges Faced During Project Implementation

Table 3: Key Challenges faced with associated impacts and actions taken by LOTUS

Challenge	Impact	Strategy Considered
High community expectation for inputs	Dependency mindset, delayed participation	Orientation on self-reliance, contributory models, seed banks
Decline in eco-friendly practices	Resistance to change, reliance on chemicals	Demonstration plots, training on biocontrol and organic soil enhancers
Unpredictable rainfall patterns	Crop failure, income insecurity	Climate-resilient varieties, water management, contingency crop planning
Difficulty procuring indigenous seeds	Limited diversity, delayed planting	Community seed banks, partnerships with seed-conserving institutions
Lack of local biopesticide availability	Delay in pest control, chemical fallback	Farmer training on natural repellents, advocacy for local availability
Lack of resource institute on agro-biodiversity	Weak knowledge transfer, inconsistent practices	Collaboration with universities, documentation of local knowledge
Poor access to packaging materials	Reduced product shelf life, weak market access	Collective marketing via FPGs, eco-friendly packaging innovation

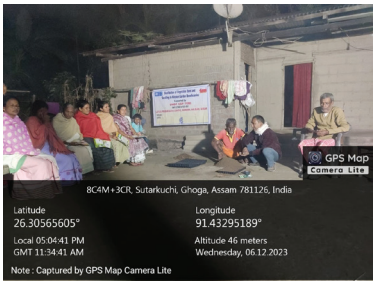
Conclusion

The challenges faced by LOTUS NGO highlight the interconnected nature of rural development where climatic variability, infrastructural gaps, and behavioral resistance intersect. By applying adaptive strategies such as farmer training, community ownership models, and eco-friendly practices, LOTUS NGO continues to promote sustainable agriculture, biodiversity conservation, and community resilience. This experience underscores the importance of a multi-stakeholder and knowledge-driven approach for scaling sustainable rural development initiatives.

Kitchen Garden Plots

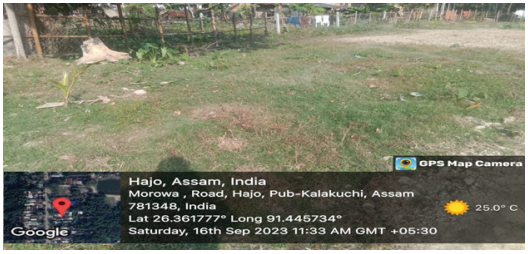
Selection of kitchen garden plots before Project Intervention

Raising of Vegetable at Kitchen Garden, Training on Growing of Vegetable Seedling in Seedling Tray at Vill- Mugkuchi & Sutarkuchi (After Project Intervention)



Community Garden

Before Project Intervention



After Project Intervention

Kitchen Garden at Chatemari Village

Before Project Intervention

After Project Intervention

Kitchen Garden at Malarkuchi Village

Before Project Intervention

After Project Intervention

SNEHPAD

Project Snapshot	
Project Title	**Conservation of Biodiversity and livelihood promotion in and nearby villages of Kakoijana Reserve Forest**
Implementing organisation	SNEHPAD
Location	Bongaigaon, Assam
GEF SGP contribution	Rs. 38,20,000/-
In cash co-financing	Rs. 17,29,000/-
In kind co-financing	Rs. 84,000/-
Number of beneficiaries	2562 (direct) and 2480 (indirect)
Total area of land impacted	53 Ha
Project duration	June 2023 - July 2025
Initiatives	» Handloom weaving » Golden Langur conservation through ecological restoration » Bee Keeping for livelihood generation
Case Study 1	Golden Langur Conservation in the Kakoijana Reserve Forest
Case Study 2	Handloom Weaving and Eri Silk Development
Case Study 3	Scientific Beekeeping for Biodiversity and Livelihood in Kakoijana

Golden Langur Conservation in the Kakoijana Reserve Forest

Background

Kakoijana Reserve Forest, spanning 17.24 sq. km in Assam's Bongaigaon district, is a critical habitat for the endangered Golden Langur (*Trachypithecus geei*), a primate species found only in a narrow range of the Indo-Bhutan border. With an estimated population of around 450 individuals in the forest, Kakoijana serves as a vital stronghold for this species. However, increasing fragmentation, habitat degradation, and a declining supply of fruit-bearing trees during certain seasons are driving the langurs closer to human settlements. This encroachment not only increases their vulnerability to threats like poaching, domestic dogs, and electrocution from power lines but also exacerbates human-wildlife conflict. The forest ecosystem, comprising sal, teak, and bamboo, supports diverse flora and fauna, but its food web is under strain due to anthropogenic pressures and seasonal scarcity. Recognizing the urgent need to protect this fragile ecosystem and ensure the survival of its flagship species, the organization SNEHPAD, under the Small Grants Programme (GEF SGP), initiated a landscape-level conservation and food security intervention. This involved ecological restoration efforts and active community participation to reduce the dependency of Golden Langurs on village outskirts for food while strengthening the forest's ecological integrity and resilience.

Implementation

The strategy focused on restoring food sources for Golden Langurs and strengthening ecological corridors within and around Kakoijana Reserve Forest. Over 9,000 fruit-bearing saplings including native species like fig, jackfruit, mango, and wild guava were planted in natural canopy gaps within the forest and on surrounding community lands. The enrichment planting spanned approximately 52.5 hectares, strategically designed to ensure year-round

availability of food for the arboreal langurs, reducing the necessity for ground-level foraging and preventing dangerous encounters with humans and infrastructure. Local youth, forest department staff, and women-led self-help groups (SHGs) were mobilized for planting, maintenance, and monitoring activities, fostering community ownership. Training and awareness sessions emphasized ecological importance, nurturing local stewardship and traditional knowledge. Moreover, the project introduced sustainable fuelwood alternatives and sensitized fringe communities on coexisting with wildlife. This holistic, participatory approach ensured not only environmental restoration but also enhanced community resilience and engagement, laying the groundwork for long-term conservation success. Partnerships between civil society, local governance structures, and grassroots stakeholders were instrumental in ensuring timely and effective project rollout.

Environmental Impact

The project has delivered substantial environmental benefits by directly addressing habitat fragmentation and food scarcity for the Golden Langur. The planting of over 9,000 fruiting trees in Kakoijana and surrounding lands has improved canopy continuity, enabling langur troops to move safely between feeding areas without descending to the forest floor, where risks of predation and human conflict are high. This canopy restoration also enhances

habitat for birds, butterflies, and other pollinators, increasing the overall biodiversity of the forest. Additionally, the planted trees contribute to long-term soil stabilization, reduce erosion, and improve local microclimates. As these saplings mature, they are expected to significantly boost groundwater recharge and carbon sequestration, contributing to broader climate resilience. Observational data from the field show a marked decline in road-crossing incidents by Golden Langurs and a reduction in their intrusion into human settlements, indicating improved food availability within the forest. The initiative highlights the power of ecological restoration in reinforcing species-specific conservation outcomes while simultaneously enriching broader ecosystem services in a biodiversity hotspot like Kakoijana.

Socioeconomic Impact

The initiative has fostered positive socioeconomic outcomes by integrating

livelihood opportunities with conservation objectives. Community members, especially youth and women, were actively involved in sapling cultivation, planting, and monitoring, providing short-term employment and skill-building opportunities. The project's emphasis on native fruit trees also holds long-term economic potential, as excess fruit can be harvested sustainably by communities for personal use or sale, supporting food security and supplemental incomes. By stabilizing the habitat and reducing langur incursions into farmland, the project has helped alleviate crop damage a major source of human-wildlife tension. Furthermore, awareness drives and environmental education sessions have cultivated a sense of pride and stewardship among villagers, strengthening their role in biodiversity protection. The reduction in the collection of fuelwood and fodder from the forest is indicative of a shift towards more sustainable resource use. In sum, the initiative has built local capacities, encouraged sustainable resource management, and reinforced the economic value of conservation. Community engagement in monitoring also supports social cohesion and a shared conservation ethic, transforming residents from passive beneficiaries into active custodians of their environment. These combined efforts contribute to long-term community resilience and sustainable rural development.

Gender Mainstreaming

Gender inclusion was a central component of the project's design and implementation. Women's self-help groups (SHGs) were not only involved in plantation activities but also in the planning and decision-making processes, ensuring their voices shaped local conservation strategies. This approach acknowledged the traditional ecological knowledge held by women, particularly regarding local flora and sustainable resource use. By training women ecological monitoring, the project enhanced their skills, leadership capacities, and financial independence. Furthermore, reduced dependency on forest-based fuelwood collection historically a responsibility shouldered by women lessened their daily drudgery and exposure to hazards within the forest. Women's involvement fostered greater acceptance of the initiative in the community, as their influence within households and local

governance structures helped disseminate conservation values more effectively. Gender-sensitive outreach also created safe spaces for dialogue, empowering women to voice concerns and advocate for the protection of their local environment. Overall, the project advanced gender equity by positioning women as vital stewards of biodiversity and environmental sustainability.

Policy Impact

The success of the Kakoijana food security initiative has drawn the attention of local and regional policymakers, emphasizing the importance of integrating community stewardship into forest and wildlife management frameworks. The project provides a practical model for aligning conservation action with rural development objectives, which could inform future revisions of forest management plans and state biodiversity strategies in Assam. It reinforces the utility of enrichment planting as a non-invasive, cost-effective tool for mitigating human-wildlife conflict and enhancing habitat connectivity. Additionally, the project's participatory structure mobilizing SHGs, youth, and local governance resonates with India's Forest Rights Act and Biodiversity Act, which mandate community participation in environmental governance. By documenting and sharing its outcomes, SNEHPAD has helped influence dialogue around decentralized conservation, prompting discussions on scaling such efforts through formal government support and funding mechanisms. The reduction in golden langur road accidents and human-animal conflicts offers tangible evidence for policymakers to invest in landscape-level, multi-stakeholder conservation strategies. If mainstreamed into district or state-level policies, this model could significantly boost the conservation of other threatened species while fostering sustainable livelihoods in ecologically sensitive zones across northeast India.

Sustainability

Sustainability is embedded in both the ecological and social design of the Kakoijana initiative. The use of native, fruit-bearing tree species ensures that the planted saplings are ecologically compatible and resilient, requiring minimal maintenance once established. By focusing on natural regeneration zones and corridors, the project optimizes tree survival and long-term ecosystem integration. Social sustainability is fostered through strong community ownership achieved by engaging local youth, SHGs, and village leaders throughout the process. Training and awareness programs have built local capacities in ecological monitoring, increasing the likelihood of continued stewardship beyond the project period. The economic value of sustainably harvested fruit offers an incentive for communities to protect the

trees and avoid overexploitation. Additionally, the reduction in fuelwood extraction, guided by energy awareness campaigns and access to alternatives, supports the forest's natural regeneration. Institutional sustainability is ensured through the project's alignment with local forest department goals, increasing its chances of integration into long-term state conservation planning. Finally, the demonstrable outcomes such as fewer langur-human conflicts strengthen the case for ongoing investment, replication, and potential incorporation into national wildlife and habitat protection schemes.

Contribution to SDGS

- It contributes to SDG 15 (Life on Land) by conserving terrestrial ecosystems, halting biodiversity loss, and improving habitat for endangered species like the Golden Langur.
- It supports SDG 13 (Climate Action) by promoting afforestation and enhancing carbon sinks.
- The enrichment planting also contributes to SDG 6 (Clean Water and Sanitation) by enhancing groundwater recharge and protecting watersheds.
- Through the creation of sustainable livelihoods and food sources, the project advances SDG 1 (No Poverty) and SDG 2 (Zero Hunger).
- Involving SHGs and women in leadership and implementation furthers SDG 5 (Gender Equality), while community education efforts strengthen SDG 4 (Quality Education).
- The collaboration between NGOs, local government, and communities advances towards SDG 17 (Partnerships for the Goals).

Replication and Upscaling

The success of the Kakoijana initiative offers a replicable model for other forest areas facing similar conservation and human-wildlife conflict challenges. Key components such as native species-based enrichment planting, community co-management, and the integration of gender-inclusive governance structures can be adapted to diverse ecological and cultural contexts. Other forest fringes in Northeast India and beyond could benefit

from this approach, particularly regions home to endangered, arboreal species. Replication would require context-specific planning but can draw heavily from the implementation blueprint established by SNEHPAD. Upscaling efforts could be supported through convergence with government schemes like the National Afforestation Programme, CAMPA funds, or the Green India Mission. A critical enabler of replication is capacity-building training local NGOs, forest staff, and community stakeholders in ecological restoration and participatory monitoring. Documentation and knowledge-sharing platforms would further support scale-up. Institutionalizing such models into district or state biodiversity plans could accelerate adoption. The project also offers a valuable case for integrating community-led conservation into India's climate adaptation and biodiversity protection strategies under international frameworks such as the Convention on Biological Diversity (CBD) and UNFCCC.

Lessons Learned

- First, **community participation is crucial** for the long-term success of conservation projects. Engagement must be meaningful and inclusive, incorporating local knowledge and addressing livelihood concerns.
- Second, **ecological restoration using native, fruiting species** can serve dual purposes: conserving wildlife and supporting community food security.

- Third, **gender mainstreaming enhances effectiveness**; women's groups proved instrumental in both ecological and social outcomes.
- Fourth, creating **green corridors not only supports species movement** but also reduces risks associated with human-animal interactions.
- Fifth, conservation and development are not mutually exclusive when aligned thoughtfully, they reinforce each other. Additionally, **partnerships across civil society, local government, and grassroots actors** are essential for mobilizing resources, maintaining momentum, and institutionalizing success.
- Finally, robust **monitoring and feedback loops** help demonstrate impact and refine strategies in real time.

Handloom Weaving and Eri Silk Development

Background

The traditional handloom weaving communities in Assam, particularly women, have long relied on low-yield, labour-intensive looms that limited their productivity and income. Despite a strong local demand and a lucrative market across the Bhutan border for handwoven Eri Silk products, the weavers were unable to scale their production. Additionally, ERI Silk Worm Rearers faced challenges in maintaining a consistent supply of quality feed for the worms, with traditional methods proving inefficient and time-consuming. Recognizing these barriers, SNEHPAD, with co-finance support from Mission Samriddhi under the Small Grants Programme (GEF SGP), initiated an integrated intervention. The objective was to improve weaving technology, raw material availability, and sustainable livelihoods through a combination of infrastructure development, training, plantation, and cooperative models. The focus was on promoting productivity, environmental restoration, and women-led entrepreneurship. This approach aimed to transform the livelihoods of rural communities while addressing biodiversity and conservation challenges in the region. The initiative brought together traditional knowledge and modern techniques to enable the community to harness the full potential of Assam's rich handloom and Eri silk heritage.

Implementation

SNEHPAD's implementation strategy began with the establishment of a Handloom Common Facility Centre (CFC) in the project area. This centre was equipped with six Jacquard Handlooms and a Warping Drum, facilitating modern, high-yield weaving. One hundred women weavers were selected and provided with three months of intensive training on the Jacquard technology. The training ensured that they could comfortably transition from traditional looms to the more efficient Jacquard system. Once trained, these weavers were supplied with high-quality Cotton and ERI Silk Yarn to begin commercial production. In parallel, an ERI Silk Yarn Spinning and Reeling Centre was established, furnished with six

machines to mechanize yarn production. To address the critical shortage of feed for ERI worms, SNEHPAD planted 1,000 Kecheru saplings, sourced from the Central ERI and Muga Research Institute, and distributed them to local women for plantation on private land. Additionally, 10 kilograms of Castor Seeds were distributed to provide an immediate food source for the silk worms. The integrated implementation ensured every part of the Eri silk value chain was strengthened from rearers to spinners to weavers.

Environmental Impact

The project had notable environmental benefits, particularly in terms of habitat restoration, reduction in forest pressure, and biodiversity enhancement. The plantation of 1,000 Kecheru plants, a native and preferred food source for ERI Silk Worms, played a dual role. It not only ensured a sustainable supply of feed for cocoon production but also restored approximately 52.5 hectares of degraded land around the Kakoijana Reserve Forest. With the introduction of sustainable plantations, pressure on the forest for fodder, fuelwood, and other resources significantly decreased. The shift from traditional, extractive silk practices to integrated farming and spinning reduced environmental degradation and introduced sustainable land-use models. The use of machines in the spinning process further reduced laborious practices that relied on forest resources, making the

entire Eri silk value chain more eco-friendly. The environmental impact thus aligned with both conservation priorities and livelihood enhancement goals.

Socioeconomic Impact

The initiative brought significant socioeconomic improvements to the target communities. One hundred women weavers trained in Jacquard handloom weaving transitioned from traditional, low-income livelihoods to more profitable, high-output production. With access to quality yarn and modern weaving infrastructure, their income levels increased due to improved product quality and higher market demand, particularly from local buyers and across the Bhutan border. The establishment of a local yarn supply chain through trained spinners further reduced dependence on external sources, ensuring timely and affordable raw materials. Additionally, the plantation initiative provided sustainable inputs to ERI

Rearers, reducing costs and improving cocoon yields. Collectively, these efforts created a localized, self-sufficient ecosystem for Eri Silk production. Women played a central role in every stage from cocoon rearing to spinning to weaving enhancing their economic autonomy and social status within their households and communities. The project also generated indirect employment through support roles in the Common Facility Centres and plantations.

Gender Mainstreaming

Gender inclusion was a core pillar of SNEHPAD's intervention. From the outset, the project prioritized women's participation at every stage of the value chain. Of the 100 trained Jacquard weavers and 100 trained ERI Silk Spinners, the overwhelming majority were women from marginalized rural households. By equipping them with modern technical skills and access to production facilities, the project helped shift their roles from informal, low-income contributors to skilled, income-earning artisans. Women were also selected as primary beneficiaries for the plantation of Kecheru saplings and distribution of Castor seeds, empowering them with assets and decision-making in ERI cocoon rearing. The increased economic contribution from women translated into greater bargaining power within families and communities, promoting gender equity. Additionally, the project's structure encouraged collective action, and many women formed self-help groups (SHGs) and cooperatives to manage production and marketing, fostering leadership and social capital. Through targeted training, mentorship, and asset ownership, the project demonstrated a successful model for gender mainstreaming in rural economic development. It also challenged traditional gender norms by creating visible and valued roles for women in a sector historically dominated by informal labour.

Policy Impact

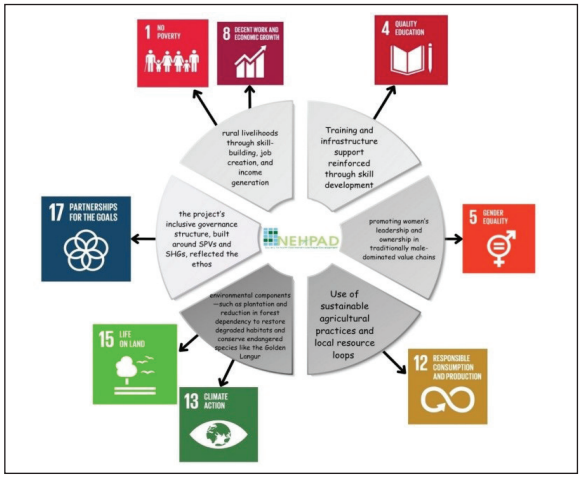
The success of SNEHPAD's Handloom and ERI Silk project has drawn the attention of policymakers and local administrative bodies. The demonstrated integration of environmental restoration with economic empowerment offers a replicable model for rural development programs. The use of Special Purpose Vehicles (SPVs) involving beneficiaries to manage the Handloom Common Facility Centre has been highlighted as a best practice in community-led governance. Additionally, the alignment with biodiversity conservation particularly in protecting the habitat of endangered species like the Golden Langur has attracted interest from forest departments and conservation bodies. Training and infrastructure support for women weavers and spinners also offer a framework for scaling up livelihood schemes under existing government programs such as the National Handloom Development Programme and Silk Samagra. Moreover, by showcasing the benefits of native species plantations (like Kecheru) for both ecology and livelihoods, the initiative provides evidence for agroforestry and rural afforestation policies. The project's documented outcomes and stakeholder involvement make it a compelling case for influencing integrated policy frameworks that unite livelihood generation, women's empowerment, and ecological sustainability.

Sustainability

Sustainability has been carefully built into the design and execution of the project through both institutional mechanisms and ecological interventions. The formation of a Special Purpose Vehicle (SPV) comprising trained weavers, spinners, and ERI Rearers ensures local ownership and long-term governance of the Common Facility Centres. These SPVs are tasked with managing operations, maintaining equipment, coordinating raw material supplies, and marketing finished products. The plantation of 1,000 Kecheru saplings and distribution of Castor Seeds ensures a renewable, local feed source for ERI Silk Worms, thereby supporting continued cocoon and yarn production without dependence on external resources. The integration of training, infrastructure, and local ecosystems has created a closed-loop production model that minimizes waste, reduces resource stress, and promotes regeneration. Additionally, partnerships with research institutions and government agencies provide technical backstopping and scalability support. Market linkages established during the project, especially with Bhutan and local buyers, continue to generate steady demand. These embedded systems social, ecological, and economic lay a robust foundation for the initiative's long-term viability, with minimal need for recurring external funding.

Contribution to SDGS

- Under SDG 1 (No Poverty) and SDG 8 (Decent Work and Economic Growth), it enhanced rural livelihoods through skill-building, job creation, and income generation.
- SDG 5 (Gender Equality) was addressed by promoting women's leadership and ownership in traditionally male-dominated value chains.
- The environmental components such as plantation and reduction in forest dependency aligned with SDG 13 (Climate Action) and SDG 15 (Life on Land), helping to restore degraded habitats and conserve endangered species like the Golden Langur.
- The project's use of sustainable agricultural practices and local resource loops contributed to SDG 12 (Responsible Consumption and Production).



- Training and infrastructure support reinforced SDG 4 (Quality Education) through skill development.
- Moreover, the project's inclusive governance structure, built around SPVs and SHGs, reflected the ethos of SDG 17 (Partnerships for the Goals).

Replication and Upscaling

Given its success, the model implemented by SNEHPAD offers strong potential for replication and scaling across similar socio-ecological landscapes. The integrated value-chain approach from rearing to weaving can be adapted in other Eri Silk producing regions of Northeast India and beyond. The use of Common Facility Centres for centralized production and training can be expanded through public-private partnerships and linked to state and national programs

supporting handlooms, sericulture, and rural enterprise. The plantation component, involving Kecheru and Castor, can be replicated as part of community agroforestry or afforestation programs, particularly in areas facing fodder scarcity or wildlife-human conflict. Capacity building modules developed during the project can be institutionalized within vocational training centers or government skill missions. The SPV model ensures sustainability and accountability and can serve as a governance prototype for community-managed assets. With proper documentation, toolkit development, and stakeholder engagement, this model is ripe for scale and can significantly contribute to rural transformation and environmental conservation on a broader scale.

Lessons Learned

- First, technology adoption among rural women is highly successful when accompanied by hands-on training and ongoing support. The transition to Jacquard looms demonstrated that traditional knowledge can be enhanced with modern methods to boost productivity and quality.
- Second, value-chain integration from raw material sourcing to final product marketing is essential for sustaining rural enterprises. The simultaneous development of rearers, spinners, and weavers ensured interdependence and economic resilience.
- Third, environmental restoration can be aligned with livelihood promotion through smart species selection and land use planning, as seen with the Kecheru plantations.
- Fourth, creating community-based institutions like SPVs builds local ownership and long-term sustainability.
- Fifth, focusing on women not just as beneficiaries but as entrepreneurs and decision-makers can transform gender roles and accelerate development.
- Lastly, partnerships with technical institutions, funding agencies, and local governance bodies are vital for knowledge exchange, resource mobilization, and policy alignment. These insights provide a blueprint for designing holistic, inclusive, and impactful rural development programs.

Scientific Beekeeping for Biodiversity and Livelihood in Kakoijana

Background

Kakoijana Reserve Forest, located in Assam, India, is a critical biodiversity hotspot known for its semi-evergreen forests and rare species, including the endangered Golden Langur. The forest and surrounding villages have faced challenges due to deforestation, declining pollinator populations, and limited livelihood opportunities for locals. With honeybees playing an essential role in pollination and ecological balance, their decline poses a severe threat to forest biodiversity and agricultural productivity. Recognizing this, the Small Grants Programme (GEF SGP) supported a project implemented by SNEHPAD, aiming to revive honeybee populations and provide sustainable livelihood through scientific beekeeping. The initiative sought to introduce an eco-friendly, low-cost, and community-driven model of beekeeping using bamboo bee boxes, a technology developed by CSIR-NEIST, Jorhat. By focusing on community involvement and ecological restoration, the project aimed to address both environmental degradation and socioeconomic instability in the region.

Implementation

Under the guidance of SNEHPAD and with support from GEF SGP, the project introduced 100 bamboo bee boxes fitted with bee colonies across villages near the Kakoijana Reserve Forest. Each bee box was entrusted to a local farmer trained in scientific beekeeping methods, including colony maintenance, honey extraction, and sustainable apiary management. The use of bamboo, a locally available and biodegradable material, made the boxes cost-effective and environmentally sustainable. Training workshops were conducted in collaboration with CSIR-NEIST to ensure proper knowledge transfer and adoption of best practices. Regular monitoring by experts ensured colony health and helped farmers address challenges. A community-based approach ensured ownership and accountability, while also promoting collaboration among farmers. Beekeepers were provided with basic equipment and ongoing technical support. The

initiative created an interconnected network of micro-apiaries around the forest, strengthening local pollinator populations and establishing a sustainable, community-owned beekeeping ecosystem.

Environmental Impact

The project has led to a significant positive impact on the environment, particularly on pollination and plant biodiversity. The increase in local bee populations has enhanced the pollination of flowering plants, fruit trees, and wild flora, contributing to the regeneration of forest ecosystems in Kakoijana. This has led to healthier vegetation, increased flowering, and improved seed dispersal. The bamboo bee boxes, being biodegradable and chemical-free, minimized environmental harm and integrated seamlessly into the natural landscape. Additionally, the scientific maintenance of bee colonies has reduced the risk of disease and colony collapse. The revitalized bee presence has also indirectly supported other wildlife by improving food sources and habitats. Through this nature-based solution, the project has created a harmonious balance between conservation and community development. Overall, the initiative has strengthened ecosystem services, supported biodiversity, and contributed to the resilience of the Kakoijana forest environment.

Socioeconomic Impact

Beyond environmental gains, the project has significantly improved the economic well-being of participating farmers. Each farmer managing a bee box has gained an additional source of income through the sale of honey and beeswax products. This diversification has reduced dependence on traditional farming and forest resources, lowering exploitation pressure on the Kakoijana Reserve Forest. Market linkages have been explored to help farmers sell their honey locally and beyond. The initiative has also built skills in entrepreneurship and cooperative working among community members. Furthermore, the project has promoted a sense of pride and responsibility among farmers as contributors to environmental protection. With improved household income, families have been able to invest in education, healthcare, and better living conditions. The community-based model has also fostered social cohesion and collective action. Overall, the initiative has created a sustainable income-generating model that aligns with conservation goals and supports rural development.

Gender Mainstreaming

Gender inclusion has been a key component of the project. Women were actively encouraged to participate in training programs and apiary management. Several female farmers took up the responsibility of managing bee boxes, breaking traditional gender roles and increasing their economic independence. The project recognized the role of women in household and community-level decision-making and created space for their voices in the planning and implementation phases. This empowerment has led to increased confidence and leadership among participating women. Income generated from beekeeping has contributed to improved well-being for entire families, with women directing resources towards children's education, nutrition, and healthcare. Gender-sensitive training materials and schedules ensured inclusive participation. The success of female beekeepers has also inspired more women in the villages to consider apiculture as a viable livelihood. The project serves as a model for integrating gender perspectives into environmental and development initiatives.

Policy Impact

The success of the Kakoijana beekeeping initiative has drawn attention from local government bodies and forestry departments. Policy discussions have been initiated to integrate scientific beekeeping into forest conservation and rural development strategies. The use of bamboo bee boxes, in particular, has been recognized for its alignment with sustainable and indigenous practices. The project has showcased the potential of low-cost, community-led models to achieve biodiversity and livelihood outcomes. It has also highlighted the importance of including pollinator conservation in forest and agricultural policies. SNEHPAD has engaged with local authorities to advocate for replicating the model in other forest-adjacent communities. The initiative aligns with national policies on sustainable agriculture, tribal development, and biodiversity conservation. The project's documentation and outcomes are being used as a case study to inform regional and state-level programs focused on ecological restoration and community-based conservation.

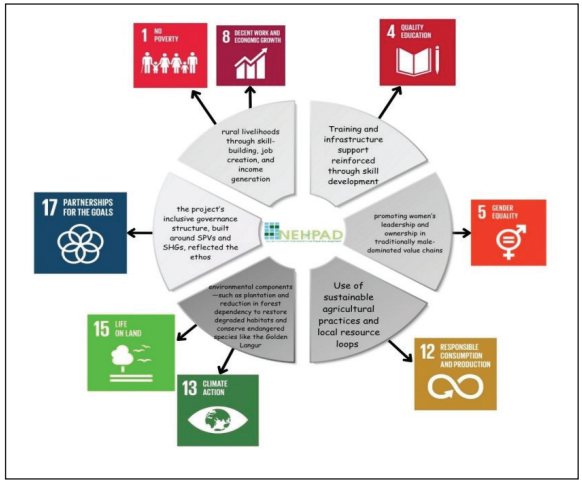
Sustainability

Sustainability has been at the core of the project design. By using locally available bamboo for the bee boxes and training farmers in

scientific methods, the project ensured long-term viability without dependency on external inputs. The decentralized nature of the apiaries and community ownership fostered resilience and adaptability. Regular monitoring and technical support from local institutions have strengthened local capacity. The integration of ecological and economic goals has created a feedback loop where improved environmental health supports livelihoods and vice versa. Plans are in place to form a cooperative to manage production, marketing, and quality control, further enhancing sustainability. The project's alignment with local cultural and ecological contexts ensures community acceptance and continued relevance. Efforts are ongoing to connect farmers with government schemes and support services to scale operations sustainably. The strong community base and clear environmental benefits position the project for enduring impact.

Contribution to SDGS

- It directly supports SDG 1 (No Poverty) and SDG 2 (Zero Hunger) by providing alternative income and enhancing food security through pollination.
- SDG 5 (Gender Equality) is advanced through active involvement of women in beekeeping.
- SDG 13 (Climate Action) and SDG 15 (Life on Land) are addressed through biodiversity restoration and ecosystem resilience.



- The project also touches SDG 8 (Decent Work and Economic Growth) by fostering sustainable livelihoods and SDG 12 (Responsible Consumption and Production) through eco-friendly practices.
- The partnership with scientific institutions contributes to SDG 17 (Partnerships for the Goals).

Replication and Upscaling

Given its success, the Kakoijana beekeeping model has strong potential for replication in other forest-fringe and rural communities. The use of bamboo bee boxes and community-led training can be adapted to diverse ecological and cultural contexts. SNEHPAD has begun knowledge-sharing workshops and exposure visits to showcase the model to other NGOs and local bodies. The scalability of the approach

lies in its simplicity, cost-effectiveness, and adaptability. Partnerships with research institutions like CSIR-NEIST provide the technical foundation for expansion. Government support, through rural development and forestry schemes, can further facilitate replication. The formation of beekeeping cooperatives will aid in scaling marketing and distribution. Lessons from this project can guide other regions in implementing similar eco-livelihood models that balance conservation with community well-being. Interest from other northeastern states has already sparked conversations about expanding the initiative across biodiversity-rich regions of India.

Lessons Learned

- First, community ownership and involvement from the outset are critical for long-term success.
- Second, low-cost and locally appropriate technologies, like bamboo bee boxes, increase sustainability and acceptance.
- Third, integrating scientific knowledge with traditional practices enhances effectiveness and community trust.
- Fourth, gender-inclusive approaches not only promote equity but also improve project outcomes. Continuous training and support are essential to maintain technical standards and colony health. Establishing linkages with markets and policy frameworks ensures greater impact and visibility.
- Finally, the project reaffirmed that environmental conservation and livelihood development are not mutually exclusive but mutually reinforcing when planned holistically. A participatory, ecosystem-based approach can create lasting benefits for both people and the planet.

Challenges faced during Project Implementation

Table 4: Key Challenges faced with associated impacts and actions taken by SNEHPAD

Challenge	Impact	Strategy Considered
Low community awareness and participation	Limited involvement, delayed mobilization	Motivational campaigns, community meetings, women's group empowerment
Decline in voluntarism	Weakening of collective spirit, reliance on monetary incentives	SHG-based group activities, recognition of voluntary efforts
Youth disengagement	Low youth participation in farming and development	Agri-entrepreneurship, modern practices, youth workshops, rebranding agriculture

Conclusion

SNEHPAD's experience reflects the complex realities of grassroots development, where cultural perceptions, systemic delays, and shifting values all shape outcomes. Despite these challenges, the project succeeded in building women's participation, initiating livelihood improvements, and fostering gradual behavioral change. The key lesson is the importance of persistent community engagement, adaptive planning, and long-term behavioral investments to ensure sustainable development outcomes.

Society for Promotion of Rural Economy and Agricultural Development in North East (SPREAD NE)

Project Snapshot	
Project Title	**Fish biodiversity conservation and utilization in few wetland areas of Nalbari district of Assam**
Implementing organisation	SPREAD NE
Location	Nal*bari*, Assam
GEF SGP contribution	Rs. 4000177/-
In cash co-financing	Rs. 1250000/-
Number of beneficiaries	200 (direct)
Total area of land impacted	100 Ha (agricultural land) 20 Ha (wetland)
Project duration	June 2023 - July 2025
Initiatives	» Multifaceted uses of water hyacinth for ecological benefit and livelihood generation » Natural Farming » Fish farming
Case Study 1	Water Hyacinth-Based Innovations in Nalbari, Assam
Case Study 2	Transforming Villages into Natural Farming Hubs for Ecological and Economic Sustainability
Case Study 3	Fish Biodiversity Conservation and Income Generation through Fish

Water Hyacinth-Based Innovations in Nal*bari*, Assam

Background

The flood-prone wetlands of Nal*bari* in Assam face recurring ecological and agricultural disruptions due to seasonal flooding and the spread of water hyacinth, an invasive aquatic plant. Traditionally regarded as a menace, this fast-growing weed clogs water channels, impedes fishing and irrigation, and drastically reduces aquatic biodiversity. In response, local communities supported by NGOs like SPREAD NE have innovatively repurposed water hyacinth into productive applications. These include floating seedbeds for agriculture, vermicompost production, the scientific revival of the traditional extract Dakhala Khar, and the crafting of water hyacinth-based handicrafts. Rooted in Indigenous Traditional Knowledge (ITK) and strengthened through structured training, these initiatives embody the transformation of an ecological threat into a vehicle for sustainability, income generation, and climate adaptation. By integrating ecological restoration with rural livelihoods, the initiative offers a comprehensive, community-led solution that redefines resilience in the face of environmental challenges. The multifaceted use of water hyacinth now supports not just agriculture but also entrepreneurship and cultural heritage underscoring the potential of local innovation in driving long-term rural development.

Implementation

The first major stride in the project involved the production of vermicompost using Water Hyacinth. Small farmers were engaged in this eco-friendly initiative. A total of 200 vermibeds were distributed, and beneficiaries were trained to convert the weed blended with cow dung and organic waste into nutrient-rich compost. This organic fertilizer improved soil fertility while reducing dependence on chemical alternatives. The process not only helped restore the health of wetlands by removing excess weed biomass but also generated a new source of income for rural households.

The second phase of the initiative focused on reviving and scientifically standardizing Dakhala Khar, a traditional alkaline extract rooted in Assamese culinary and medicinal heritage. Made

from the ashes of dried water hyacinth stems, it was historically used for treating stomach ailments and enhancing food flavor. The project documented indigenous practices, refined the method, and introduced a validated protocol to ensure purity and safety. Controlled burning minimized environmental harm, while field tests confirmed its efficacy, creating scope for sustainable, small-scale community enterprises.

Thirdly, floating seedbeds are created by bundling and weaving water hyacinth into dense, floating rafts. These are layered with nutrient-rich organic matter, including soil, compost, cow dung, and decomposed crop residues. Vegetable crops such as brinjal, tomato, and leafy greens are cultivated on these rafts for 20–30 days before being transplanted to permanent fields. Anchored with bamboo poles, the rafts remain buoyant and functional throughout the flood season. Community-based training sessions organized by SPREAD NE train local farmers in raft-building, seed propagation, and organic farming techniques.

The initiative also introduced handicraft training using dried water hyacinth stems. Participants were taught to make eco-friendly products like baskets, mats, bags, and decorative items. These sessions included skill development, product design, quality control, and basic marketing strategies. The incorporation of handicrafts significantly broadened the economic scope of the initiative, turning harvested hyacinth into a creative and saleable commodity. These efforts are fully integrated, empowering communities

to harvest, reuse, and transform water hyacinth into multiple value chains.

Environmental Impact

The initiative directly addresses multiple environmental challenges. Floating seedbeds help manage the rampant growth of water hyacinth by removing it from water bodies and using it constructively. This mitigates its harmful effects on aquatic ecosystems and restores biodiversity. Additionally, the seedbeds function as floating bio-platforms that stabilize wetland habitats, reduce soil erosion, and maintain water quality due to the absence of synthetic fertilizers or pesticides.

The composting of water hyacinth into vermicompost offers another environmentally sound solution. This eco-friendly fertilizer enriches soil health and eliminates the need for chemical alternatives. The production of Dakhala Khar is done through controlled burning methods to reduce emissions, ensuring ecological sensitivity.

Handicraft production contributes to environmental restoration by making long-term use of harvested hyacinth and minimizing waste. Instead of returning to waterways, dried stems are repurposed into durable goods. These practices align with agroecological and circular economy principles closing the loop between waste removal and sustainable resource use. Collectively, the project reduces the invasive plant's environmental burden while enhancing ecosystem functions and supporting climate adaptation strategies.

Socioeconomic Impact

The project has significantly improved livelihoods by creating multiple income streams and enhancing food security. Floating seedbeds allow for off-season vegetable cultivation during floods, ensuring a continuous food supply and lowering dependence on external markets. The sale of surplus seedlings and floating raft kits generates supplementary income for smallholder farmers.

Handicraft training has unlocked new entrepreneurial opportunities, especially for women and youth. Items such as eco-friendly baskets, mats, and bags are sold in local markets and fairs, earning substantial returns. Many artisans have also begun branding their products, exploring online and urban markets. Similarly, the production and sale of water hyacinth-based vermicompost and Dakhala Khar further diversify

household income and reduce dependency on conventional, often costly, agricultural inputs.

Socially, the initiative strengthens community ties through cooperative raft-making, shared composting units, and SHG-led craft clusters. Economic stability has improved access to education and healthcare and enhanced household resilience. By converting environmental challenges into economic assets, the initiative creates a robust local economy embedded in ecological balance and community cooperation.

Gender Mainstreaming

Women are integral to every facet of this initiative, from floating seedbed management to composting and handicraft production. Recognizing their traditional expertise and central role in household agriculture, the program ensured that women were prioritized in all training and implementation stages. Women-led Self-Help Groups (SHGs) were at the forefront of both vermicompost production and handicraft development.

The inclusion of handicrafts added a particularly gender-responsive dimension. Craft-making is flexible, less physically demanding, and compatible with women's domestic responsibilities, making it accessible even to elderly or differently-abled participants. Many women who previously had limited income opportunities are now earning and saving regularly through these enterprises.

Moreover, several women have assumed leadership roles as trainers, coordinators, and market linkers. These roles have improved their confidence, decision-making capacity, and social standing. The initiative has not only provided women with new economic opportunities but has also reshaped gender roles in rural communities proving that inclusive design enhances both effectiveness and equity in development.

Policy Impact

The growing success of the initiative has begun influencing local and regional policy frameworks. District agriculture departments have expressed interest in integrating floating seedbeds into their climate-resilient farming schemes. Several Panchayats have adopted the model into flood management and livelihood support plans, providing seedbed materials and organizing community workshops.

SPREAD NE and partner organizations have been actively advocating for the inclusion of water hyacinth valorization in national rural development programs such as MGNREGA and NRLM. Early-stage discussions suggest that these methods could be formally recognized as community assets, qualifying for public investment and rural employment generation.

In addition, the standardization of Dakhala Khar has opened the door for potential intellectual property rights (IPR) protections ensuring

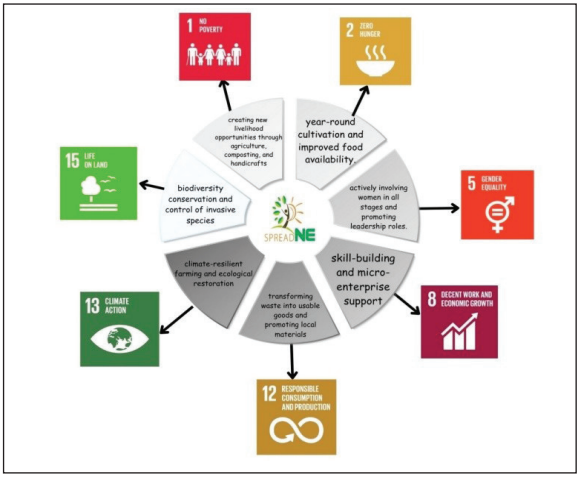
that Indigenous Knowledge is respected and rewarded. Policymakers are increasingly viewing this initiative as a model of grassroots innovation with replicable, scalable potential. Formal policy integration would not only ensure continuity and funding but also legitimize community-based, environmentally sound practices within broader agricultural and economic systems.

Sustainability

The interventions are built on principles of environmental, economic, and social sustainability. Floating seedbeds, compost, and handicrafts all rely on locally sourced, biodegradable materials particularly the abundant water hyacinth. Minimal external inputs are needed, and most production processes can be maintained with community resources and skills.

The handicraft component further strengthens sustainability by creating durable, high-value products from invasive plant waste. Unlike temporary agricultural uses, handicrafts have a longer shelf life and offer consistent income. Composting processes are designed to be cyclical and low-impact, converting waste into soil-replenishing resources. Even post-use, raft components can be composted or reused, reinforcing circularity.

Social sustainability is promoted through training, community ownership, and inclusive participation. The initiative reduces vulnerability to climate shocks and economic volatility,



helping communities adapt and thrive. Its success has also inspired neighbouring regions to adopt similar models, indicating cultural resonance and transferability.

Overall, the project offers a long-term, self-reliant system that restores environmental balance while supporting rural livelihoods a practical blueprint for sustainability at the grassroots level.

Contribution to SDGS

- SDG 1 (No Poverty): By creating new livelihood opportunities through agriculture, composting, and handicrafts.
- SDG 2 (Zero Hunger): Through year-round cultivation and improved food availability.
- SDG 5 (Gender Equality): By actively involving women in all stages and promoting leadership roles.

- SDG 8 (Decent Work and Economic Growth): Through skill-building and micro-enterprise support.
- SDG 12 (Responsible Consumption and Production): By transforming waste into usable goods and promoting local materials.
- SDG 13 (Climate Action): Through climate-resilient farming and ecological restoration.
- SDG 15 (Life on Land and Water): Through biodiversity conservation and control of invasive species.

Replication and Upscaling

The simplicity, affordability, and adaptability of the water hyacinth model make it ideal for replication across similar wetland and flood-prone regions in South Asia. Neighbouring districts have already begun pilot projects. Key enablers include local availability of raw materials, strong community institutions, and minimal infrastructure requirements.

Successful replication depends on building training ecosystems, demonstration plots, and knowledge hubs. NGOs and Panchayats can coordinate to provide starter kits, instructional materials, and exposure visits. Developing standardized guides for handicrafts and compost will help maintain quality and improve marketability. Digital platforms and mobile applications can facilitate knowledge dissemination, peer learning, and monitoring.

Financial incentives such as inclusion in rural credit schemes, subsidies, or startup grants could ease barriers for first-time adopters. Ensuring gender inclusion and capacity-building for marginalized communities will preserve the model's equity and impact. With structured support, this multi-faceted, community-based innovation can be upscaled to promote climate resilience, rural employment, and ecological restoration on a much broader scale.

Lessons Learned

1. **Indigenous Knowledge is Transformative:** Community-rooted traditions like floating farming and Dakhala Khar provide scalable solutions to complex modern challenges.
2. **Inclusivity Drives Success:** Gender-sensitive, community-led approaches ensure wide participation and greater sustainability.
3. **Waste Can Be Wealth:** Valorizing invasive species into productive resources illustrates the power of circular economy thinking.
4. **Policy Engagement is Key:** Integration into formal schemes expands reach, legitimacy, and financial sustainability.
5. **Skill Multiplication Enhances Impact:** Training in handicrafts and vermicomposting diversifies income and deepens community resilience.
6. **Adaptability is Vital:** Models designed to suit local contexts thrive best and respond flexibly to climate variability.

Transforming Villages into Natural Farming Hubs for Ecological and Economic Sustainability

Background

Rural agriculture in India faces mounting challenges such as soil degradation, high input costs, reduced productivity, and declining farm incomes. Conventional farming, heavily reliant on chemical fertilizers and hybrid seeds, has led to depleted soil health and fragile farm economies. In response, SPREAD NE launched a comprehensive program to transition selected villages into Natural Farming Hubs. The initiative was grounded in the vision of promoting agroecological practices that regenerate the environment while enhancing livelihoods. Target areas were chosen based on vulnerability indicators like declining soil fertility, water scarcity, and farmer distress. SPREAD NE adopted a bottom-up approach, engaging local communities in the design and implementation of solutions. The primary focus was on building capacity for natural farming, reducing dependence on external inputs, and diversifying income sources. Complementary interventions included the promotion of Azolla cultivation for livestock nutrition, lemon farming through vegetative propagation, and improved potato cultivation using eco-friendly methods. These activities were aligned to support rural resilience, food security, and sustainable development. The initiative also emphasized indigenous knowledge, climate-resilient practices, and economic self-reliance. Overall, this initiative aimed to develop community-led models of sustainable agriculture that could be replicated across other agro-climatic zones, serving as hubs for ecological regeneration and rural prosperity.

Implementation

The implementation process began with a detailed village-level assessment to identify suitable beneficiaries and resource capacities. SPREAD NE prioritized participatory planning, engaging local leaders, women's groups, and farmers in co-developing the roadmap. Initial phases focused on farmer training, introducing the fundamentals of natural farming which are composting, mulching, bio-inputs, and

indigenous seed use. Practical, hands-on sessions were conducted in local dialects to ensure inclusive learning. Each beneficiary received indigenous vegetable seeds suited to local agro-climatic conditions, reducing dependency on market-purchased hybrid seeds.

Azolla cultivation was introduced as a livestock feed strategy. Farmers were trained to construct low-cost tarpaulin-lined pits in their backyards, enabling sustainable feed production. Additionally, Azolla was cultivated in beels (seasonal wetlands) to boost biomass at the community level.

Lemon cultivation was scaled through vegetative propagation using leaf bud cuttings, providing disease-free, uniform saplings. Farmers learned nursery techniques and received 10 healthy lemon plants each for planting.

Potato cultivation practices were enhanced through demonstrations involving certified seed tubers, mulching with water hyacinth, and improved post-harvest handling.

Technical support teams conducted regular field visits for guidance and monitoring. Market linkages were facilitated with local aggregators to ensure fair pricing. Integration of knowledge, resource access, and practical demonstrations proved central to the program's success.

Environmental Impact

The shift to natural farming significantly reduced the environmental footprint of agricultural practices in the target villages. By eliminating the use of chemical fertilizers and pesticides, the initiative contributed to the gradual restoration of soil health. Practices like mulching, use of bio-inputs, and composting helped increase soil organic matter, improved water retention, and encouraged beneficial soil microbiota. Indigenous seed varieties promoted biodiversity and were better adapted to local climate

and pests, reducing the need for chemical intervention. Azolla cultivation, a sustainable aquatic practice, turned previously unused household spaces and wetlands into productive biomass zones. Azolla's nitrogen-fixing ability also improved soil fertility when applied to fields as green manure. The introduction of water hyacinth mulch in potato cultivation showcased how invasive species could be repurposed to benefit farming systems controlling weeds and retaining soil moisture naturally.

Socioeconomic Impact

The program-built confidence among farmers, many of whom had previously experienced economic losses due to conventional farming. With diversified income streams and improved farming knowledge, communities began moving toward financial resilience. Furthermore, on-farm employment opportunities increased, reducing migration pressure and supporting rural economic development.

Azolla cultivation played a pivotal role in reducing expenses on commercial livestock feed. As milk productivity and animal health improved, households experienced better returns from dairy activities. Lemon farming emerged as a promising supplementary income source, especially given the early fruiting and uniform quality from leaf bud propagated plants. Some farmers also established small nurseries, selling saplings locally and generating additional income. Potato cultivation saw an increase in acreage and yield, leading to better market returns. Linkages with aggregators improved bargaining power and ensured fair prices.

Gender Mainstreaming

The initiative created spaces for women's participation and leadership, especially in home-based activities. Women were also encouraged to participate in natural farming training sessions, which were conducted at village locations to accommodate their mobility constraints. In many

cases, women formed informal support groups to share techniques, manage backyard cultivation, and jointly market produce.

Azolla cultivation, being low-tech and easily manageable within household premises, saw strong uptake among women. This gave them a direct role in livestock management, enhancing their economic contribution to the household.

In lemon nursery development, women's dexterity in handling delicate propagation tasks proved valuable. They gained nursery management skills and some began earning from sapling sales, increasing their financial independence. These roles not only contributed to household income but also elevated women's voices in farm decision-making.

Policy Impact

The initiative's success demonstrated the viability of natural farming as a grassroots solution to multiple policy challenges, including rural poverty, food security, and climate resilience. Field evidence from the pilot villages provided inputs for local agricultural departments and Panchayati Raj institutions. The district agriculture office took note of the approach, prompting interest in integrating natural farming components into local development plans.

Policy interest also emerged around the use of Azolla for decentralized livestock feed production. The model demonstrated cost-effective feed solutions that could complement existing animal husbandry schemes. Furthermore, the integration of gender in farming activities aligned with government efforts to mainstream women in agriculture through targeted programs and self-help groups.

The project facilitated stakeholder workshops to share results with government officials, civil society, and agricultural universities. These forums opened dialogues on scaling agroecological methods through convergence with MGNREGS, watershed development programs, and state-run farmer training schemes.

Although not a formal policy shift, the project's demonstrated results catalyzed local administrative interest and created momentum toward policy support for sustainable agriculture practices. Continued documentation and evidence sharing are likely to influence broader agroecological planning and budgeting frameworks in the future.

Sustainability

The long-term sustainability of the initiative lies in its emphasis on local knowledge, resource efficiency, and community ownership. Natural farming practices promoted under the project require minimal external inputs, relying instead on composting, biofertilizers, and indigenous seedsall of which are available locally. This ensures continued application without dependency on subsidies or external support.

The training-of-trainers model and field demonstrations enabled knowledge transfer that is both scalable and replicable. Farmers who

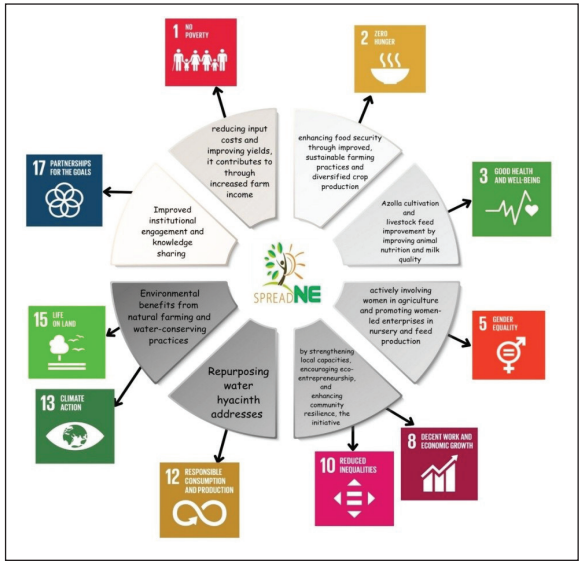
mastered techniques became resource persons in their own villages, facilitating horizontal learning. The formation of farmer groups and informal seed-sharing networks further strengthened the local ecosystem for sustainability.

Azolla pits and lemon nurseries were established in home settings, ensuring continuity even beyond the project lifecycle. The economic viability of these interventions through reduced costs and added income provides strong incentives for farmers to continue the practices.

Market linkages offer pathways for scaling and sustaining rural enterprises. Moreover, the project embedded ecological literacy, encouraging stewardship of natural resources as part of daily farm life.

Contribution to SDGS

- It directly supports SDG 2 (Zero Hunger) by enhancing food security through improved, sustainable farming practices and diversified crop production.
- By reducing input costs and improving yields, it contributes to SDG 1 (No Poverty) through increased farm income.
- Azolla cultivation and livestock feed improvement promote SDG 3 (Good Health and Well-being) by improving animal nutrition and milk quality.
- SDG 5 (Gender Equality) is advanced by actively involving women in agriculture and promoting women-led enterprises in nursery and feed production.
- Environmental benefits from natural farming and water-conserving practices support SDG 13 (Climate Action) and SDG 15 (Life on Land),
- Repurposing water hyacinth addresses SDG 12 (Responsible Consumption and Production).
- Improved institutional engagement and knowledge sharing align with SDG 17 (Partnerships for the Goals).
- Furthermore, by strengthening local capacities, encouraging eco-entrepreneurship, and enhancing community resilience, the initiative contributes to SDG 8 (Decent Work and Economic Growth) and SDG 10 (Reduced Inequalities).



Replication And Upscaling

Given its reliance on locally available inputs, the initiative is highly replicable. The natural farming model can be easily adapted to different agro-climatic zones with minor contextual modifications. The approach has already sparked interest in neighbouring villages where farmer-to-farmer exchanges have begun informally. To support wider replication, SPREAD NE documented training modules, demonstration videos, and crop calendars tailored to local conditions. Resource farmers have emerged as community trainers, enabling peer-based expansion. Government departments have shown willingness to integrate elements like Azolla cultivation and lemon propagation into existing schemes.

Upscaling is feasible through convergence with flagship rural programs like NRLM, RKVY, and MGNREGS, which can support infrastructure, training, and seed inputs. For instance, Azolla pit construction and compost pits can be financed under labour-based schemes, while agricultural universities can support capacity-building. The success of the pilot model underscores the importance of knowledge-sharing platforms, institutional partnerships, and community champions. Strategic support in the form of policy incentives, extension services, and financial linkages will accelerate the replication of this holistic rural transformation model across districts and states.

Lessons Learned

- **Localized Design Ensures Relevance:** Tailoring training and seed inputs to local ecological and social conditions led to greater farmer adoption and success.
- **Hands-On Training is Critical:** Practical demonstrations outperformed classroom training in building confidence and enabling behavior change.
- **Women are Key Enablers:** Involving women in manageable, home-based interventions led to higher adoption rates and broader household benefits.
- **Community Champions Drive Scale:** Identifying and nurturing farmer-leaders helped in disseminating techniques across communities.
- **Low-Cost Interventions Work:** Eco-friendly, low-input techniques like Azolla pits and vegetative propagation offered high returns with minimal investment.
- **Integration Yields Impact:** Aligning agriculture, livestock, and livelihoods created synergistic outcomes, enhancing resilience and income.
- **Market Linkages Matter:** Supporting access to fair markets was essential to sustaining interest and ensuring economic viability.
- **Documentation Enables Scale:** Developing replicable materials and guides helped spread the model beyond direct intervention areas.

Fish Biodiversity Conservation and Income Generation through Fish Farming in Nal*bari*, Assam

Background

The Nal*bari* district of Assam is home to numerous wetland ecosystems, or beels, that support rich aquatic biodiversity and offer significant potential for inland fisheries. However, challenges such as habitat degradation, overfishing, and limited livelihood alternatives have affected local communities, particularly women. Recognizing these challenges, a targeted project was launched to promote sustainable fish farming, conserve indigenous species, and empower rural populations, especially women, through value-added fish-based enterprises. With a holistic and inclusive approach, the initiative aimed to transform fish-farming practices into profitable, biodiversity-friendly, and gender-sensitive livelihoods. Over 1,000 community members were engaged, with 200 individuals receiving focused support and training more than 80% of whom were women. The project sought to restore key water bodies, introduce modern post-harvest technologies, and integrate traditional knowledge with scientific practices to ensure long-term environmental and social benefits.

IMPLEMENTATION

The project involved a multi-pronged implementation strategy, starting with the identification and restoration of key wetland areas like Thongthongia, Kheluwa Moneri, and Borbilla Beel. Under the guidance of the Fishery Officer, habitat restoration followed sustainable and scientific methods to support native fish populations. Technical sessions facilitated the identification of key indigenous fish species, including ***Anabas testudineus*** (Kawai), ***Channa striatus*** (Sol), and ***Monopteruscuchia*** (Cuchia). Capacity-building initiatives focused on value addition through the preparation of fish pickles, dried fish, and smoked fish. Training modules covered hygienic processing, improved preservation, branding, packaging, and local marketing. A total of 8 improved smoking kilns were distributed to selected beneficiaries.

Entrepreneurship training, especially for women, was a core element. Community participation was encouraged at all levels, from planning to execution, ensuring local ownership and sustainability. Technical experts, local authorities, and community-based organizations collaborated to ensure smooth and culturally appropriate implementation.

Environmental Impact

The restoration of degraded wetlands led to a significant improvement in the local aquatic ecosystem. The scientific revival of beels not only enhanced water quality but also promoted the re-emergence of indigenous fish species. The identification and conservation of local species like *Channa marulius*, *Puntius ticto*, and *Amblypharyngodon mola* contributed to maintaining biodiversity and ecological balance. Sustainable fishing practices were promoted among the communities, reducing pressure on fragile habitats. The introduction of improved fish processing technologies, such as energy-efficient smoking kilns, reduced reliance on traditional, often polluting, methods of fish preservation. These kilns also minimized fuel consumption and emissions. Awareness campaigns on ecosystem services and biodiversity importance were conducted to strengthen community commitment to conservation. Overall, the project demonstrated how integrated fishery development can align with environmental protection, contributing to climate resilience and the preservation of freshwater biodiversity in rural Assam.

Socioeconomic Impact

The project had a notable socioeconomic impact on fish-farming households, particularly those led by women. Through training and capacity-building, beneficiaries gained new skills in fish processing, preservation, and marketing, which opened up alternative income streams. Fish pickling, drying, and smoking activities enabled farmers to add value to their produce and reduce post-harvest losses. With enhanced product shelf-life and quality, many participants accessed new markets, boosting their household incomes. The distribution of smoking kilns and the promotion of home-based enterprises allowed for income generation without the need for relocation or high startup costs. The economic empowerment of women improved family livelihoods and strengthened their decision-making roles within households and communities. Furthermore, community

involvement in biodiversity conservation created a sense of ownership and pride, leading to greater engagement in sustainable practices. The diversification of income sources through fish-based microenterprises increased financial resilience among vulnerable groups, contributing to poverty reduction and rural economic development.

Gender Mainstreaming

Gender equity was a central focus of the initiative. More than 80% of the direct beneficiaries were women, reflecting deliberate efforts to empower rural women in a traditionally male-dominated sector. Trainings were designed to be inclusive and accessible, addressing the specific needs and constraints faced by women. Women were encouraged to take leadership roles in community fishery groups and were prioritized in the distribution of assets such as smoking kilns. The project promoted the concept of women as "fish entrepreneurs", moving beyond traditional roles and enabling them to participate actively in the fisheries value chain. Gender-sensitive value addition training provided women with the confidence and skills to manage processing, packaging, branding, and marketing independently. As a result, women not only contributed significantly to household incomes but also gained social recognition and increased autonomy. The project created a foundation for long-term gender equity in rural fish farming by challenging stereotypes and demonstrating the economic and environmental value of women's participation.

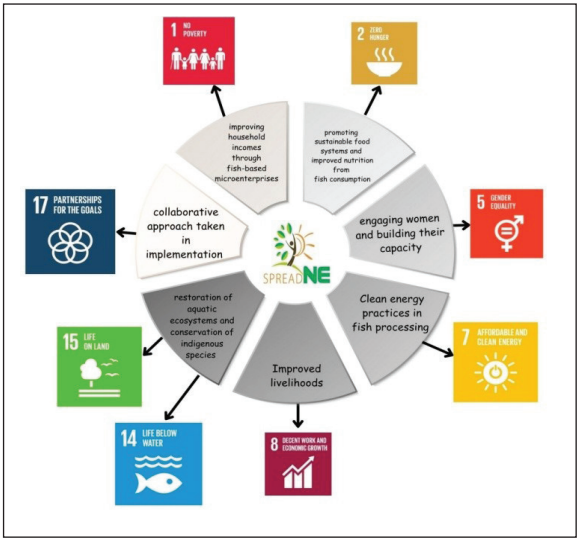
Policy Impact

The success of the Nal*bari* project provided valuable insights for policy advocacy in community-based fisheries management. The project's emphasis on biodiversity conservation, gender inclusion, and value-chain development demonstrated a practical model for integrating ecological sustainability with rural development. Local authorities took note of the project's approach, and discussions began on incorporating its methodologies into broader district and state-level fisheries programs. The restoration of indigenous species and sustainable use of wetlands aligned with national priorities on biodiversity and resource management. The project highlighted the need for supportive policies on training access, market linkages, and infrastructure for small-scale fish

entrepreneurs. Its outcomes encouraged increased investment in decentralized, women-led fishery initiatives and demonstrated the effectiveness of cross-sector collaboration. Policy briefs and recommendations based on the project's findings were shared with relevant departments, contributing to an enabling environment for scaling similar interventions across Assam and beyond.

Sustainability

Sustainability was built into the project from the beginning, with a focus on ecological balance, economic viability, and social inclusion. The use of scientific methods in habitat restoration ensured long-term support for indigenous fish populations. Training beneficiaries in value addition and entrepreneurship equipped them with practical skills that extend beyond the project period. The promotion of energy-efficient technologies like improved smoking kilns not only reduced environmental impact but also offered cost-effective solutions for rural entrepreneurs. Community ownership was fostered through participatory planning and implementation, while strong linkages with local governance and fishery departments ensured institutional support. By empowering women as active participants and decision-makers, the project created lasting social change. Continuous follow-up and peer learning networks among beneficiaries further supported sustained impact.



Contribution to SDGS

- It supported SDG 1 (No Poverty) by improving household incomes through fish-based microenterprises.
- SDG 2 (Zero Hunger) was addressed by promoting sustainable food systems and improved nutrition from fish consumption.
- By engaging women and building their capacity, the project advanced SDG 5 (Gender Equality).
- The restoration of aquatic ecosystems and conservation of indigenous species aligned with SDG 14 (Life Below Water) and SDG 15 (Life on Land).
- Clean energy practices in fish processing contributed to SDG 7 (Affordable and Clean Energy),

» Improved livelihoods supported SDG 8 (Decent Work and Economic Growth).

» The collaborative approach taken in implementation contributed to SDG 17 (Partnerships for the Goals).

Replication and Upscaling

Given its success in Nal*bari*, the project offers a replicable model for other regions with similar ecological and social contexts. Key features such as participatory planning, gender-focused training, and ecosystem-based fish farming can be adapted to various settings. The use of low-cost technologies like smoking kilns and the integration of traditional knowledge with scientific methods make the model both accessible and adaptable. Local institutions can take the lead in replicating the approach, with technical support from fisheries departments and NGOs. The success also opens up opportunities for upscaling through government schemes, donor programs, and public-private partnerships. Communities neighbouring the pilot areas have already expressed interest in adopting similar practices, and informal knowledge-sharing networks are beginning to emerge. With policy support and strategic investment, this model has the potential to transform rural fish farming across Assam and other states with rich wetland resources.

Lessons Learned

» First, integrating biodiversity conservation with income generation is both practical and impactful when rooted in local contexts.

» Second, women's empowerment in fisheries is not only achievable but essential for inclusive development.

» Third, value addition and post-harvest technologies can greatly enhance the viability of small-scale fish farming.

» Fourth, building community ownership through participation ensures long-term sustainability.

» Fifth, low-cost innovations like improved smoking kilns can address both environmental and economic concerns.

» Sixth, alignment with policy priorities strengthens the case for institutional support.

» Finally, continued engagement, mentoring, and networking among beneficiaries are crucial for lasting change.

Challenges Faced During Project Implementation

Table 5: Key Challenges faced with associated impacts and actions taken by SPREAD NE

Challenge	Impact	Strategy Considered
Weather-related disruptions	Loss of nurseries, reduced water availability	Tarpaulin ponds, bamboo fencing, seasonal activity planning
Community control of beels	Difficulty in collective management and conservation	Stakeholder consultations, conflict resolution, governance documentation
Initial resistance to change	Delay in adopting sustainable practices	Demonstrations, awareness campaigns, peer success stories
Limited technical awareness	Slow technology adoption, repeated training needs	Hands-on training, refresher workshops, visual learning tools
Water hyacinth management	Labor-intensive removal, difficulty scaling reuse practices	Community mobilization, exploration of mechanization
Inadequate infrastructure	Constrained processing, drying, and storage	Infrastructure mapping, proposals for micro-infrastructure, community resource centers
Weak market linkages	Limited income generation	Trader/SHG engagement, branding and packaging, local exhibitions

Conclusion

The challenges faced during project implementation highlight the complexities of working in climate-sensitive wetlands with fragmented resource ownership. SPREAD NE's adaptive strategies—ranging from climate-resilient planning to institutional capacity building, helped overcome many barriers. The project experience emphasizes the importance of community mobilization, technical training, market development, and governance clarity to ensure long-term sustainability and resilience in wetland-based livelihoods.

M S Swaminathan Research Foundation (MSSRF)

Project Snapshot	
Project Title	**Minimizing the Impact of Ghost Gears to Conserve the Biodiversity of Ramanathapuram Coast through a Community-Centric Collective Approach**
Implementing Organization	M.S. Swaminathan Research Foundation
Location	Ramanathapuram district in Tamil Nadu
Project Number	IND/SGP/OP7/Y3/CORE/BD/2023/01
SGP contribution in INR	3978700
Co-financing in INR	4428000

Minimizing the Impact of Ghost Gears to Conserve the Biodiversity of Ramanathapuram Coast through a Community-Centric Collective Approach in Tamil Nadu

Project Description

Relevance of the project: The project is highly relevant as it addresses the growing threat of ghost gears to marine biodiversity while promoting sustainable fishing practices. By integrating conservation with livelihood enhancement through women-led recycling initiatives, it safeguards coastal ecosystems, empowers communities, and supports long-term environmental and socio-economic resilience in Ramanathapuram district.

Impacts: The project restored 0.54 km² of seawater and cleaned 141.8 hectares of coastal terrain, significantly improving marine habitat health and reducing ghost gear pollution. Socio-economically, 1,158 households—mainly fishers and SHG members—benefited through awareness, cleanup, and upcycling initiatives, enhancing livelihoods, gender inclusion, and community commitment to sustainable marine resource management.

Lessons Learned for Project Replication and Up-scaling: The project highlights that flexible scheduling, proactive coordination with authorities, and community-driven participation are crucial for success. Integrating gender-inclusive training, adaptive planning to weather conditions, and awareness campaigns fostered strong local ownership—demonstrating that replication and upscaling are feasible when ecological restoration aligns with livelihood enhancement and institutional collaboration.

Background

The coastal and island regions of Ramanathapuram district hosted diverse marine ecosystems that supported several threatened species. However, these habitats were increasingly endangered by ghost gears—abandoned or lost fishing nets that continued to trap marine life and damage habitats. To address this challenge, the M.S. Swaminathan Research Foundation launched a community-based initiative focusing on ghost gear retrieval, recycling, and awareness generation. Through participatory research, fisher training, and gender-inclusive livelihood promotion, the project aimed to reduce marine pollution, restore biodiversity, and build local stewardship. It also developed voluntary codes of practice to encourage sustainable fishing and long-term marine conservation.

Implementation

The project on ghost gear management was implemented through an integrated, community-driven approach combining scientific assessment, capacity building, and practical interventions. Ghost gear hotspots were mapped using field surveys, fisher inputs, and GPS-based geo-mapping. Awareness and training sessions educated fishers on responsible gear practices and empowered women through upcycling and entrepreneurship training. Retrieval operations were carried out along shorelines, islands, and underwater zones with strict safety protocols and coordination with the Forest Department. By integrating environmental restoration with livelihood generation, the project effectively promoted marine conservation, gender-inclusive participation, and sustainable coastal management, ensuring long-term ecological and socio-economic resilience.

Application of Indigenous Knowledge

The project leveraged the traditional knowledge of local fishers and coastal communities to identify ghost gear accumulation hotspots and disseminate sustainable practices. Their firsthand experience guided mapping, retrieval, and prevention strategies, ensuring culturally appropriate interventions while integrating community wisdom with scientific tools for

effective marine conservation and livelihood enhancement.

Environmental Impact

The project led to substantial ecological restoration across both marine and coastal zones. Approximately 0.54 km² of seawater showed marked improvement, with clearer waters, reduced ghost gear debris, and signs of habitat recovery in key marine areas. Additionally, 141.8 hectares (1.418 km²) of coastal and island terrain were effectively cleaned, demonstrating the significant scale and impact of community-led interventions in mitigating marine litter and protecting biodiversity.

Socioeconomic Impact

The project generated significant socioeconomic benefits by directly engaging 1,158 households, including fisher families, SHG members, and youth, in community-led clean-up drives, awareness sessions, and upcycling workshops. It enhanced livelihood opportunities, environmental awareness, and community participation. Around 100 women and girls received hands-on training in repurposing ghost gear into eco-friendly products, gaining income-generating skills and confidence. Furthermore, 10 women entrepreneurs emerged, transforming marine waste into marketable goods with SHG and expert support. These initiatives fostered financial independence, promoted circular economy practices, and strengthened gender-inclusive development, making coastal communities more resilient and environmentally conscious while improving long-term livelihood sustainability.

Gender Mainstreaming

The project successfully advanced gender mainstreaming by actively involving women in marine conservation and livelihood activities. Women participated in shoreline clean-ups, upcycling training, and product innovation, breaking traditional gender roles. Through SHG-led enterprises, they gained leadership, entrepreneurship, and financial independence. This inclusive approach empowered women as key agents of environmental stewardship, strengthened community resilience, and demonstrated the transformative impact of integrating gender perspectives into sustainability initiatives.

Policy Impact

The project activities are directly aligned with several programs of the Government of India (GOI) and the state, such as Clean Seas campaign, Swatch Bharat Mission, Tamil Nadu- Coastal Restoration Mission.

Impact at a Glance

Area of marine habitats under improved practices (Ha): 300

No. of Direct project beneficiaries: 850

Sustainability

MSSRF has established partnerships with several institutions and organizations, including CMFRI, GOMBRT, the Fisheries Department, Panchayats, NCCR, the Tourism Department, Traditional Panchayats, boat owners, women's groups and youth associations, and the HCL Foundation. The following are the partnerships, institutions, and organizations.

S. No	Institute involved	Role
1	Central Marine Fisheries Research Institute (CMFRI)	Training and Capacity Building
2	Gulf of Mannar Biosphere Reserve Trust (GOMBRT)	Clean up action on the island
3	Fisheries department	Training and capacity building, advocacy, voluntary guidelines development, and expansion of the upcycling programme with more women's groups
4	Panchayat	Clean up action on the shore
5	NCCR	Resource person in the training
6	Tourism department	Develop a comprehensive plan for the debris-free green Rameswaram
7	Traditional panchayat	Clean up drives and retrieval of ghost gears
8	Boat owners	Collection and retrieval of ghost gears from the sea, supporting all the field-level actions
9	Women's groups and youth associations.	Actively involved in all retrieval actions
10	HCL Foundation	Funding Expanding the work in other clusters

Before

After

Contribution to SDGs

The ghost gear upcycling project contributes to multiple Sustainable Development Goals (SDGs) by integrating social, economic, and environmental benefits. By providing alternative livelihoods to fisherwomen through recycling and upcycling of ghost gear, the project supports poverty alleviation (SDG 1) and promotes gender equality through women's active participation in training and economic activities (SDG 5). It fosters sustainable economic growth, entrepreneurship, and skill development for coastal communities (SDG 8) while encouraging responsible consumption and circular economy practices by transforming waste into value-added products (SDG 12). By mitigating marine pollution and restoring ecosystems, the project indirectly enhances climate resilience and adaptation of coastal livelihoods (SDG 13). Its direct focus on reducing ghost gear, conserving marine habitats,

and protecting threatened species contributes to marine biodiversity conservation (SDG 14), and shoreline clean-ups and habitat rehabilitation strengthen coastal terrestrial biodiversity and ecosystem health (SDG 15). Overall, the project exemplifies a holistic approach where environmental sustainability, community empowerment, and economic development are mutually reinforced.

Replication & Up-scaling

The Fisheries Department in the district showed keen interest in adopting aspects of the project model, particularly the ghost gear retrieval and upcycling initiatives. They initiated discussions to explore how these practices could be integrated into ongoing coastal management and fisher welfare programs, reflecting the model's potential to address marine pollution while promoting sustainable livelihoods, especially for women and youth in coastal communities.

Challenges Faced & Lessons Learned

The project faced challenges such as limited fisher availability, procedural delays for island access, and adverse marine conditions. Flexible scheduling, proactive coordination, and strict safety measures helped overcome these barriers. Lessons learned emphasized the importance of adaptive planning, gender-inclusive participation, and multi-stakeholder collaboration for sustainable, community-driven marine conservation.

Participatory Learning Action Network & Training Trust

Project Snapshot	
Project Title	**Reef for fish for Ever Fabrication and Deployment of Artificial Reef to enhance the marine fisheries resources and conserve the coastal biodiversity at Rameshwaram fishing villages in Ramanathapuram District**
Implementing Organization	Participatory Learning Action Network & Training Trust
Location	Gulf of Mannar region in Ramanathapuram district in Tamil Nadu
Project Number	IND/SGP/OP7/Y3/CORE/BD/2023/04
SGP contribution in INR	4066425
Co-financing in INR	1515825

Reef for fish for Ever: Fabrication and Deployment of Artificial Reef to enhance the marine fisheries resources and conserve the coastal biodiversity at Rameshwaram fishing villages in Ramanathapuram District, Tamil Nadu

Project Description

Relevance of the project: The project was highly relevant as it addressed declining fish stocks, coral reef degradation, and livelihood vulnerabilities in the Gulf of Mannar. By integrating indigenous knowledge with scientific reef restoration, it enhanced marine biodiversity, promoted sustainable fisheries, and empowered coastal communities—especially women—through participatory, gender-inclusive conservation and livelihood diversification

Impacts: The artificial reef project enhanced marine biodiversity over 1,500 sq. m, sequestering 1,098–3,000 kg CO_2 annually and reducing 13.25 kg CO_2 emissions per boat daily. Fish catches rose to 3,000–5,000 kg monthly, benefiting 5,000 families. Women-led fish marketing and youth-led reef monitoring generated ₹15 lakh monthly income, strengthening ecological health and community resilience.

Lessons Learned for Project Replication and Up-scaling: Lessons from the project highlight the value of community ownership, gender-inclusive participation, and integration of traditional knowledge for successful replication. Establishing local management committees, providing technical training, and creating revolving funds ensured sustainability. Strong institutional coordination and stakeholder partnerships proved essential for scaling up artificial reef initiatives across coastal regions.

Background

The Gulf of Mannar, along the Rameshwaram coast in Ramanathapuram District, was a globally significant marine ecosystem, enriched with coral reefs, seagrasses, mangroves, estuaries, rocky shores, and sandy beaches. Home to over 4,200 species of flora and fauna, it has been recognized for its biodiversity since the UNESCO Man and Biosphere (MAB) program in 1971.

Despite its ecological richness, the region faced severe threats from overfishing, destructive fishing practices, coral reef degradation, and loss of habitat. These pressures led to declining fish stocks, reduced biodiversity, and diminished livelihoods for local fisherfolk, particularly women who were often engaged in post-harvest activities. Additionally, limited awareness of sustainable fishing practices and the lack of community-managed marine conservation initiatives exacerbated environmental and socioeconomic vulnerabilities. The Reef for Fish project addressed these challenges by deploying 300 artificial reefs across key fishing villages, enhancing fishery resources, preserving endangered species, and promoting gender-inclusive, community-led coastal conservation.

Implementation

The Reef for Fish project adopted a participatory, community-driven approach. It began with stakeholder consultations, mapping fisherfolk, women, youth, and indigenous groups to ensure inclusive engagement. Beneficiaries were trained in artificial reef fabrication and deployment, combining traditional knowledge with technical guidance. Women actively participated in reef construction and fish marketing, while management committees oversaw reef maintenance and equitable fund utilization. Three reef clusters were established across key villages, supported by IEC campaigns, community workshops, folk media, and digital awareness tools. Continuous monitoring, capacity building, and knowledge documentation ensured sustainability, increased fish biomass, and promoted responsible fishing practices.

Application of Indigenous Knowledge

Fisher folk have vast traditional knowledge, identifying ocean depths, seasonal changes, and ocean currents mixed with flora and fauna, known as the “biological soup.” They predict fish locations by observing seawater colour and prepare crafts and gear accordingly. The project utilized their expertise to identify shallow depths for artificial reef deployment. A survey on June 12, 2024, assessed nine stations, selecting three optimal sites with fishermen’s support. This collaboration emphasizes the value of integrating traditional knowledge with scientific approaches for marine conservation.

Environmental Impact

The artificial reef project has significantly contributed to marine biodiversity, carbon sequestration, and sustainable fishing practices. Covering an area of 1,500 square meters, the artificial reef served as a buffer zone where fish species migrate, settle, and breed, leading to increased fish populations. Beyond fisheries, artificial reefs played a crucial role in carbon sequestration. A single artificial reef structure absorbs between 3.66 to 10 kg of CO_2, per year. With the planting of 300 reefs, annual CO_2, sequestration ranges from 1,098 to 3,000 kg, contributing to climate change mitigation. The reefs also offer economic advantages by reducing fishing time and fuel consumption. Since fishing grounds are within a 5 km radius, fishers saved an estimated 5 liters of fossil fuel per boat daily.

This resulted in a CO_2, emission reduction of approximately 13.25 kg per boat per day. These combined benefits showcased how artificial reefs supported sustainable fisheries, reduced environmental impact, and created long-term economic gains for local fishing communities while ensuring marine conservation. The reefs also control the sea erosion by way of controlling the seismic activity.

Socioeconomic Impact

The artificial reef deployment greatly increased fishery resources, with fishermen reporting 3,000–5,000 kg of catch per month after a one-year maturation period. Over 5,000 families in

Rameshwaram benefited through more stable and sustainable livelihoods. Youth played a major role, using their hook-and-line fishing skills to efficiently harvest high-value species in reef zones, ensuring quality catches with less time at sea. Many also supported reef monitoring and conservation, strengthening long-term sustainability. Women contributed by removing middlemen in fish sales; they led auctioning, vending, and exporting to nearby cities, securing fair prices for the community. Across three reef zones, fishing increased to 50 tons per month, generating Rs. 1500000 in monthly income for 1,200 families. Each family now earned Rs. 12,500–15,000 per month, improving financial security. Overall, the initiative enhanced livelihoods, empowered women, engaged youth in sustainable fishing, improved access to education and healthcare, and strengthened community resilience.

Gender Mainstreaming

The project actively empowered women by involving them in artificial reef fabrication, fish marketing, and reef management committees. Women now lead decision-making on sustainable fishing practices, regulate reef conservation, and manage community funds, strengthening household incomes. Their participation fostered social equity, built technical skills, and enhanced leadership. By integrating women in all aspects of reef management, the project ensured gender-

Policy Impact

The project's success influenced state-level fisheries policy, leading to the Tamil Nadu government's adoption of participatory artificial reef models. It catalyzed replication across districts through government, CSR, and international collaborations, institutionalizing community-led reef management and demonstrating effective policy integration of sustainable fisheries and coastal ecosystem restoration practices.

Impact at a Glance

Area of marine habitats under improved practices (Ha): 316

Beneficiaries (total): 3900 households

No. of Direct project beneficiaries (No.): 600

inclusive, sustainable fisheries, promoting both ecological conservation and economic resilience in coastal communities.

Sustainability

The artificial reef project united multiple stakeholders to address fisheries, marine conservation, and livelihood challenges in a transboundary coastal zone. Because the site lay near shared marine waters, PLANT engaged the Navy, Coast Guard, Marine Police, Wildlife, Forest, and Fisheries Departments from the start, securing permissions and ensuring smooth, conflict-free deployment. Government agencies, especially the Tamil Nadu Fisheries Department, provided policy support, funding, and standardized practices, while local administrations coordinated field activities. CSR partners offered co-financing and logistics, and research institutions guided impact assessments, monitoring, and reef design. Fisher cooperatives and self-help groups led fabrication, deployment, and fisheries management, strengthening biodiversity, fish stocks, and community resilience.

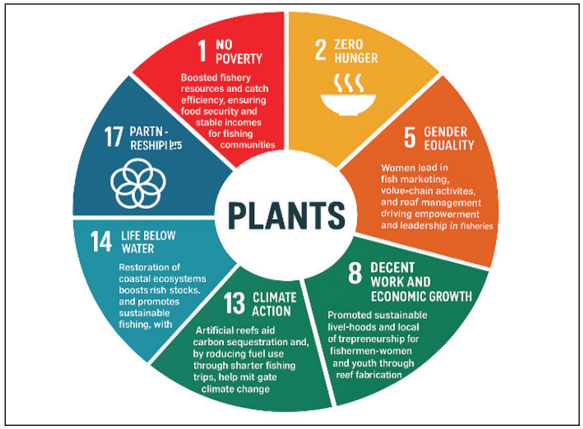
S. No	Institute involved	Role
1	Navy	Provided permissions and coordination for operations near transboundary waters; ensured security and compliance.
2	Coast Guard	Monitored maritime safety and assisted in deployment logistics
3	Marine Police	Facilitated local maritime enforcement and safety during reef deployment
4	Wildlife Department	Advised on biodiversity conservation, habitat protection, and environmental compliance.
5	Forest Department	Provided guidance on ecological conservation and ecosystem protection
6	Fisheries Department (Tamil Nadu State)	Policy support, funding facilitation, standardization of reef deployment practices, and regulatory oversight.
7	Local Administration / Panchayats	Facilitated on-ground coordination, logistics, and community engagement.
8	Private Sector / CSR Partners	Provided co-financing, logistical support, and resources for large-scale reef fabrication and deployment
9	Research Institutions & Academia	Conducted environmental impact assessments, biodiversity monitoring, and optimized reef designs
10	Community Networks (Fisher Cooperatives, SHGs)	Assisted in reef fabrication, deployment, and ongoing fisheries management; ensured community ownership

Contribution to SDGs

The artificial reef project advanced multiple Sustainable Development Goals. SDG 1 and 2 were addressed by enhancing fishery resources, improving catch efficiency, and ensuring food security and stable incomes for fishing communities. SDG 5 was promoted through women's active participation in marketing, reef management, and decision-making, fostering economic empowerment and leadership. SDG 8 was supported via sustainable livelihood opportunities and local entrepreneurship in reef fabrication and seafood value chains. SDG 13 benefits from reduced fuel use and carbon sequestration. SDG 14 was reinforced through ecosystem restoration and sustainable fisheries, while SDG 17 was highlighted through multi-stakeholder partnerships enabled by GEF SGP support.

Replication & Up-scaling

The project's success led the Tamil Nadu government to approve more artificial reef projects at Rameshwaram in Ramanathapuram District. Recognizing its impact, the Tamil Nadu Fisheries Department standardized the participatory fabrication and deployment model for wider replication. It also attracted corporate CSR support, with the Madras Atomic Power Station replicating the initiative in 17 villages, deploying over 5,000 structures in Mahabalipuram and Kalpakkam through PLANT Trust. Additionally, the Australian Consulate



General in Chennai co-financed 100 artificial reef structures for Kasimedu fishermen, furthering efforts initiated under the OP 5 GEF SGP project to enhance fisheries and coastal conservation.

Challenges Faced & Lessons Learned

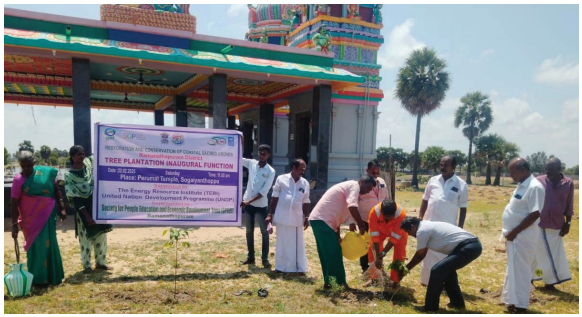
The project overcame challenges such as coordinating diverse stakeholders, ensuring equitable participation of women, youth, and indigenous communities, and addressing overfishing pressures in reef areas. Technical difficulties in artificial reef fabrication and deployment also emerged. Lessons learned include the importance of inclusive community engagement, gender-sensitive approaches, capacity building, and knowledge sharing. Strengthening local management committees and establishing revolving funds proved effective in sustaining reef conservation, enhancing fishery resources, and promoting long-term ecological and socio-economic resilience.

Society for People Education and Economic Development Trust

Project Snapshot	
Project Title	**Restoration and conservation of coastal sacred groves**
Implementing Organization	Society for People Education and Economic Development Trust
Location	Tamil Nadu
Project Number	IND/SGP/OP7/Y3/CORE/BD/2023/03
SGP contribution in INR	3600000
Co-financing in INR	2300000

Restoration and conservation of coastal sacred groves in Tamil Nadu

Project Description



Relevance of the project: The project was highly relevant as it safeguards the rapidly vanishing Tropical Dry Evergreen Forest ecosystem through sacred grove restoration. By integrating ecological rehabilitation with community-led governance, it enhances biodiversity, strengthens freshwater resources, preserves indigenous knowledge, and builds resilient local stewardship essential for long-term coastal environmental sustainability.

Impacts: The project enhanced green cover by 0.2 sq. km through planting 22,340 indigenous trees and restoring 10 water bodies across 6.27 hectares. It generated livelihoods for 365 women and 3,895 MGNREGA workers, directly benefiting 1,180 households and supporting 2,085 more, including 1,083 Scheduled Caste individuals.

Lessons Learned for Project Replication and Up-scaling: Project replication demonstrated benefits from strong community partnerships, as seen with SPEED Trust's support in managing heat stress. Adequate resource mobilization, especially for summer maintenance, is essential. Clear institutional roles, local participation, and adaptive strategies ensure successful scaling, as demonstrated by ONGC and the Tamil Nadu Forest Department adopting the model.

Background

Along India's southeastern coast, the ancient coastal sacred groves stood as the last living pieces of the Tropical Dry Evergreen Forest (TDEF). These groves, only 0.5 to 1 km from the sea, had once been rich and widespread. But years of deforestation and land-use change had reduced them to small, fragile fragments. Seeing their importance for both nature and local people, the project worked to restore and protect them. It planned to revive 20 hectares of degraded groves by planting native TDEF species to improve biodiversity and ecosystem services. The project also worked to restore and increase freshwater sources linked to the groves so that both plants and nearby communities could access clean water.

Implementation

The project followed a clear, participatory process to plan and carry out the work. It started with village meetings where people learned about the aims, timeline, budget, and steps, and key local stakeholders were identified. A detailed situation analysis was done using social mapping, focus group discussions, field visits, drone images, and GPS surveys. A Coastal Sacred Grove Management Committee was formed with members from PRI, traditional panchayats, BMC, women, and youth. Together, they prepared a plan for species selection, plantation sites, water-body restoration, roles, and budget.

Partnerships with government departments supported training, MGNREGA labour, sapling supply, surveys, and monitoring. Continuous participation, monitoring, and maintenance ensured long-term benefits. Local residents formed gender-balanced Village-Level Institutions that helped plan, implement, and monitor the work. The project aimed to conserve about 22,080 trees, set up a sapling nursery, restore 10 water bodies, and create 15 strong Sacred Grove Management Committees to ensure long-term protection.

Application of Indigenous Knowledge

The project integrated indigenous knowledge through Participatory Rural Appraisal (PRA), capturing traditional management practices of coastal sacred groves. Local communities contributed expertise in species selection, water resource management, and grove conservation, ensuring culturally rooted, ecologically sustainable restoration while documenting and

sharing these practices for broader replication and public awareness.

Environmental Impact

Under this project, 22,340 indigenous trees were planted over 20.54 hectares (0.2681 sq. km). Ten water bodies were restored, covering 6.27 hectares of land.

Consequently, forest/vegetation cover increased by 0.2 sq. km following project activities.

Socioeconomic Impact

The project directly benefited 1,180 households and indirectly supported 2,085 households, reaching a total of 6,020 people. Notably, 1,083 individuals from the Scheduled Castes benefited from the initiative. A total of 365 women gained direct employment through project activities—345 women participated in plantation activities, earning a daily wage of ₹800, while 20 women were engaged in nursery tree raising, also receiving ₹800 per day. In addition, 3,895 MGNREGA workers were employed in maintenance activities such as watering, weed removal, and providing shade, with each earning a daily wage of ₹300.

Gender Mainstreaming

The participation of women in the project was high from the beginning. Women leaders and members of the PRI, as well as women's groups such as Self-Help Groups and Panchayat-level Federations of SHGs, and other women from the village participated in project orientation

meetings to understand the project, its goals, and the process. During the Participatory Rural Appraisal, they made a significant contribution to understanding the traditional management system and available biodiversity in the coastal sacred groves. They were part of the Village Level Institution, namely the Coastal Sacred Grove Management Committee, and participated in the preparation, implementation, and monitoring of the plant. They also secured employment in the project operation by joining the MGNREGA workforce. In general, women's participation in the project is equal to and, in some villages, more than equal to men's participation and contribution.

Policy Impact

The project demonstrates significant policy impact, aligning with the objectives of initiatives such as the National Environmental Policy (2006), Paris Agreement, Green India Mission, and National Coastal Mission Scheme at both national and state levels.

Impact at a Glance

Area of land restored (Ha): 20

No. of Direct project beneficiaries (No.): 1303

The role and responsibility taken by women were as follows:

i. **Knowledge provider:** Women actively contributed knowledge on local biodiversity, sacred grove and temple management, and water body governance during PRA and throughout project planning and implementation.

ii. **Decision-making:** Women actively shaped decisions in species selection and plantation site planning within the Coastal Sacred Grove Committee.

iii. **Planner:** Women as equal partners in the Coastal Sacred Grove Management Committee were involved in the preparation of plans relating to the planting of saplings and their management.

iv. **Monitoring:** Women, as members of the Coastal Sacred Grove Management Committee, were involved in the monitoring project implementation and survival and growth of the planted saplings.

Sustainability

To ensure successful implementation and impact, the host NGO established partnerships with the Panchayat Raj Institution, Block Development Office, Tamil Nadu Forest Department, Biodiversity Management Committee, Isha Foundation, and the Botanical Gardens of Auroville. These partners contributed technical, managerial, and financial resources.

S. No	Institute involved	Role
1	Panchayat Raj Institution	Providing permission to implement the project in the Gram Panchayat ii. Planning project activities by being part of the Coastal Sacred Grove Management Committee iii. Contributing to project implementation by deploying the MGNREGA workforce in the maintenance of the plantation iv. Contributing cash to restore water bodies.
2	Block Development Office of the Tamil Nadu Rural Development and Panchayat Raj Department	Providing permission to the PRI to utilise the MGNREGA workforce in project activities ii. Permitting BMC members to be part of the Coastal Sacred Grove Management Committee.
3	Tamil Nadu Forest Department	Conducting GPS survey of the project sites ii. Training women members of nursery establishment and management, iii. Supplying seedlings iv. Monitoring project activities v. Social Audit Group
4	Biodiversity Management Committee	Planning and monitoring by being part of the Coastal Sacred Grove Management Committee
5	Isha Foundation	Supplying seedlings free of cost
6	Botanical Gardens of the Auroville	Supplying seedlings well-grown TDEF species

Contribution to SDGs

The project made significant contributions to multiple Sustainable Development Goals through integrated ecological restoration and community empowerment. By ensuring women's leadership in planning and livelihood activities, it advanced SDG 5. Restoration of ten water bodies strengthened freshwater security, supporting SDG 6. Large-scale plantations and increased vegetation enhance climate resilience, contributing to SDG 13.

Improved coastal ecosystem management benefited aquatic habitats, aligning with SDG 14. Reviving over 20 hectares of sacred groves with native TDEF species promoted biodiversity under SDG 15. Strong collaboration among government agencies, NGOs, and communities reinforced SDG 17, ensuring sustainability and long-term impact.

Replication & Up-scaling

Two organizations—the Oil and Natural Gas Corporation (ONGC, under its CSR programs) and the Tamil Nadu Forest Department (under the Tamil Nadu Biodiversity and Greening Project)—have replicated this project model in other locations across the country.

Challenges Faced & Lessons Learned

The project faced challenges such as high maintenance costs, particularly during summer when young seedlings required shading due to heat stress. SPEED Trust's support in providing palm fronds highlighted the importance of resource mobilization and community collaboration for effective plantation management.

THE COVENANT CENTRE FOR DEVELOPMENT (CCD)

Project Snapshot	
Project Title	**Empowering Small-Holder Farms for Preventing Desertification and Enhancing Livelihoods through Soil, Water and Agro-biodiversity Augmentation**
Implementing Organization	The Covenant Centre for Development (CCD)
Location	Madurai, Tamil Nadu
Project Number	IND/SGP/OP7/Y3/CORE/LD/2023/02
SGP contribution in INR	4075500
Co-financing in INR	12521200

Empowering Small-Holder Farms for Preventing Desertification and Enhancing Livelihoods through Soil, Water, and Agro-biodiversity Augmentation in Madurai, Tamil Nadu

Project Description

Relevance of the project: The project aimed to build climate-resilient farming systems in rainfed smallholder farms through soil and water conservation, agro-biodiversity enhancement, and adoption of climate-resilient crops. Implemented by CCD and engaged 500 farmers in participatory training, agroforestry, and capacity-building initiatives to enhance productivity, income, and environmental sustainability.

Impacts: The project restored 700 acres of degraded land, enhancing forest and vegetation cover on 500 acres and improving soil and ecological health. It directly benefited 500 households and indirectly reached 1,200 more, fostering environmental resilience and achieving a 20–25% increase in crop yields and household income within six months of its interventions.

Lessons Learned for Project Replication and Up-scaling: The project developed a model through the CSIR (Council of Scientific &Industrial Research) program to guide subsequent interventions. Similar initiatives, such as Isha Outreach's "Cauvery Calling" in Coimbatore, which planted trees along tea plantation borders, demonstrated the potential for replication and provided scalable solutions for agroforestry, land restoration, and climate-resilient farming practices.

Background

The smallholders' rainfed farms in the identified villages (in Kariapatti and Narikudi blocks of aspirational district Virudnagar) faced severe land degradation and desertification due to erratic rainfall, soil erosion, and declining soil fertility, limiting crop productivity and threatening livelihoods. Climatic variability further exacerbated these challenges, reducing the adaptive capacity of farmers and increasing their vulnerability. Faced with such daunting challenges, migration no longer remained a choice but a compulsion as farmers started migrating to cities like Chennai and Mumbai. Limited access to sustainable farming practices, water conservation measures, and agro-biodiversity interventions hampered resilience. The project aimed to address these issues by building and promoting climate-resilient farming systems through soil and water conservation, introducing climate-resilient crops, enhancing agro-biodiversity, and building the capacity of farmers—particularly women and youth—to improve productivity, income, and long-term sustainability.

Implementation

The Covenant Centre for Development (CCD), approved as a Cluster-Based Business Organization (CBBO) by NABARD, implemented the project through a structured, farmer-centric approach. The SGP project engaged 500 farmers selected from a larger pool of 1,200 farmers involved in a CSIR-funded FPO initiative. Fifty farmers were trained as farmer leaders, each overseeing Primary Producer Groups of 12–20 members. These groups convened monthly cluster-level meetings to discuss agroforestry, soil and water conservation, climate-resilient farming practices, crop production, and strategies to reduce costs, enhance productivity, and improve incomes. Soil sample testing from lands of 500 famers were done and test results showed very low organic material (0.25 to0.40 %). To improve soil health each farmer was provided 250 kg of vermi compost. Training programs were designed with dual focus—one for organizational leaders and working committee members, and another, held annually, for farmers. Farmers actively participated in selecting and planting 20 saplings per acre as border crops, including fruit and forest trees which supported soil and water conservation and increased soil carbon. Groundnut was cultivated as the principal crop, while border crops offered ecological and income benefits through participatory, skill-based, and regularly monitored interventions.

Application of Indigenous Knowledge

The project integrated indigenous knowledge by leveraging traditional farming practices, local crop varieties, and community wisdom in soil and water conservation, agroforestry,

and resilient cultivation methods. This approach enhanced sustainability, preserved ecologically strengthened smallholder farmers' adaptive capacity to climate variability while complementing modern climate-resilient technologies.

Environmental Impact

This project has a significant positive impact on environmental restoration and conservation, as well as improving forest and vegetation coverage. About 700 acres of landscape have been improved under this project. 10,000 trees of varieties such as Mahogany, Jackfruit, Red santos, etc were planted during the project that added immensely to land restoration. Out of the total intervened landscape, about 500 acres of land have now outstandingly improved forest and vegetation coverage, which enriched the ecological health, soil health, and ensured environmental resilience.

Socioeconomic Impact

The project directly benefited 500 households and indirectly impacted 1,200 households, reaching out to a total of 1,500 people. 70% of beneficiaries were women. A 20–25% increase in crop yields and income is expected within six months of project commencement.

Gender Mainstreaming

Women participate equally with men in the project, with all participants treated as farmers regardless of gender. No gender-biased tasks are assigned, ensuring equal opportunities, responsibilities, and recognition for both women and men.

Policy Impact

The project demonstrates scalable models of soil, water, and biodiversity conservation, providing evidence for climate-resilient agriculture policies. By integrating agroforestry, women's leadership, and youth agri-entrepreneurship, it strengthens rural livelihoods while addressing land degradation. Documented best practices and farmer-led platforms offer insights for shaping state and national policies on sustainable farming and desertification prevention.

Impact at a Glance

Area of landscapes under improved practices (Ha): 200

No. of Direct project beneficiaries: 500

Land Before Intervention

Land After Intervention

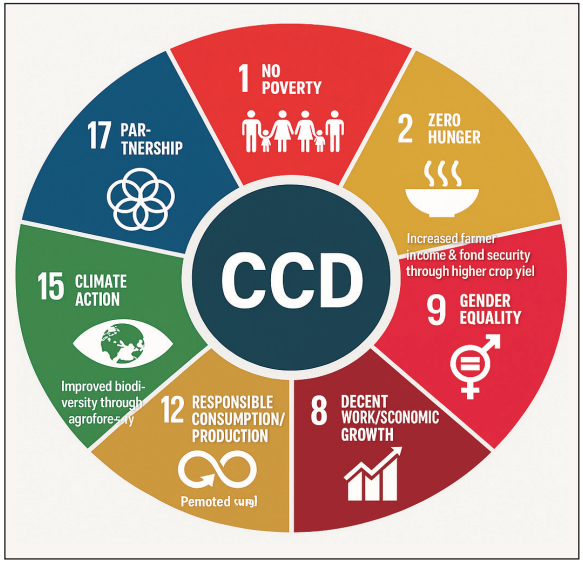
Sustainability

CCD has built on strong partnerships that ensure sustainability and scalability. NABARD supports CCD as a CBBO, guiding FPO development. Thirty-two FPOs and their village-level PPGs provide platforms for collective action and farmer empowerment. Collaboration with CSIR has strengthened innovation through sustainable farming models. Local communities, including 500 farmers (360 women) and 25 youth agri-entrepreneurs, actively participate, ensuring ownership, skill enhancement, and long-term impact in combating land degradation and desertification.

S. No	Institute involved	Role
1	National Bank for Agriculture and Rural Development (NABARD)	Approved CCD as a Cluster-Based Business Organization (CBBO) and provides guidance for FPO development.
2	Farmer-Producer Organizations (FPOs)	32 FPOs supported by CCD form the implementation platform at the village level.
3	Primary Producer Groups (PPGs)	Grassroots farmer groups for training, knowledge sharing, and collective action.
4	CSIR (Council of Scientific & Industrial Research)	Linked through a program to create a model for sustainable farming.
5	Local Village Communities and Farmers	Active participants, including 500 farmers (360 women), and 25 youth agri-entrepreneurs

Contribution to SDGs

The project contributes to multiple Sustainable Development Goals (SDGs) by integrating environmental, social, and economic benefits. By increasing crop yields and farmers' incomes by 25–30%, it supports SDG 1 – No Poverty and enhances economic security. Climate-resilient crops and improved productivity advance SDG 2 – Zero Hunger, while women's active participation in training and leadership promotes SDG 5 – Gender Equality. Water conservation measures address SDG 6, and skilling youth and promoting agri-entrepreneurship strengthen SDG 8. Sustainable farming supports SDG 12, soil and water conservation lend strength to SDG 13, and agroforestry and tree plantations contribute to SDG 15 – Life on Land, fostering holistic community resilience.



Replication & Up-scaling

The project developed a comprehensive model through the CSIR program to guide subsequent interventions aimed at promoting sustainable farming systems and land restoration. Similar initiatives, such as Isha Outreach's "Cauvery Calling" in Coimbatore, which planted trees along tea plantation borders, demonstrated the potential for replication. These integrated approaches offered a scalable and valuable reference for policymakers, researchers, and practitioners seeking to enhance ecological sustainability and strengthen the adaptive capacity of smallholder farmers in climate-vulnerable regions.

Challenges Faced & Lessons Learned

The project faced challenges due to drought-prone conditions, limited 2–3 months of rainfall, and threats from cattle grazing, making tree survival difficult. Planting before the rainy season, appointing tree guards, and promoting social fencing through Primary Producer Groups proved essential. Lessons learned include the importance of timing, community involvement, and protective measures. The initiative improved soil moisture, reduced erosion, enhanced carbon content, and supported both short-term crop yields and long-term income opportunities.

Sri Kannapiran Educational & Charitable Trust (SKECH Trust)

Project Snapshot	
Project Title	**Integrated Development of Farming Communities with Climate Proofing Interventions**
Implementing Organization	Sri Kannapiran Educational & Charitable Trust (SKECH Trust)
Location	Tamil Nadu
Project Number	IND/SGP/OP7/Y3/CORE/LD/2023/05
SGP contribution in INR	3887166
Co-financing in INR	4030246

Integrated Development of Farming Communities with Climate-Proofing Interventions in Tamil Nadu

Project Description

Relevance of the project: The project was highly relevant as it addressed locally troublesome challenges of drought and land degradation in Ramanathapuram district by integrating indigenous knowledge with modern interventions. It enhanced soil and water conservation, promoted climate-resilient agriculture, and strengthened community resilience, contributing to sustainable livelihoods and improved adaptation to mitigate the adverse impacts of climate change.

Impacts: The project restored 4 square kilometers of land, improved soil fertility, and increased groundwater levels through farm ponds and water conservation measures. It directly benefited 236 households, including marginalized communities, enhancing agricultural productivity, promoting climate-resilient farming, and increasing farmers' average income by 25% through diversified livelihoods.

Lessons Learned for Project Replication and Up-scaling: The project demonstrated that community participation, women's leadership, capacity building, and strong institutional linkages are crucial for replicating and up-scaling climate-resilient farming models and ensuring long-term sustainability in drought-prone region.

Background

Ramanathapuram district in Tamil Nadu, India, faced consecutive droughts over the past decade due to the failure of the northeast and southwest monsoons, leading to significant economic decline and migration of residents seeking better opportunities. This project aimed to revitalize degraded lands and enhance agricultural activities to mitigate drought impacts associated with climate change. Key initiatives included introducing technologies for improved soil water retention and efficient drainage into storage structures, educating farmers on cultivating cash crops suited to local environmental and climatic conditions, and promoting sustainable agricultural practices and allied activities to bolster livelihoods. Additionally, the project constructed machine-protected seawater intrusion into shallow aquifers, encouraged farmers to adopt crop insurance schemes to safeguard against climate-induced losses, and advocated for the implementation of large-scale desalination plants by government organizations to provide fresh water for agricultural purposes.

Implementation

The project in Ramanathapuram district was implemented through a participatory and community-driven approach. Village-level meetings and PRA tools were used to assess local needs, followed by baseline surveys on soil, water, and farming systems. A Village Development Committee guided interventions, identifying key issues and coordinating with relevant stakeholders to render solutions. Training sessions, workshops, and exposure visits strengthened farmers' knowledge of climate-smart agriculture and water conservation. On-field demonstrations showcased soil moisture improvement through green manuring, mulching, and organic fertilizers. Rainwater harvesting structures, including farm ponds, were established to enhance water availability, while borewell irrigation was discouraged. Self-help groups and local institutions were empowered, and collaboration with NGOs, research bodies, and government agencies ensured technical and policy support. This integrated process enhanced community capacity, resource efficiency, and climate resilience.

Application of Indigenous Knowledge

The project effectively integrated traditional wisdom with modern interventions. Farmers applied age-old practices such as organic manuring, mulching, and mixed cropping, while women preserved and exchanged indigenous seed varieties. These practices, combined with scientific methods, enhanced soil fertility, conserved water, strengthened resilience, and supported community-driven climate adaptation strategies.

Environmental Impact

The project has successfully improved approximately 4 square kilometers of land, making it cultivable and enhancing soil fertility. We have provided 1,000 tree saplings, which were planted in various locations within the project area where water sources are available. Additionally, 1,000 fruit plants were distributed to farmers, who planted the saplings in the backyards of their households. Saline intrusion has not occurred anywhere in the project area. However, in some places, farmers are using borewell water for their cropping activities.

These areas are affected by salinity, which has been treated through the application of gypsum and green manure, among other methods. These affected areas cover approximately 20 hectares and are not included in the project. Under the project has 20 farm ponds have been dug out in the area, which are helping to increase groundwater levels and prevent the intrusion of salinity. A total of 94 hectares have witnessed the adoption of improved farming techniques, including climate-resilient cropping practices and water conservation methods

Socioeconomic Impact

About 236 households have directly benefited from enhanced agricultural productivity and income generation. An estimated 450 households have indirectly benefited from improved community infrastructure and increased water availability. Approximately 1,130 individuals have directly benefited, gaining increased farming income, livelihood opportunities, and access to water-saving technologies. The project benefited 150 individuals from socially marginalized scheduled communities. They have been supported through agricultural practices and livelihood

improvement programs. The average additional income per farmer has increased by 25% thanks to diversified crop cultivation and livelihood activities.

Gender Mainstreaming

Women played an active role in adopting sustainable farming practices and participating in self-help groups, which strengthened their financial independence, with no gender-related issues arising in the process. They were actively involved in making key agricultural decisions, such as selecting crops for the next season, deciding on loans, and managing all cropping-related activities.

Women also contributed to decisions regarding training needs and the application of new technologies, while playing an important part in shaping marketing strategies and selecting appropriate platforms for sales. In addition, they engaged in organic farming, livestock rearing, and resource management, while also taking responsibility for financial planning and decision-making, thereby ensuring their central role in both household and community-level development.

Sustainability

A total of 5 institutions/agencies have supported this initiative, which ensured the sustainability of the project. The contributing institutions and organizations were the Panchayat Raj Institutions, Village Development Committee, Block Development Office (Rural

Policy Impact

The activities under the project included the formation of farm ponds, which had been implemented by other departments about three years ago. Recently, no such activities have been undertaken in the project area, and the other planned interventions were new to the region.

Impact at a Glance

Area of landscapes under improved practices (Ha): 100

No. of Direct project beneficiaries (No.): 800

S. No	Institute involved	Role
1	Panchayat Raj Institutions	Announce the activities to the villagers and grant permission to carry out these activities on common lands, while coordinating the people involved.
2	Women Self-Help Group and its Panchayat Level Federation	Most of the beneficiaries are from the SHGs, and they coordinate all activities, including conducting training and workshops related to the project
3	Village Development Committee	Prepare the Detailed Project Report (DPR) and oversee the implementation of all activities
4	Block Development Office (Rural Development Department)	Encourage the villagers to water the plants that have been planted under this scheme
5	Agricultural Department	Coordinate with the Soil Testing Department and support the process of Organic Certification.

Development Department), Agricultural Department, and Women Self-Help Group and its Panchayat Level Federation.

Contribution to SDGs

The project advanced seven SDGs by improving livelihoods through climate-resilient farming and women-led SHGs (SDG 1, 5), enhancing food security via sustainable crop cultivation (SDG 2), and improving water availability through conservation measures (SDG 6). It strengthened climate action and ecosystem restoration (SDG 13, 15) while promoting decent work and economic growth (SDG 8) through farmer training, capacity building, and

inclusive community participation in sustainable agricultural development.

Replication & Up-scaling

The project's integrated approach to soil and water conservation, climate-resilient farming, and community participation can be replicated in other drought-prone districts. By strengthening village institutions, promoting women's participation, and leveraging government and NGO partnerships, the model offers significant potential for up-scaling across semi-arid regions in India.

Challenges Faced & Lessons Learned

The project demonstrated that sustained awareness, capacity building, and expert support are vital for overcoming resistance to new technologies. Diversified livelihoods, community participation, and strong market linkages—such as promoting GI-tagged 'Ramnad Mundu Chilly'—proved essential for enhancing resilience, ensuring adoption of climate-smart practices, and achieving long-term sustainability in drought-prone regions.

BHAGIRATH GRAMVIKAS PRATISHTHAN

Project Snapshot	
Project Title	**Biogas project for poor farmer along with AI (Artificial insemination) worker by providing Travis and Canister for Liquid nitrogen**
Implementing Organization	Bhagirath Gram Vikas Pratishthan
Location	Sindhudurg, Maharashtra
Project Number	IND/SGP/OP7/Y3/CORE/CC/2023/06
SGP contribution in INR	3000000
Co-financing in INR	11970000

Biogas project for poor farmers along with AI (Artificial insemination) worker by providing Travis and Canister for Liquid nitrogen in Maharashtra

Project Description

Relevance of the project: The project was highly relevant as it addressed rural energy needs by promoting biogas as a clean, affordable, and sustainable alternative to firewood and fossil fuels. By integrating indigenous practices with modern technology, it reduced deforestation, improved livelihoods, empowered women, and strengthened community resilience toward environmental and economic sustainability.

Impacts: The project achieved a 70% reduction in firewood use, lowering methane emissions and easing forest pressure. Biogas slurry improved soil fertility and carbon retention. It benefited 250 households (1,000+ individuals), including 40–50 SC/ST families, and it enhanced women's livelihoods and improved well-being through time savings and empowerment.

Lessons Learned for Project Replication and Up-scaling: The project demonstrated that successful replication and upscaling of biogas technology depend on continuous capacity building, local ownership, and community participation. Training local masons and technicians ensures long-term maintenance, while sustained awareness and farmer motivation drive adoption. Strengthening institutional linkages and financial support mechanisms further enhances scalability and sustainability.

Background

Bhagirath Gramvikas Pratishthan (BGP) promoted sustainable rural development in Maharashtra's Sindhudurg district by installing over 8,000 biogas units, reducing dependence on firewood and fossil fuels while conserving forests and diminishing carbon emissions. The organization supported villagers in accessing loans and subsidies, supplied quality construction materials, and trained local masons in biogas installation and maintenance. BGP also strengthened self-help groups, empowering women through skill development in agro-allied and home-based enterprises. By promoting organic farming, high-yield crops, and facilitating microloans for poultry and dairy ventures, BGP enhanced livelihoods, fostered financial independence, and advanced environmental sustainability across rural communities, creating lasting socio-economic transformation.

Implementation

In the villages of Sindhudurg, Bhagirath Gramvikas Prathishtan (BGP) brought in a quiet energy revolution. Local masons identified farming families and trained them to lead their communities toward cleaner, sustainable energy. Through village meetings, people were intimately educated about biogas benefits and financing options. Regular training sessions equipped masons and farmers with practical skills in construction, maintenance, and operation of bio-gas plants. Rural Energy Technicians offered continuous support, ensuring every flame burned steadily. BGP worked hand in hand with banks, SHGs, and Gram Panchayats to provide loans and subsidies, while quality materials and standardized manuals guaranteed lasting installations—turning rural homes into hubs of sustainable energy and empowerment.

Application of Indigenous Knowledge

Indigenous knowledge leveraged by BGP has played a vital role in promoting biogas adoption in rural Sindhudurg. Traditional practices of livestock rearing, organic manure use, and community cooperation have been integrated with modern biogas technology. This blend ensures sustainability, cost-effectiveness, and strong community ownership, fostering resilience and environmental conservation.

Environmental Impact

The adoption of biogas technology in Sindhudurg has led to a 70% reduction in firewood use, significantly lowering methane emissions from traditional cooking methods. While 20–30% of households continue to use firewood, the overall decrease contributes to climate change mitigation and reduces pressure on local forests. The biogas slurry byproduct is used as organic manure, enhancing soil fertility and retaining carbon content in soil. Improved soil health supports microbial activity and can indirectly reduce methane emissions, as healthier soils better manage carbon and limit conditions favorable for methane production. Overall, biogas adoption promotes both sustainable energy use and improved soil-carbon management.

Socioeconomic Impact

The biogas project in Sindhudurg directly supported about 250 households, benefiting more than 1,000 people. It was socially inclusive, as 40–50 households from Scheduled Castes and Scheduled Tribes gained reliable access to biogas. Women benefited through reduced cooking time, giving them more opportunities for income-generating work. The project also

Before

After

improved their overall well-being and sense of empowerment, even if this change is not easy to measure.

Locally trained veterinary doctors, known as gopals, performed artificial insemination with a strong success rate of around 60 percent. This led to increased milk production and higher household incomes.

Gender Mainstreaming

The primary contribution of women in the biogas project was convincing their husbands to install the plant in their homes. Additionally, they actively assisted as helpers during the construction of the biogas units, supporting the implementation process and ensuring successful adoption. Women were brought into to play a direct role in implementing the project through linking SHG members with the project related activities.

Policy Impact

The project activities were integrated and scaled effective implementation through convergence with NREGA, enabling the construction of biogas plants while leveraging existing government resources and employment schemes.

Impact at a Glance

No. of Direct project beneficiaries (No.): 360

Beneficiaries (total): 250 households & 1000 people

Land Restored: 100 acres

Sustainability

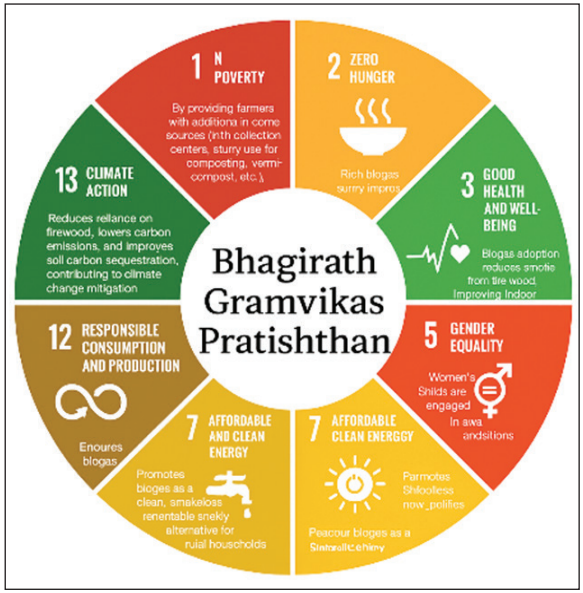
Bhagirath Gramvikas Pratishthan (BGP) established strong partnerships with three key institutions—the Sindhudurg District Central Cooperative Bank, the Gram Panchayat, and the SHG Federation—to ensure the successful implementation of the biogas project. The bank provided vital financial support and access to credit, while the Gram Panchayat contributed resources and facilitated

community participation. The SHG Federation mobilized women, extended small loans, and strengthened local ownership of the initiative. Together, these collaborations not only ensured smooth project execution but also generated positive environmental, social, and economic impacts, fostering sustainable development and self-reliance within rural communities.

S. No	Institute involved	Role
1	Sindhudurg District Central Cooperative Bank	Financial help
2	Gram Panchayat	Capacity Building
3	SHGs	Community engagement, financial linkage for group women members

Contribution to SDGs

The Biogas Project by Bhagirath Gramvikas Pratishthan significantly advances multiple Sustainable Development Goals (SDGs). By reducing poverty (SDG 1) and hunger (SDG 2) through enhanced livelihoods and sustainable agriculture, it ensures improved health and well-being (SDG 3) by cutting indoor smoke pollution. Women's SHGs actively participate, reinforcing gender equality (SDG 5), while affordable, clean biogas energy (SDG 7) reduces dependence on firewood. Employment opportunities for masons and AI workers strengthen economic



growth (SDG 8). Responsible consumption and organic farming practices (SDG 12) align with climate action efforts (SDG 13), and reduced deforestation safeguards biodiversity (SDG 15). Overall, the project fosters inclusive rural development and climate resilience.

Replication & Up-scaling

The Bhagirath model is highly replicable across forest-dependent communities in South Asia, Africa, and Latin America. What makes it scalable is its simplicity, low-cost technology, and reliance on existing community structures. NGOs and governments looking to replicate this model must focus on three pillars: community mobilisation, gender inclusion, and integrated

training. With international support and local customisation, the model can be scaled to serve millions who currently rely on unsustainable biomass fuels.

Replication and upscaling focus on expanding biogas adoption models by training more local masons, enhancing technical capacity, and empowering communities to independently construct, maintain, and replicate sustainable energy solutions across villages.

Challenges Faced & Lessons Learned

The key challenge faced was ensuring long-term maintenance of biogas plants, as sustainability depends on proper operation and monitoring. Regular training, monthly meetings, and community involvement helped overcome this issue. The major learning is that continuous capacity building and farmer motivation are essential for scaling and sustaining biogas adoption.

Center of Needy, Creative, Experimental & Participatory Techniques Society (CONCEPT)

Project Snapshot	
Project Title	**Solar Powered Egg Incubator and Brooder - A Sustainable Livelihood Solution in Barwani, MP**
Implementing Organization	Center of Needy, Creative, Experimental & Participatory Techniques Society (CONCEPT)
Location	Barwani, Madhya Pradesh
Project Number	IND/SGP/OP7/Y3/CORE/CC/2023/09
SGP contribution in INR	3950000
Co-financing in INR	4000000

Solar Powered Egg Incubator and Brooder- A Sustainable Livelihood Solution in Barwani, Madhya Pradesh

Project Description

Relevance of the project: The project was highly relevant as it addressed livelihood insecurity among tribal women by integrating renewable energy with traditional poultry practices. By introducing solar-powered incubators, it promoted sustainable, low-carbon, and women-led income generation, reduced migration, enhanced financial stability, and fostered climate-resilient rural development in Barwani's tribal communities.

Impacts: The project reduced 29,930 kg of CO_2 emissions annually by replacing coal-based incubators with solar-powered systems. It empowered 150 tribal women in Barwani's Rajpur block, enabling each to earn an additional ₹5,000 monthly. SHGs completed 20–23 hatching cycles, generating an average monthly income of ₹12,000 from chick sales and ₹30,000 annually from full-grown chickens. This initiative promoted green livelihoods and women's economic resilience.

Lessons Learned for Project Replication and Up-scaling: The project highlighted the importance of inclusive community participation, continuous capacity building, and hands-on technical training for successful replication. Integrating traditional poultry knowledge with solar technology, promoting financial literacy, and strengthening SHGs ensured sustainability. These lessons provide a strong foundation for scaling similar women-led, climate-resilient livelihood models across tribal regions.

Background

District Barwani in Madhya Pradesh is a predominantly tribal region where agriculture is the primary livelihood, yet small landholdings and seasonal farming limited income. Families, especially women, often worked as daily wage labourers, facing financial instability and out-migration. Limited livelihood options and dependence on traditional agriculture restricted economic empowerment and social development. Backyard poultry was a traditional practice among tribal women but was constrained by inconsistent access to chicks, inadequate technology, and reliance on coal-based incubators. The project addressed these challenges by introducing fully solar-powered egg incubators and brooders, enabling sustainable, off-grid poultry livelihoods while reducing carbon emissions and empowering women economically.

Implementation

The project implementation followed a participatory, community-driven approach. Initial focus group discussions, PRA exercises, and stakeholder mapping identified tribal women SHG members, resources, and training needs. Technical training and handholding were provided on operating solar-powered incubators and brooders. IEC materials and community awareness sessions reinforced sustainable poultry practices. Ten solar incubators were installed, shared among 12–15 women per unit, ensuring minimal human intervention.

Regular monitoring, record-keeping, and financial management support strengthened SHG operations. Women were trained in chick rearing, brooding, and marketing, integrating livelihood enhancement with renewable energy adoption, financial inclusion, and climate-friendly technology for sustainable, community-led poultry production.

Application of Indigenous Knowledge

The project leveraged tribal women's traditional knowledge in backyard poultry, including egg selection, chick rearing, and feeding practices. By integrating these indigenous methods with solar-powered incubators and brooders, the initiative enhanced hatch rates, improved poultry health, and ensured sustainable,

culturally aligned livelihood opportunities while preserving valuable community expertise.

Environmental Impact

The project's solar-powered egg incubators and brooders offered a clean, off-grid alternative to conventional coal-based systems, directly reducing 29,930 kg of CO_2 emissions annually. By generating renewable energy at the point of use, the system eliminated transmission losses and air pollution while ensuring an uninterrupted power supply. This decentralized, self-sustaining model not only supported climate change mitigation but also fostered energy security and resilience in remote tribal regions. Additionally, it promoted sustainable poultry rearing, reduced reliance on fossil fuels, and enhanced environmental awareness among rural women, contributing to long-term ecological balance and green livelihood development in Barwani district.

Socioeconomic Impact

The project empowered 150 tribal women in Rajpur block, Barwani, by turning their traditional backyard poultry skills into a sustainable livelihood through solar-powered egg incubators and brooders. With minimal time investment and no disruption to daily routines, women now earn a steady additional income of ₹5,000 per month. Each SHG has completed 20–23 hatching cycles, generating an average

monthly income of ₹12,000 from chick sales and ₹30,000 from full-grown chickens annually. This initiative has enhanced financial independence, reduced migration, strengthened women's decision-making power, and fostered inclusive, climate-smart rural entrepreneurship among marginalized tribal families.

Gender Mainstreaming

The project ensures gender mainstreaming by empowering tribal women through renewable energy–based poultry enterprises. It transforms their traditional poultry skills into sustainable income sources, enhances leadership in SHGs, and promotes financial inclusion. Women manage production, marketing, and operations, fostering economic independence, decision-making power, and long-term livelihood security within their communities.

Sustainability

The project leveraged multiple organizations to ensure effective implementation and sustainability. SHG members drove production and management, while the poultry department, veterinary department, and agriculture department provided technical support. Gram Panchayats, NRLM, and MNREGA facilitated community engagement and policy alignment. CSR companies and donor agencies contributed funding and resources, and the market ensured product sales. Together, these stakeholders created a supportive ecosystem that enhanced income generation, capacity building, and long-term livelihood resilience for tribal women through decentralized, solar-powered poultry initiatives.

Policy Impact

The project strengthens policy impact by aligning with government programs like NRLM, MNREGA, and poultry development schemes. It demonstrates successful integration of renewable energy and women-led livelihoods, influencing local and state policies on sustainable agriculture, clean energy adoption, and tribal economic empowerment, promoting replication and long-term institutional support.

Impact at a Glance

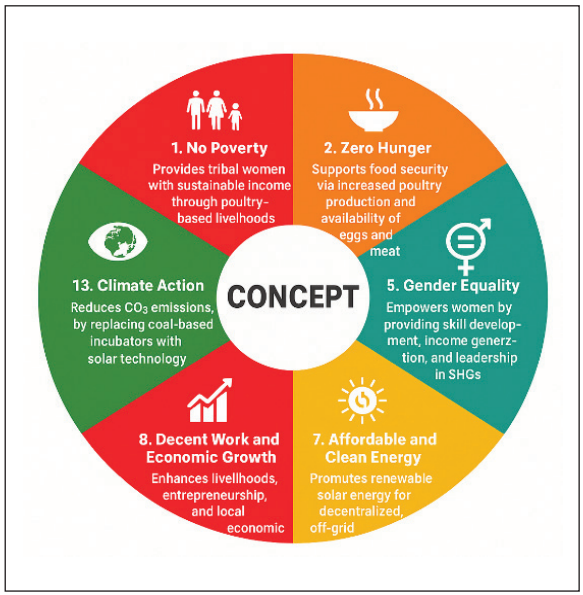
Greenhouse Gas Emissions Mitigated (metric tons of CO2e): 29930kg CO2 emission reduced per year by installing 10 incubators and brooders

No. of Direct project beneficiaries (No.): 150

S. No	Institute involved	Role
1	SHG members	Production and management
2	Market - Chicken buyer	Marketing
3	NRLM,	Community engagement and policy alignment
4	MNREGA	Community engagement and policy alignment
5	Poultry department,	Provided technical support
6	Gram Panchayat	community engagement
7	Veterinary Dept.	Technical support
8	Agriculture Dept	Technical support

Contribution to SDGs

The Solar-Powered Egg Incubator and Brooder project in Barwani directly advanced multiple Sustainable Development Goals (SDGs). It reduced poverty (SDG 1) by generating sustainable income for tribal women, improved food security (SDG 2) through increased poultry production, and promoted gender equality (SDG 5) via skill development and leadership opportunities in SHGs. By using solar energy, it supported affordable, clean energy (SDG 7) and fostered economic growth (SDG 8) through entrepreneurship. Additionally, the project mitigated climate change (SDG 13) by replacing coal-based incubators, lowering CO_2 emissions,



and encouraging sustainable, environmentally friendly livelihoods in tribal communities.

Replication & Up-scaling

The success of the solar-powered egg incubator and brooder project demonstrated a scalable model for tribal livelihoods. Its replicable design enabled other SHGs and villages to adopt similar systems, promoting decentralized poultry hatcheries. Government and CSR partners supported expansion, while training and technical guidance ensured sustainable adoption, increasing women's income and clean energy use across Barwani and neighboring districts.

Challenges Faced & Lessons Learned

The project faced challenges in ensuring equitable participation of tribal women, coordinating multiple stakeholders, and overcoming technical issues in solar incubator installation and operation. Lessons learned included the importance of inclusive community engagement, capacity building, and hands-on training. Establishing SHGs, promoting financial literacy, and integrating traditional poultry knowledge with solar technology proved effective for sustainability, income generation, and women's empowerment, highlighting the value of community-led, gender-sensitive renewable energy interventions for livelihoods.

Darshna Mahila Kalyan Samiti

Project Snapshot	
Project Title	**To improve the soil fertility and decrease the soil erosion by promoting sustainable integrated farming system**
Implementing Organization	Darshna Mahila Kalyan Samiti
Location	Madhya Pradesh
Project Number	IND/SGP/OP7/Y3/CORE/LD/2023/10
SGP contribution in INR	3942000
Co-financing in INR	4130000

To improve the soil fertility and decrease the soil erosion by promoting sustainable integrated farming system in Madhya Pradesh

Project Description

Relevance of the project: The project was highly relevant as it addressed local challenges like severe soil erosion and declining land productivity in Bundelkhand. By combining indigenous practices with modern soil and water conservation, millet revival, and renewable energy adoption, it strengthened climate resilience, improved livelihoods, restored degraded land, and promoted sustainable, nutrition-sensitive farming for rural communities.

Impacts: The project restored 720 hectares of land, improved 1,012 hectares of land, improved soil fertility, and enhanced water availability through building mini ponds. Solar stoves' distribution and promotion among community members reduced emissions by 100 metric tons annually. Organic farming and millet revival lowered farming costs by 30%, while women's empowerment and livelihood diversification strengthened health, income, and environmental sustainability.

Lessons Learned for Project Replication and Up-scaling: The project showed that active community participation, especially by women and youth, is vital for success of any community intervention. Integrating sustainable farming, nutrition, and clean energy initiatives enhances livelihoods and health conditions. Demonstrations, continuous training, and participatory approaches build ownership, enabling effective replication and long-term scalability across similar drought-prone and resource-poor regions.

Background

In the Bundelkhand region, soil erosion caused by slope runoff severely reduced land productivity, significantly affecting farmers' income and family livelihoods based predominantly on agriculture. The project addressed this issue by implementing land treatment measures such as levelling and bunding to reduce runoff and enhance soil fertility. It promoted sustainable integrated farming among 1,000 farmers, millet revival, and the plantation of 5,000 immunity-boosting plants at the household level. Additionally, 100 households adopted solar stoves, reducing smoke and firewood consumption. The project aimed to restore 500 hectares of degraded land, improve farm-based income diversification, and strengthen environmental sustainability and community well-being.

Implementation

The project was implemented through a participatory and community-driven approach, engaging 1,830 farmers across selected villages in Bundelkhand. Land treatment activities such as levelling and bunding were carried out to reduce soil upper-layer runoff and improve soil fertility. Training programs promoted sustainable integrated farming, millet cultivation, and organic practices. Women were encouraged to manage homestead nutrition gardens, while 100 households adopted solar stoves to reduce smoke and firewood use. Youth were trained as lead farmers to ensure knowledge dissemination. Regular monitoring, social media documentation, and experience-sharing workshops supported transparency, learning, and large-scale adoption of project interventions.

Application of Indigenous Knowledge

The project integrated indigenous knowledge of soil and water conservation, crop rotation, and mixed cropping practices in traditional ways. Local methods of small pond building, bunding, and contour farming were adapted to reduce runoff and enhance soil fertility. Indigenous seed varieties, especially millets, were revived to promote climate-resilient farming. Traditional food recipes of millets were developed and promoted for household nutrition and health.

Environmental Impact

The project successfully restored 720 hectares of degraded land and improved 1,012 hectares of land. The land levelling agriculture practices

reduced soil erosion through sustainable land management. About 76 constructed mini ponds increased the groundwater level recharge and ensured water availability for Rabi crops in the winter season.

The adoption of organic farming, particularly for millets, minimized chemical use, while the cultivation of 5,000 immunity-boosting plants enhanced biodiversity and carbon sequestration. The use of solar stoves at the household level reduced greenhouse gas emissions by 100 metric tons yearly and decreased firewood dependency, contributing to cleaner air, improved soil health, and a more resilient and eco-friendly farming ecosystem.

Socioeconomic Impact

The project enhanced socio-economic conditions by increasing farmers' income through promoting diversified, low-cost, and sustainable farming systems. Restoring 720 hectares of land improved productivity and

improved 1,012 hectares of land, while organic practices reduced agricultural expenses by 30%. Women attained empowerment through the use of homestead gardens and solar stoves, which improved their health and saved time that they could use for income generation. The revival of millet and seed banks has reduced the farming costs for farmers.

Gender Mainstreaming

The project promoted gender mainstreaming by actively involving women in sustainable agriculture, homestead nutrition gardens, and decision-making processes. The promotion of solar stoves reduced women's exposure to harmful smoke and saved time for other productive activities. Over 50% of beneficiaries were women, ensuring equitable participation. Youth and male farmers supported women's leadership, fostering inclusive growth, improved livelihoods, and gender equality within farming and household systems.

Sustainability

Several organizations and institutions played key roles in supporting Darshna Mahila Kalyan Samiti for the successful project implementation. The District Agriculture Department provided technical guidance, ensuring effective farming practices. TATA Trust contributed co-financing to enable future replication of interventions on a larger scale. Farmers' groups offered human capital support by actively participating in project activities. Local businessmen facilitated market access by promoting and marketing processed millet, enhancing farmers' income, and sustaining the value chain.

Policy Impact

On the front of Policy impact, particularly, the millets' revival program of the project was appreciated and honored by the state Agriculture Department of Madhya Pradesh. The millet revival activities aligned appropriately with the State Millet Cultivation Programme.

Impact at a Glance

Area of land restored (Ha): 720

Area of landscapes under improved practices (Ha): 1012

Greenhouse Gas Emissions Mitigated (metric tons of CO_2e): Integrated Domestic Energy Systems (IDES) to 100 families and increased RE capacity of 4.5 KW

No. of Direct project beneficiaries (No.): 1832

S. No	Institute involved	Role
1	District Agriculture Department.	Technical support.
2	Sir Dorabji Tata Trust	Co-financing for future replication in large areas.
3	Farmers Groups	Human capital support
4	Local Business Men	Marketing the processed millet.

Contribution to SDGs

The project contributed to multiple SDGs by improving livelihoods, nutrition, and health in Bundelkhand. It enhanced farmers' income through sustainable integrated farming (SDG 1) and promoted food security via millet revival and homestead gardens (SDG 2). Solar stoves and immunity-boosting plants improved health outcomes (SDG 3), while women's active participation advanced gender equality (SDG 5). Organic farming, land restoration, and tree planting supported responsible consumption, climate action, and biodiversity conservation (SDGs 12, 13, and 15).

Replication & Up-scaling

The project has drawn significant attention from various organizations interested in learning and replicating its best practices. Around 15 organizations—including Sir Dorabji Tata Trust, Reliance Foundation, Vikas Samvad Samiti, and Bundelkhand University, among others—have visited the project site to understand its approach and impact. These institutions have shown keen interest in adopting and scaling the project's successful models, particularly for addressing land degradation and promoting sustainable agriculture in the semi-arid regions of western India. The millet revival activities of this project have been successfully replicated and scaled up by other NGOs in the surrounding districts of Madhya Pradesh.

Challenges Faced & Lessons Learned

Involving the community, especially women and youth, is key to the project's success. Combining sustainable farming, nutrition, and clean energy improves income, health, and the environment. Ushering new practices, providing training, and sharing knowledge helps people adopt them. Participatory methods increase ownership and make the project sustainable and scalable.

Haritika

Project Snapshot	
Project Title	**Landscape Restoration Through Nature-based Solutions**
Implementing Organization	**Haritika**
Location	Madhya Pradesh
Project Number	IND/SGP/OP7/Y3/CORE/LD/2023/11
SGP contribution in INR	3950000
Co-financing in INR	13800000

Landscape restoration through nature-based solutions in Madhya Pradesh

Project Description

Relevance of the project: The Nirmal Project is highly relevant as it addressed local challenges like land degradation, water scarcity, and low productivity in Bundelkhand through nature-based, climate-smart farming. By integrating indigenous knowledge, agroforestry, and women's empowerment, it enhances soil fertility, food security, and ecological resilience, offering a sustainable model for restoring fragile rural livelihoods.

Impacts: The Nirmal Project restored 400.52 hectares of degraded land, developed a 25-acre Biodiversity Park, and planted 12,000 native trees, enhancing biodiversity and soil health. Socio-economically, it benefited 3,000 households—60% from SC/ST groups—by improving income, livelihoods, and climate resilience through sustainable farming, women's participation, and resource management.

Lessons Learned for Project Replication and Up-scaling: With early success in Bijawar Block, Haritika is exploring replication in other parts of Chhatarpur and neighboring districts. Interest has been expressed by local organizations, and the project's methodology — from PRA to ToT capacity building — offers a ready blueprint for scaling up.

Background

The Bundelkhand region, particularly Bijawar Block in Chhatarpur District, faced severe land degradation, erratic rainfall, and declining soil fertility, leading to low agricultural productivity and fragile livelihoods. Marginalized and smallholder farmers, especially women, depended heavily on degraded natural resources, making them vulnerable to poverty and climate shocks and stresses. Unsustainable farming practices, loss of biodiversity, and water scarcity further aggravated the situation. The Nirmal Project addressed these challenges through nature-based solutions leveraging traditional wisdom, focusing on restoring degraded land, promoting agroforestry, and empowering 1,500 farmers to adopt climate-smart, sustainable farming practices that enhanced livelihoods, food security, and ecological resilience in the region.

Implementation

The Nirmal Project was implemented through a participatory, community-driven approach that ensured inclusive planning and sustainable outcomes. Using Participatory Rural Appraisal (PRA) and Integrated Natural Resource Management (INRM), baseline data and local challenges were identified collaboratively. Stakeholders—including farmers, women's groups, and local leaders—actively participated in planning and execution. Practical training, village-level workshops, and geo-tagged participant registration promoted transparency and skill-building. Agro-forestry plantations were supported through fencing, solar irrigation, and regular monitoring. Women trained as Mahila Gram Sewaks educated 3,000 farmers, while youth contributed to plantation and awareness drives. Convergence with government schemes and partner organizations strengthened sustainability and community ownership.

Application of Indigenous Knowledge

The project integrated Indigenous Knowledge by promoting traditional millet cultivation, local seed preservation, and sustainable agroforestry practices. Tribal and marginalized women leveraged ancestral wisdom in soil improvement, water management, and biodiversity conservation, ensuring culturally appropriate, climate-resilient farming. This approach strengthened community ownership, enhanced food security, and preserved local ecological heritage.

Environmental Impact

The project has made significant environmental improvements through nature-based restoration activities. Approximately 400.52 hectares (4.01 sq. km) of degraded land were fenced and restored, reducing soil erosion and enhancing soil fertility. A 25-acre (0.10 sq. km) Biodiversity Park was developed to conserve local flora and fauna, while 10 hectares of additional land were afforested.

In Rajpura, around 12,000 vulnerable and near-extinct tree species were planted, contributing to biodiversity enhancement and carbon sequestration. These interventions collectively promoted ecological balance, groundwater recharge, and improved microclimatic conditions, strengthening the region's resilience to climate change.

Socioeconomic Impact

This project has significantly improved the socio-economic conditions of rural communities in Bijawar Block. Over 1,000 households directly benefited, while another 2,000 households gained indirect advantages through better resource management and enhanced climate resilience—impacting nearly 5,000 individuals, including 1,000 women. Around 60% of direct beneficiaries belong to SC/ST communities, reflecting the project's inclusive approach. Farmers reported annual income increases of ₹30,000–₹50,000 due to improved soil health, diversified crops, and sustainable farming practices.

Gender Mainstreaming

The project emphasized gender mainstreaming by actively engaging women (Mahila Gram Sewaks) from Tribal and other disadvantaged

communities in decision-making and governance through micro-enterprises like the Bio-Input Resource Centre (BRC). Women received comprehensive training on natural farming and sustainable agriculture practices, including procedures, rules, and benefits, enabling them to lead and manage initiatives effectively.
At least 500 women farmers participated in soil improvement programs, enhancing their technical skills and economic empowerment.
With 80% of the target population from disadvantaged small and marginal farmer groups, the project ensured women's equitable participation, strengthened their leadership capacity and most importantly boosted their self-confidence and thus in real essence fostering inclusive and sustainable rural development.

Policy Impact

This project was closely aligned with national policies and programs, including the National Mission for Sustainable Agriculture (NMSA), Jal Shakti Abhiyan, and the National Agroforestry Policy 2014. By promoting sustainable agriculture, water conservation, and agroforestry interventions, the project reinforces government priorities on climate-resilient farming, efficient natural resource management, and biodiversity enhancement. This alignment ensures policy coherence, facilitates technical and financial support, and enhances the potential for scaling up successful practices across the region.

Impact at a Glance

Area of landscapes under improved practices (Ha): 1265.34

Greenhouse Gas Emissions Mitigated (metric tons of CO2e): 5 solar pumps of total 25 KW benefitting 40 farmers

No. of Direct project beneficiaries (No.): 1500

Sustainability

The project ensured its sustainability through strong community ownership, capacity building, and institutional support. Village Development Committees (VDCs), Common Interest Groups (CIGs), and Water User/Farmer Groups provide enduring platforms for skill transfer, leadership development, and collective decision-making at the village level. Mahila Gram Sevaks, trained as master trainers, continue to educate farmers on climate-smart and sustainable agricultural practices, reaching over 3,000 beneficiaries. Champion Farmers (CRPs) reinforce the adoption of sustainable techniques through regular field guidance and demonstrations. Together, these organizations and community institutions foster long-term engagement, knowledge retention, and self-reliance, ensuring that project contributes benefits in agroforestry, soil improvement, and climate resilience are maintained and expanded beyond the project period.

Contribution to SDGs

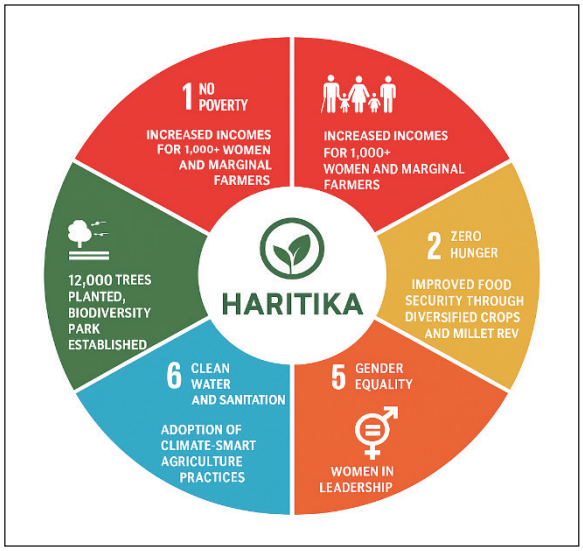
The project significantly contributed to multiple Sustainable Development Goals (SDGs). SDG 1 – No Poverty was addressed by increasing incomes for over 1,000 women and marginal farmers through improved and diversified farming practices. SDG 2 – Zero Hunger was

S. No	Institute involved	Role
1	Village Development Committees (VDCs), Common Interest Groups (CIGs), Water User Groups / Farmer Groups.	Provided platforms for skill transfer, capacity building, and leadership development at the village level.
2	Mahila Gram Sevaks	Trained women who facilitated the training of 3,000 farmers and ensured community-level knowledge dissemination
3	Champion Farmers (CRPs)	Promoted adherence to sustainable practices through field handholding and demonstrations

supported via enhanced food security from millet revival and diversified crop cultivation. SDG 5 – Gender Equality was promoted through women's leadership in micro-enterprises and decision-making roles. SDG 6 – Clean Water and Sanitation benefited from water harvesting structures that irrigated 500 hectares. SDG 13 – Climate Action was advanced through the adoption of climate-smart agriculture, and SDG 15 – Life on Land was reinforced by planting 12,000 trees and establishing a biodiversity park, enhancing ecosystem health and biodiversity.

Replication & Up-scaling

With early success in Bijawar Block, Haritika explored replication of model in other parts of Chhatarpur and neighbouring districts. Interest has been expressed by local organisations, and the project's methodology — from PRA to ToT capacity building — offered a ready blueprint for scaling up this model.



Challenges Faced & Lessons Learned

Early challenges, such as limited infrastructure and initial community hesitancy, were overcome through patient and rigorous mobilisation, visible early wins (like quick-yield crops and functioning water structures), and leveraging partnerships with government departments and community stakeholders. The importance of blending traditional knowledge with modern climate-smart techniques emerged as a key insight.

Table of Acronyms

Acronym	Full Form
APART	Assam Agribusiness and Rural Transformation Project
APCC	Assam's Action Plan on Climate Change
ASRLM	Assam State Rural Livelihoods Mission
ATMA	Agricultural Technology Management Agency
CAMPA	Compensatory Afforestation Fund Management and Planning Authority
CBD	Convention on Biological Diversity
CBR	Community Biodiversity Register
CBRPs	Community Based Resource Persons
CFC	Common Facility Centre
CRP	Community Resource Person
CSIR-NEIST	Council of Scientific & Industrial Research – North East Institute of Science & Technology
CSR	Corporate Social Responsibility
EBA	Ecosystem Based Adaptation
FPO	Farmer Producer Organisation
FSSAI	Food Safety and Standards Authority of India
GI sheet	Galvanized Iron sheet
GVS	Green Valley Society
HYV	High Yield Variety
IEC	Information, Education and Communication
IPM	Integrated Pest Management
IRRI	International Rice Research Institute
ITK	Indigenous Traditional Knowledge
JFM	Joint Forest Management
KVK	Krishi Vigyan Kendra
LPC	Lotus Progressive Centre
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act

Acronym	Full Form
MKSP	Mahila Kisan Sashaktikaran Pariyojana
MOVCDNER	Mission Organic Value Chain Development for North Eastern Region
NAPCC	National Action Plan on Climate Change
NBA	National Biodiversity Authority
NGO	Non-Governmental Organisation
NLM	National Livestock Mission
NMSA	National Mission on Sustainable Agriculture
NRLM	National Rural Livelihoods Mission
PBR	People's Biodiversity Register
PIU	Project Implementation Unit
PKVY	Paramparagat Krishi Vikas Yojana
PMFME	Prime Minister's Formalisation of Micro Food Processing Enterprises
PRA	Participatory Rural Appraisal
PRI	Panchayati Raj Institution
PSB	Phosphate Solubilizing Bacteria
RF	Reserved Forest
RKVY	Rashtriya Krishi Vikas Yojana
SBAP	State Biodiversity Action Plan
SDG	Sustainable Development Goals
GEF SGP	Small Grants Programme
SHG	Self Help Group
SNEHPAD	Society for Nature Education and Health Promotion for All-round Development
Spread NE	Society for People's Rights, Education and Awareness Development in North East India
SPV	Special Purpose Vehicle
TOT	Training of Trainers
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
ZBNF	Zero Budget Natural Farming