

PROMISING PRACTICES IN NATURAL RESOURCE MANAGEMENT

With Special Reference to Land and Water Management

MYRADA's Field Experience



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Foreword

Myrada has designed, crafted, and implemented several types of development interventions in all our project geographies and monitored their sustained relevance to the rural communities concerned across several years.

This compendium of Best Practices is expected to be offered as reading material in the training sessions of Myrada CIDORRs and to add value to the trainings. Hopefully, this will support replication and scaling across all our communities and subject domains in the coming years. Myrada will be happy to receive comments and suggestions to improve the quality of this Manual and will make all efforts to come out with a revised and enlarged version as soon as necessary.

Shri Arvind G. Risbud, IAS (Retired)

Executive Director, MYRADA

9 February 2026

Preface

Sustainable management of land and water resources is vital for securing rural livelihoods, strengthening climate resilience, and restoring local ecosystems. Practical solutions emerge when communities, local institutions, and development agencies work together to address the connected challenges of soil health, water availability, and farm productivity.

This compendium presents **23 Promising Practices (PPs)** drawn from MYRADA's field work across Tamil Nadu, Karnataka, Andhra Pradesh, Telangana, and Puducherry. The practices are organised under three themes:

1. **Community and Institutional Processes** — highlighting the role of Self-Help Groups (SHGs), Village Watershed Committees (VWCs), and Community-Based Organisations (CBOs) in collective resource management.
2. **Ecological Restoration and Water Management** — demonstrating ways to rejuvenate soils, aquifers, tanks, wells, and traditional water systems for greater resilience and productivity.
3. **Technology and Innovation** — showcasing simple, locally appropriate, and scalable technologies that improve water efficiency and farm sustainability.

Each practice documents not only technical measures but also participatory planning, community ownership, and local institution-building, which are central to long-term success. The book also captures innovations in rainwater harvesting, groundwater recharge, climate-smart agriculture, and digital tools that can be adapted in other semi-arid and water-stressed regions.

We acknowledge the support of our donor agencies and CSR partners, and the commitment of MYRADA's field teams, community members, farmers, and local institutions whose collective efforts made these practices possible.

We hope this compilation serves as a practical guide for practitioners, Panchayats, NGOs, CSR teams, and development agencies working on land and water management in similar agro-ecological contexts.

Murugan Ethiraj

Chief Training Officer, MYRADA

5 February 2026

Acknowledgement

This publication is the result of collective effort, shared learning, and sustained commitment to natural resource management. I sincerely thank all those who contributed—directly and indirectly—to the development of this book.

I gratefully acknowledge the encouragement, guidance, and institutional support of MYRADA, particularly the Executive Director, Shri Arvind G. Risbud, IAS (Retired), whose vision and continued motivation made this documentation possible. My sincere thanks to the project teams across MYRADA programmes, whose field-based work and practical insights form the foundation of these Promising Practices.

I extend special appreciation to Ms. Malligai, BE (Civil), ME in Water Resources Engineering and Management, for guiding me on key technical aspects of land and water management and for strengthening the scientific grounding of the cases presented.

I also thank Mr. Raghavendra Sudi, retired Senior Scientist, formerly with ICRISAT, for his expert review and technical guidance.

This book would not have been possible without the communities and community institutions who trusted new ideas, adopted improved practices, experimented on their own lands, and generously shared their knowledge and experiences. Their willingness to learn and collaborate is the true foundation of these Promising Practices.

I thank all others who contributed in ways not individually acknowledged here. Any omissions are unintentional, and responsibility for any errors or interpretations rests solely with me.

Murugan Ethiraj

Chief Training Officer, MYRADA

5 February 2026

Abbreviations and Acronyms

AWD — Alternate Wetting and Drying
AWS — Alliance for Water Stewardship
BFIL — Bharat Financial Inclusion Ltd
CBO — Community-Based Organisation
CMRC — Community Managed Resource Centre
CRP — Community Resource Person
CSR — Corporate Social Responsibility
DCON — Digital Controller (IoT-based irrigation control application)
DSR — Direct Seeding of Rice
FL — First Flush (Rainwater Harvesting filter)
FFS — Farmer Field School
FPO — Farmer Producer Organisation
FYM — Farmyard Manure
GE — Google Earth
GEE — Google Earth Engine
GIS — Geographic Information System
GP — Gram Panchayat
GPDP — Gram Panchayat Development Plan
GPS — Global Positioning System
GST — Goods and Services Tax
HDPE — High-Density Polyethylene
HUL — Hindustan Unilever Limited
ICAR — Indian Council of Agricultural Research
ICRISAT — International Crops Research Institute for the Semi-Arid Tropics
IEC — Information, Education and Communication
INPM — Integrated Nutrient and Pest Management
IoT — Internet of Things
ITC — ITC Limited
JCB — J.C. Bamford Excavators (earthmoving machine)
JIVA — Joint Initiative for Value Addition in Agriculture — a NABARD-supported programme
KL — Kilolitre
KVK — Krishi Vigyan Kendra
LCC — Leaf Colour Chart
LIC HFL — LIC Housing Finance Limited
LULC — Land Use and Land Cover

MAR — Managed Aquifer Recharge
MGNREGA — Mahatma Gandhi National Rural Employment Guarantee Act
MGNREGS — Mahatma Gandhi National Rural Employment Guarantee Scheme
MSL — Mean Sea Level
MYKAPS — MYRADA Kaveri Prakruthi Samsthe
MYRADA — Mysore Resettlement and Development Agency
NABARD — National Bank for Agriculture and Rural Development
NDVI — Normalized Difference Vegetation Index
NGO — Non-Governmental Organisation
NRM — Natural Resource Management
PRA — Participatory Rural Appraisal
PRI — Panchayati Raj Institution
RWH — Rainwater Harvesting
SHG — Self-Help Group
SOC — Soil Organic Carbon
SRI — System of Rice Intensification
SRTM-DEM — Shuttle Radar Topography Mission – Digital Elevation Model
TUG — Tank User Group
VWC — Village Watershed Committee
WUG — Water User Group

Context, Approach, and Synopsis

1. Introduction

Southern India is confronting an increasingly complex set of environmental challenges driven by climate variability, declining groundwater levels, erratic rainfall, soil degradation, and growing economic pressures on agriculture. Semi-arid and drought-prone regions across Karnataka, Tamil Nadu, Andhra Pradesh, Telangana, and the Union Territory of Puducherry are particularly vulnerable, with smallholder farmers facing heightened risks to livelihoods and food security.

At the same time, these regions also demonstrate how locally grounded, community-led responses can foster resilience and ecological recovery. Over several decades, MYRADA has worked closely with rural communities, local institutions, and government programmes to design and implement integrated Natural Resource Management (NRM) strategies that combine technical soundness with social inclusion and environmental sustainability.

This manual, *Promising Practices in Natural Resource Management with Special Reference to Land and Water Management*, documents and reflects upon these field-based experiences. It brings together selected practices that have emerged through sustained engagement with farming communities and local institutions, demonstrating how participatory processes, appropriate technologies, and strong governance systems can restore degraded resources while improving livelihoods.

2. Purpose of the Manual

The purpose of this manual is to:

- Document field-tested and replicable NRM practices implemented by MYRADA
- Highlight community-driven approaches to land and water management
- Provide practical insights for practitioners, policymakers, researchers, and development organisations
- Serve as a learning and reference resource for climate-resilient NRM interventions

This manual is practice-oriented and grounded in real-world implementation, local adaptation, and institutional learning, rather than prescriptive technical designs.

3. MYRADA's Approach to Natural Resource Management

MYRADA's NRM approach is rooted in participatory watershed development and has evolved over time in response to changing ecological and socio-economic conditions.

Key features of this approach include:

- Community-led planning and implementation
- Strong emphasis on local institutions such as Village Watershed Committees (VWCs), Self-Help Groups (SHGs), and Panchayati Raj Institutions
- Integration of traditional knowledge with scientific and technological tools
- A focus on ecological restoration alongside livelihood enhancement

While early interventions focused primarily on soil and water conservation through area treatment, MYRADA's approach has expanded to include supply- and demand-side water management, soil health restoration, biodiversity enhancement, and climate-resilient farming systems.

4. Integrated Water Management Framework

Water scarcity and declining water quality are major constraints affecting agriculture and rural livelihoods. MYRADA follows an integrated water management framework that combines conservation, efficiency, governance, and quality management.

4.1 Supply-Side Interventions

- Water harvesting through check dams, community ponds, farm ponds, and trench-cum-bunds
- Groundwater recharge through percolation tanks, recharge pits, recharge shafts, and subsurface structures
- Rooftop rainwater harvesting in households and institutions, particularly schools

4.2 Demand-Side Interventions

- Efficient agricultural water use, including practices such as Alternate Wetting and Drying (AWD)
- Adoption of micro-irrigation systems such as drip and sprinkler irrigation

- Household water conservation through simple devices and behavioural change
- Community-led water budgeting and water governance

4.3 Water Quality Management

- Pollution control addressing organic waste, wastewater discharge, and other contaminants
- Regular water testing covering physical, chemical, and biological parameters
- Nature-based solutions such as constructed wetlands and greywater treatment systems

Together, these elements reinforce water governance as a shared responsibility among communities, institutions, and technical agencies.

5. Soil and Nutrient Management

Healthy soils form the foundation of sustainable agriculture. MYRADA's land management strategies prioritise improving Soil Organic Carbon (SOC) to enhance soil structure, moisture retention, microbial activity, and climate resilience.

Nutrient management is based on soil testing and crop-specific planning, promoting the judicious use of organic inputs while minimising environmental degradation. These practices are designed to be low-cost, locally accessible, and suitable for smallholder farmers.

6. Role of Community Institutions

Community institutions are central to all interventions documented in this manual. Village Watershed Committees, farmer groups, women's Self-Help Groups, and Panchayati Raj Institutions play key roles in planning, implementation, monitoring, and post-project sustainability.

Capacity building, participatory decision-making, and institutional convergence ensure that interventions are locally relevant, collectively owned, and sustained beyond project cycles.

7. Synopsis of Promising Practices

The 23 Promising Practices presented in this manual are organised into three thematic sections, reflecting a progression from community and institutional processes, to ecological restoration and water management, and finally to technology-enabled innovations. Together, they demonstrate that sustainable natural resource management is most effective when community institutions, ecological understanding, and appropriate technologies converge.

Theme I. Community and Institutional Processes

Practices 1 to 7 highlight the foundational role of people, institutions, and collective decision-making in managing land and water resources.

1. Participatory Rural Appraisal (PRA) for Land and Water Management: Participatory Rural Appraisal tools enable communities to analyse local land and water resources, identify priorities, and build shared understanding as the basis for inclusive and informed planning.
2. Community Institution–Led Planning for Natural Resource Management: Strengthened local institutions lead planning and implementation processes, ensuring continuity, accountability, and ownership beyond project timelines.
3. Greening the Commons - Community Forestry for Biodiversity and Climate Resilience: Community-managed forestry on common lands enhances biodiversity, improves microclimates, strengthens collective stewardship, and contributes to climate resilience.
4. Water Budgeting as a Tool for Community-Based Water Management: Participatory water budgeting helps communities balance water demand and availability, strengthening equitable and sustainable management of both surface and groundwater resources.
5. Goat Bank – Enhancing Soil Health and Rural Livelihoods: Goat banks support women’s livelihoods while contributing organic manure that improves soil fertility, farm productivity, and household income security.
6. Managing Cattle Resources for Sustainable Farming and Soil Health: Improved cattle management strengthens organic nutrient cycles, reduces input costs, and supports sustainable and integrated farming systems.

7. Farmer-Led Production of Organic Inputs and Biopesticides: Decentralised, farmer-led production of organic inputs and biopesticides reduces dependency on external chemicals and builds local self-reliance in sustainable agriculture.

Theme II. Ecological Restoration and Water Management

Practices 8 to 16 focus on restoring the ecological functions of soils, aquifers, tanks, wells, and traditional water systems.

8. Biochar for Soil Health Improvement and Water Retention: Biochar enhances soil moisture retention, fertility, and carbon content while addressing crop residue management challenges in dryland farming systems.

9. Reduced Tillage for Soil and Water Conservation: Reduced tillage conserves soil moisture, improves soil biological activity, reduces erosion, and lowers energy and labour requirements.

10. Tech-Enabled Integrated Farming Systems for Water Efficiency and Livelihood Sustainability: Integration of crops, livestock, value addition, and water-efficient technologies enhances productivity, resilience, and income stability in semi-arid and water-scarce regions.

11. Community-Led Revival of Traditional Open Wells for Irrigation Security and Groundwater Sustainability: Community-led desilting and restoration of traditional open wells enhance irrigation security, improve groundwater access, and reduce costs through collective action and shared machinery use.

12. Well Recharge Pits as a Climate Resilience Strategy for Enhancing Farm Income: Recharge pits improve groundwater replenishment around wells, strengthen irrigation reliability, and support sustained agricultural income under changing climatic conditions.

13. Subsurface Dams for Groundwater Recharge in Water-Stressed Regions: Subsurface dams intercept underground water flows, raise local water tables, and enhance groundwater availability with minimal evaporation losses.

14. Tank Revival and Community Empowerment for Sustainable Water Management: Integrated tank restoration improves storage capacity and water availability while revitalising community institutions for long-term management.

15. Feeder Channel–Led Renovation of Water Bodies for Restoring Natural Inflows: Restoration of feeder channels re-establishes hydrological connectivity, ensuring sustainable inflows and long-term functionality of tanks and water bodies.

16. Restoration of Traditional Stepwells (Kalyanis) for Groundwater Recharge and Cultural Revival: Reviving heritage stepwells combines groundwater recharge with cultural conservation, reinforcing community identity and sustainable water use practices.

Theme III. Technology and Innovation

Practices 17 to 23 demonstrate how appropriate technologies, when embedded within community processes, can significantly enhance efficiency, equity, and sustainability.

17. School Rooftop Rainwater Harvesting for Institutional Water Security and Awareness: Schools function as water-secure institutions while serving as learning spaces that promote water conservation awareness among students and communities.

18. Nature-Based Wastewater Treatment Systems for Protecting Village Lakes: Ecological wastewater treatment systems, such as reed beds, treat domestic wastewater and protect village lakes from pollution.

19. GIS-Based Planning and Monitoring for Sustainable Land and Water Management: GIS tools support scientific planning, monitoring, and transparent communication of land and water management interventions.

20. IoT-Based Smart Irrigation Systems for Efficient Water Use: Sensor-based irrigation systems optimise water use, reduce labour, and improve crop management through real-time data and automation.

21. System of Rice Intensification (SRI) for Water-Efficient Paddy Cultivation: SRI practices reduce water use while increasing yields, improving soil health, and lowering cultivation costs.

22. Direct Seeding of Rice (DSR) for Reduced Water and Labour Use: Direct seeding addresses labour shortages and water scarcity by promoting climate-smart and resource-efficient paddy cultivation.

23. Hydrogeological Mapping and Managed Aquifer Recharge for Groundwater Sustainability: Scientific hydrogeological mapping guides recharge interventions, strengthening long-term groundwater security and informed water governance.

Together, these practices illustrate that sustainable land and water management emerges from the integration of strong community institutions, ecological restoration, and context-appropriate technologies. The experiences documented in this manual offer practical, scalable insights for practitioners, policymakers, and development organisations working toward resilient and inclusive rural development.

This manual is organised in three parts. Part I sets out the context of natural resource management and explains MYRADA's integrated approach that combines community institutions, ecological restoration, and appropriate technologies. Part II provides detailed documentation of each of the 23 Promising Practices, describing implementation processes, technical design, community participation, outcomes, and key learnings, supported by field photographs. Part III synthesises the overall insights and outlines the way forward for scaling, convergence, and climate-resilient land and water management.

The manual is intended as a practical resource for watershed practitioners, farmer organisations, development professionals, researchers, and policymakers engaged in sustainable land and water management.

Theme I: Community and Institutional Processes

The first set of promising practices highlights community and institutional processes that enable sustainable land and water management. While several practices also draw on technical and ecological innovations, farmer leadership, local institutions, and collective action remain the central drivers of change.

PROMISING PRACTICE 1

Participatory Rural Appraisal (PRA) for Land and Water Management

Donor: CIPLA Limited; LIC Housing Finance Limited

Location: Bangalore District, Karnataka; Krishnagiri District, Tamil Nadu

1. Introduction and Context

The project villages were facing increasing pressure on land and water resources due to rapid urbanisation, changing land-use patterns, and intensifying agricultural activity. Seasonal rainfall variability, declining groundwater levels, and limited surface water availability constrained agricultural productivity, particularly for smallholder farmers.

Farmers often lacked systematic planning tools and technical guidance for managing land and water resources efficiently. Decisions related to cropping, irrigation, and soil conservation were frequently taken in isolation, without a holistic understanding of local watershed dynamics and the interlinkages between land, water, and livelihoods.

To address these challenges, MYRADA introduced Participatory Rural Appraisal (PRA) as a foundational process for community-led land and water management planning.



Photo: Community-led social mapping and wealth ranking to inform equitable land and water planning.

2. Objective of the PRA-based Intervention

- Enable farmers to systematically analyse their own land and water resources
- Facilitate collective planning for soil and water conservation at the micro-watershed level
- Strengthen farmer participation in decision-making related to land and water management
- Promote locally appropriate, low-cost, and sustainable interventions

3. Approach and Implementation Process

MYRADA facilitated PRA exercises through a structured, step-by-step process involving farmers, community groups, and local institutions.

3.1 Key PRA Activities

These activities were carried out with the active participation of community members and facilitators:

- **Transect Walks:** Joint field walks enabled observation of soil conditions, erosion-prone areas, waterlogged patches, drainage patterns, and irrigation inefficiencies.
- **Community Mapping:** Preparation of social and resource maps to identify land-use patterns, water sources, drainage paths, settlements, and problem areas within the village landscape.
- **Resource Flow PRA:** Visual mapping of the movement of natural, financial, and material resources into and out of the village, identifying who controlled them and who benefited from them.
- **Trend Analysis:** Analysis of changes over time in rainfall patterns, water availability, cropping systems, and yields.
- **Seasonal Calendars:** Mapping of rainfall, water availability, cropping cycles, labour demand, and stress periods across the year.
- **Matrix Scoring and Ranking:** Comparison of different options based on agreed criteria to support collective decision-making.
- **Venn Diagram – Institutional Linkages:** Mapping of relationships between the community and external institutions using a Venn diagram.

3.2 Planning, Prioritisation and Implementation

Planning and Prioritisation: Based on PRA findings, community members collectively prioritised interventions such as farm ponds, check dams, bund strengthening, contour farming, and improved cropping practices.

Implementation and Follow-up: Interventions were implemented collectively with technical guidance from MYRADA. Progress and outcomes were periodically reviewed in group meetings using participatory PRA tools.



Photo: Community trend analysis capturing long-term changes in rainfall, water availability, and livelihoods.



Photo: Community members preparing a Venn diagram to map institutional linkages



Photo: Community members preparing a Resource Flow PRA diagram to show how resources move into and out of the village.



Photo: Community members conducting matrix scoring and ranking.

4. Technical Details: Practices Identified

- Farm ponds and micro water-harvesting structures
- Bund strengthening and contour farming
- Intercropping and mulching to reduce runoff and improve soil moisture
- Demand-side water management, including micro-irrigation

5. Community and Institutional Arrangements

- Farmers, Farmer Groups, and Women SHGs: Primary planners, decision-makers, and implementers

- Community Resource Persons (CRPs): Supported mapping, data collection, and monitoring
- MYRADA Project Team: Provided facilitation, training, and technical guidance
- Local Panchayats / PDOs: Supported mobilisation and convergence with local resources
- Donor Agency: Provided financial support

The PRA process strengthened collective decision-making and laid the foundation for sustained engagement with Water User Groups (WUG) and Village Watershed Committees (VWC).

6. Outcomes and Impact

Aspect — Observed Outcome

- **Community Participation:** All target communities actively engaged in PRA exercises, resulting in enhanced awareness and improved planning capacity.
- **Water Availability:** Improved planning and siting of farm ponds and micro-catchments.
- **Soil Management:** Adoption of contour farming, mulching, and crop rotation practices.
- **Replication:** The PRA approach was adopted by neighbouring communities.

Farmer testimony:

“By mapping our fields and water sources together, we understood why some areas remained dry while others near the tank bund were waterlogged, and how this affected both farming and water storage.”

7. Key Learning and Replicability

- Participatory planning strengthens ownership and accountability
- Visual tools such as maps and transects improve clarity in problem analysis
- PRA is a low-cost, flexible approach suitable across diverse contexts
- Continuous facilitation and capacity building sustain long-term outcomes

8. Conclusion

The PRA-based land and water management initiative in Bangalore and Krishnagiri demonstrated that assessment and planning led by farmers and the wider community can significantly improve the effectiveness and sustainability of natural resource management interventions.

PROMISING PRACTICE 2

Reviving Village Watershed Committees (VWCs) for Post-Project Watershed Management

Donor: GE Oil & Gas India Pvt. Ltd.

Location: Chellagurki Village, Ballari District, Karnataka

1. Introduction and Context

Ballari district, located in the semi-arid Deccan Plateau, relies heavily on rainfed and dryland agriculture. Chellagurki village exemplifies the region's vulnerability, with an average annual rainfall of 691 mm—well below the Karnataka state average—resulting in frequent crop failures, declining groundwater, and water scarcity. Once a relatively self-sustaining agrarian community, Chellagurki experienced progressive ecological degradation and livelihood stress, prompting seasonal and permanent migration, particularly among younger farmers. While previous watershed interventions created soil and water conservation assets, these gains were not sustained due to weak local institutions and limited community ownership.

The Chellagurki Watershed Project addressed these challenges through a community-led, institutionally anchored approach, focusing on natural resource restoration, improved livelihoods, and strengthened local institutions to ensure post-project continuity.



Photo: Executive Director, MYRADA interacting with Village Watershed Committee members.

2. Key Challenges

- Declining maintenance of watershed assets, leading to deterioration of bunds, tanks, and plantations
- Weak functionality of Village Watershed Committees (VWCs) after withdrawal of external facilitation
- Limited technical capacity and leadership renewal within VWCs, affecting planning and supervision
- Degradation of common lands and recurring water scarcity, impacting agriculture and livelihoods

These challenges emphasised the need for institutional revival, capacity building, and community-led post-project management to safeguard watershed investments.

3. Objective of the Intervention

- Strengthen the institutional capacity of VWCs for post-project governance
- Build skills for operation and maintenance (O&M) of watershed assets
- Facilitate convergence with government schemes and line departments
- Enable VWCs to plan and implement post-project development initiatives

4. Location and Scale

- Village: Chellagurki, Ballari District
- Scale: Three functional committees—one Village Watershed Committee (VWC) and two Tank User Groups (TUGs), with a total of 38 members

5. Approach and Implementation Process

The intervention combined institutional strengthening, governance reforms, and capacity building.

Institutional Strengthening and Post-Project Maintenance

- Village-level institutions were reactivated, with clearly defined roles and responsibilities.
- A Maintenance Fund MoU was formalised between MYRADA and the VWC.
- ₹ 200,000 was set aside to ensure upkeep of watershed structures, including kalyani filling, tank and pond maintenance, and other essential repairs.
- The agreement specified transparent fund management, contractor selection, milestone verification, and overall responsibility of VWCs for quality and sustainability.

- The MoU became effective on 1 August 2025 and remains valid until post-project maintenance is complete.

Capacity Building and Field Practices

A three-day VWC Capacity-Building Workshop was conducted at the Chellagurki Training Centre in March 2025.

Participatory sessions focused on:

- Post-project governance and asset maintenance planning
- Village development and convergence with government schemes
- Transparent fund management and inclusive leadership (youth and women)



Photo: Village Watershed Committee members engaged in planning and decision-making, reflecting collective responsibility for managing and maintaining watershed assets beyond the project period.

6. Community and Institutional Arrangements

- Village Watershed Committees (VWCs): Leads post-project management and decision-making, oversees the maintenance fund, and ensures community participation and monitoring at the village level.

- Tank User Groups (TUGs): Responsible for the maintenance and management of tanks, including the rejuvenation and upkeep of the renovated Kalyani, ensuring equitable water distribution and sustained operation.
- FPO: Facilitate collective input procurement, aggregation, value addition, and marketing farm produce such as fruits and other dryland crops.
- SHGs: Promote savings and credit, manage revolving fund, provide livelihood loans, and support vulnerable households through income-generating activities.
- MYRADA: Training, facilitation, mentoring, and technical guidance.
- Line Departments & Panchayati Raj Institutions: Technical guidance, programme convergence, and local governance support.

7. Outcomes and Impact

Institutional Outcomes: VWCs prepared Vision 2025 action plans; leadership renewal observed with increased youth and women participation; improved clarity of roles, responsibilities, and compliance mechanisms.

Water and Land Management Outcomes: Restoration plans for tanks, ponds, pipelines, and common lands proposed across 15 villages; Chellagurki's Kalyani restoration model replicated in neighbouring villages.

Livelihood and Environmental Outcomes: Renewed focus on horticulture, dryland agroforestry, and micro-irrigation; plans initiated for afforestation of hillocks and degraded commons.

8. Key Learning and Replicability

The experience in Chellagurki highlights the following lessons for sustaining watershed institutions:

- Post-project sustainability relies more on institutional revival than physical infrastructure
- Periodic capacity building and mentoring keep VWCs functional and motivated
- Peer learning accelerates adoption and spreads good practices
- The 2025 Ballari workshop catalysed district-wide VWC revival
- Follow-up block-level workshops are planned
- Chellagurki VWC now serves as a mentoring model for neighbouring villages



Photo: *Functioning Village Watershed Committee meeting, demonstrating strengthened local institutions and sustained management of watershed resources after project closure.*

9. Conclusion

The Ballari experience demonstrates that revitalising Village Watershed Committees is essential for sustaining watershed investments. By strengthening institutions, promoting peer learning, and establishing structured linkages with government systems, MYRADA enabled VWCs to transition from dormant bodies into active agents of post-project natural resource management, ensuring long-term ecological, livelihood, and institutional benefits.

PROMISING PRACTICE 3

Greening the Commons — Community Forestry for Biodiversity and Climate Resilience

Donor: Rotary Cantonment, Bengaluru and ITC – Mission Sunehra Kal (MSK)

Location: Injanahalli Village, Hosakote Taluk, Kolar District, Karnataka

1. Introduction and Context

Injanahalli Hill, like many degraded hillocks in semi-arid regions, faced soil erosion, loss of native vegetation, reduced groundwater recharge, and declining biodiversity. Large tracts of community-owned land in the Malur–Hosakote region had remained degraded due to neglect, low vegetative cover, and weak collective management. Once used for grazing and ecological functions, these commons had gradually become underutilised, increasing climate vulnerability and ecological degradation

In response to this situation, MYRADA undertook an ecological restoration initiative by planting diverse species across 13 hectares of Injanahalli Hill. This reflected its long-standing commitment to sustainable natural resource management, community participation, and climate-resilient rural development.

The plantation was designed not merely as a tree-planting exercise but as a holistic hill ecosystem restoration programme. MYRADA adopted a mixed-species plantation approach using native, drought-tolerant, and multipurpose species — including indigenous forest trees, fodder species, soil-binding shrubs, fruit trees, and medicinal plants. Native species were prioritised for better survival, local adaptation, and long-term sustainability.

With support from Rotary Cantonment, Bengaluru and ITC–Mission Sunehra Kal, and in partnership with the Social Forestry Department, MYRADA initiated a community forestry intervention in Injanahalli village to restore degraded commons, enhance biodiversity, and strengthen climate resilience through collective action.

2. Key Land and Environmental Challenges

- Degraded and underutilised community land with poor tree cover
- Loss of local biodiversity and ecological functions
- Increased exposure to heat stress and soil erosion
- Weak institutional responsibility for management of common lands

3. Intervention and Stakeholder Engagement

3.1. Summary of the Intervention

The intervention supported the plantation of 1,200 saplings comprising 30 native and multipurpose tree species on community land under Panchayat control. The approach combined technical guidance, institutional coordination, and strong community participation.

Initial maintenance and protection were supported by MYRADA through dedicated field staff. Favourable rainfall over three years contributed to high survival rates and healthy growth. Gradually, the degraded common land transformed into a dense green space, improving the local micro-environment.

After three years, full responsibility for protection and management was formally transferred to the Gram Panchayat and the Biodiversity Management Committee, marking a successful transition to community ownership.



Photo: Restoration of degraded village common land with prepared pits and newly planted saplings.

3.2. Stakeholders Involved

- MYRADA: Facilitation, coordination, and technical support
- Rotary Cantonment, Bengaluru and ITC–MSK: Financial support
- Social Forestry Department, Hosakote: Species selection and technical inputs
- Orohalli Gram Panchayat: Institutional ownership and governance
- Local community members: Plantation, protection, and long-term stewardship
- Biodiversity Management Committee: Conservation oversight and monitoring

4. Community Engagement and Ownership

Community participation was central at all stages—from site identification and planting to protection and maintenance. The phased handover of responsibility strengthened local accountability and ensured sustainability beyond the project period. Recognition by neighbouring villages and district officials further reinforced community pride and ownership.

5. Technical Design and Components

Site Selection Criteria

- Availability of suitable community land under Panchayat control
- Soil suitability and drainage for multi-species plantations
- Accessibility for protection and routine maintenance
- Alignment with village-level greening priorities

Plantation Design

- Species diversity: 30 native and multipurpose tree species
- Planting density: Designed for canopy development and long-term viability
- Management approach: Chemical-free, low-input practices

Environmental Measures

- Soil stabilisation through root systems
- Improved moisture retention and microclimatic regulation
- Long-term enhancement of local biodiversity

6. Operation and Maintenance

- Initial care and monitoring supported by MYRADA field staff
- Protection ensured through community vigilance and Panchayat oversight
- Periodic monitoring by the Biodiversity Management Committee
- Gradual integration into Panchayat-led conservation planning

7. Outcomes

Environmental Outcomes

- Significant increase in green cover on degraded common land
- Improved biodiversity through multi-species plantation
- Enhanced soil stability and local microclimate

Water and Soil Benefits (Indirect)

- Improved rainwater infiltration and groundwater recharge potential
- Better soil moisture retention benefiting adjacent agricultural areas

Social Outcomes

- Strengthened community ownership and institutional responsibility
- Enhanced aesthetic and ecological value of village commons
- Recognition from neighbouring villages and government officials



Photo: Injanahalli Hill after restoration, showing regenerated native vegetation on community commons.

8. Sustainability Considerations

- Full ownership by the Gram Panchayat and Biodiversity Management Committee
- Use of locally suitable native tree species
- Low recurring costs after establishment phase
- Integration with Panchayat conservation and greening plans

9. Learning and Replication Potential

- Community-managed commons can be effectively restored with limited external inputs
- Institutional handover is critical for long-term sustainability
- Species diversity enhances ecological resilience and community acceptance
- The model is easily replicable across semi-arid village commons

10. Conclusion

The Greening the Commons initiative demonstrates how community-led forestry can restore degraded common lands while delivering multiple ecological and social benefits. By combining native species plantation, soil and moisture conservation, and strong institutional arrangements, the intervention enhanced biodiversity, improved micro-climatic conditions, and strengthened local resilience.

Long-term sustainability depends on collective ownership, clear usage norms, and continuous community stewardship. The regeneration of commons reduced pressure on private agricultural lands and created shared ecological assets that support livelihoods, fodder security, and ecosystem services.

This approach is highly replicable across semi-arid and rainfed regions where common lands play a critical role in local livelihoods and environmental stability.

PROMISING PRACTICE 4

Water Budgeting — A Practical Tool for Community-Based Water Management

Donor: LIC Housing Finance Ltd.

Location: Bettamugilalam Village, Kelamangalam Block, Krishnagiri District, Tamil Nadu

1. Introduction and Context

Although located within a forested landscape that receives relatively higher rainfall, forest villages such as Bettamugilalam continue to experience persistent water scarcity. Rainfall is highly seasonal and unevenly distributed, and much of it is lost as surface runoff due to limited storage infrastructure and the absence of collective water-use planning. Groundwater levels decline rapidly during the dry months, resulting in water stress during critical periods for agriculture, livestock, and domestic use.

Agriculture and forest-based livelihoods in the village depend heavily on timely rainfall and shallow groundwater sources. In the absence of systematic planning, individual water-use decisions—particularly related to cropping patterns and groundwater extraction—have led to recurring shortages and growing competition for limited water resources.



Photo: Community members discussing seasonal water availability for collective planning.

To address these challenges, MYRADA introduced Water Budgeting as a participatory and practical tool that enables communities to understand, plan, and manage their water resources collectively. The approach supports informed decision-making for agriculture, livestock, and household needs while strengthening village-level institutions and promoting shared responsibility for sustainable water management.

Water budgeting involves assessing water availability from rainfall, surface water, and groundwater; estimating water demand for agriculture, livestock, domestic, and ecosystem needs; comparing supply and demand to identify surplus or deficit conditions; and planning measures to bridge gaps through conservation, crop planning, and efficiency improvements. In simple terms, it functions like a financial budget for water—understanding how much water comes in, how much goes out, and how to balance the account.

2. Challenges Before Water Budgeting

- Absence of reliable village-level data on water availability and use
- Unregulated groundwater extraction leading to declining water tables
- Crop choices not aligned with actual water availability
- Limited awareness of rainfall variability and storage capacities
- Predominance of individual decision-making rather than collective water governance

3. Intervention and Stakeholder Engagement

3.1. Summary of the Intervention

- **Village-Level PRA:** Participatory tools were used to map water sources and estimate storage capacities.
- **Data Collection:** Rainfall, farm pond storage, borewell discharge, and household water requirements were measured.
- **Supply–Demand Estimation:** Total inflows and outflows were calculated at the village level.
- **Water Allocation Planning:** Irrigation schedules and crop choices were decided collectively.
- **Maintenance and Strengthening of Water Infrastructure:** Communities jointly prepared plans for repairing and maintaining water harvesting structures and pipelines, addressing leakages, seepage losses, and wastage.
- **Monitoring:** Monthly tracking of rainfall, water levels, and usage enabled regular updating of the water budget.

3.2. Stakeholders Involved

- Village Water Committee (VWC): Custodians of the water budget and facilitators of collective decision-making.
- Women's SHGs and Federation: Led household-level conservation and water quality practices.
- MYRADA Project Team: Facilitation, training, and technical support.
- LIC HFL: Support for training, materials, and field tools.
- Panchayats and Local Farmers: Implementation and adherence to agreed water-use norms.



Photo: Participatory water budgeting exercise where community members analyse rainfall, groundwater availability, crop water demand, and seasonal water use.

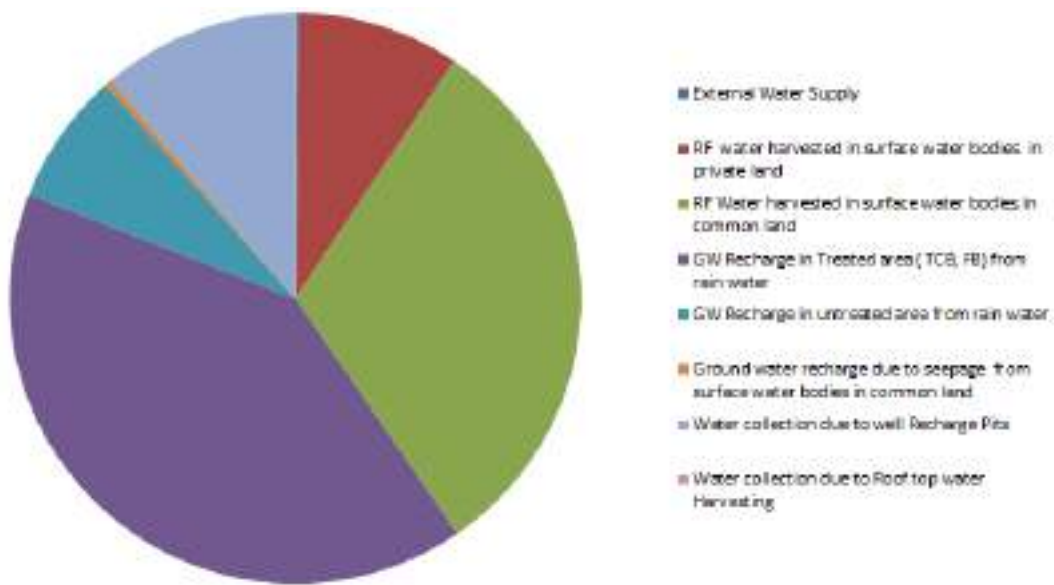
4. Tools and Methods Used

- Resource mapping of tanks, ponds, borewells, streams, and catchments
- Rainfall measurement using a village rain gauge installed at the Government Sericulture Farm
- Crop-wise water requirement tables covering different crops and growth stages
- Preparation of water balance sheets comparing inflows and outflows
- Participatory meetings for planning maintenance of water harvesting structures, crop choices, and irrigation schedules
- Awareness and capacity-building activities using posters, wall charts, and structured training sessions

5. Technical Design and Components

5.1 Assessment of Water Availability

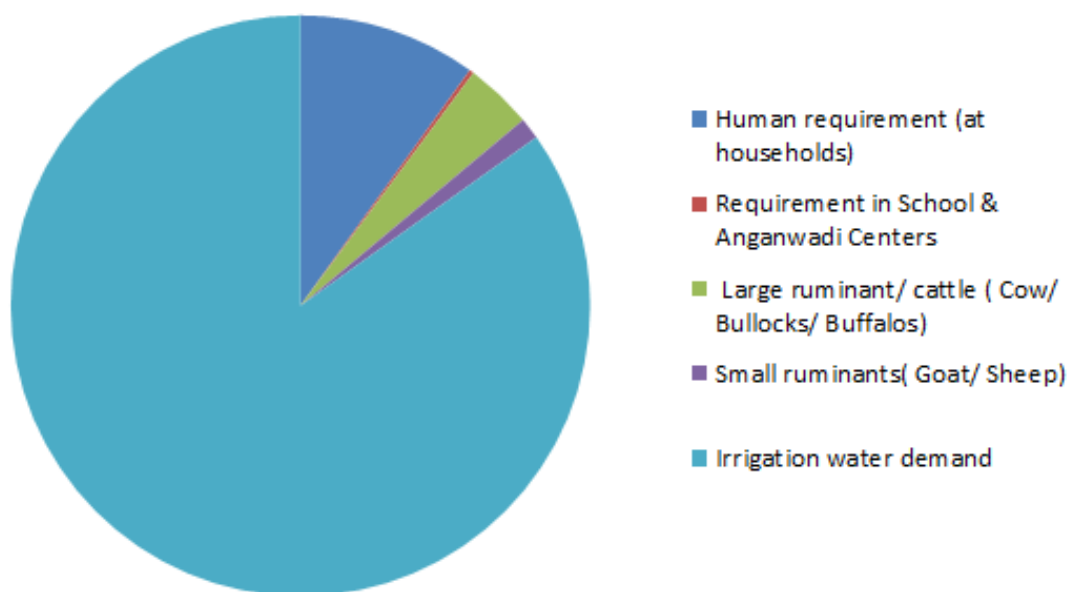
- Analysis of annual, seasonal, and monthly rainfall
- Estimation of groundwater recharge
- Assessment of storage in tanks, ponds, and farm reservoirs



Source: Bettamugilalam Water Budget Study Report 2020 (Malligai MK)

5.2 Assessment of Water Demand

- Crop-wise irrigation demand (area × crop water requirement)
- Livestock water requirements
- Domestic water needs



Source: Bettamugilalam Water Budget Study Report 2020 (Malligai MK)

5.3 Balancing Supply and Demand

Identification of surplus and deficit scenarios; planning of conservation and recharge measures; decisions on cropping intensity and crop selection.

A summary village-level water balance was prepared to compare total water availability and demand, which guided crop planning and water allocation decisions.

Component	Source / Category	Estimated Quantity (KL)
Water Availability (Supply)	External water supply	1,265
	Rainfall & surface water harvested on private land	59,660
	Rainfall & surface water harvested on common land	202,085
	Groundwater recharge in treated area (TCB, FB)	263,378
	Groundwater recharge in untreated area	48,826
	Groundwater recharge from seepage of surface water bodies	2,489
	Water collected from well recharge pits	72,672
	Roof-top rainwater harvesting	80
Total Water Availability		650,455

Water Demand	Human requirement (households)	31,680
	Human requirement (schools & anganwadis)	799
	Livestock – large ruminants	12,000
	Livestock – small ruminants	3,840
	Irrigation water demand	270,608
Total Water Demand		318,927
Water Balance	Surplus / Deficit	+331,528

Source: Bettamugilalam Water Budget Study Report 2020 (Malligai MK)

5.4 Water Use Efficiency Measures

- Promotion of micro-irrigation systems (drip and sprinkler)
- Mulching and soil moisture conservation practices
- Staggered sowing to distribute peak water demand

5.5 Measures to Enhance and Maintain Storage

- Desilting of farm ponds and check dams
- Desilting and bund strengthening of village water bodies

5.6 Monitoring and Updating

- Monthly VWC meetings
- Continuous rainfall and water-use tracking
- Crop adjustments based on real-time data

6. Outcomes and Impact

Aspect — Impact

- Water Security: Reduced water stress during peak agricultural seasons
- Groundwater: Improved recharge and reduced over-extraction
- Crop Planning: Shift towards water-efficient crops such as millets, pulses, and vegetables
- Community Empowerment: Collective planning, record maintenance, and transparency
- Livelihoods: Improved crop yields and agricultural incomes

Farmer Testimony: “Earlier, we grew water-intensive crops and our borewells dried up. Through water budgeting, we shifted mainly to millets and carefully planned vegetables with drip, so our farm pond water lasted the entire season.”

7. Sustainability Considerations

- Strong community ownership through VWCs
- Integration of water budgeting with soil and water conservation planning
- Capacity building of farmers in basic data collection and analysis

8. Lessons and Replication Potential

- Data-driven planning strengthens trust and collective ownership
- Visual tools make complex water concepts easier to understand
- Linking water budgeting with crop planning reduces climate risk
- The model is scalable to watershed and taluk levels with facilitation support

9. Conclusion

The MYRADA Water Budgeting initiative in Bettamugilalam demonstrates how participatory planning can transform village-level water management. By systematically assessing, planning, and monitoring water resources, communities were able to secure water for agriculture, livestock, and domestic needs, promote efficient and equitable use, and adapt to rainfall variability. Water budgeting emerges as a promising, scalable, and cost-effective practice for semi-arid and forest-fringe regions.

PROMISING PRACTICE 5

Goat Bank — Enhancing Soil Health and Rural Livelihoods

Donor: HDFC CSR

Location: Basavakalyan Block, Bidar District, Karnataka

1. Introduction and Context

The MYRADA Bidar project area lies in a semi-arid agro-climatic zone where rainfed agriculture is the primary livelihood. The region is characterised by declining soil fertility, erratic rainfall, and low and uncertain farm incomes. Livestock—particularly goats—play a critical role in sustaining rural livelihoods, especially for women-headed and smallholder households.

However, livestock productivity and its potential contribution to land management had remained limited due to poor access to suitable goat breeds, inadequate stall-feeding practices, and underutilisation of organic manure. Free grazing reduced the effective recovery of goat droppings for soil improvement, while land degradation and moisture stress continued to constrain crop yields.

To address these interconnected challenges, MYRADA, with support from HDFC CSR, introduced a Goat Bank model that integrates women-led livelihood enhancement with sustainable land and water management. The initiative promotes goat rearing as a collective micro-enterprise while systematically improving soil health and moisture retention through organised manure collection, composting, and application.





Photos: Women members of Self-Help Groups engaged in goat rearing as a key livelihood activity in resource-constrained rural households.

2. Key Land and Water–Related Challenges

- Declining soil fertility and low soil organic carbon
- Poor moisture retention in red and black soils
- High dependence on rainfed agriculture with frequent crop failure risks
- Limited access to improved goat breeds suited to semi-arid conditions
- Underutilisation of livestock manure due to free-grazing practices

3. Intervention and Stakeholder Engagement

3.1 Summary of the Intervention

- SHG Selection: During 2022–23, 29 women SHGs were selected, with five members per SHG (approximately 145 women) receiving initial support.
- Financial Support: Each member received ₹6,400 as project assistance and contributed ₹3,600 to purchase a pregnant Jawari (Jamunapari-type) goat adapted to semi-arid conditions.
- Scale-Up: In 2023–24, an additional 150 goats were introduced, expanding coverage through both direct support and internal growth.

- Goat Bank Mechanism: Each beneficiary commits to pass on one six-month-old kid to a new member after the first kidding cycle, following a “Pass-on-the-Goat” principle.
- Current Reach: By 2025, the initiative benefits 525 women, with the goat population increasing steadily through successive cycles.
- Livelihood Support: Goats are often sold during urgent household needs, functioning as a reliable and liquid asset that strengthens financial resilience.
- Practice insight: Distribution of pregnant goats accelerated herd growth and enabled early livelihood returns for women members.

3.2. Stakeholders Involved

- Women SHGs: Primary implementers and custodians of the goat bank
- MYRADA Bidar Project Team: Facilitation, training, and monitoring
- HDFC CSR: Financial support
- Veterinary and Livestock Extension Services: Health camps, vaccination, and deworming
- Community Resource Persons (CRPs): Training support and record keeping



Photo: Goat bank initiative managed by women’s SHGs, involving collective decision-making, animal distribution, and shared responsibility for livestock management.

4. Community Innovations and Practices

- Shift to Stall Feeding: Many members adopted stall feeding, enabling systematic collection of goat droppings.
- Feed Container Innovation: Members adapted locally available metal drums into raised feed containers, significantly reducing fodder wastage.

- Shared Care Arrangements: In households with space constraints, goats were housed collectively, strengthening cooperation and mutual accountability.
- Practice insight: Stall feeding reduced land degradation caused by free grazing while improving manure recovery and soil regeneration.



Photo: Raised metal-drum feed containers adapted by community members to reduce fodder wastage.

5. Technical Design and Components

5.1 Breed Selection and Animal Management

- Use of Jawari/Jamunapari-type goats suited to semi-arid conditions
- Distribution of pregnant females to accelerate herd expansion

5.2 Goat Droppings Collection and Composting

- Droppings collected from stall-fed goats
- Mixed with crop residues and cow dung to prepare enriched compost
- Compost applied to redgram, jowar, and intercropped systems

Research-backed note: Goat manure contains relatively higher levels of nitrogen and phosphorus compared to cow or buffalo manure, making it particularly suitable for rainfed cropping systems (recent livestock and soil management studies, 2023).

5.3 Land Application and Soil Benefits

- Compost applied as a basal dose prior to sowing
- Integrated with judicious chemical fertiliser use
- Farmers reported improved soil texture, better moisture retention, and yield increases of approximately two additional bags of redgram per acre

Research-backed note: Repeated application of goat manure improves soil porosity, infiltration, and moisture-holding capacity while reducing surface runoff (recent soil management studies, 2023).

5.4 Soil Moisture and Water Management Benefits

- Increased soil organic carbon enhances rainfall infiltration
- Improved moisture retention extends crop survival during dry spells
- Manure application complements watershed treatments and bund plantations

6. Outcomes and Impact

6.1. Livelihood and Social Outcomes

- 525 women now own goats as a stable livelihood asset
- Goat rearing functions as a “living savings” mechanism during emergencies
- Increased confidence and decision-making power among women SHG members

6.2. Soil and Water Outcomes

- Improved soil fertility and soil structure
- Enhanced moisture retention and reduced evaporation losses
- Better crop performance under rainfed conditions

6.3. Replication

Membership expanded significantly within two years through the pass-on mechanism, without a proportional increase in external funding.

7. Sustainability Considerations

- **Community Ownership:** The pass-on rule enables self-expansion without continuous donor support
- **Integrated Approach:** Livestock development is directly linked with soil and water management
- **Low-Cost and Replicable:** Relies on local breeds, SHG institutions, and simple composting practices
- **Gender Empowerment:** Women manage goats, manure application, and income decisions

8. Lessons and Replication Potential

- Integrating livestock support with soil and water management multiplies impact

- Stall feeding combined with composting improves both animal productivity and farm performance
- Goat Bank models are highly suitable for semi-arid regions with active SHGs
- Training on composting, fodder cultivation, veterinary care, and insurance enhances sustainability

9. Conclusion

The MYRADA Bidar Goat Bank initiative, supported by HDFC CSR, demonstrates how livestock-based livelihoods can be effectively integrated with land and water management. By combining goat rearing, manure composting, and women's collective action, the initiative delivers a "triple benefit": strengthened rural women's incomes, improved soil health and moisture retention, and a self-sustaining cycle of asset creation and knowledge transfer.

This "Goat Bank for Land Development" stands out as a practical, adaptable, and easily replicable model for semi-arid regions.

PROMISING PRACTICE 6

Managing Cattle Resources for Sustainable Farming and Soil Health

Funding Source: Self-financed by farmer

Location: TN Palayam Block, Erode District, Tamil Nadu

1. Introduction and Context

Traditional Indian farming systems were deeply integrated with livestock, relying on organic inputs such as cow dung, cow urine, leaf manure, ash, and crop residues to sustain soil fertility and biological activity. These practices supported healthy soil ecosystems rich in beneficial microorganisms and earthworms, enabling stable productivity over generations.

The transition to chemical-intensive agriculture following the Green Revolution disrupted this balance. Prolonged use of synthetic fertilisers and pesticides led to soil compaction, declining organic matter, loss of soil biodiversity, and reduced water-holding capacity. As soil health deteriorated, farmers increasingly depended on higher quantities of external inputs to sustain yields, resulting in escalating cultivation costs without proportional productivity gains. Concerns related to food safety, soil degradation, and long-term sustainability also intensified.

This promising practice documents how efficient management of cattle resources, combined with simple organic farming practices, can restore soil health, improve water-use efficiency, and enhance farm profitability—without external financial support.

2. Overview of the Area and Farmer Context

Mr. Arumugam, a progressive farmer from TN Palayam Block in Erode district, cultivates red banana on two acres, with turmeric grown during alternate seasons. While irrigation water availability in the village is relatively assured, years of intensive chemical farming and repeated deep ploughing resulted in compacted soils, low biological activity, and poor moisture retention.

To address these challenges, Mr. Arumugam gradually transitioned to an organic farming system centred on effective cattle resource management. The shift was supported by continuous learning, experimentation, and technical guidance, rather than project-based financial assistance.



Photo: Banana cultivation as a key livelihood activity, highlighting the importance of soil fertility and integrated farm nutrient management.

3. Key Land and Water Challenges

- Depletion of soil microbial life and disappearance of earthworms
- Soil compaction and low soil organic matter
- Reduced water-holding capacity despite access to irrigation
- High cost of cultivation due to chemical inputs
- Long-term risks to soil fertility and farm sustainability

4. Intervention and Stakeholder Engagement

4.1. Summary of the Intervention

Mr. Arumugam adopted a cattle-based organic farming system that relies entirely on farm-produced organic inputs such as Panchagavya and Jeevamrutha, eliminating chemical fertilisers and pesticides. Weed control and soil moisture conservation were addressed through cover cropping using Thattai Payir (cowpea).

This transition demonstrates how individual farmer initiative, when supported by knowledge systems, can result in sustainable land and water management outcomes.

4.2 Stakeholders Involved

- Farmer (Mr. Arumugam): Innovator and practitioner
- Pasumai Vikatan (Vikatan Media Group): Initial exposure to organic farming concepts through a training programme in 2007

- MYRADA–ICAR KVK, Erode: Ongoing technical guidance and mentoring
- Media Platforms (Makkal TV, Podhigai TV): Dissemination and peer learning through farm exposure



Photo: KVK scientist team visiting Mr. Arumugam's organic turmeric field.



Photo: Mr. Arumugam preparing and applying cattle-based organic inputs to fields, promoting soil health restoration and reduced dependence on chemical fertilisers.

5. Community Engagement and Knowledge Sharing

The visible success of the farm attracted frequent visits from neighbouring farmers. Media coverage, farmer-to-farmer exchanges, and exposure visits enabled wider dissemination of practical knowledge, demonstrating the economic and ecological viability of cattle-based organic farming systems.

6. Technical Design and Components

6.1 Resource Base and Feasibility

- Adequate irrigation infrastructure
- Suitable agro-climate for banana and turmeric cultivation
- Ownership of two Kangeyam native cows, ensuring regular availability of organic inputs

6.2 Bio-input Preparation and Application

- Cow Urine Collection System
- Urine collected hygienically using mesh filters and cloth sieves
- Stored in sealed barrels to maintain anaerobic conditions
- Long-term storage without foul odour indicated effective hygiene and fermentation

Preparation of Organic Inputs

- Panchagavya: Prepared using cow dung, cow urine, jaggery, curd, banana, and other organic ingredients
- Jeevamrutha: Enriched with beneficial microorganisms such as *Pseudomonas* and *Trichoderma*

6.3 Cover Cropping and Soil Management

- Thattai Payir (cowpea) grown as a living mulch alongside banana
- Suppresses weeds, reduces evaporation, improves soil structure, and enhances microbial activity

7. Operation and Maintenance

- Organic preparations were typically stirred two to three times daily to ensure uniform fermentation
- Inputs were applied within 48 hours of preparation as a good practice to maximise microbial activity
- Panchagavya: Applied as foliar spray at two key growth stages of the banana crop.

- Jeevamrutha: Applied weekly through drip irrigation and once annually as a foliar spray
- Regular applications through drip systems did not result in emitter clogging
- Consistency and discipline in preparation and application were critical to effectiveness

8. Technology and Innovation

- Use of living mulch to improve microclimate and soil moisture retention
- Integration of indigenous organic practices with drip irrigation systems
- Low-cost, farmer-managed innovations without reliance on heavy mechanisation

9. Outcomes and Impact

- Water use reduced by about 50 per cent in banana cultivation.
- Cost of banana cultivation has reduced to approximately ₹30,000 per acre.
- Noticeable improvement in soil organic carbon and microbial activity.
- Better soil moisture retention and reduced evaporation losses.
- Elimination of chemical contamination in soil and water through organic practices.

10. Sustainability Considerations

- Reliance on locally available, low-cost inputs ensures affordability
- Focus on a limited set of proven practices simplifies adoption
- Improved soil health supports long-term productivity
- Growing demand for organic produce enhances economic viability

11. Key Learnings and Replication Potential

Key Learnings

- Efficient use of cattle resources significantly reduces cultivation costs
- Simplicity and consistency are more effective than complex interventions
- Organic farming can be economically viable without external subsidies
- Integrated soil–water–livestock management enhances resilience

Replication Potential

- The model is highly replicable in similar agro-climatic regions. With training support from KVKs, NGOs, or Farmer Producer Organisations, smallholders can adopt this approach.
- Exposure visits and peer learning can accelerate wider uptake.

12. Conclusion

Promising Practice 6 highlights the critical role of well-managed cattle resources in strengthening sustainable farming systems and improving soil health. By integrating cattle management with on-farm nutrient recycling, bio-input preparation, and organic soil enrichment, farmer was able to reduce dependency on external chemical inputs while enhancing soil fertility and biological activity.

The practice demonstrates that livestock, when managed as productive assets rather than auxiliary components, can significantly contribute to resilient and low-cost agricultural systems. The use of cattle-based bio-inputs improved nutrient availability, supported crop health, and promoted environmentally safe farming practices without requiring external donor support.

Most importantly, this farmer-led initiative reinforces the value of traditional knowledge combined with practical innovation. Its low-cost, locally available inputs and ease of adoption make it highly sustainable and replicable across smallholder farming systems. The approach strengthens the crop–livestock linkage, enhances farm self-reliance, and contributes meaningfully to long-term soil health and sustainable agriculture.

Did You Know? Mechanisation in Cattle Resource Management

To address labour constraints and hygiene concerns in organic farming, MYRADA–ICAR KVK Erode has promoted mechanised organic filtration units that convert cattle waste into enriched liquid manures. Between 2005 and 2024, adoption increased from 16 to over 1,000 farmers, covering nearly 5,800 acres. These systems reduce manual effort, improve cleanliness, and enhance nutrient availability—demonstrating how traditional cattle-based practices can be strengthened through appropriate, farmer-friendly mechanisation.

PROMISING PRACTICE 7

Farmer-Led Large-Scale Production of Organic Inputs (Biopesticides and Liquid Manures)

Donor: NABARD

Location: Krishnagiri (Tamil Nadu) and Vinukonda (Andhra Pradesh)

1. Introduction and Context

Across rural India, prolonged dependence on chemical fertilisers and pesticides has contributed to declining soil health, pest resistance, rising input costs, and environmental degradation. In response, many farmers are transitioning towards natural and organic farming systems that rely on locally available resources and ecological processes.

Recognising this shift, MYRADA has promoted farmer-led production of organic inputs as a key strategy for sustainable land and water management. This practice documents two farmer initiatives that demonstrate how traditional knowledge, combined with basic technical facilitation, can support large-scale production of organic inputs for both on-farm use and local markets.

The two cases presented are:

- Brahmastra, a natural biopesticide produced by a farmer in Krishnagiri, Tamil Nadu
- Jeevamrutha, a liquid organic manure produced using a bio-digester in Vinukonda, Andhra Pradesh

Both practices reduce dependence on chemical inputs, improve soil biological health, and strengthen farm-level resilience.

2. Overview of the Area

- Krishnagiri district, Tamil Nadu has a strong base of vegetable and horticultural cultivation. Prolonged chemical pesticide use led to pest resistance, declining soil health, and rising production costs, creating demand for effective, affordable, locally produced biopesticides.
- Vinukonda, Andhra Pradesh: Located in the semi-arid region of Guntur district, the area supports crops such as tobacco, chilli, cotton, tomato, and brinjal. Continuous chemical fertiliser use degraded soil structure and fertility. Under NABARD's JIVA

Project, MYRADA introduced bio-digester-based Jeevamrutha production to promote regenerative soil management.

3. Intervention and Stakeholder Engagement

3.1 Case 1: Farmer-Led Production of Brahmastra - Krishnagiri

Mr. Jayavel, a farmer from Krishnagiri, participated in NABARD–MYRADA training on climate-resilient organic farming and began producing Brahmastra, a traditional liquid biopesticide used to control borers, caterpillars, and sucking pests.

Preparation Process

- Ingredients: neem, custard apple, castor, Dhatura (*Datura stramonium*), bael (*Aegle marmelos*) leaves, and cow urine
- Leaves are crushed or ground (often using a tractor-operated grinder)
- The extract is mixed with cow urine and natural microbial starters
- Natural fermentation for a few days in shaded or underground containers
- The liquid is filtered and stored in airtight containers

Shelf Life

- Up to six months under airtight and shaded storage conditions

Application

- Vegetables: 1 litre per acre diluted in 20 litres of water
- Mango: 15 litres per acre applied at 20-day intervals

Scale and Economics

- Cost of production (2022–23): ~₹60 per litre
- Sale price: ~₹200 per litre
- Average monthly income: ~₹12,000
- Sold directly to farmers in nearby villages



Photo: Farmer-led biopesticide unit serving as a local learning space for student volunteers.

3.2 Case 2: Jeevamrutha Production Using Bio-Digester – Vinukonda

Under the Ramalayam JIVA Project, MYRADA works in five villages where around 400 farmers practise Jeevamrutha-based organic inputs for crops such as red gram, jowar, bajra, tomato, marigold, and tobacco. To demonstrate decentralised production, a 1,000-litre HDPE bio-digester was installed on Mr. Chinnareddy's farm.

System Description

- Bio-digester capacity: 1,000 litres
- Feed drum: 200 litres (gravity-fed)
- Installation cost (2021–22): ₹23,000
- Farmer contribution: ₹5,000

Inputs

- Cow dung and Cow urine
- Green leaves such as neem and custard apple
- Jaggery, curd, and local soil

Process

- Initial fermentation in the feed drum
- Anaerobic digestion for approximately 45 days

- Gas-release valve ensures pressure safety
- Output is odour-free, microbe-rich Jeevamrutha



Photos: Installation of a Bio-digester unit at Perumbotlapalem Village



Photo: Farmers preparing plant-based materials as key inputs for producing organic formulations and biopesticides using locally available resources.



Photo: Filtered and stored liquid organic formulation ready for field application.

4. Technical Design and Components

Brahmastra

- Non-heated, leaf-based fermentation system
- Batch production model suited for village-level enterprise
- Airtight storage to maintain bioactivity and shelf life
- Suitable for small-scale decentralised production

Jeevamrutha Bio-Digester

- Sealed anaerobic digestion chamber made of HDPE
- Gravity-fed feed drum for easy loading
- Gas-release safety valve to prevent pressure build-up
- Protective masonry wall (0.6 m height) around the unit
- Suitable for batch or semi-continuous operation
- Dilution ratio before application: 1:20

5. Operation and Maintenance

Brahmastra – Non-Heated Method

- Store in shaded or underground conditions
- Use clean, airtight containers to preserve efficacy
- Maintain hygiene during handling and transfer
- Avoid exposure to direct sunlight or rain
- Regular quality check (odour, colour, and consistency)

Jeevamrutha Bio-Digester

- Regular feeding of inputs as per crop cycle
- Periodic removal of accumulated sludge
- Routine inspection of valves, pipes, and joints
- Keep the unit shaded and protected from direct sun
- Periodic refresher training for farmers on maintenance

6. Outcomes and Impact

- Reduced expenditure on chemical pesticides and fertilisers
- Additional income through local sales of organic inputs
- Lower crop loss risk from pest outbreaks
- Improved soil organic carbon and microbial activity
- Better soil structure and moisture retention
- Reduced chemical runoff into water bodies
- Increased farmer confidence in natural farming
- Peer-to-peer learning and local dissemination
- Potential for collective production at village level

7. Learning and Replication Potential

- Farmer-led innovation accelerates adoption when results are visible
- Use of local resources ensures affordability and sustainability
- Bio-digester systems need periodic handholding
- Collective production models can improve scale and access
- Models are replicable across semi-arid and irrigated regions

8. Conclusion

This practice demonstrates that farmer-led production of organic inputs can simultaneously address soil degradation, water efficiency, and livelihood resilience. By combining traditional knowledge with simple technology and institutional support, MYRADA has enabled farmers to reduce chemical dependency, improve soil health, and create local economic opportunities. These models offer practical and scalable pathways for promoting sustainable and regenerative agriculture.

Theme II: Ecological Restoration and Water Management

This section demonstrates community-led approaches for restoring soils, aquifers, tanks, wells, and traditional water systems, strengthening ecological balance while improving water security, agricultural productivity, and climate resilience.

PROMISING PRACTICE 8

Turning Waste into Wealth: Biochar for Soil Health and Water Retention

Donor: Primark – Cotton Connect

Location: Warangal and Mahabubabad Districts, Telangana

1. Introduction and Context

In the semi-arid regions of Telangana, declining soil fertility, low organic carbon content, and poor moisture retention have emerged as major constraints to sustainable agriculture. Years of intensive cultivation, heavy reliance on chemical inputs, and widespread burning of crop residues—particularly cotton stalks—have degraded soil health and contributed to air pollution and nutrient loss.

At the same time, farmers face increasing climate variability, erratic rainfall, and declining groundwater levels, making rainfed agriculture highly vulnerable. Recognising the need for low-cost, locally appropriate, and climate-resilient solutions, MYRADA introduced biochar production as a soil amendment strategy that simultaneously addresses crop residue management, soil restoration, and water use efficiency.



Photo: SHG members discussing soil health challenges and the role of biochar as a low-cost, locally produced soil amendment during a community meeting.

This practice documents the promotion of biochar made from cotton stalk residues using a simple cone shaped pit pyrolysis method, combined with compost enrichment, to improve soil fertility, enhance water retention, and strengthen climate resilience among small and marginal farmers.

2. Overview of the Area

The intervention spans three blocks across two districts, covering approximately 150 villages:

- Nekkonda Block, Warangal District
- Nellikuduru and Thorrur Blocks, Mahabubabad District

Key Characteristics

Soil types: Black, red, and sandy loam soils.

Cropping pattern:

- Kharif (June–September): Bt (*Bacillus thuringiensis*) cotton, maize, pulses and paddy
- Rabi (October–January): Pulses, paddy and limited irrigated crops

Landholding: Predominantly small and marginal farmers

Gender dimension: Significant participation of women farmers

Water sources:

- Open wells: 15–18 m
- Borewells: 45–210 m
- Average annual rainfall: ~994 mm over ~47 rainy days

3. Key Land and Water Challenges

- Declining soil fertility due to prolonged chemical input use
- Soil organic carbon levels below 0.5% in many locations
- Poor moisture retention in red and black soils
- Increasing depth to groundwater and higher irrigation costs
- Limited access to sustainable soil management practices
- Widespread burning of cotton stalk residues, leading to:
 - Nutrient loss
 - Air pollution
 - Missed opportunities for soil carbon enhancement

4. Intervention and Stakeholder Engagement

4.1. Summary of the Intervention

MYRADA promoted biochar production from cotton stalks as a soil amendment to improve moisture retention, reduce fertiliser dependency, and enhance crop productivity. Biochar was produced locally using the cone shaped pit pyrolysis method, a low-cost and low-emission technique suitable for village-level adoption.

To improve nutrient availability, biochar was mixed with farmyard manure (FYM) in a 1:1 ratio and fortified for 45 days before field application. Pilot demonstrations were conducted primarily in cotton fields.

The intervention combined technical demonstrations with strong community engagement through training programmes, exposure visits, and IEC materials.

4.2. Stakeholders Involved

- Local farmers (men and women)
- MYRADA field teams
- Krishi Vigyan Kendra (KVK), Warangal
- Local body representatives
- Technical consultants on pyrolysis and biochar production

4.3. Community Engagement

- Village-level planning meetings
- On-field demonstrations across 150 villages
- Training programmes for 300 farmers
- Active involvement of women and youth
- Farmer-to-farmer learning supported by trained local resource persons

5. Technical Design and Components

5.1 Site Selection and Feasibility

Sites were selected based on:

- Medium to low soil fertility
- Predominantly rainfed conditions
- Baseline soil test results
- Willingness of farmers to adopt new practices

5.2 Biochar Production Method

Technology: Cone shaped pit pyrolysis

Pit dimensions: Approximately 1–1.5 m depth and 1–2 m diameter

Process:

- ✓ Cotton stalks are placed in the cone pit
- ✓ Controlled partial combustion under low-oxygen conditions converts biomass into biochar rather than ash

Environmental benefit: Significantly reduced emissions compared to open residue burning

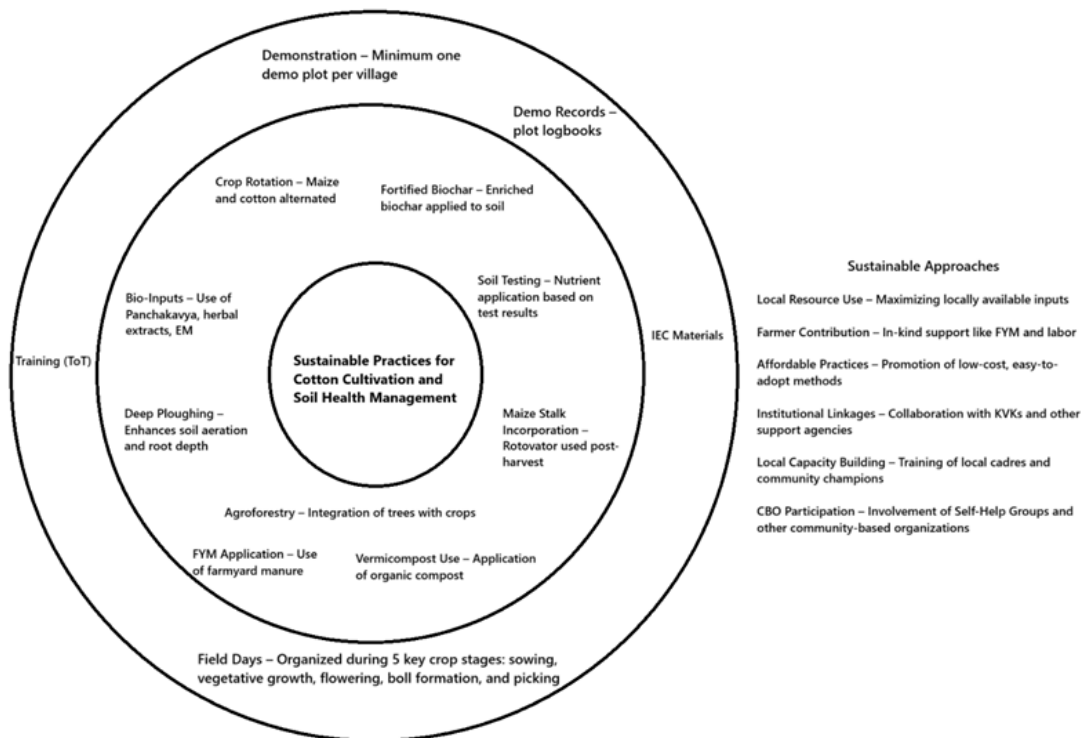


Diagram: Biochar-Centred Integrated Soil Health Management in Cotton-Based Systems

This diagram illustrates how biochar improves soil structure, enhances water retention, supports microbial activity, and sequesters carbon. When enriched with compost, biochar acts as a nutrient carrier, improving fertiliser-use efficiency and reducing moisture stress in rainfed crops.



Photo : Biochar production using a cone-shaped pit, where agricultural biomass is converted through controlled pyrolysis under community supervision.



Photo: Locally produced biochar ready for enrichment and field application, demonstrating a practical solution for improving soil structure and moisture retention.

5.3 Enrichment and Application

- Biochar mixed with FYM in a 1:1 ratio (by weight)
- Fortification period: 45 days
- Applied to cotton fields before sowing or as a basal soil amendment

5.4 Environmental and Safety Measures

- Avoidance of open residue burning
- Controlled combustion reduces smoke and particulate emissions
- Safe handling and disposal of residual ash

6. Operation and Maintenance

- Local youth trained in pit preparation, firing, and safety practices
- Farmer groups manage production schedules
- Use of locally available tools and materials
- Continued technical support through MYRADA and KVK

7. Technology and Innovation

- Low-cost, low-tech biochar production using agricultural waste
- Integration of pyrolysis and composting for enhanced nutrient value
- Carbon sequestration potential: Typically, 1 kg of biochar may contain 0.6–0.8 kg of stable carbon, equivalent to 2.2–2.9 kg CO₂e.
- Suitable for decentralised, farmer-managed adoption

8. Outcomes and Impact

Water and Soil Benefits

- Soil moisture retention improved by 15–20%
- Improved soil structure and aggregation

Agricultural and Economic Benefits

- From 1 acre of cotton, approximately 2,000 kg of dry cotton stalks are available
- Biochar yield: 400–500 kg per acre
- Enriched biochar sufficient to treat 0.5–1 acre, depending on application rate

- Typical application: 400–800 kg per acre (Application of biochar should be based on soil properties.)
- Crop yield increase: 10–15% (cotton)
- Chemical fertiliser reduction: 20–30% (cotton)
- Estimated cost savings: ~₹2,000 per acre (2024)

Social and Environmental Impact

- Elimination of crop residue burning
- Improved soil organic carbon and biological activity
- Enhanced participation of women and youth
- Improved awareness of climate-resilient practices

9. Sustainability Considerations

- Farmer-led production and application
- Potential convergence with MGNREGA and watershed programmes
- Continuous learning through IEC materials and exposure visits
- Long-term carbon sequestration and emerging carbon credit potential

10. Learning and Replication Potential

Key Learnings

- Biochar is highly effective in semi-arid, rainfed regions
- Proper training is essential for correct production and application
- Local resource use increases adoption and sustainability
- Compost-enriched biochar delivers better results than raw biochar

Scalability

- High replication potential across dryland regions of Telangana
- Suitable for integration with watershed and soil health programmes
- Opportunities for youth-led rural enterprises in biochar production

11. Conclusion

Promising Practice 8 demonstrates how agricultural and biomass waste can be transformed into a valuable resource through biochar production and use. By converting crop residues into biochar, farmers improved soil structure, moisture retention, and nutrient efficiency, particularly in light and degraded soils. Biochar enhanced soil aeration, root growth, and

microbial activity while reducing crop stress during dry spells and lowering irrigation demand. The practice also curtailed open residue burning and promoted carbon sequestration through a low-cost, farmer-managed process accessible to smallholders. Overall, biochar offers a scalable and replicable pathway that integrates soil health, water conservation, and climate resilience while strengthening farm livelihoods.

Did You Know?

The MYRADA Kolar Project has supported biochar production using a perforated drum method:

- Agricultural waste is filled into a metal drum
- Fire is ignited from the top
- A lid with a chimney improves airflow and combustion control
- After complete cooling, biochar is collected safely
- This method offers an additional low-cost option for decentralised biochar production.



PROMISING PRACTICE 9

Advancing Reduced Tillage and Integrated Farming Systems

Nature of Initiative: Farmer-led and self-financed

Location: Surahalli Village, Nanjangud Taluk, Karnataka

1. Introduction and Context

Mr. Prabhu Swami, a farmer from Surahalli village in Nanjangud Taluk, Karnataka, is a progressive practitioner of reduced tillage and integrated farming systems. Coming from a modest background and having completed SSLC education, he began farming with limited resources on four acres of land. Like many small and marginal farmers, he initially faced low income, declining soil health, and increasing water stress.

Over time, instead of relying on repeated and intensive ploughing, he consciously adopted minimum soil disturbance practices, guided by the belief that frequent tillage weakens soil structure and reduces biological activity. Gradually, this approach led to improved soil aggregation, conservation of organic matter, reduced erosion, and better soil moisture retention.

Combined with crop diversification, organic inputs, and water conservation measures, reduced tillage became the foundation of a resilient, low-cost, and productive farming system. His experience demonstrates how farmer-led, context-specific practices can strengthen livelihoods while conserving land and water resources.

2. Description of Practice

2.1 Reduced Tillage as a Core Principle

- Ploughing is minimised and carried out only when absolutely necessary.
- Crop residues are retained on the field as surface mulch, reducing direct soil exposure.
- Reduced soil disturbance has improved soil structure, reduced runoff on gentle slopes, and maintained soil moisture during dry periods.



Photo: Organic trenches used for collecting and decomposing leaf litter, supporting soil cover and reduced soil disturbance.



Photo: Tree mulching combined with pepper grown as an intercrop on coconut trees, illustrating reduced tillage and moisture conservation practices.

2.2 Crop Diversification and Integrated Farming

- The farm includes a diverse mix of crops and trees: banana (G9 variety), mango, cocoa, pepper, sapota, guava, amla, cardamom, teak, and silver oak.

- Pepper vines are trained on teak, silver oak, and coconut trees, efficiently utilising vertical space.
- Castor plants function as a natural live fence and contribute to pest reduction.
- Cocoa seedlings supplied through Cadbury have matured, and the produce is sold directly to the company, ensuring assured market linkage.

2.3 Soil Fertility Management and Organic Inputs

- Building on the experience in Mulbagalu, where field practitioner Mr. Prabhakar produces biochar from silver oak branches to improve soil moisture retention and nutrient availability, Mr. Prabhu Swami has implemented a similar practice on his own farm.
- Crop residues such as banana pseudostems, teak leaves, and other farm waste are converted into vermicompost.
- Organic mulching plays a central role in conserving moisture and adding biomass to the soil.

2.4 Water Conservation Measures

- Trenches laid across slopes and filled with leaf litter slow surface runoff and enhance groundwater recharge.
- A farm pond and open well provide irrigation security, with excess rainwater diverted for recharge.
- Drip irrigation fitted with venturi systems enables application of organic liquid inputs while keeping drip lines clean and functional.

2.5 Farm Management Practices

- A brush cutter is used for weed control, particularly grasses, reducing labour requirements.
- Detailed income and expenditure records have been maintained continuously for over 17 years, supporting informed farm planning.
- Seven varieties of fodder crops are grown to support livestock, integrating cattle into the farming system.
- Active family participation—especially by his wife in cultivating vegetables and greens—adds nutritional and economic stability.

3. Outcomes and Impact

- Soil Health: Improved organic matter content, better soil aggregation, enhanced moisture retention, and increased biological activity.
- Economic Benefits: Farm income increased almost doubled within the last few years

- **Water Efficiency:** Reduced irrigation demand due to improved soil moisture retention and mulching.
- **Market Assurance:** Stable income from cocoa through direct linkage with Cadbury Industries.
- **Knowledge Sharing:** The farm functions as a demonstration site for farmers, students, and development practitioners.
- **Social Recognition:** Featured in radio programmes; currently serves as Vice President of the local Farmer Producer Organisation (FPO).
- **Environmental Benefits:** Increased on-farm biodiversity, including regular bird presence, indicating gradual ecosystem recovery.



***Photo:** Cocoa cultivated within a shaded garden system, reflecting improved microclimate, soil health, and sustained productivity under reduced tillage.*

4. Sustainability and Replication Potential

This practice demonstrates that reduced tillage, when combined with integrated farming, soil and water conservation, and organic inputs, is both sustainable and adaptable. The model:

- Reduces dependence on external inputs
- Enhances resilience to rainfall variability
- Is suitable for small and marginal farmers in rainfed and semi-irrigated areas

Key factors supporting replication include low-cost interventions, visible results, farmer-to-farmer learning, and institutional support through FPOs and NGOs.

5. Key Learnings

- Minimising soil disturbance improves long-term soil health and productivity.
- Integrated farming systems provide diversified income streams and reduce risk.
- Farmer experimentation, combined with exposure to scientific practices, accelerates innovation.
- Consistent record-keeping strengthens decision-making and accountability.
- Family involvement and peer learning enhance sustainability and adoption.

6. Conclusion

Promising Practice 9 highlights how reduced tillage, when integrated with diversified farming systems, can improve soil health, enhance water retention, and strengthen farm resilience. By minimising soil disturbance and combining crops, livestock, and organic inputs, farmers were able to reduce cultivation costs while maintaining or improving productivity.

The practice demonstrates that sustainable agriculture does not rely on a single intervention but on a systems approach that links soil conservation, efficient water use, and livelihood diversification. Reduced tillage lowered energy and labour requirements, while integrated farming improved nutrient recycling and risk management.

This approach is environmentally sound, economically viable, and well-suited to small and marginal farmers. With appropriate capacity building and field-level demonstrations, it offers strong potential for replication across rainfed and semi-arid regions.

Did You Know? Banana Pseudostem – A Natural Water Reservoir

After harvesting banana bunches, Mr. Prabhu Swami temporarily retains the mother plant (pseudostem) instead of removing it immediately. The pseudostem slowly releases stored moisture and nutrients to nearby suckers for nearly two months, supporting early growth and reducing immediate irrigation needs. This traditional practice highlights how simple on-farm observations can significantly improve water-use efficiency in banana cultivation.

PROMISING PRACTICE 10

Efficient Use of Groundwater through Irrigation Ponds and Micro-Irrigation Systems

Nature of Initiative: Farmer-led, with technical facilitation

Location: Kalaburagi District, Karnataka

1. Introduction and Context

Kalaburagi district lies in a semi-arid agro-climatic zone characterised by erratic rainfall, prolonged dry spells, and a high dependence on groundwater for agricultural production. Rainfed farming alone is inadequate to sustain crops, making borewells the primary source of irrigation for most farmers. However, conventional irrigation practices—such as direct pumping from borewells and flood irrigation—have resulted in inefficient water use, high energy consumption, and uneven crop growth.

In response to these challenges, farmers in the project area adopted irrigation ponds as a practical groundwater management solution. Unlike farm ponds that harvest rainwater, irrigation ponds are designed to store groundwater pumped from borewells, allowing water to be used judiciously through micro-irrigation and fertigation systems. This approach enables farmers to optimise groundwater use, reduce pumping frequency, improve irrigation efficiency, and enhance crop productivity while conserving scarce water resources.



Photo: Farm irrigation pond serving as a central water source within an integrated farming system, supporting crop and livelihood activities.

2. Overview of the Area

The practice is documented from villages in Kalaburagi district, where agriculture is predominantly semi-irrigated and heavily dependent on borewell irrigation.

Key Characteristics

- Agro-climatic conditions: Semi-arid with frequent dry spells
- Average annual rainfall: Low and erratic, insufficient for reliable rainfed farming
- Soil types: Predominantly black cotton soils with moderate to high water-holding capacity
- Primary water source: Borewells (groundwater)
- Cropping systems: Commercial and food crops under protective irrigation

Key Irrigation Challenges

- High energy costs due to continuous groundwater pumping
- Inefficient water use under flood irrigation
- Limited scope for fertigation without intermediate water storage

To overcome these constraints, farmers constructed lined irrigation ponds to temporarily store groundwater pumped from borewells. Stored water is then supplied through drip and sprinkler irrigation systems, enabling precise application of water and nutrients.

3. Key Challenges and Relevance to Water Management

Key Challenges

- Acute water stress despite groundwater availability
- Absence of intermediate storage for regulated irrigation
- Low crop productivity and unstable farm income
- Limited investment capacity among small and marginal farmers

Relevance to Water Management

- Storage of pumped groundwater in lined surface ponds to minimise seepage losses
- Optimisation of limited groundwater through micro-irrigation
- Integration of water-efficient crops and input-efficient farming practices

4. Intervention and Stakeholder Engagement

4.1 Summary of the Intervention

The intervention focused on the construction of a lined irrigation pond for groundwater storage, combined with drip irrigation, fertigation, organic farming practices, and enterprise diversification. Stored groundwater enabled regulated irrigation schedules, reduced pumping stress on borewells, and improved fertiliser-use efficiency. Livestock, poultry, and small value-addition enterprises were integrated to enhance income stability and resource recycling.

4.2. Stakeholders Involved

- Farmer: Planning, investment, and day-to-day management
- MYRADA: Technical guidance, facilitation, and monitoring
- Village Watershed Committee (VWC): Local oversight and coordination
- Agriculture and Horticulture Departments: Convergence support

Farmer Profile

Mr. Paramma Revansiddappa, a former computer engineer, returned to his village to establish a sustainable, technology-enabled farming system on 15 acres of land. His initiative demonstrates how technical knowledge combined with local resources can drive innovation even in water-scarce environments.

4.3. Community Engagement

- The farm serves as a demonstration site for small and marginal farmers
- Exposure visits and peer learning encouraged replication

5. Technical Design and Components

5.1 Site Selection and Feasibility

- Marginal land with no prior irrigation access selected to demonstrate feasibility
- Hard rock terrain necessitated a shallow, lined pond design

5.2 Irrigation Pond Construction

- Dimensions: 100 ft × 100 ft × 12 ft
- Lining: Plastic (tarpaulin) lining to minimise seepage losses
- Safety: Fencing provided
- Maintenance: Periodic desilting and inspection of lining

5.3 Water-Use Technologies

- Drip irrigation for efficient water application
- Venturi-based fertigation for combined delivery of water and nutrients
- Plastic mulching to reduce evaporation and suppress weeds

5.4 Organic Farming Practices

- Use of panchagavya, beejamrutha, vermicompost, and vermiwash
- On-farm composting of crop residues and livestock waste
- Dedicated vermiwash collection system



***Photo:** Farmer-led preparation of bio-inputs as part of an integrated farming approach that combines water management, soil health, and crop productivity.*

5.5 Integration of Livestock and Poultry

- Cattle, goats, and Sonali poultry units
- Manure recycling for crops, supplementary income, and household nutrition

6. Outcomes and Sustainability

Water Resource Use and Efficiency

- Groundwater storage in irrigation ponds enabled protective irrigation
- Reduced frequency and duration of borewell pumping
- Drip irrigation improved water-use efficiency and crop performance

Economic Outcomes

- Crop diversification including sugarcane, papaya, and vegetables

- Value-added enterprise: Organic sugarcane juice parlour with refrigerated stalk storage
- Employment generation for five full-time workers

Social and Environmental Benefits

- Direct marketing strengthened local income flows
- Reduced dependence on chemical fertilisers and pesticides
- Improved soil health and on-farm biodiversity

Sustainability Practices

- Farmer-managed operation and maintenance of pond and irrigation systems
- Planned diversification into beekeeping and mushroom cultivation
- Efficient recycling of farm waste and nutrients



Photo: Use of mulching sheets in crop fields to minimise evaporation losses and improve water-use efficiency under integrated farming systems.

Voices from the Field

“I always try to adopt and demonstrate agricultural technologies that are suitable for small and marginal farmers.”— Mr. Paramma Revansiddappa

7. Lessons and Replication Potential

Key Learnings

- Groundwater storage combined with micro-irrigation significantly improves water-use efficiency

- Irrigation pond design must respond to local geology and groundwater conditions
- Integrated farming systems reduce livelihood risks in water-scarce regions
- Technical knowledge, when locally adapted, ensures long-term sustainability

Scalability

- This practice is highly replicable across dry and semi-arid regions through convergence with watershed programmes, agriculture and horticulture schemes, and community institutions.
- It is particularly suitable for small and marginal farmers seeking groundwater security, efficient irrigation, and diversified livelihoods.

8. Conclusion

Promising Practice 10 demonstrates how the combined use of irrigation ponds and micro-irrigation systems enables efficient and sustainable groundwater management. By pumping groundwater during low-demand periods, storing it in farm ponds, and applying it through drip and fertigation systems, farmers optimised water use while reducing losses from evaporation and over-irrigation.

The intervention improved irrigation reliability, enhanced crop productivity, and reduced pressure on groundwater sources. Efficient water application also lowered energy consumption and fertiliser wastage, contributing to both economic and environmental benefits.

This practice offers a practical, scalable solution for water-stressed regions, particularly where groundwater is the primary irrigation source. With appropriate technical support and farmer training, it can be widely replicated to strengthen agricultural resilience and water security.

PROMISING PRACTICE 11

Community-Led Revival of Traditional Open Wells for Irrigation Security

Donor: Bharat Financial Inclusion Ltd (BFIL)

Location: Pattana Village, Kalaburagi District; Raichur District, Karnataka.

1. Introduction and Context

In the dryland regions of Kalaburagi district, traditional open wells have historically served as a critical source of irrigation and drinking water. Over time, however, many of these wells became non-functional due to sedimentation, declining recharge, and lack of periodic maintenance. As groundwater levels fell and rainfall became increasingly erratic, farmers were forced to deepen borewells or abandon cultivation, leading to rising costs and heightened water insecurity.

At the same time, the cost of reviving individual wells posed a major barrier. Mechanical desilting of deep open wells requires long-reach (boom) excavators, and transporting such heavy machinery to individual sites is expensive. Recognising this constraint, the watershed project adopted a cluster-based, community-led approach. Multiple silted wells within the village were identified together, and the excavator was mobilised only once to the community. Wells were then revived systematically, one after another, significantly reducing transport and mobilisation costs compared to individual interventions.

This practice demonstrates how collective planning and shared logistics can make groundwater recharge interventions affordable, efficient, and scalable, while strengthening community ownership of traditional water sources.

2. Overview of the Area

Pattana village lies in the dryland tract of the Bhima River Basin and is characterised by low and erratic rainfall, high evaporation rates, and increasing stress on groundwater resources. Agriculture in the village depends largely on groundwater drawn from traditional open wells and a few borewells.

The dominant soils—black and sandy—have moderate to low infiltration rates and are prone to moisture stress under prolonged dry conditions. Over the years, declining recharge, heavy sedimentation, and absence of systematic maintenance rendered many open wells ineffective, reducing their storage capacity and reliability.

3. Key Challenges

- Shallow aquifers with limited natural recharge
- Heavy sedimentation reducing effective storage in open wells
- High cost of mechanical desilting when undertaken individually
- Declining soil fertility and moisture stress in cultivated fields
- Increasing dependence on borewells

Relevance to Water Management

Groundwater is the primary source of irrigation in the village. Renovation and desilting of existing open wells offers a cost-effective, locally appropriate, and climate-resilient strategy to enhance groundwater storage, improve recharge, and stabilise irrigation for small and marginal farmers.

4. Intervention and Stakeholder Engagement

4.1. Summary of the Intervention

Several silted open wells were identified through village-level discussions under the Bharat Pragat Watershed Programme. A long-reach (60-foot boom) excavator was mobilised once to the village, and well renovation work was carried out sequentially across identified sites.

The selected well documented under this practice had become largely non-functional due to prolonged silt accumulation. Mechanical desilting and deepening were undertaken, restoring its storage capacity and recharge function. The excavated silt—rich in nutrients—was transported and spread on nearby agricultural fields, improving soil quality and crop performance.

The total cost of renovation was approximately ₹50,000 per well (2025), of which the farmer contributed ₹23,000 through a combination of cash and labour (silt transport and spreading), reflecting strong ownership and commitment.

4.2. Stakeholders Involved

- Farmers: Identification of wells, partial financial and labour contribution
- Village Watershed Committee (VWC): Planning, coordination, and monitoring
- Watershed Project Team: Technical facilitation and financial support
- Agriculture Department: Convergence support for micro-irrigation (drip/sprinkler systems)
- Donor: Funding support

4.3. Community Engagement

The cluster-based approach encouraged cooperation among farmers, reduced individual costs, and demonstrated the economic advantage of collective action. The intervention reinforced shared responsibility and long-term stewardship of groundwater resources.

5. Technical Design and Components



Photo: Long-reach excavator used for efficient desilting and deepening of an open well

5.1 Site Selection and Feasibility

- Wells with severe siltation and reduced storage capacity were prioritised
- Strategic importance for irrigating nearby agricultural land considered
- Renovation identified as more cost-effective than new well construction

5.2 Design and Excavation

- Mechanical desilting using a 60-foot boom excavator
- Nutrient-rich silt removed and uniformly applied to agricultural fields
- Protective bund constructed around the well to prevent contamination, collapse, and runoff entry

5.3 Environmental and Safety Measures

- No tree felling or disturbance to surrounding vegetation
- Bunding enhanced recharge potential and reduced surface contamination

5.4 Operation and Maintenance

- Annual inspection of bund integrity and well profile
- Periodic monitoring of water levels using simple depth indicators

5.5 Technology and Innovation

- Cluster-based mobilisation of long-reach excavator reduced transport costs
- Use of traditional open wells combined with modern machinery
- Convergence with micro-irrigation systems to optimise water use

6. Outcomes and Sustainability

Water Resource Creation and Use

- Post-renovation, the open well stores an additional ~200 cubic metres of water
- Water quality verified by KVK Kalaburagi
- Reliable irrigation water restored for crop cultivation

Economic and Agricultural Benefits

- Minimum 50% expansion of irrigated area.
- Reduced dependence on borewells and associated energy costs

Social and Environmental Impact

- Beneficiary is a small, marginal farmer from a backward-class community
- Application of fertile silt improved soil structure and crop productivity

No adverse environmental impacts observed



Photo: Farmers inspecting a revived open well after desilting and deepening interventions to improve groundwater availability



Photo: Year-round water availability from the renovated well has enabled farmers to cultivate multiple crops

Sustainability Considerations

- Low-cost, locally replicable intervention
- Strong farmer contribution ensures long-term upkeep and ownership
- Multiple crop grown

7. Learnings and Replication Potential

Key Learnings

- Periodic maintenance of traditional wells is critical for groundwater sustainability
- Collective planning significantly reduces machinery mobilisation costs
- Farmer contribution—financial or labour-based—strengthens ownership
- Combining water-source revival with soil improvement multiplies benefits

Scalability

This practice is highly scalable across dryland regions with shallow aquifers and existing open wells. With modest investment, basic machinery, and community coordination, similar interventions can be implemented widely through watershed and convergence programmes.

8. Conclusion

The open well revival initiative in Pattana village illustrates how community-led planning, shared logistics, and farmer ownership can restore traditional groundwater systems in a cost-effective and sustainable manner. By mobilising heavy machinery collectively and combining water-source renovation with soil improvement, the practice offers a practical pathway to enhance irrigation security, groundwater recharge, and rural livelihoods in water-stressed regions.

PROMISING PRACTICE 12

Well Recharge Pits as a Climate Resilience Strategy for Enhancing Farm Income

Donor: NABARD

Location: Denkanikottai Taluk, Krishnagiri District, Tamil Nadu

1.Introduction and Context

Groundwater forms the backbone of agricultural livelihoods in semi-arid regions of Tamil Nadu, particularly in areas where surface water sources are limited and rainfall is highly variable. In Denkanikottai Taluk, years of erratic rainfall, prolonged dry spells, and increasing dependence on borewells and dug wells have resulted in declining groundwater levels and reduced reliability of irrigation. Small and marginal farmers are especially vulnerable, as even short interruptions in water availability directly affect crop survival and farm income.

While groundwater extraction has increased steadily, systematic recharge mechanisms have remained limited. Much of the seasonal runoff generated during monsoon rainfall flows out of farm boundaries without contributing to aquifer replenishment. Recognising this imbalance, the watershed programme supported by NABARD introduced well recharge pits as a simple, low-cost, and farmer-friendly solution to enhance groundwater recharge, stabilise irrigation sources, and strengthen climate resilience at the farm level.

2.Overview of the Area

Denkanikottai Taluk in Krishnagiri District lies in the semi-arid zone of Tamil Nadu and is predominantly rainfed. The region is characterised by undulating terrain, small and marginal landholdings, and highly variable rainfall. Agriculture is the primary livelihood, with a heavy dependence on groundwater for irrigation. However, persistent over-extraction combined with declining and erratic rainfall has resulted in falling groundwater levels, threatening farm productivity, livelihoods, and food security.

3. Key Challenges Related to Land and Water

- Rapid groundwater depletion due to over-extraction and absence of systematic recharge mechanisms
- Seasonal water scarcity limiting crop productivity and diversification
- High dependence on rainfed agriculture with low resilience to drought and climate variability
- Limited access to in-situ water conservation and recharge infrastructure
- Rising input costs and low farm returns in the absence of assured irrigation

4. Intervention and Stakeholder Engagement

4.1. Summary of the Intervention

As part of an integrated watershed development initiative, well recharge pits were introduced to enhance groundwater recharge by diverting and filtering surface runoff into existing dug wells. The intervention aimed to stabilise groundwater levels, extend irrigation duration, and enable crop diversification.

To assess impact, a comparative study was conducted over two agricultural years involving 57 farmers—28 farmers with well recharge pits and 29 farmers without recharge pits. The study compared changes in groundwater levels, irrigated area, crop productivity, and farm income.

4.2. Stakeholders Involved

- Farmers and landowners (primary beneficiaries)
- Village Watershed Committees (VWCs)
- MYRADA (facilitating NGO)
- NABARD (donor agency)
- Local masons and material suppliers

4.3. Community Engagement

The intervention followed extensive community mobilisation and Participatory Rural Appraisal (PRA) to identify suitable sites. Farmers and VWCs were trained in construction, operation, and maintenance. Awareness programmes highlighted the long-term benefits of groundwater recharge, fostering strong community ownership and sustainability.

5. Technical Design and Components

5.1. Site Selection and Feasibility

- Sites selected based on runoff availability, well condition, and land topography
- Catchment areas free from open defecation
- Rainfed uplands and sloping lands prioritised to maximise runoff harvesting
- In some locations, seasonal stream flows diverted towards recharge pits
- Final selection approved through community consensus facilitated by VWCs

5.2. Design Features

- Recharge pits constructed with an approximate dimension of 1.0–1.2 m diameter and 1.5–2.0 m depth
- Cement rings used for structural stability
- Multi-layer filtration system comprising sand and graded aggregates (boulders, 40 mm and 20 mm gravel)
- Recharge pits connected to dug wells to allow filtered runoff to percolate



***Photo:** Well recharge pit fitted with modular cement rings and portable filtration units, channelising surface runoff into the dug well to enhance groundwater recharge.*

5.3. Environmental and Safety Measures

- Filter media reduced sediment load and contamination risks
- Safe distance maintained from septic tanks and sanitation facilities
- Adequate distance maintained from open wells, as most wells are unlined
- Seasonal inspection ensured water quality and structural safety

5.4. Operation and Maintenance

- Managed by trained farmers with oversight from VWCs
- Use of jute gunny bags placed above filter media to minimise silt deposition
- Gunny bags replaced before each monsoon season
- Pre-monsoon maintenance ensured effective capture of initial rainfall events

5.5. Technology and Innovation

- Simple, low-cost, and locally replicable design
- Use of local materials and labour reduced costs and improved acceptance
- Modular cement rings allowed flexibility in sites with access or crop cover constraints

6. Outcomes and Sustainability

(Source: Study Report. Murugan E)

Water Resource Creation and Use

- Average groundwater level rise of 6 metres in wells with recharge pits (834 m MSL compared to 828 m MSL in control wells)
- Irrigated area increased from 30 acres to 40.25 acres in intervention farms (compared to 33 acres to 36 acres in control farms)
- Improved water availability enabled multi-cropping and irrigation during lean seasons

Economic and Agricultural Benefits

- Significant improvement in crop productivity and cropping intensity
- Average net farm returns increased from ₹27,225 to ₹38,875 per acre per year
- Crop diversification achieved, including vegetables and horticultural crops
- Income stabilisation observed across farm sizes, with greatest benefits for smallholders

Social and Environmental Impact

- Reduced drudgery for women in water collection
- Increased time availability for livelihoods and children's education
- Improved soil moisture, vegetation cover, and reduced erosion
- Strengthened community cohesion through collective maintenance



Photo: Restored water level in the dug well following installation of the recharge pit, indicating effective aquifer recharge.



***Photo:** Drone view of the recharged dug well and surrounding agricultural fields, demonstrating improved water availability and enhanced irrigation potential at the farm level.*

7. Sustainability Considerations

- Local fabrication of cement rings supported long-term adoption
- Timely construction before cropping seasons is critical for effectiveness
- Integration with SHGs, VWCs, and CMRCs supported monitoring and financial management
- Farmer feedback emphasised advance planning and local material availability

8. Learnings and Replication Potential

Key Learnings

- Small-scale recharge structures can deliver measurable gains in income and resilience
- Construction timing and material access are critical success factors
- Participatory planning strengthens ownership and sustainability
- Training VWCs improves technical monitoring and long-term outcomes

Scalability

- Highly replicable in rainfed and groundwater-stressed regions
- Low investment with high returns suits large-scale programmes

- Strong potential for convergence with MGNREGA, CSR initiatives, and water security missions
- Digital tools can support monitoring and scaling

9. Conclusion

The well recharge pit intervention in Denkanikottai Taluk demonstrates that localized, low-cost groundwater recharge structures can significantly improve water availability, crop productivity, and farm income. By strengthening climate resilience through community-led planning and simple engineering solutions, the practice offers a technically sound, economically viable, and socially acceptable model for widespread replication in semi-arid regions.

PROMISING PRACTICE 13

Enhancing Water Availability through Sub-Surface Dams

Donor: HIDA

Location: Kadiri Mandal, Anantapur District, Andhra Pradesh

1. Introduction and Context

Anantapur District is among the most drought-affected regions in India, where chronic water scarcity poses severe constraints on agriculture, livestock rearing, and rural livelihoods. In Kadiri Mandal, erratic rainfall, rapid runoff, and limited natural recharge have led to continuous depletion of groundwater resources. Conventional surface water harvesting structures are often ineffective in this hard-rock terrain due to high evaporation losses and limited storage potential.

Recognising the need for a climate-resilient and context-specific solution, MYRADA introduced sub-surface dams as a groundwater recharge strategy. Unlike surface storage structures, sub-surface dams intercept underground water flows and store water within aquifers, ensuring year-round availability with minimal land disturbance. This approach aimed to stabilise groundwater levels, revive existing wells, and enhance water security for agriculture, livestock, and domestic use in drought-prone communities.

2. Overview of the Area

Kadiri Mandal in Anantapur District is one of the most drought-prone regions of Andhra Pradesh, receiving an average annual rainfall of only 552 mm. The terrain is characterised by rocky uplands, shallow sandy soils, and sparse vegetation cover. Agriculture is predominantly rainfed, and groundwater serves as the primary source for both drinking water and irrigation, accessed mainly through borewells and open wells.

Chronic water scarcity, combined with rapid groundwater depletion, has severely constrained agricultural productivity, livestock rearing, and domestic water availability, affecting overall livelihood security.

Key Challenges Related to Land and Water

- Erratic and low rainfall
- Rapid depletion of groundwater levels
- Heavy dependence on borewells
- High surface runoff leading to soil erosion
- Absence of natural recharge points
- Limited access to water for agriculture, livestock, and domestic use

3. Intervention and Stakeholder Engagement

3.1. Summary of the Intervention

During 2007–08, MYRADA constructed three sub-surface dams at strategically identified water-stressed locations in Kadiri Mandal. These structures were built entirely below ground level to intercept and arrest underground water flow, allowing water to accumulate and gradually recharge surrounding aquifers.

The intervention focused on locations with proven sub-surface water movement, ensuring effective groundwater recharge without creating surface reservoirs. This eliminated evaporation losses and avoided displacement or land-use conflicts.

3.2. Stakeholders Involved

- MYRADA: Technical design, facilitation, and capacity building
- Community-Based Organizations (CBOs): Local planning and post-construction management
- Gram Panchayats (GPs): Oversight and long-term ownership
- Farmers and Livestock Owners: Primary Beneficiaries
- HIDA: Funding support

3.3. Community Engagement

Community participation was integral throughout the process and included:

- Identification of suitable sites using local knowledge
- Labour contribution during construction
- Awareness-building on post-construction maintenance
- Training in water-use efficiency and conservation practices

4. Technical Design and Components

4.1. Site Selection and Feasibility

Sites were selected based on:

- Geohydrological assessments confirming sub-surface water flow
- Proximity to existing borewells, open wells, and habitations
- Availability of common land
- Willingness and consensus of the local community

4.2. Design Features

- Construction of an impervious barrier below ground across drainage lines
- Designed to intercept and store sub-surface water movement
- Dimensions (length, height, and width) varied based on local geology and topography
- No surface reservoir formed; water stored within aquifers and shallow sub-soil zones

4.3. Environmental and Safety Measures

- Natural vegetation around construction sites preserved
- Minimal ecological disturbance due to sub-surface construction
- No displacement of households, agricultural land, or infrastructure

4.4. Operation and Maintenance

- Village Watershed Committees trained in routine inspection and monitoring
- Structures formally handed over to Gram Panchayats for long-term upkeep
- Maintenance requirements remain minimal due to robust design

4.5. Technology and Innovation

- Use of locally sourced construction materials
- Integration of traditional water conservation knowledge with modern engineering principles
- Sub-surface storage eliminates evaporation losses and surface contamination



Photos: Construction of a subsurface dam below ground level using earth-moving equipment and manual labour, capturing the landscape context and scale of intervention.



***Photo:** Completed subsurface dam with only a low masonry section visible above ground, illustrating how water is stored within the soil profile with minimal surface storage.*

5. Outcomes and Sustainability

Water Resource Creation and Use

- Improved groundwater recharge in surrounding aquifers
- Revival and stabilisation of nearby borewells and open wells
- Increased soil moisture and sub-surface water retention
- Water availability during lean and dry months

Economic and Agricultural Benefits

- Increased irrigation potential through revived wells
- Expansion of cultivable areas in adjacent farmlands
- Reduced expenditure on drilling new borewells
- Improved livestock health and productivity due to assured water access

Social and Environmental Impact

- Regeneration of native vegetation around recharge zones
- Strengthened community-level water governance
- Reduced seasonal migration during drought periods
- Improved quality of life for women and children due to closer water access

Sustainability Considerations

- Joint management by Community Managed Resource Centres (CMRCs) and Gram Panchayats
- Farmer training in water-efficient cropping and irrigation practices
- Strong emphasis on community ownership and periodic monitoring
- Long functional life with minimal maintenance requirements



***Photo:** Borewell located in the vicinity of the subsurface dam supplying water for paddy cultivation, demonstrating improved groundwater availability for agriculture.*

6. Learnings and Replication Potential

Key Learnings

- Sub-surface dams are highly effective in dry, rocky terrains with defined underground water flow
- Community participation is essential for long-term success
- Simple, low-cost interventions can deliver sustainable outcomes in resource-constrained settings

Scalability

- Easily replicable across other Mandals of Anantapur and similar agro-ecological regions
- Low capital investment and non-invasive design suit CSR programmes and government schemes
- Strong potential for integration within watershed and drought-proofing initiatives

7.Conclusion

The sub-surface dams constructed in Kadiri Mandal demonstrate how strategically designed, community-managed groundwater recharge structures can significantly improve water availability, agricultural viability, and livelihood resilience in drought-prone regions. This practice offers a technically sound, environmentally sensitive, and socially inclusive model for replication in water-stressed landscapes.

PROMISING PRACTICE 14

Restoring Life to Water – Tank Revival and Community Empowerment

Donor: CIPLA Limited

Location: Gangadevanapalli Village, Thally Block, Krishnagiri District, Tamil Nadu

1. Introduction and Context

Gangadevanapalli is a remote border village located along the Tamil Nadu–Karnataka boundary in Krishnagiri District. The village comprises about 60 households, with a population of approximately 430 people, primarily dependent on agriculture (ragi, beans, flowers) and cattle rearing for their livelihoods. The village farmlands lie adjacent to the forest fringe, making water sources vulnerable to frequent human–elephant interactions.

Traditionally, irrigation and domestic water needs were met through the *Sillegowander Kere* (village tank), supplemented by open wells and borewells. Over a period of more than 55 years, continuous silt accumulation, declining rainfall, and the absence of systematic maintenance severely reduced the tank’s storage capacity. As a result, the village experienced seasonal water scarcity, crop failures, drying wells, and increased human–elephant conflict around water sources, affecting both livelihoods and community safety.

2. Key Challenges Related to Land and Water

- Declining groundwater levels and drying borewells
- Erratic rainfall leading to frequent crop failures
- Inadequate irrigation infrastructure
- Soil degradation and weakened tank bunds
- Limited collective systems for water governance

3. Intervention and Stakeholder Engagement

Community Mobilisation

- Formation of a Water User Group with a functional bank account to ensure long-term maintenance, accountability, and financial transparency

- Establishment of the Abdul Kalam Children's Group to promote water conservation awareness, leadership, and life skills among children

Physical Interventions

- o **Desiltation:** Removal of 18,062 m³ of silt after reclaiming 2 acres of encroached tank bed
- o **Spillway Construction:** Construction of a 6-metre concrete spillway, increasing storage capacity by 8,071 m³ and ensuring safe and controlled overflow
- o **Channel Rejuvenation:** Cleaning, widening, and deepening of three inflow channels to improve runoff entry
- o **Bund Strengthening:** Reuse of desilted soil for strengthening tank bunds and forming pathways
- o **Stone Pitching:** Reinforcement of outlets and channel sides to prevent erosion and improve accessibility
- o **Plantation Drive:** Plantation of 909 saplings (12 species) and *Stylosanthes hamata* grass to stabilise bunds and enhance ecological health
- o **Borewell Recharge Shaft:** Identification and construction guided by Electrical Resistivity Surveys (ERS) to locate suitable recharge zones



Photo: Severely silted irrigation tank with limited water storage capacity, highlighting reduced holding potential and declining reliability for agriculture.

Capacity Building and Awareness

- **Household Awareness Programme**
 - o Distribution of aerator-based kitchen shower taps, reducing water use from 3 litres to 1.5 litres per minute
- **Street Play and Field Day**
 - o Conducted to promote water conservation messages and celebrate collective community effort

4. Technical Design and Components

Component	Details
Present tank water contour area	16,851.92 m ²
Free Catchment Area	44.7 hectares
Slope	4% – 5.5%
Catchment Classification	GOOD (as per Strange Table)
Average Annual Rainfall	886.10 mm
Storage before intervention	15,504 KL
Yield from runoff	46,750 KL
Actual storage added (post-intervention)	26,963 KL

Methodology and Tools

- Catchment demarcation using Google Earth Pro, transect walks, and GPS-enabled mobile applications
- Rainfall data obtained from the Block-level rain gauge station
- Runoff yield estimated using the Dry/Damp/Wet method, validated with field observations
- Tank storage assessed through Total Station survey and AutoCAD analysis, with depth measured at 32 locations
- Silt depth assessed through trial pits (average depth: 2 metres)
- Excavated soil reused for bund widening and creation of internal islands
- Project costing based on equipment rates (tractor, JCB) and applicable GST

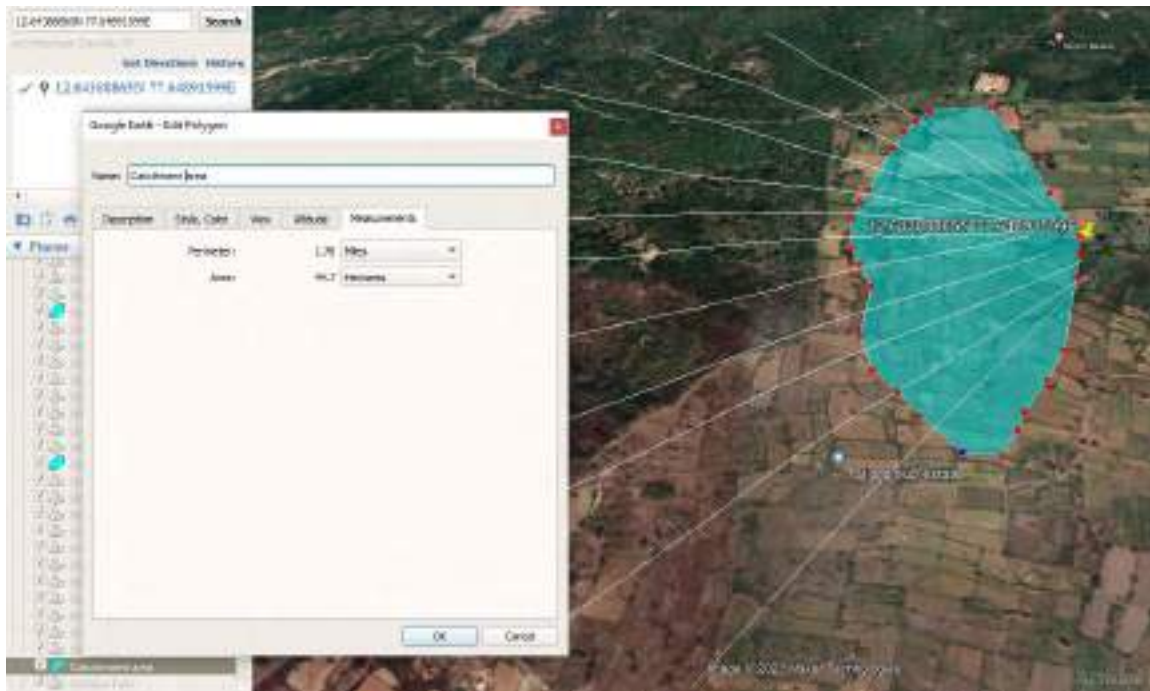


Diagram: Catchment demarcation using Google Earth Pro



Photo : Technical assessment using Total Station survey to estimate silt volume, map tank contours, and plan systematic desilting and storage enhancement.



***Photo:** Tank desilting in progress with removed silt and strengthened bunds, restoring storage capacity and improving structural stability.*

5.Outcomes and Impact

Tangible Outcomes

- Creation of 26,963 KL of additional water storage
- Recharge of two previously dry open wells
- Revival of fallow agricultural lands and increased vegetable cultivation
- Improved and reliable water access for cattle and small ruminants

Ecological and Social Outcomes

- Reduction in human–elephant conflict due to improved water availability within the tank
- Visible improvement in green cover and micro-ecosystem around the tank
- Strengthened community ownership through Water User Groups and child-led initiatives

Voices from the Village

- **Mr. Ramchidrapa:** *“Tank renovation helped keep wild animals away and improved village safety.”*
- **Mr. Suresh:** *“After leaving my land uncultivated for a decade, I have resumed farming.”*



Photo: Revived tank with increased water storage and improved surplus weir height, ensuring enhanced water availability and safe overflow management.

6. Learnings and Replication Potential

- Nearly 80% of the tank bed was desilted; deeper clay layers beyond 2 metres were retained to avoid infiltration risks
- Community-led tank restoration is most effective when technical rigour, ecological sensitivity, and local ownership are integrated
- The model is highly replicable in semi-arid villages facing groundwater depletion

7. Conclusion

The Gangadevanapalli Tank Renovation Project demonstrates how integrated technical planning combined with strong community institutions can successfully revive degraded water bodies. Beyond restoring storage capacity, the intervention strengthened livelihoods, reduced ecological conflict, and rebuilt social cohesion—offering a robust and replicable model for village-level water governance.

Did You Know?

Biodiversity Improvement through Village Pond Restoration (2023–2025)

Between 2023 and March 2025, the MYRADA–Cipla Limited partnership restored eight village tanks around Bengaluru through desilting, removal of invasive species, native grass bunding, and creation of bird islands, which revitalised wetland ecosystems and local biodiversity; conservation and planting of native species such as *Aegle marmelos*, *Butea monosperma*, and *Ficus benghalensis* led to the return of aquatic plants, fauna, and diverse bird species.

Species	Observation	Ecological Significance
Red Avadavat (<i>Amandava amandava</i>)	Bright red breeding plumage observed	Indicator of breeding habitat quality
Scaly-breasted Munia (<i>Lonchura punctulata</i>)	Common along reed-grass edges	Healthy grassland–wetland interface
White-breasted Waterhen (<i>Amaurornis phoenicurus</i>)	Frequent vocal presence	Low-disturbance wetland margins
Darter (<i>Anhinga</i> spp.)	Regular sightings across multiple lakes	Fish abundance and habitat complexity

Seasonal monitoring documented rare and ephemeral species, while sites near forest corridors—such as Sillegowander Kere —highlighted the role of village ponds in landscape connectivity and ecological resilience.



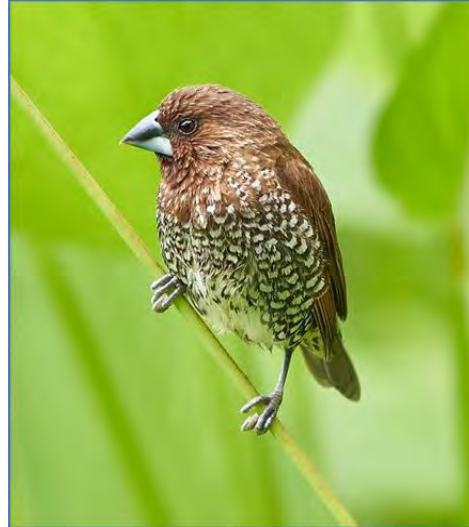
White-breasted Waterhen
(*Amaurornis phoenicurus*)



Darter (*Anhinga* spp.)



Red Avadavat (*Amandava amandava*)



Scaly-breasted Munia
(*Lonchura punctulata*)



Alysicarpus bupleurifolius var. *gracilis* –
Annual legume



Enicostema axillare

PROMISING PRACTICE 15

Water Body Renovation Begins with the Feeder Channel

Donor: AMPYR

Location: Jannenahalli, Chitradurga District, Karnataka

1. Introduction and Context

In semi-arid regions, the effectiveness of tanks and small water bodies depends not only on storage capacity but, critically, on the condition of their feeder and diversion channels. In many dryland landscapes, tanks fail not because they lack capacity, but because rainfall runoff never reaches them. Over time, neglect of feeder channels—through siltation, vegetation growth, and encroachments—disrupts natural hydrological connectivity, rendering even structurally sound tanks ineffective.

Recognising this challenge, MYRADA adopted a “channel-first” approach to water body renovation in Chitradurga District. Instead of focusing only on tank desilting, the intervention prioritised restoration of feeder and diversion channels to re-establish natural inflows. This approach ensured efficient capture of surface runoff, reduced repeated siltation, enhanced groundwater recharge, and improved irrigation reliability for downstream farmers.



Photo: Satellite image illustrating the feeder channel network and interconnected tank cascade system, highlighting natural runoff pathways and hydrological linkages.

2. Overview of the Area

Chitradurga District lies in the semi-arid zone of Karnataka and is characterised by erratic rainfall, hard rock geology, and limited surface water resources. Agriculture is predominantly rainfed, with farmers depending on monsoonal rainfall, traditional tanks, and cattle ponds for crop cultivation and livestock needs. The terrain is undulating, interspersed with dryland farming plots, while livestock plays a critical role in household livelihoods.

Challenges Related to Land and Water

Over time, many cattle ponds and small reservoirs became defunct due to neglect of their feeder channels. Diversion drains were clogged with silt and invasive vegetation, obstructing water flow. As a result:

- Tanks filled poorly or not at all
- Groundwater recharge declined
- Uncontrolled runoff increased erosion and silt deposition
- Farmers faced unreliable irrigation and fodder shortages

3. Intervention and Stakeholder Engagement

3.1. Summary of the Intervention

The intervention prioritised the restoration of feeder and diversion channels before tank renovation. Supply channels were deepened, widened, realigned, and cleared of vegetation to restore natural water flow. Trench-cum-bund structures were constructed along channels to slow runoff, reduce erosion, and minimise silt inflow into tanks.

As a result:

- Five interconnected cattle ponds now fill sequentially
- Approximately 3.7 billion litres (≈ 3.7 million m³) of surface runoff are harvested annually
- Nearly 50 hectares of farmland, owned by 23 farmers, receive irrigation benefits



Photos: Newly constructed feeder channel guiding surplus runoff from agricultural fields into the tank system, preventing erosion and restoring natural inflow patterns.

3.2. Stakeholders Involved

- Village Watershed Committee (VWC)
- Local farmers and Self-Help Groups (SHGs)
- MYRADA field team and engineers
- Panchayat representatives
- Donor agency and technical consultants

3.3. Community Engagement

The intervention was planned and executed through participatory processes. Beneficiary farmers identified problem points along the channels and contributed labour during implementation. Women's SHGs played an active role in monitoring channel functionality and ensuring regular maintenance of feeder systems supplying reservoirs such as Jannenahalli Main Tank and Go-Katte Reservoir.

4. Technical Design and Components

4.1. Site Selection and Feasibility

Sites were selected based on slope gradient, condition of tanks and channels, and proximity to agricultural fields. Jannenahalli Main Tank, with a 700-m embankment (2.44 m height) and a command area of 21.73 ha, was prioritised due to its high downstream impact potential. GIS mapping and Participatory Rural Appraisal (PRA) were used to validate site selection.

4.2. Design Elements

- Interconnection of cattle ponds to enable sequential filling
- Diversion channels deepened, widened, and realigned to maintain designed discharge
- Desilting and bush clearance along flow paths
- Trench-cum-bund structures on both sides of channels to prevent erosion and silt deposition

4.3. Environmental and Safety Measures

All earthworks followed natural drainage alignments to avoid altering local hydrology. Tree cutting was avoided, and vegetation clearance was limited to invasive bushes. Silt traps were installed near embankments, including at the structurally sound Go-Katte Reservoir embankment (4,880 m³), to minimise sediment inflow.

4.4. Operation and Maintenance

The Village Watershed Committee assumed responsibility for periodic channel cleaning and bund repairs, supported through cost-sharing arrangements among the 23 beneficiary farmers managing nearly 50 ha of command area.

4.5. Technology and Innovation

The intervention combined traditional pond-interlinking concepts with modern engineering approaches such as contour-aligned trench-cum-bund systems. This “channel-first” strategy ensured efficient filling of tanks without repeated desilting, making the solution both low-cost and durable.

5.Outcomes and Sustainability

5.1. Water Resource Creation and Use

The restored feeder channels and interconnected ponds now function as a seasonal water-harvesting network, capturing approximately 3.7 billion litres of surface runoff annually. The Go-Katte Reservoir alone supports irrigation for 8.53 ha, while the combined system benefits 30–50 ha downstream.

5.2. Economic and Agricultural Benefits

- Timely irrigation and reduced dependence on diesel pumping
- Improved crop yields reported by farmers along the channel
- Diversified cropping patterns:
 - o *Kharif*: Pearl millet, maize
 - o *Rabi*: Chickpea
 - o *Vegetables*: Onion, tomato
- Increased fodder availability supporting livestock productivity

5.3. Social and Environmental Impact

- Reduced waterlogging and visible greening along channels
- Enhanced participation of women and youth in water management
- Strengthened collective responsibility through SHGs and watershed institutions

5.4. Sustainability Considerations

- Restoring feeder channels upstream ensures long-term tank functionality
- Community cost-sharing improves ownership and accountability
- Integration with watershed institutions supports long-term maintenance and replication under NRM, MGNREGS, and CSR programmes



Photos: Strengthened and widened tank bund to enhance storage capacity and safety during high inflow

6. Learnings and Replication Potential

6.1. Key Learnings

- Water body renovation must begin with restoring feeder channels
- Tank desilting alone is ineffective if inflow systems are blocked
- Simple trench-cum-bund designs significantly reduce siltation
- Community-led maintenance is essential for sustainability

6.2. Scalability

This low-cost, replicable model is well suited for semi-arid regions with degraded tanks and cattle ponds. With basic data on catchment areas, storage capacities, and flow volumes, the approach can be scaled through watershed development programmes across similar geographies.



Photo: Floriculture using micro-irrigation enabled by improved tank water availability.

7.Conclusion

The experience from Chitradurga shows that restoring feeder and diversion channels must precede tank renovation. The “channel-first” approach improved hydrological connectivity, revived linked ponds and tanks, enhanced groundwater recharge, reduced silt inflow, and expanded irrigation benefits. Combining engineering with community participation ensured cost-effectiveness, local ownership, and sustainability, offering a practical, replicable model for semi-arid water security and climate-resilient agriculture.

Did you know? Raja Kalvai (Stormwater Drains) – Purpose & Issues

Raja Kalvai (or Rajakaluve) are Bengaluru’s historic stormwater drains linking tanks, lakes and wetlands. Built to channel rainwater from higher areas to lower ones, they once prevented flooding, supported irrigation and indirectly recharged groundwater. Today the city has about 859 km of these drains, but only 490 km have been remodelled. Surveys have identified 2,600+ encroachments and over 1.34 lakh houses within their buffer zones, severely reducing their capacity. Many stretches are clogged with silt and untreated sewage, turning them into polluted channels and causing urban flooding during heavy rains. Reviving, cleaning and widening these drains is crucial for successful tank rejuvenation projects.

(Sources: Bangalore Mirror, The Hindu, BBMP storm water drain data 2022–23)

PROMISING PRACTICE 16

Kalyani (Traditional Stepwell) Rejuvenation for Community Water Security and Cultural Revival

Donor: AHT (Ashraya Hastha Trust), Bengaluru; GE Oil & Gas India Pvt. Ltd.

Location: Kolar and Ballari Districts, Karnataka

1. Introduction and Context

Kolar and Ballari districts lie in the semi-arid zone of Karnataka and are marked by low and erratic rainfall, recurrent droughts, and increasing dependence on groundwater. Traditionally, water security in these regions was supported by an integrated system of tanks, ponds, and Kalyanis (traditional stepwells), which served multiple purposes—domestic water supply, livestock needs, irrigation support, and religious and cultural functions.

Over time, neglect, pollution, encroachment, and structural deterioration led to the decline of many Kalyanis. As borewells replaced traditional systems, groundwater levels fell, and the cultural connection between communities and their water heritage weakened. Recognising the dual importance of water security and cultural preservation, MYRADA initiated the rejuvenation of selected Kalyanis to restore their functional role while reviving community stewardship and cultural value.

2. Overview of the Area

Kolar and Ballari districts experience semi-arid climatic conditions with limited surface water availability and high seasonal variability. Agriculture and livestock rearing are major livelihood activities, heavily dependent on groundwater extracted through borewells.

Historically, Kalyanis functioned as reliable water sources that buffered communities against droughts. Their decline has contributed to increased pressure on groundwater and reduced availability of water for livestock and supplementary irrigation.

Key Challenges Related to Land and Water

- Depletion of groundwater due to excessive borewell dependence
- Pollution of open water bodies from greywater inflow and solid waste dumping

- Structural decay of traditional stepwells
- Limited water availability for domestic use, agriculture, and livestock
- Weakening of community engagement with traditional water heritage



Photo: Field visit to a traditional Kalyani (stepwell) by project staff, highlighting the condition of heritage water structures.

3. Intervention and Stakeholder Engagement

3.1. Summary of the Intervention

The intervention focused on identifying, restoring, and protecting traditional Kalyanis to enhance groundwater recharge, surface water storage, and community water access. Key activities included de-silting, strengthening stone masonry walls and steps, restoring inlets and outlets, fencing, and reviving functional water-use linkages.

- **Ballari:** A nearby village pond was hydraulically connected to the Kalyani through a pipeline, transforming it into an active storage and distribution structure. Stored water is pumped for community horticulture using drip irrigation, and a dedicated cattle water trough is also constructed.

- **Kolar:** The Kalyani is located within a temple complex, providing natural protection from pollution. Restoration included desilting, fencing, solar lighting, and preservation of a chemically untreated mango grove catchment to ensure clean recharge. Nearby open wells and borewells showed improved water levels post-restoration.

3.2. Stakeholders Involved

- Gram Panchayats and Village Watershed Committees (VWCs)
- Temple committees and traditional custodians
- MYRADA
- CSR partners

3.3. Community Engagement

Communities actively participated in site identification, documentation of traditional knowledge, and labour contribution. In Kolar, religious sanctity ensured long-term protection of the Kalyani. In Ballari, farmers and livestock owners collectively planned water reuse for irrigation and cattle needs, strengthening ownership and accountability.

4. Technical Design and Components

4.1. Site Selection and Feasibility

- Historical relevance and cultural significance
- Structural condition and recharge potential
- Catchment quality and protection status
- Proximity to agricultural land and existing water sources

4.2. Design Features

- De-silting and repair of stone masonry walls and steps
- Restoration of inlets with basic filtration arrangements
- Fencing and access control (Kolar)

Ballari-specific components:

- o Pipeline connecting village pond to the Kalyani
- o Pumping system for community drip irrigation
- o Construction of a concrete cattle water trough



***Photo:** Diversion of surplus water from the village tank through a sluice channel into the Kalyani, demonstrating integration of traditional water structures with the local tank system.*

4.3. Environmental and Safety Measures

- Solar lighting installed around the Kolar Kalyani
- Chemical-free mango grove catchment preserved in Kolar
- Safety fencing, signboards, and vegetative filters
- Temple-based cultural protection minimized misuse and pollution

5. Operation and Maintenance

- **Kolar:** Temple committees and local volunteers manage routine upkeep
- **Ballari:** The VWC oversees irrigation scheduling, pump operation, and pipeline maintenance.
- Periodic cleaning, monitoring, and community inspections are institutionalised

6. Technology and Innovation

- Geo-tagging and digital documentation of restored structures
- Integration of gravity flow, pumping systems, and solar lighting
- Use of low-cost, locally available filtration materials

7. Outcomes and Sustainability

Water Resource Creation and Use

- Ballari Kalyani functions as a storage reservoir supplying community irrigation
- Improved groundwater recharge observed in nearby wells in Kolar
- Dedicated cattle water access created in Ballari
- Continued ritual use reinforces functional relevance

Economic and Agricultural Benefits

- Irrigation support to 5 acres of horticulture in Ballari
- Reduced water stress for livestock owners
- Local employment generated through MGNREGS and CSR-supported works

Social and Environmental Impact

- Reduced pollution through fencing and cultural stewardship
- Strengthened community cohesion
- Return of birds and aquatic life in restored Kalyanis
- Increased awareness among youth and school children on traditional water systems

Sustainability Considerations

- Temple management ensures long-term care in Kolar
- The VWC manages water use and maintenance in Ballari.
- Solar lighting and fencing prevent misuse
- Integration into Gram Panchayat Development Plans (GPDs) supports sustained funding

8. Learnings and Replication Potential

Key Learnings

- Heritage conservation combined with functional water use enhances sustainability
- Temple-based Kalyanis receive stronger protection than open-water bodies
- Linking stepwells to irrigation and livestock use restores relevance
- Cultural and spiritual ownership is critical for long-term maintenance

Scalability

- Highly replicable in drought-prone and culturally rich regions
- Suitable for convergence with Jal Shakti Abhiyan, CSR initiatives, and heritage programmes
- Significant potential to map and rejuvenate unused Kalyanis across Karnataka
- Digital documentation supports monitoring, fundraising, and awareness



Photo: Restored Kalyani with perennial water availability, reviving its role in groundwater recharge, cultural heritage, and community water access.

9. Conclusion

The rejuvenation of Kalyanis in Kolar and Ballari demonstrates how traditional water systems can be revived to address contemporary challenges of water scarcity, climate resilience, and cultural erosion. By integrating stepwells into irrigation, livestock use, religious practices, and community stewardship, this model offers an inclusive, sustainable, and culturally grounded pathway to rural water security.

Theme III: Technology and Innovation

This section highlights appropriate and scalable technologies that enhance water efficiency, soil health, and overall resource sustainability. The practices demonstrate how scientific tools, nature-based solutions, and climate-smart innovations can reduce water stress while improving productivity and strengthening long-term resource security

PROMISING PRACTICE 17

Schools as Water Guardians – Rooftop Rainwater Harvesting for Urban Sustainability

Donor: AHT (Ashraya Hastha Trust)

Location: Devasandra, K.R. Puram, Bengaluru, Karnataka

1. Introduction and Context

Bengaluru's rapid urbanisation and population growth have placed severe pressure on its water resources. Increasing dependence on municipal supply and private water tankers, coupled with the degradation of lakes and traditional water bodies due to encroachment, sewage inflow, and solid waste dumping, has intensified urban water stress.

In this context, educational institutions emerge as strategic intervention points—not only as significant water users but also as centres for environmental learning and behaviour change. Rooftop Rainwater Harvesting (RWH), which involves capturing, filtering, storing, and reusing rainwater, offers a practical and scalable solution to reduce pressure on urban water systems. Schools, with their large roof areas and consistent non-potable water demand, are ideal settings to demonstrate this approach.



Photo: Rooftop rainwater collection system in a school building, marking the starting point of decentralised rainwater harvesting in an urban institutional setting.

2. Overview of the Area

Devasandra, located in the K.R. Puram zone of Bengaluru, is a densely populated urban locality characterised by residential neighbourhoods, schools, markets, and major transport corridors. The area is situated close to Devasandra Lake, once an important wetland ecosystem and groundwater recharge zone, now severely degraded due to sewage inflows, encroachment, and poor solid waste management.

3. Challenges Related to Land and Water

- Severe pollution and degradation of Devasandra Lake
- High surface runoff and localised flooding during monsoons
- Heavy dependence on municipal water supply and tanker water
- Limited groundwater recharge in a heavily built-up area
- Low awareness of urban water conservation practices

To reduce pressure on the lake and manage rooftop runoff effectively, school-based Rainwater Harvesting systems were introduced as decentralised urban water solutions.

4. Intervention and Stakeholder Engagement

4.1. Summary of the Intervention

Rainwater Harvesting systems were installed within school premises to capture rooftop runoff, filter it, store it for non-potable use, and divert excess water for groundwater recharge.

Rainwater from the school rooftop is filtered through 110 mm Rainy first-flush filters and conveyed into a 10,000-litre underground sump. From the sump, water is pumped into a 1,000-litre overhead Syntex tank, which is directly connected to the school's existing toilet plumbing. This enables seamless use of harvested rainwater for toilet flushing and cleaning, without major infrastructure modification.

During heavy rainfall, overflow water is diverted to recharge pits and percolation wells within the campus, preventing runoff into polluted drains or the nearby lake.

4.2. Stakeholders Involved

- School Management
- Teachers and non-teaching staff
- Students (Eco-clubs and environment groups)

- Donor – Funding support
- MYRADA – Technical support and facilitation

5. Community Engagement

Although the intervention is physically confined to the school campus, it promotes strong internal ownership. Teachers and staff were trained in system operation and maintenance, while students participate through eco-clubs, awareness activities, and basic monitoring.

The school functions as a practical learning space, enabling students to understand water conservation by observing and managing a real system, thereby extending these practices to their homes and communities.

6. Technical Design and Components

6.1 Catchment and Water Potential

- Rooftop Area: 50 m × 10 m = 500 m²
- Average Annual Rainfall (Bengaluru): ~970 mm
- Collection Efficiency Assumed: 80%

Annual Harvesting Potential:

$$500 \times 0.97 \times 0.8 \approx 388 \text{ m}^3$$

(≈ 3.88 lakh litres per year)

6.2 Filtration System

- Rainy FL-110 (110 mm) vortex filters
 - o Installed at downpipe inlets
 - o Remove dust, leaves, and first-flush contaminants
 - o Chemical-free and low-maintenance
 - o Well suited for institutional rooftop systems

6.3 Storage and Distribution

Underground Sump

- Capacity: 10,000 litres
- Brick masonry with waterproofing
- Used for non-potable water storage

Overhead Tank

- Capacity: 1,000 litres
- Provides gravity-based distribution to toilets

6.4 Pumping System

- 1 HP submersible pump
- Transfers water from sump to overhead tank
- Operated based on water-level requirements

6.5 Distribution Integration

- Overhead tank connected to existing toilet flush lines
- Minimal plumbing modification
- Low-cost, easy to operate and maintain
- Gradual increase in pipe diameter from rooftop to sump optimises flow while minimising material use



Photo: Rainwater filtration and conveyance system showing gradual increase in pipe diameter from rooftop to underground sump, optimising flow capacity while minimising material costs.

6.6 Overflow Management and Groundwater Recharge

- Excess rainwater diverted to recharge pits and percolation wells
- Prevents campus flooding
- Enhances groundwater recharge in a water-stressed urban area

7. Site Selection and Feasibility

Site Selection Criteria

- Proximity to Devasandra Lake to reduce runoff pressure
- High daily water demand (600+ students and 40+ staff)
- Adequate flat rooftop area
- Existing toilet plumbing infrastructure
- Space availability for sump, tanks, and recharge pits
- Willing participation of school management

Economic and Environmental Feasibility

- One-time investment offset by long-term savings on water bills and tanker costs
- Reduced polluted runoff entering the lake
- Improved groundwater recharge
- Strong demonstration value for urban sustainability

8. Environmental and Safety Measures

- First-flush diversion to prevent contamination
- Harvested water restricted to non-potable uses
- Monthly filter cleaning and post-monsoon inspections
- Recharge pits designed for safe overflow management

9. Operation and Maintenance

- Designated school staff responsible for routine upkeep
- Oversight by science teachers and eco-club coordinators

Monthly Checklist

- Filter and pipeline inspection; Pump functionality check
- Sump and overhead tank inspection
- Verification of flow to toilet systems

Annual Servicing

- Professional inspection of mechanical and plumbing components

Students support rainfall recording, water-level observation, and basic documentation as part of experiential learning.

10. Technology and Innovation

- Rooftop Rainwater Harvesting applied as a decentralised urban water solution
- Use of vortex-based Rainy FL-110 filters requiring no chemicals or electricity
- Gravity-based distribution reducing energy use
- Integration of water reuse and groundwater recharge within a compact campus
- Seamless adaptation to existing institutional infrastructure

11. Outcomes and Sustainability

Water Resource Benefits

- Reduced dependence on municipal supply and tanker water
- Reliable non-potable water for sanitation
- Groundwater recharge through controlled overflow
- Reduced runoff into polluted drains and the lake

Educational and Social Impact

- 600+ students and 40+ staff engaged in water stewardship
- Increased awareness of urban water challenges and solutions
- School acts as a demonstration site for sustainable practices

Sustainability

- Strong ownership by school management and students
- Low operation and maintenance requirements
- Embedded educational value ensures long-term relevance
- High replication potential across urban institutions



***Photo:** Underground rainwater storage tank supplying harvested water to an overhead tank, enabling non-potable use such as toilet flushing and reducing dependence on municipal water supply.*

12. Learnings and Replication

Key Learnings

- Institutional RWH systems are effective and manageable
- Simple technologies can deliver significant water and educational benefits
- Schools are powerful agents for urban sustainability

Scalability and Replication

- Easily replicable across urban schools
- Applicable to colleges, offices, hospitals, community halls, and housing complexes

13. Conclusion

The Rooftop Rainwater Harvesting intervention in Devasandra demonstrates how urban schools can play a pivotal role in addressing water scarcity while nurturing environmental stewardship among young citizens. By converting unused rooftop runoff into a reliable non-

potable water source and enabling groundwater recharge, the initiative reduces pressure on municipal supply and mitigates polluted urban runoff.

Beyond water savings, the practice embeds sustainability into everyday school functioning, transforming the campus into a practical learning space where students, teachers, and staff actively engage with water conservation. The simplicity of the design, low maintenance requirements, and seamless integration with existing infrastructure make this model highly replicable across urban institutions. As Bengaluru and other cities face growing water stress, schools as water guardians offer a scalable, educationally enriching, and sustainable pathway toward urban water resilience.

Did You Know?

The MYRADA Kolar Project has installed water flow meters to track rooftop runoff, groundwater recharge diversions, and washroom water use—showing how systematic monitoring enhances accountability and operational efficiency

PROMISING PRACTICE 18

Nature's Treatment Plant – Reed Bed System for Rural Wastewater Management

Donor: ITC Limited

Location: B2 – Chikkajala (Peddanahalli Village), Tumkur District, Karnataka

1. Introduction and Context

Untreated domestic wastewater discharged into surface water bodies poses serious environmental and public health risks, particularly in rural settings where lakes and open wells remain critical water sources. Conventional sewage treatment plants are often expensive, energy-intensive, and difficult to operate and maintain at the village level.

Nature-based treatment systems, such as reed bed systems, offer a low-cost, decentralised, and environmentally sustainable alternative. This Promising Practice documents the implementation of a reed bed-based sewage treatment system in Peddanahalli village, designed to treat domestic wastewater before it enters the village lake—thereby protecting water quality, ecosystems, and community health.

2. Overview of the Area

Peddanahalli is a small rural village with a population of approximately 220 people across 60 households. The village depends primarily on Peddanahalli Lake and a deep borewell for domestic and livelihood water needs. Over time, untreated household wastewater was being discharged directly into the lake, threatening its ecological health and significantly reducing its usability for the community.

3. Challenges Related to Land and Water

- Untreated domestic sewage was being discharged directly into the village lake
- Declining surface water quality and increasing pollution load
- Environmental degradation and loss of aquatic biodiversity
- Public health risks linked to contaminated water bodies
- Absence of affordable, low-maintenance wastewater treatment infrastructure

4. Intervention and Stakeholder Engagement

4.1 Summary of the Intervention

To prevent untreated sewage from entering the lake, a reed bed–based sewage treatment system was constructed near the Peddanahalli tank. The system collects domestic wastewater from 60 households, treats it through a series of natural filtration and biological processes, and releases treated water into the lake instead of raw sewage.

The intervention demonstrates how nature-based solutions can be effectively adapted to small rural settlements, offering pollution control without complex mechanical systems.

4.2 Stakeholders Involved

- Gram Panchayat, Peddanahalli
- Tank User Group (TUG)
- Local community members
- MYRADA
- ITC Limited

4.3 Community Engagement

A Tank User Group (TUG) was formed to support implementation and long-term management. Community members were oriented towards the purpose and functioning of the system and its role in protecting the lake. This participatory approach strengthened local ownership and collective responsibility for wastewater management.

5. Technical Design and Components

5.1 Site Selection and Feasibility

Objective: To intercept and treat domestic wastewater before it enters Peddanahalli Lake and reduce surface water pollution.

Location: Near the lake, enabling gravity-based interception and treatment of wastewater before discharge.

Feasibility Considerations:

- Proximity to the wastewater source
- Availability of land near the lake

- Suitability for gravity-driven flow
- Clear environmental need and strong community acceptance

5.2 Design and Treatment Process

The system follows a multi-stage natural treatment process similar to a simplified constructed wetland.

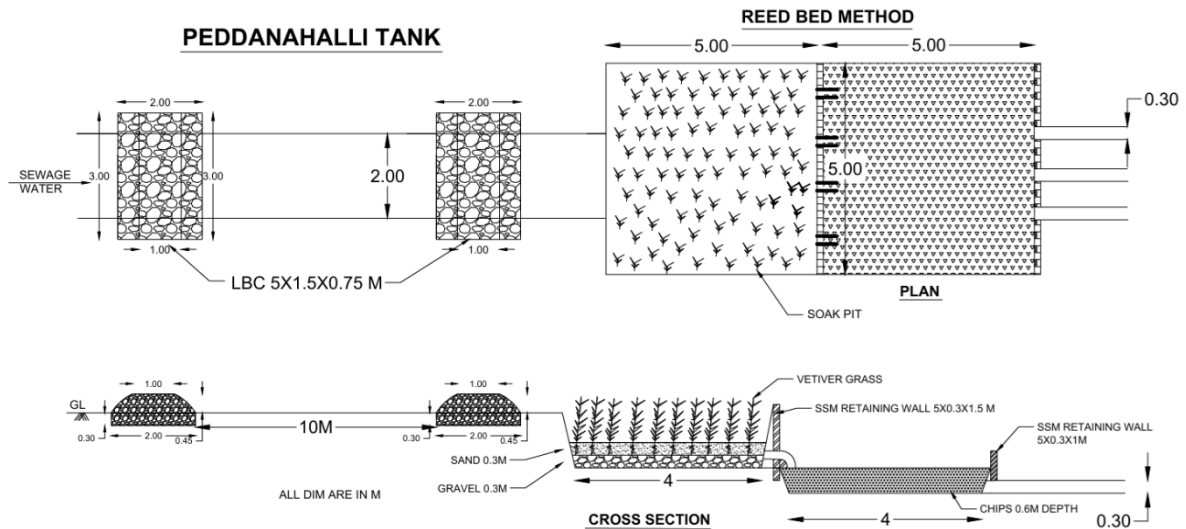


Diagram: Schematic representation of a nature-based wastewater treatment system integrated into a drainage line, illustrating sequential treatment through loose boulder checks, grass filters, and sand filtration chambers.

Treatment Stages:

- 1. Entry Stage – Loose Boulder Checks (3 Units)**
 - o Act as preliminary screening structures
 - o Reduce flow velocity
 - o Trap larger solids and floating debris
- 2. First Treatment Chamber – Grass and Sand Filter**
 - o Facilitates sedimentation
 - o Supports microbial activity for organic matter breakdown
 - o Grass roots enhance biological treatment
- 3. Second Treatment Chamber – Sand with Top-Layer Chips**
 - o Provides finer filtration
 - o Improves aerobic conditions
 - o Polishes partially treated wastewater

4. Final Collection Tank

- o Collects treated water after all treatment stages
- o Ensures only treated effluent enters the lake

This staged process enables progressive sediment removal, biological degradation, and filtration, resulting in significant improvement in effluent quality.



Photos: Step-by-step construction process; the final image shows debris and waste collected materials that would otherwise have flowed into the tank.

6. Operation and Maintenance

6.1 Operational Responsibility

- Managed by village-level “waterman” in coordination with Community-Based Organisations (CBOs)

6.2 Key Maintenance Tasks

- Routine inspection of flow paths
- Removal of debris from boulder checks
- Cleaning and upkeep of grass and sand layers
- Clearing accumulated solids and excess vegetation
- Periodic replenishment of filter media, as required

6.3 Operational Challenges

- Ensuring consistent engagement of local operators
- Preventing clogging in sand and grass layers
- Sustaining long-term performance through regular maintenance

7. Technology and Innovation

- Adoption of a nature-based wastewater treatment system using reed bed principles
- Elimination of electricity, chemicals, and mechanical components through gravity-driven flow
- Use of locally available materials such as sand, stones, grass, and chips
- Multi-stage treatment enabling sedimentation, biological degradation, and polishing
- Low-cost, decentralised alternative to conventional sewage treatment plants
- Technology tailored to village-level management capacity, ensuring long-term operability

This approach translates ecological principles into a practical and scalable rural sanitation solution.

8. Outcomes and Sustainability

8.1 Water Resource Protection

- Significant reduction in untreated wastewater entering Peddanahalli Lake
- Improved surface water quality and protection of the lake ecosystem

8.2 Social and Environmental Impact

- Reduced pollution-related health risks
- Protection and gradual revival of aquatic biodiversity
- Improved community awareness on sanitation and environmental responsibility
- Strengthened role of local institutions in water management

8.3 Sustainability

- Low operating cost and minimal technical dependence
- Community-managed system through the TUG and Gram Panchayat
- High potential for replication in similar rural contexts



Photo: Completed drainage line treatment with loose boulder checks, grass filters, and sand filter chambers, demonstrating on-ground implementation of decentralised wastewater treatment and improved water quality.

9. Conclusion

The reed bed-based sewage treatment system in Peddanahalli demonstrates how nature itself can function as an effective treatment plant. By combining simple engineering with ecological processes, the intervention provides a sustainable, affordable, and community-managed solution to rural wastewater pollution. This Promising Practice offers a replicable model for protecting village lakes while strengthening local water governance and environmental stewardship.

PROMISING PRACTICE 19

GIS-Based Planning and Monitoring for Sustainable Land and Water Management

Location: MYKAPS Programme Areas, Mysore, Karnataka; Krishnagiri District, Tamil Nadu

1. Introduction and Context

Effective management of land and water resources is central to watershed development and climate resilience. Traditionally, planning and monitoring of natural resource management (NRM) interventions relied on field surveys, farmer feedback, and visual observations. While these approaches remain valuable, they are often time-consuming, resource-intensive, and limited in providing scientific and spatial evidence of change over time.

To address these limitations, the MYKAPS programme has systematically adopted Geographical Information Systems (GIS) as a decision-support and monitoring tool. GIS enables the visualization, analysis, and tracking of changes in land use, cropping patterns, vegetation cover, drainage systems, and water resources across seasons and years. By integrating remote sensing with field validation, GIS strengthens planning accuracy, improves monitoring efficiency, and enhances transparency in communication with communities, donors, and government agencies.

2. Overview of Practice

The practice involves the systematic use of GIS and remote sensing tools to support watershed planning, implementation monitoring, and impact assessment. Satellite imagery and spatial datasets are analysed to understand baseline conditions, guide the placement of soil and water conservation interventions, and assess post project-intervention outcomes related to land productivity and water availability.

3. Methodology

3.1 Shapefile Preparation

Digital shapefiles of watershed boundaries are prepared as the base layer for all spatial analysis and mapping activities.

3.2 Google Earth Engine (GEE)

Java-script programming within Google Earth Engine (GEE) is used to process and analyse satellite imagery across multiple seasons and years, enabling large-scale temporal analysis.

3.3 Remote Sensing Datasets

The following datasets are used for temporal and spatial analysis:

- Landsat 5, 7, and 8 imagery, Sentinel-2 and SRTM-DEM
- Earth Explorer datasets

These datasets support elevation mapping, land-use classification, vegetation assessment using NDVI, stream order mapping, and surface water spread area analysis.

3.4 Hydro-Basin Modelling

Hydrological data are analysed at basin scales ranging from 1,000 to 10,000 hectares to understand runoff patterns, drainage behaviour, and watershed responses to rainfall.

3.5 Analysis of Before-and-After Interventions

Satellite images from pre- and post-intervention periods are compared to assess the impact of structures such as check dams, recharge pits, contour bunds, and other soil and water conservation measures.

3.6 Cropping Intensity Measurement

Cropping intensity is calculated as the ratio of total cropped area to total arable land. This serves as a key indicator of improved land and water productivity following watershed interventions.

3.7 Land Use and Land Cover Mapping

Land use and land cover (LULC) maps classify and colour-code areas into categories such as vegetation, barren land, settlements, roads, and water bodies, enabling clear interpretation and communication of temporal and spatial changes.

4. Integration with Field Work

GIS analysis under the MYKAPS programme is always complemented by ground-truthing and expert field verification. For example, stream order and drainage maps help identify potential locations for check dams or recharge structures. However, final decisions incorporate soil type, slope stability, land ownership, and community priorities through field visits and participatory planning processes.

This integration ensures that scientific spatial planning remains context-specific, socially acceptable, and practically relevant.

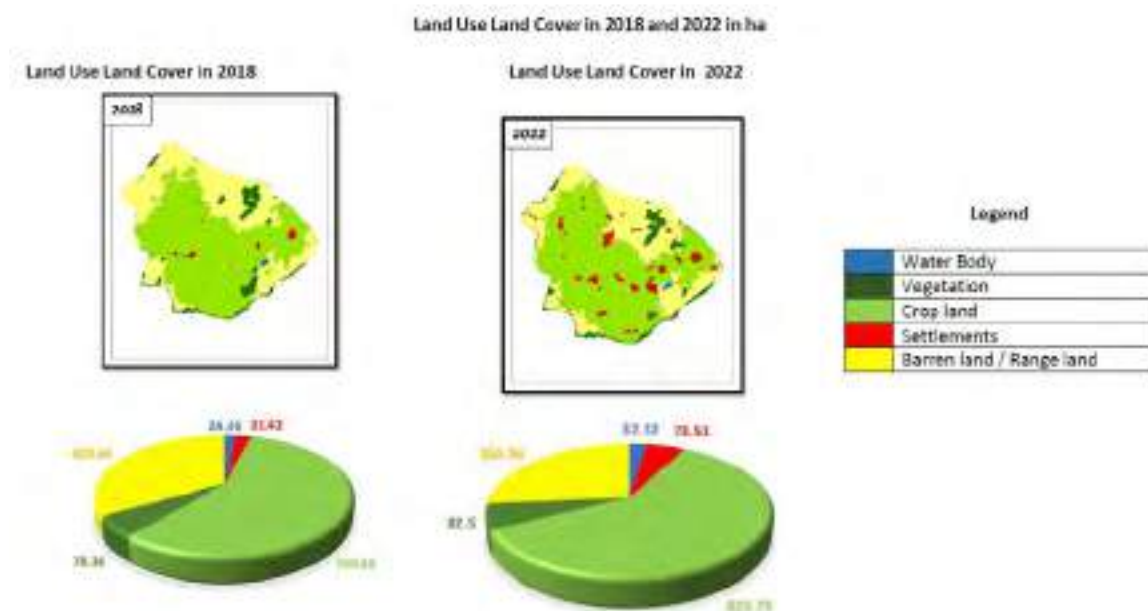


Diagram: Land use and land cover (LULC) classification for 2018–2022 generated through GIS analysis, depicting changes in agriculture, vegetation, water bodies, settlements, and infrastructure to support evidence-based watershed planning and monitoring.

5. Technology and Innovation

- Integration of Geographical Information Systems (GIS) as a decision-support tool for land and water management
- Use of remote sensing and satellite imagery for evidence-based planning and monitoring
- Application of before-and-after spatial analysis to objectively assess intervention impacts

- Combination of open-source platforms (QGIS) and advanced tools (ArcGIS, Google Earth Engine) for flexibility and scalability
- Visual mapping used as a communication and accountability tool for communities, donors, and government agencies
- Blending scientific spatial analysis with participatory field validation to ensure contextual relevance

6. Outcomes and Impact

The application of GIS under the MYKAPS programme has generated multiple tangible benefits:

6.1 Evidence-Based Planning

Stream order and drainage maps support scientifically sound placement of soil and water conservation structures.

6.2 Improved Monitoring

Before-and-after satellite imagery clearly demonstrates improvements in vegetation cover, cropping intensity, and surface water spread.

6.3 Operational Efficiency

Reduced dependence on labour-intensive field surveys saves time and financial resources while improving analytical depth.

6.4 Enhanced Donor Confidence

Visual and scientific outputs strengthen accountability, transparency, and credibility in reporting project outcomes.

6.5 Farmer and Livelihood Benefits

Treated watersheds show improved groundwater recharge, increased cropping intensity, and reduced soil erosion.

6.6 Effective Communication

Maps and visual outputs are easily understood by communities, enhancing participation, transparency, and ownership.

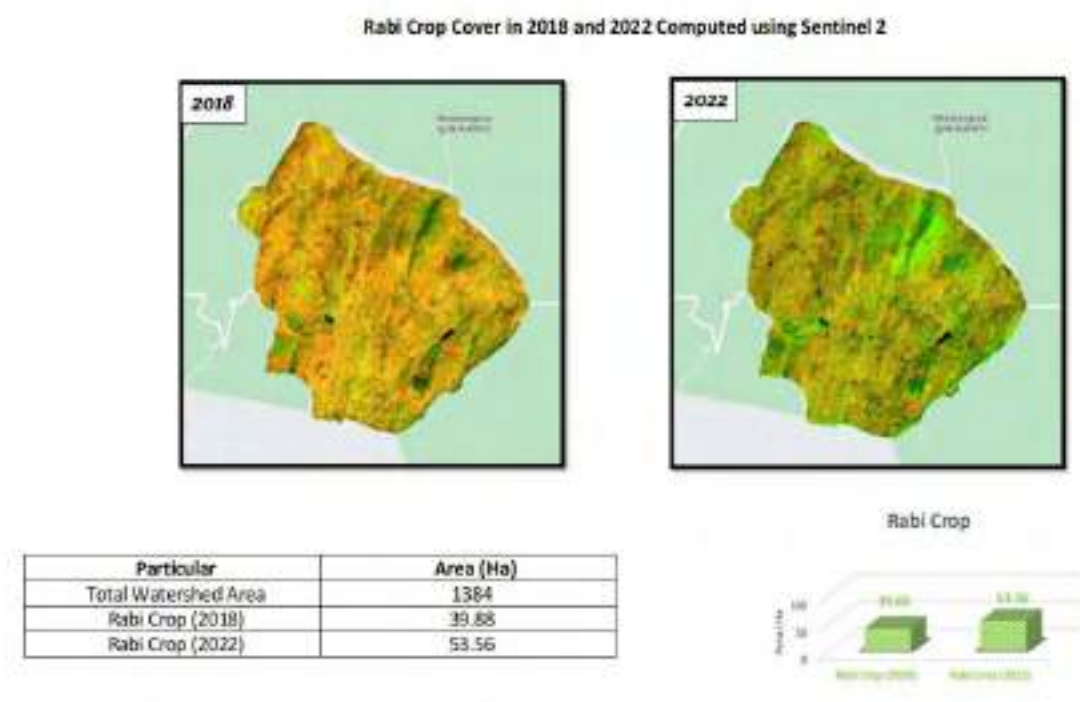


Diagram: Change in rabi crop cover between 2018 and 2022 derived from Sentinel-2 satellite imagery, illustrating spatial expansion of cultivated areas following land and water management interventions.

7. Sustainability and Replication Potential

The GIS-based approach is both sustainable and highly scalable:

- **Low-Cost Options:** Open-source platforms such as QGIS enable effective analysis without high software costs, while advanced tools like ArcGIS can be used where resources permit.
- **Capacity Building:** Local staff can be trained in GIS applications, reducing long-term dependence on external consultants.
- **Scalability:** The methodology can be applied across diverse agro-ecological regions with minimal adaptation.
- **Balanced Approach:** Combining spatial analysis with field verification ensures reliability even under variable rainfall and terrain conditions.

This model is well suited for replication in watershed development, NRM, and climate resilience programmes.

8. Key Learnings

- GIS provides strong scientific and visual evidence that enhances planning, monitoring, and reporting.
- Rainfall variability can affect satellite interpretation, making field validation essential.
- Open-source GIS tools make spatial analysis accessible even for small and medium-scale projects.
- GIS is most effective when integrated with participatory, community-based planning.
- Visual maps are powerful tools not only for donors but also for community mobilisation and capacity building.

9. Conclusion

The GIS-based planning and monitoring approach adopted under the MYKAPS programme demonstrates how spatial science can significantly strengthen land and water management interventions. By integrating remote sensing, GIS analysis, and participatory field validation, the practice enables more accurate planning, efficient monitoring, and transparent communication of impacts. This Promising Practice offers a scalable, cost-effective, and evidence-driven model for enhancing watershed governance, climate resilience, and sustainable natural resource management.

PROMISING PRACTICE 20

Automation in Irrigation through IoT-Based Soil and Weather Monitoring Systems

Donor: NABARD

Location: Nambiyur Block, Erode District, Tamil Nadu

1. Introduction and Context

In Erode District, Tamil Nadu—particularly in the Nambiyur region—agriculture is increasingly constrained by water scarcity, groundwater quality issues, and declining availability of farm labour. In response, many farmers have adopted micro-irrigation systems such as drip irrigation to improve water-use efficiency. These systems have reduced water consumption by up to 40 percent and enabled fertigation, contributing to improved crop productivity.

However, persistent challenges remain. Groundwater drawn from deep aquifers often has high hardness, resulting in frequent clogging of drip lines and reduced system efficiency. Labour shortages further affect timely irrigation, especially for water-intensive crops such as banana, which require frequent and precise watering.

To address these constraints, MYRADA facilitated the introduction of IoT-based semi-automated irrigation systems. These systems integrate soil moisture sensors, weather monitoring, and automated control mechanisms to enable precise, need-based irrigation. The approach reduces manual intervention, optimises water use, and enhances farmers' capacity to manage irrigation efficiently and remotely.

2. Overview of the Area

Nambiyur Block in Erode District receives moderate rainfall and has soils suitable for both horticultural and agricultural crops. Despite this, the groundwater table is under increasing stress due to continuous extraction, and water quality poses challenges for irrigation infrastructure.

Farmers commonly cultivate water-demanding crops such as banana, areca nut, and groundnut, along with vegetables like ridge gourd. On Mr. Palanisamy's 15-acre farm, irrigation water is sourced from seven borewells, with open wells occasionally used as storage

tanks. Under these conditions, efficient and timely irrigation management is critical for sustaining farm productivity and profitability.

3. Intervention and Stakeholder Engagement

3.1 Summary of the Intervention

With support from government subsidy schemes and technical partners, Mr. Palanisamy installed a semi-automated irrigation and fertigation system combining wired and wireless IoT technologies. The system includes:

- **Soil Moisture Sensors:** Installed in crop root zones for real-time moisture monitoring
- **Weather Station:** Records rainfall, temperature, and humidity
- **Gateway Controller:** Integrates sensor data and enables centralised control
- **Drip Controller:** Automates irrigation through solenoid valves based on schedules or sensor feedback
- **Pump and Filter Unit:** Supplies clean, pressurised water to drip lines
- **Solar Panels:** Power the system, including eight solenoid valves, ensuring reliability during power outages
- **Safety Valve:** Diverts water back to the well in case of valve malfunction, preventing water loss



The entire system is monitored and controlled through the DCON mobile application, enabling remote operation. The total project cost was approximately ₹3 lakhs, with a farmer contribution of ₹85,000 (2025), demonstrating affordability when supported by subsidies.



Photo: Central control unit of the automated irrigation system, containing controllers, solenoid valves, pipelines, and fertigation equipment that regulate water and nutrient delivery across the farm.



Photo: District Collector visiting the automated weather station providing real-time data on rainfall, temperature, humidity, and wind speed, supporting data-driven irrigation scheduling.



Photo: KVK team visiting the IoT-installed banana field, where the crop exhibits healthy and vigorous growth.

3.2 Stakeholders Involved

- Mr. Palanisamy – Progressive farmer and Director of the local Farmer Producer Organisation (FPO)
- MYRADA – ICAR KVK, Erode – Facilitation, technical guidance, and handholding
- Mobitech Wireless Solutions – Technology supply and installation support
- Government Departments – Provision of subsidies for irrigation automation



Photo: KVK scientist visiting the IoT-enabled field to discuss irrigation practices.

3.3 Community Engagement

Mr. Palanisamy's farm functions as a demonstration site for neighbouring farmers and FPO members. Field visits, peer learning, and interactions have helped build awareness of IoT-based irrigation benefits, encouraging wider adoption of semi-automated systems within the local farming community.

4. Technical Design and Components

4.1 Site Selection and Feasibility

The 15-acre farm was selected due to the presence of water-intensive crops, multiple water sources, and limited labour availability. The size and complexity of irrigation operations made manual management inefficient, highlighting the suitability of automation.

4.2 System Design

- Hybrid wired and wireless system architecture
- Solar-powered sensors and solenoid valves
- Mobile application-based remote control
- Fertigation tanks integrated with filtration systems
- Real-time, data-driven irrigation scheduling

5. Environmental and Safety Measures

- Pressure relief mechanisms to prevent pipeline damage
- Safety valves to reduce the risk of accidental water wastage
- Solar energy use to minimise carbon footprint and dependence on grid electricity

6. Operation and Maintenance

- Minimal manual intervention through automated scheduling
- Reduced clogging due to effective filtration systems
- Reliable performance during power cuts
- Low maintenance requirements supported by system alerts and periodic checks

7. Technology and Innovation

- Introduction of IoT-based semi-automated irrigation systems tailored for medium and large farms

- Real-time soil moisture and weather monitoring enabling need-based irrigation
- Mobile application-based remote control reducing labour dependency and response delays
- Solar-powered sensors and valves ensuring uninterrupted operation
- Integration of fertigation, filtration, and safety mechanisms for efficient and secure system performance
- Practical balance between affordability and advanced automation, improving adoption feasibility

8. Outcomes and Impact

8.1 Water Resource Optimisation

- Approximately 20 percent water savings by avoiding unnecessary irrigation
- Improved timing and precision of water application
- Reduced energy consumption through efficient pump operation

8.2 Economic and Agricultural Benefits

- Expansion of cultivated area using the same volume of water
- Lower operational costs due to reduced labour and energy use
- Improved fertigation efficiency and reduced chemical inputs
- Enhanced crop health and yield

8.3 Social and Environmental Impact

- Promotion of sustainable groundwater management
- Reduced dependence on migrant and seasonal labour
- Increased digital literacy and confidence among farmers
- Lower environmental impact through energy efficiency and reduced runoff

9. Sustainability and Replication Potential

The system is powered by renewable energy and constructed using durable components, ensuring long-term functionality. With appropriate training, subsidy support, and involvement of Farmer Producer Organisations, IoT-based semi-automated irrigation systems are practical and sustainable for medium and large farmers. Continued institutional and technical support will be critical for scaling adoption.

10. Key Learnings

- Semi-automation provides an effective balance between affordability and technological advancement
- Real-time monitoring enables informed and timely irrigation decisions
- Government subsidies significantly improve adoption feasibility
- Demonstration farms are powerful tools for technology diffusion

11. Scalability

This model is highly replicable in water-stressed regions. With minor local adaptation, access to financing, and technical support, similar IoT-based irrigation systems can be implemented across Tamil Nadu and other semi-arid agricultural regions.

12. Conclusion

The IoT-based semi-automated irrigation system implemented in Nambiyur Block demonstrates how digital technologies can effectively address contemporary challenges of water scarcity, labour shortages, and inefficient irrigation practices. By integrating real-time soil and weather monitoring with automated control and renewable energy, the intervention enhances water-use efficiency, farm productivity, and resilience. This Promising Practice offers a scalable and practical pathway for modernising irrigation management while promoting sustainable groundwater use in semi-arid agricultural landscapes.

PROMISING PRACTICE 21

Rice Revolution – Water-Smart Farming through System of Rice Intensification (SRI)

Donor: Hindustan Unilever Limited (HUL)

Location: Puducherry (Union Territory)

1. Introduction and Context

Rice is the staple food and the dominant agricultural crop in Puducherry, a coastal Union Territory with a large agrarian population. Conventional paddy cultivation practices rely on continuous flooding, high seed rates, and intensive input use, resulting in excessive water consumption and rising production costs.

With declining groundwater levels, increasing pressure on irrigation sources, and growing climate variability, there is an urgent need for water-efficient and climate-resilient rice cultivation practices. In response, the “Prabhat Water Stewardship Program” introduced the System of Rice Intensification (SRI) as a sustainable alternative to conventional flooded paddy cultivation.

2. Overview of the Area

Agriculture in Puducherry depends largely on groundwater sources. Paddy occupies a major share of the cultivated area, but traditional cultivation practices have led to:

- High irrigation water demand
- Rising cultivation costs
- Gradual soil degradation
- Stagnant or marginally declining yields

These challenges underscore the need for improved water and input efficiency in rice production.

3. Key Challenges Related to Land and Water

- Excessive water use in conventional flooded paddy cultivation (approximately 6 million litres per acre per season).
- Declining groundwater levels due to over-extraction

- Limited awareness of water-saving rice technologies
- High input costs with modest yield gains
- Low adoption of climate-resilient agronomic practices

4. Intervention and Stakeholder Engagement

4.1 Summary of the Intervention

The project promoted System of Rice Intensification (SRI) to reduce water use, lower cultivation costs, and improve paddy yields. The approach focused on farmer-centred capacity building through:

- On-field demonstrations
- Field day celebrations
- Village-level meetings
- Promotion of local farmer champions

4.2 Stakeholders Involved

- Hindustan Unilever Limited (HUL) – Donor
- Department of Agriculture, Puducherry (Uzhavar Udhaviyagam)
- Community Resource Persons (CRPs)
- Agricultural Universities and Subject Matter Experts
- MYRADA – Facilitation, training, and monitoring

4.3 Community Engagement

- Hands-on demonstrations of SRI practices at field level
- Exposure visits and farmer-to-farmer learning
- Identification and support of local SRI champion farmers
- Continuous engagement through village meetings and advisory support

5. Technical Design and Components

5.1 Site Selection and Feasibility

- Willingness of farmers to adopt and demonstrate SRI practices
- Availability of field-level irrigation control
- Suitability of land for line planting and alternate wetting and drying

5.2 Key SRI Practices Promoted

- Transplanting young seedlings (8–14 days old)
- Single seedling per hill
- Wider spacing (25 × 25 cm) in square planting
- Mechanical weeding using Cono weeders
- Alternate Wetting and Drying (AWD) instead of continuous flooding
- Soil-test-based nutrient application
- Increased use of organic and bio-inputs with reduced chemical dependency



Photo: Line transplanting of young rice seedlings at 25 × 25 cm spacing using rope markers, a core SRI practice that improves root development, aeration, and water-use efficiency.



Photo: Demonstration of the Cono weeder for mechanical weed management, enhancing soil aeration, reducing labour drudgery, and improving crop vigour under SRI.



Photo: Perforated PVC field water tube used to monitor soil moisture and guide Alternate Wetting and Drying (AWD), enabling timely irrigation and significant water savings under SRI

6. Environmental and Safety Measures

- Reduced use of chemical fertilizers and pesticides
- Promotion of organic inputs to improve soil health
- Safety orientation on the use of Cono weeders

7. Operation and Maintenance

- Regular technical guidance from MYRADA agronomists
- Monitoring of irrigation schedules and crop stages
- Periodic evaluation of crop growth and yield performance

8. Technology and Innovation

- Adoption of SRI as a water-efficient alternative to flooded paddy
- Use of Cono weeders to improve soil aeration and reduce labour
- AWD practice optimising water use without yield reduction
- Reduced seed rate and wider spacing enhancing root growth and plant vigour
- Integration of organic inputs to strengthen soil biological activity
- Farmer-led demonstrations accelerating behavioural change

9. Outcomes and Impact

9.1 Water Resource Efficiency

- 30–40% reduction in irrigation water use per acre
- Improved soil aeration and moisture regulation
- Reduced pressure on groundwater sources

9.2 Economic and Agricultural Benefits

- Paddy yield increase of 225–300 kg per acre
- Significant reduction in seed requirement
- Lower expenditure on fertilizers and pesticides
- Improved net farm income

9.3 Social and Environmental Impact

- Increased participation of women farmers and rural youth
- Enhanced awareness of water stewardship and climate resilience

- Improved soil fertility and biological activity
- Reduced methane emissions due to limited field flooding

10. Sustainability Considerations

- Strong farmer capacity building for long-term adoption
- Convergence with the Department of Agriculture & Farmers' Welfare
- Continued technical support from PKKVK and MYRADA
- Peer learning and local champions sustaining behaviour change

11. Learnings and Replication

Key Learnings

- Community-led demonstrations accelerate technology adoption
- Significant water savings are achievable without yield loss
- Peer learning is a powerful driver of behavioural change
- Timely transplanting of young seedlings is a critical success factor

Scalability

- High potential for expansion across water-stressed paddy-growing regions
- Low-cost and high-impact intervention
- Strong alignment with climate-smart agriculture and water stewardship goals

12. Cost and Benefit

Field evidence shows that SRI:

- Reduces seed, water, and input costs
- Lowers overall cultivation expenditure per acre
- Delivers higher yields and improved net returns compared to traditional methods

13. Conclusion

SRI in Puducherry demonstrates that rice can be grown in a water-smart, climate-resilient, and profitable way without yield loss. Through reduced water use and farmer-led learning, SRI offers a scalable model for sustainable paddy cultivation that links productivity with responsible water stewardship.

PROMISING PRACTICE 22

Direct Seeding of Rice (DSR) for Land and Water Management

Donor: ITC Limited

Location: Bhadrachalam Mandal, Bhadrachalam District, Telangana

1. Introduction and Context

Bhadrachalam Mandal lies in a semi-arid, predominantly rainfed agro-climatic zone of Telangana where paddy remains the principal crop. Farmers in this region face persistent challenges such as water scarcity, erratic rainfall, declining soil fertility, and acute labour shortages—particularly during the peak transplanting season. Traditional puddled transplanting of rice is both water-intensive and labour-intensive, resulting in delayed sowing, higher production costs, and increasing pressure on groundwater resources.

To address these constraints, MYRADA, with the support of ITC Limited, introduced Direct Seeding of Rice (DSR) as a climate-smart agricultural practice. DSR promotes efficient land and water use, reduces labour dependency, improves soil health, and enhances farm profitability. The intervention forms part of MYRADA's broader Community-led Sustainable Water Resource Programme, aimed at strengthening climate resilience through sustainable agriculture.

2. Challenges Related to Land and Water

- Excessive water consumption under puddled transplanting systems
- Groundwater depletion and rising irrigation costs
- Declining soil fertility due to mono-cropping and low organic matter
- Poor land levelling and weak bunding causing inefficient water use
- Severe labour shortages during transplanting season
- High dependence on external chemical inputs



Photo: Farmer Field School (FFS) session introducing Direct Seeding of Rice (DSR), focusing on land preparation, seed treatment, weed management, and water-efficient crop establishment.

3. Intervention and Stakeholder Engagement

3.1 Summary of the Intervention

Scale of Implementation:

Adopted by 1,867 households covering approximately 5,400 hectares in Bhadradri Kothagudem District.

DSR Technologies Promoted:

- Dry DSR: Sowing seeds in dry fields using seed drills
- Wet DSR: Sowing pre-germinated seeds using drum seeders

Complementary Practices:

- Integrated Nutrient and Pest Management (INPM)
- Crop residue management
- Use of Leaf Colour Charts (LCC) for nitrogen optimisation

Capacity Building:

MYRADA conducted Farmer Field Schools (FFS) focusing on seed treatment, line sowing, weed management, irrigation scheduling, and soil fertility management.

Equipment Support:

- ITC-supported seed drills, drum seeders, cono weeders, and power sprayers were shared among farmer groups, reducing individual investment costs.

4. Stakeholders Involved

- Farmers' Groups – Primary adopters and practitioners
- MYRADA – Training, facilitation, monitoring, and documentation
- ITC Limited – CSR funding and strategic support
- Krishi Vigyan Kendra (KVK) – Technical guidance
- Lead Farmers – Demonstration, peer learning, and field monitoring

5. Community Innovations

- **Shared Equipment Model:** Collective use of seeders, weeders, and sprayers
- **Residue Recycling:** Retention of crop residues and use of green manures
- **Improved Weed Management:** Timely mechanical and chemical interventions

6. Technical Design and Components

6.1 Land Preparation

- Precision land levelling for uniform slope and efficient water distribution
- Minimal tillage with residue retention to conserve soil moisture

6.2 Direct Seeding Practices

- Dry DSR using seed drills
- Wet DSR using drum seeders
- Seed rate reduced to 10-12 kg/ acer compared to 25 kg/ acer under transplanting

6.3 Water Management

- Intermittent irrigation instead of continuous flooding
- Alternate wetting and drying method as water-saving practice
 - o 25–30% reduction in irrigation water use
 - o 4–5 fewer irrigations per season
 - o Improved soil aeration and reduced methane emissions

6.4 Soil Fertility Management

- Application of FYM and green manure crops
- Use of Nano Urea, INPM practices, and Leaf Colour Charts
- Optimised fertiliser use and improved nutrient uptake



Photo: Wet Direct Seeding of Rice using a manually operated drum seeder, enabling uniform line sowing, reduced seed rate, and timely crop establishment under puddled conditions.



Photo: Dry Direct Seeding of Rice using a tractor-mounted seed drill, allowing early sowing under dry conditions, minimal tillage, and significant reduction in labour and water use.

7. Technology and Innovation

- Introduction of DSR as a climate-smart alternative to puddled transplanting
- Use of dry seed drills and wet drum seeders for uniform crop establishment
- Reduced tillage with residue retention to improve soil structure
- Precision nutrient management using LCC and INPM
- Intermittent irrigation reducing water use, labour demand, and methane emissions
- Shared equipment model lowering investment barriers and enhancing adoption

8. Outcomes and Impact

8.1 Cost and Yield Comparison (Per Acre)

Parameter	DSR Method	Transplanting
Total Cost	₹18,300	₹25,700
Seed Rate	10 kg	25 kg
Yield	2.7 t/acre	2.5 t/acre
Cost Saving	₹7,400/acre	—

8.2 Comparative Performance

Parameter	Traditional	DSR	Impact
Water Use	8–10 irrigations	4–5 irrigations	↓ 30%
Labour Requirement	High	Very low	↓ 80–90%
Sowing Timeliness	Delayed	Early & uniform	+20–25 days
Cost of Cultivation	₹27,000/acre	₹21,000/acre	↓ ₹6,000
Yield	2.5 t/acre	2.7–3.0 t/acre	↑ 8–15%
Net Income	₹25–28k	₹33–38k	↑ ₹8–10k

8.3 Summary of Key Impacts

- Water Efficiency: ~30% reduction in irrigation water use
- Labour Savings: 80–90% reduction during peak season
- Cost Reduction: ₹5,000–₹6,000 saved per acre. Cost savings come from transplanting costs of ₹ 5500-6000 and seed costs of ₹ 1000-1600
- Yield Improvement: +0.5–1.0 t/acre
- Soil Health: Improved organic carbon, moisture retention, and aeration

Farmer Testimony

“Earlier we struggled with high labour costs and water shortages. With DSR, I saved nearly ₹6,000 per acre, reduced irrigation, and my yield increased from 2.5 to 2.7 tons per acre.”
— **S. Venkateshwar Rao, Krishnasagar Village**



Photo: Healthy DSR paddy crop at harvest stage, demonstrating strong crop establishment, uniform growth, and improved productivity with reduced water and labour inputs.

9. Sustainability Considerations

- Strong community ownership through shared equipment
- Climate-smart practice suited to rainfall variability
- Active participation of women in sowing, weeding, and monitoring
- Low-cost, scalable technology adaptable to similar agro-ecologies

10. Lessons and Replication Potential

- Integrating water, labour, and soil management improves productivity
- Farmer-led experimentation accelerates adoption
- DSR is scalable in both irrigated and semi-rainfed systems
- Training on land levelling, seed treatment, and irrigation scheduling is critical

11. Conclusion

The MYRADA–ITC Direct Seeding of Rice initiative shows how DSR, together with efficient water management and soil health practices, can transform paddy cultivation in semi-arid regions.

Triple benefits achieved:

1. Reduced water and labour use with lower costs
2. Improved soil health and productivity
3. Farmers enabled to adopt climate-resilient practices independently

This promising practice provides a scalable, climate-smart, and farmer-led pathway for sustainable rice production in water-stressed areas.

Did You Know? — Direct Seeded Rice (DSR)

- An IRRI–DBT study shows that targeted investment in DSR can make rice farming more climate-resilient and water-efficient.
- Traditional transplanted puddled rice is water- and labour-intensive, while dry DSR offers a practical alternative.
- New DSR-ready rice lines recorded about 15% higher yields under DSR in multi-season field trials while remaining suitable for transplanting.
- Wider adoption of DSR can reduce irrigation demand, lower greenhouse gas emissions, and strengthen India's climate commitments.

Source: The Hindu Business Line, 4 Feb 2026 (IRRI–DBT study in The Plant Genome).

PROMISING PRACTICE 23

Hydrogeological Assessment and Managed Aquifer Recharge (MAR) for Water Security in Micro-Watersheds

Donor: LIC HFL

Location: Bettamugilalam and Kambalam Micro-Watersheds, Krishnagiri District, Tamil Nadu

1. Introduction and Context

Groundwater is considered a reliable source for meeting water demand in the Bettamugilalam and Kambalam micro-watersheds, which together cover an area of 14 sq. km in Krishnagiri district, Tamil Nadu. Its reliability is attributed to longer residence time, wide spatial distribution, and availability within the reach of end users. However, natural replenishment of the groundwater reservoir is slow and, in certain parts of these micro-watersheds, has been unable to keep pace with continuous extraction. This has resulted in a steady decline in groundwater levels, adversely affecting both the quality and quantity of groundwater over the long term.

To address groundwater stress in over-drafted areas and to enable regulated pumping in locations experiencing chronic groundwater decline, a geo-hydrological study was undertaken in the two micro-watersheds. The study aimed to identify suitable sites for the construction of artificial recharge structures. Recharge and discharge zones were demarcated for each village by analysing reduced groundwater level data for the Rabi season (October 2021–February 2022) from 182 observation wells, using mathematical modelling techniques and detailed lithological profiling.

The study identified 40 potential recharge locations across the micro-watersheds, with scope for constructing 55 artificial recharge structures, including recharge shafts, recharge pits, catch pits, percolation ponds, and dug-well recharge systems, to augment natural groundwater replenishment.

In addition, a water budgeting exercise was carried out to develop a Water Security Plan through consultations with community stakeholders. This participatory process aimed at promoting optimal water resource management and building community resilience to water-related risks.

This practice demonstrates how the integration of scientific hydrogeology with participatory watershed management can deliver sustainable, scalable, and locally relevant water security solutions.

2. Overview of the Area

The study area comprises the Bettamugilalam and Kambalam micro-watersheds, located in Kelamangalam Block of Krishnagiri District, Tamil Nadu, covering an area of about 14 km². The watersheds lie between 12°21'–12°23' N latitude and 77°52'–77°56' E longitude, at an average elevation of approximately 1,037 m above mean sea level. The terrain is characterized by upland plateaus and valleys, and the region is surrounded by forested landscapes rich in biodiversity.

The area experiences a semi-arid climate, with temperatures ranging from 17°C in winter to 35°C in summer. Rainfall is highly seasonal and is received predominantly during the Northeast Monsoon (October–December), based on rainfall records from 1995–2021. This uneven rainfall distribution results in high surface runoff during monsoon periods and water stress during dry months, significantly influencing agricultural productivity and water availability.

Soils in the micro-watersheds are predominantly sandy loam at the surface; however, compacted subsoil layers limit effective infiltration, causing the catchment to behave hydrologically like Soil Group 'D', with high runoff potential and low natural percolation. The underlying charnockite (crystalline) geology gives rise to shallow, fractured, and discontinuous aquifers with limited groundwater storage, making groundwater availability largely dependent on seasonal monsoon recharge.

Agriculture is the primary livelihood, with farmers cultivating ragi, groundnut, lablab, vegetables, and flower crops such as rose and chrysanthemum across Kharif, Rabi, and summer seasons. Irrigation depends mainly on open wells and borewells, rendering farming systems highly sensitive to groundwater fluctuations. With the stage of groundwater development at 45%, the watersheds have scope for sustainable use; however, systematic soil and water conservation and groundwater recharge interventions are essential to reduce runoff losses and improve water security.

3. Intervention and Stakeholder Engagement

The hydrogeological assessment was undertaken to develop a scientific understanding of groundwater behaviour in the study area and to identify priority locations for recharge interventions. The study adopted a rigorous scientific methodology combined with a

participatory approach, actively involving local communities, Village Watershed Committees (VWCs), and MYRADA's technical team to ensure both technical accuracy and community ownership of outcomes.

3.1 Key Objectives

The key objectives of the assessment were to:

1. Assess the existing groundwater status and aquifer characteristics
2. Identify zones suitable for artificial groundwater recharge
3. Design appropriate recharge structures based on site-specific hydrogeological conditions
4. Prepare a community-owned Water Security Plan

3.2 Data Collection and Analysis

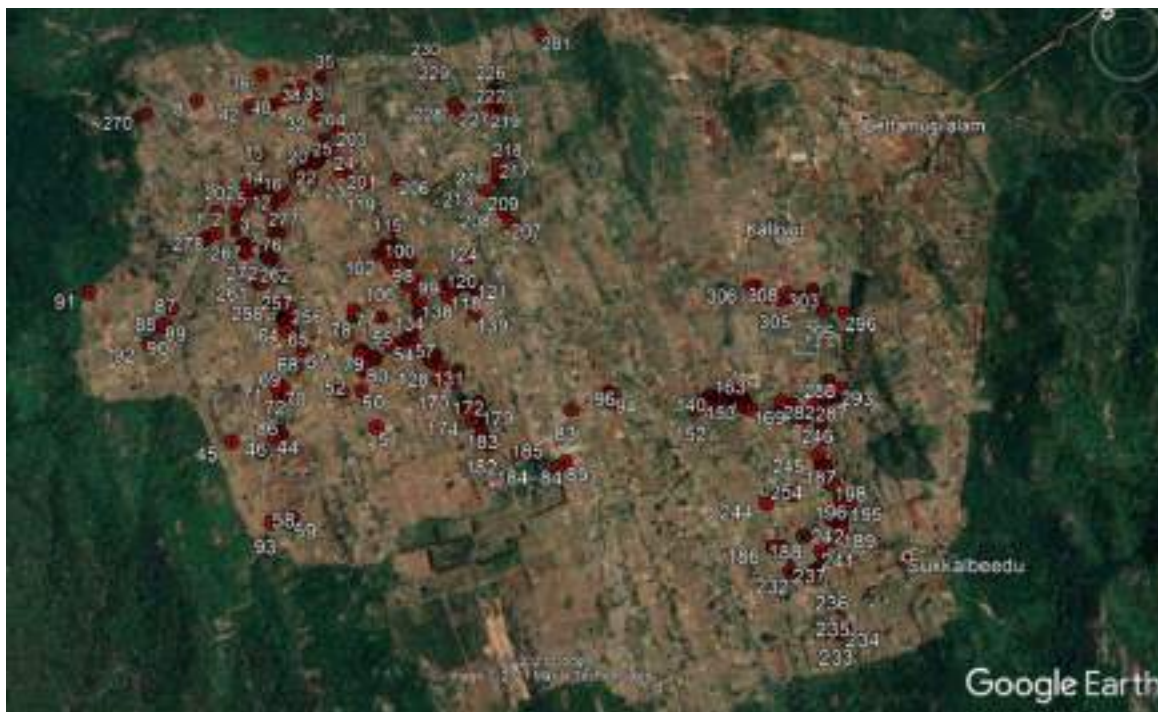
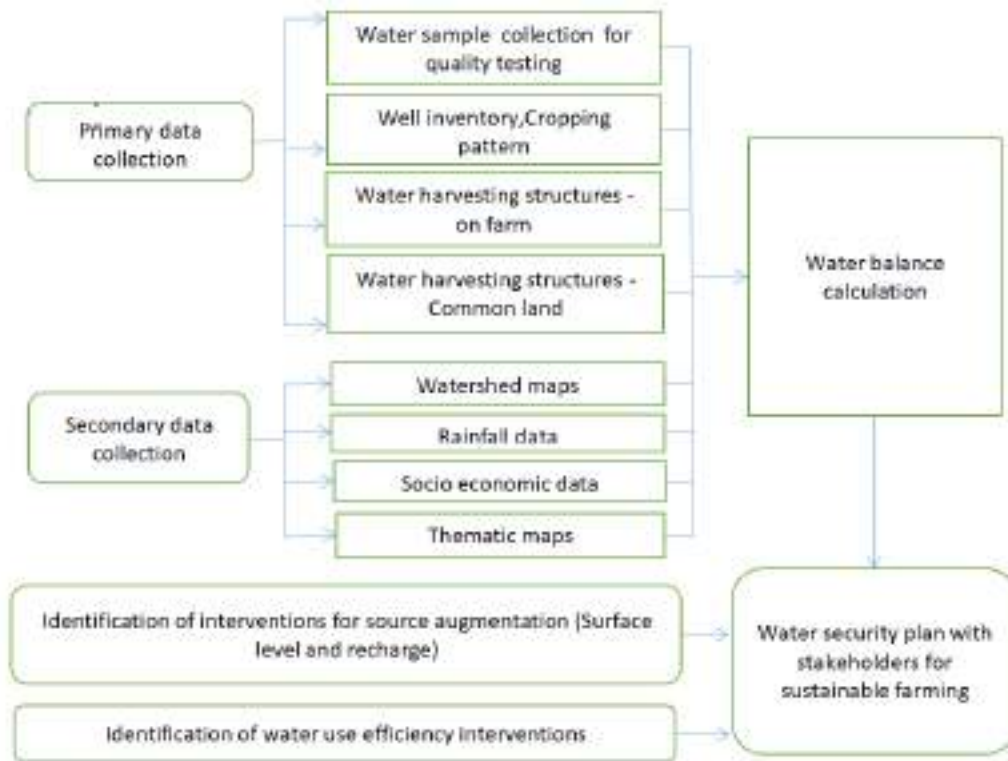


Diagram: Spatial distribution of monitoring wells mapped using Google Earth Pro, forming the basis for groundwater level measurement, lithological analysis, and seasonal assessment.

A total of 182 monitoring wells were assessed during the Rabi season (October 2021–February 2022) to measure static groundwater levels. Lithological logs were analysed to understand subsurface geological formations and aquifer characteristics. Modelling and

water-budgeting tools were employed to delineate recharge and discharge zones, while seasonal groundwater behaviour was mapped to guide the siting of interventions.

The scientific findings were validated through stakeholder consultations, ensuring alignment with local knowledge, land-use practices, and community priorities.



Diagrammatic overview linking hydrogeological assessment, recharge zone identification, structure selection, and implementation of Managed Aquifer Recharge (MAR) interventions.

4. Technical Design and Components

Based on the hydrogeological assessment, 40 potential recharge sites were identified across the Bettamugilalam and Kambalam micro-watersheds, leading to the recommendation of 55 Managed Aquifer Recharge (MAR) structures. The selection and placement of structures were guided by aquifer characteristics, soil type, slope, and runoff availability to ensure maximum recharge efficiency with minimal land disturbance.

Types of MAR Structures Implemented

The following recharge structures were designed and implemented:

- Recharge shafts and pits to facilitate direct infiltration into shallow aquifers

- Catch pits along drainage lines to slow runoff and enhance percolation
- Percolation ponds to store surface runoff and enable gradual groundwater recharge
- Dug-well recharge systems to rejuvenate existing wells and stabilise groundwater levels

A water budgeting exercise was integrated into the design process to assess recharge potential in relation to groundwater extraction. This analysis informed the preparation of a Water Security Plan, which outlines norms for water use, conservation, and monitoring at the micro-watershed level.

5. Operation and Maintenance

The long-term effectiveness of MAR structures depends on regular operation and maintenance to prevent clogging and maintain infiltration capacity. Village Watershed Committees (VWCs) were trained to manage and oversee these activities.

Key maintenance tasks include desilting, cleaning of inlets, removal of obstructive vegetation, and periodic structural inspections. Pre-monsoon maintenance is emphasised to ensure optimal performance during rainfall events. Continuous groundwater monitoring through observation wells is being carried out to track changes in water levels and well yields, with initial observations indicating improved groundwater stabilisation in areas surrounding recharge structures.

6. Technology and Innovation

The initiative adopted a science-led and data-driven approach to groundwater recharge, integrating hydrogeological principles with participatory watershed management. Key technological and methodological innovations include:

- Application of hydrogeological mapping and assessment to guide recharge planning
- Use of monitoring wells, lithological logs, and groundwater modelling for site-specific design
- Integration of Managed Aquifer Recharge (MAR) within community-led watershed frameworks
- Structure design tailored to aquifer depth, soil texture, slope, and runoff dynamics
- Use of water budgeting tools to link recharge potential with sustainable extraction norms

This approach marked a clear shift from ad hoc construction to targeted, evidence-based recharge interventions.

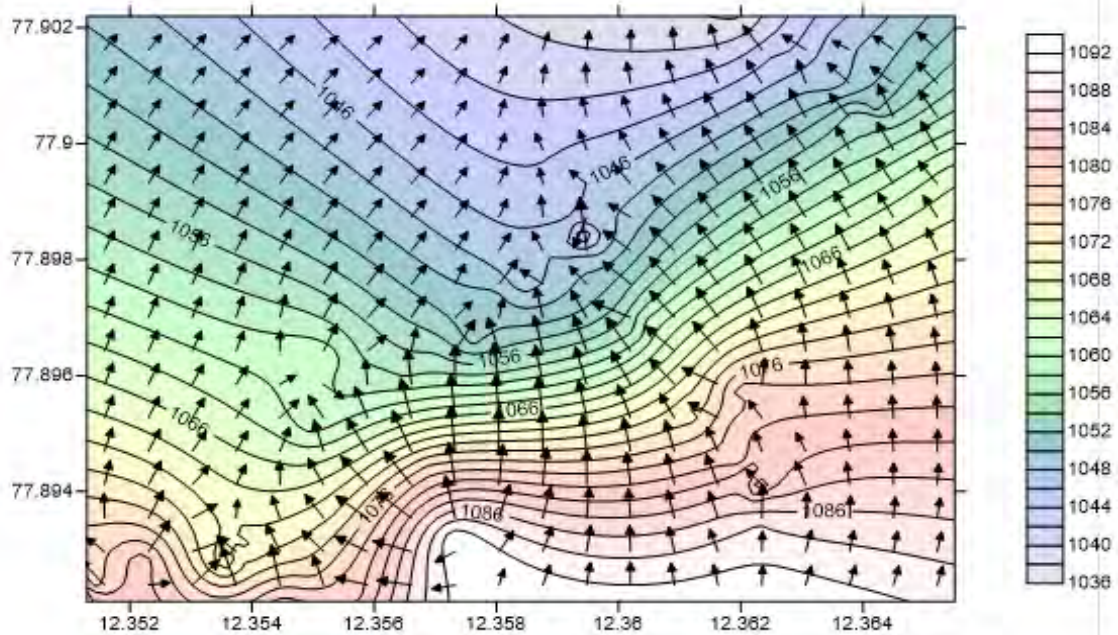


Diagram: Conceptual representation of groundwater movement through fractured rock aquifers, illustrating recharge, storage, and flow dynamics that informed MAR site selection.

7. Outcomes and Sustainability

The MAR interventions generated multiple environmental and social benefits, including:

- Stabilisation and gradual improvement of groundwater levels near recharge sites
- Enhanced availability of water for irrigation and domestic use during dry periods
- Reduction in surface runoff and soil erosion, conserving fertile topsoil
- Strengthened community capacity in groundwater monitoring, operation, and governance
- Improved agricultural sustainability through more reliable water access

Beyond immediate outcomes, the initiative demonstrates how hydrogeological science can inform targeted investments, improve efficiency and reducing trial-and-error in watershed development.

8. Learnings and Replication Potential

8.1 Key Learnings

- Scientific groundwater assessment is critical for appropriate placement and design of recharge structures
- Community participation ensures long-term maintenance, ownership, and sustainability
- Water budgeting supports balanced recharge and extraction at the micro-watershed scale
- Linking MAR interventions with agriculture and livelihoods multiplies development impact

8.2 Replication Potential

The MAR approach is highly replicable in semi-arid and water-stressed regions characterised by fractured rock aquifers. By combining hydrogeological analysis, participatory planning, and simple recharge structures, similar initiatives can strengthen climate resilience and local water security across diverse geographies.

9. Conclusion

The MYRADA–Krishnagiri MAR initiative, supported by LIC HFL, demonstrates that groundwater security is achievable when scientific hydrogeological assessment and community action converge. Through systematic analysis, carefully designed recharge structures, and strong local stewardship, the project has laid a solid foundation for sustainable groundwater management at the micro-watershed level.

Conclusion and Way Forward

This document has presented 23 Promising Practices in Natural Resource Management, with special reference to land and water management, drawn from MYRADA's long-term engagement across diverse agro-ecological and socio-economic contexts. Together, these practices reflect not isolated interventions, but a coherent approach that integrates community institutions, scientific planning, appropriate technologies, and sustained facilitation.

A key insight emerging from the documentation is that natural resource sustainability cannot be achieved through structures or technologies alone. Whether in watershed development, groundwater recharge, irrigation efficiency, soil health improvement, or climate-resilient agriculture, outcomes are strongest where technical interventions are embedded within robust community processes. Village-level institutions such as SHGs, Tank User Groups, Village Watershed Committees, Farmer Producer Organisations, and informal farmer collectives play a central role in planning, implementation, maintenance, and governance of resources.

Across the practices, MYRADA's experience demonstrates the importance of context-specific solutions. Rather than promoting uniform models, interventions are adapted to local hydrogeology, rainfall patterns, land use systems, livelihood strategies, and institutional capacities. This reinforces MYRADA's long-held position that these are promising practices—with high potential for impact—rather than rigid “best practices” to be replicated without adaptation.

Another cross-cutting learning is the value of combining science with participation. Tools such as hydrogeological assessments, GIS-based planning, water budgeting, soil testing, and remote sensing strengthen decision-making, while participatory processes ensure relevance, ownership, and long-term sustainability. This integration reduces trial-and-error approaches and enhances the efficiency of investments in land and water management.

The documented practices also highlight the growing relevance of technology and innovation, including micro-irrigation, IoT-based irrigation automation, rainwater harvesting, biochar production, and nature-based wastewater treatment systems. However, technology is most effective when introduced as a support to farmer decision-making, rather than as a standalone solution. Capacity building, demonstrations, and peer learning emerge as critical success factors in enabling adoption and sustained use.

Way Forward

Building on the insights from these 23 Promising Practices, the following directions are proposed for future action:

1. Strengthening Knowledge Use and Learning

This compilation should serve as a reference for practitioners, trainers, policymakers, CSR partners, and academic institutions. The practices can be further adapted into training modules, field guides, and learning tools for wider dissemination.

2. Deepening Community-Led Water Governance

Continued investment in community institutions is essential to manage water as a shared resource. Emphasis should be placed on water budgeting, groundwater monitoring, and collective norms for water use at micro-watershed and village levels.

3. Scaling with Contextual Adaptation

While many practices have high replication potential, scaling efforts must respect local ecological and institutional conditions. Replication should prioritise principles and processes over rigid designs.

4. Strengthening Convergence and Partnerships

Greater convergence with government programmes, research institutions, and CSR initiatives can enhance reach and impact. MYRADA's role as a facilitator and knowledge partner is critical in aligning investments with local needs.

5. Responding to Climate and Water Stress

With increasing climate variability, future interventions must further integrate climate resilience, water efficiency, soil health, and livelihood diversification to safeguard rural communities.

In conclusion, this document affirms that sustainable land and water management is fundamentally a social process supported by science and appropriate technology. MYRADA's experience shows that when communities are empowered to understand, manage, and govern their natural resources, lasting outcomes are possible. These Promising Practices provide both evidence and inspiration for building resilient rural landscapes and water-secure futures.

MYRADA (Mysore Resettlement and Development Agency)

MYRADA is a non-governmental organisation founded in 1968, working across Karnataka, Tamil Nadu, Andhra Pradesh, Telangana, and Puducherry. For over five decades, MYRADA has partnered with rural communities to strengthen local institutions, enhance livelihoods, and promote sustainable natural resource management.

Its work integrates participatory processes, scientific planning, and appropriate technologies to address water security, soil health, climate resilience, and social inclusion.

Promising Practices in Natural Resource Management draws from this rich field experience, documenting community-led innovations in land and water management that are practical, scalable, and adaptable to diverse agro-ecological contexts across South India.

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