

# State-Managed Irrigation to Participatory Governance: Evidence from Water User Cooperative Societies in Distributary-95 Of The Tungabhadra Left Bank Canal, Karnataka

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## Abstract

Participatory Irrigation Management (PIM) has emerged as an immensely important institutional reform in irrigation governance across India. It aims at improving efficiency, equity and sustainability of water distribution by involving farmer participation. This paper examines the transition from state-managed irrigation systems to participatory governance through the functioning of Water User Cooperative Societies (WUCS) in Distributary-95 of the Tungabhadra Left Bank Canal (TLBC) command area in Karnataka. The study draws upon field observations, project implementation records and interactions with WUCS members conducted during the implementation of Land and Water Management (LWM) pilot interventions between 2020 and 2024. The interventions included Community Participatory Packages (CPP) for canal improvement, farmer capacity building, and introduction of decision-support technologies for irrigation scheduling. The findings indicate that strengthening WUCS institutions has contributed to improved community participation, better coordination between farmers and irrigation officials, and enhanced awareness of water management practices. However, challenges remain in sustaining collective action, ensuring financial autonomy, and institutionalizing participatory governance mechanisms.

**Keywords:** Participatory Governance, Water User Cooperative Societies, Irrigation, Tungabhadra Left Bank Canal, Karnataka

## 1. Introduction

Historically irrigation systems in India have played a pivotal role in sustaining agricultural production and rural livelihoods. Large canal irrigation projects constructed during the colonial and post-independence periods were primarily designed and managed through centralized state institutions. While such state-managed irrigation systems enabled expansion of irrigated agriculture and improved food production, their long-term performance has often been constrained by operational inefficiencies, inequitable water distribution, weak maintenance of canal networks, and limited participation of farmers in decision-making processes. One of the widely observed challenges in canal irrigation systems is the unequal distribution of water between head-reach and tail-end farmers. In many canal command areas,

farmers located near the head reaches of canals tend to receive more reliable water supply, while those in middle and tail reaches experience irregular or inadequate irrigation. Such disparities not only affect agricultural productivity but also lead to social tensions and conflicts over water sharing. In addition, centralized management structures often face difficulties in monitoring field-level water use, maintaining minor irrigation structures, and responding effectively to local needs.<sup>1</sup>

In Karnataka, PIM has been promoted through the formation of WUCSs in major canal command areas. These institutions are expected to function as local governance bodies that facilitate farmer participation in irrigation management and strengthen coordination between irrigation departments and farming communities. However, the effectiveness of such institutions varies across regions depending on factors like institutional capacity, farmer participation, technical support, and availability of water resources.

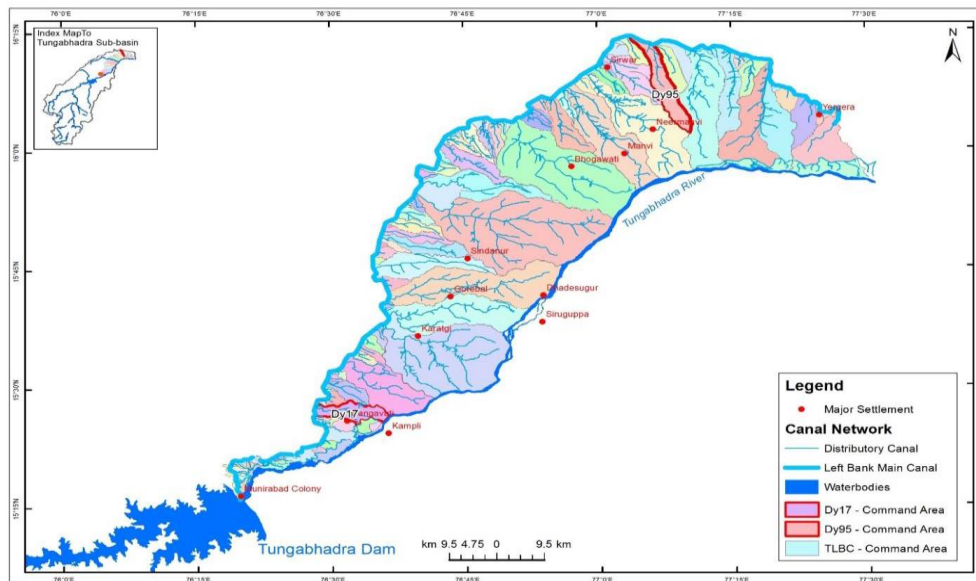
## **PARTICIPATORY IRRIGATION MANAGEMENT IN INDIA**

Irrigation development has been a cornerstone of agricultural policy in India since independence, with substantial investments made in large and medium canal irrigation projects to support food security and rural livelihoods. These irrigation systems were traditionally designed and managed by state irrigation departments, which retained full responsibility for the planning, construction, operation, and maintenance of canal infrastructure. While this centralized approach enabled rapid expansion of irrigated agriculture, over time several institutional and operational challenges emerged. These included poor maintenance of irrigation networks, increasing financial burdens on the state for system upkeep, inefficient water delivery, and limited accountability in water distribution at the field level. In Karnataka, PIM has been implemented through the formation of WUCS's in major irrigation command areas. The Land and Water Management pilot interventions implemented under the Karnataka Integrated and Sustainable Water Resources Management Investment Program (KISWRMIP) represent one such effort aimed at strengthening WUCSs and demonstrating improved irrigation management practices in canal command areas. The present study examines these institutional dynamics through the case of Dy-95 of the TLBC command area, where participatory interventions were implemented to enhance community engagement in irrigation governance. By analysing the functioning of WUCSs in this context, the study seeks to contribute to the broader discourse on participatory governance and institutional reforms in irrigation management.

## **STUDY AREA**

The Tungabhadra Left Bank Canal (TLBC) is one of the major irrigation systems in the Krishna River basin, serving extensive agricultural areas in the northern districts of Karnataka. The canal originates from the Tungabhadra Dam and irrigates large tracts of land in districts Koppal and Raichur (Figure 1). The command area of the canal supports a variety of crops including paddy, cotton, jowar, chilli, and pulses, which form the primary source of livelihood for farming households in the region. Like many large canal irrigation systems in India, the TLBC command area faces several management challenges related to water distribution, maintenance of canal infrastructure, and equitable access to irrigation water. Water availability within the canal system varies across locations, with farmers located in head-reach areas generally receiving more reliable water supply compared to those in middle and tail reaches. As a result, farmers in tail-end areas often depend on supplementary sources

such as rainfall, groundwater, or farm ponds to meet crop water requirements. Consequently, farmers frequently rely on rainfall and locally constructed farm ponds to store runoff and canal water for use during dry spells. This mixed irrigation situation makes Dy-95 a representative case for examining the challenges of irrigation management in semi-arid canal command areas. Recognizing these challenges, Dy-95 was selected as one of the pilot locations for implementing LWM interventions under the KISWRMIP.



**Fig.1** Distributary-95 of the TLBC command area, located in Raichur district, Karnataka

## METHODOLOGY

This study adopts a qualitative case study approach to examine the institutional dynamics of PIM in Dy-95 of the TLBC Canal command area. The case study method is appropriate for analysing governance processes and institutional performance within specific local contexts, particularly where complex interactions between state agencies, community organizations, and resource users are involved. The analysis is primarily based on field observations, project implementation experiences, and review of project documents generated during the implementation of LWMPilot interventions between 2020 and 2024. These interventions were carried out as part of the KISWRMIP with the objective of improving water use efficiency and strengthening community participation in irrigation management. The combination of field observations, stakeholder interactions, and review of project documentation enabled a comprehensive understanding of how PIM initiatives were implemented and how they influenced institutional practices at the local level.

## INSTITUTIONAL INTERVENTIONS AND PARTICIPATORY INITIATIVES

The LWM pilot interventions implemented in the TLBC command area were designed to demonstrate how technological innovation and community participation could jointly improve irrigation governance. Within this framework, a set of institutional and infrastructure interventions were introduced in Dy-95 to strengthen the role of WUCSs and promote PIM. These interventions were implemented under the KISWRMIP with technical coordination by the Advanced Centre for Integrated Water Resources Management (ACIWRM). A key component of the intervention strategy involved the

preparation of community based LWM plans through participatory consultations with farmers and local institutions. These plans adopted a bottom-up planning approach and identified a range of interventions across irrigation service delivery, agricultural intensification, institutional capacity building, and project management..

## STRENGTHENING WATER USER COOPERATIVE SOCIETIES

Strengthening WUCS institutions was central to the participatory governance approach adopted under the project. Training programs were organized for WUCS members on PIM, bookkeeping and financial management, and water conservation practices. These capacity-building initiatives aimed to enable members of WUCS to actively participate in water allocation decisions, maintain irrigation infrastructure, and improve transparency in water management. The training programs also involved engineers and field-level officials, facilitating improved coordination between irrigation authorities and farmer institutions.

### Community Participatory Packages (CPP)

One of the most significant institutional innovations implemented in the project was the introduction of CPP. These packages were designed as a participatory mechanism through which WUCS members could jointly identify and implement priority irrigation infrastructure improvements in collaboration with irrigation engineers and technical experts.



Photo: Participatory mechanism through which WUCS

Under this initiative, Memorandums of Understanding were formalized with four WUCS in Dy-95. Each WUCS received financial support of approximately Rs.20 lakhs to undertake infrastructure improvement works identified through participatory planning exercises. These works included clearing vegetation along canal banks, desilting canals, repairing pipe outlets, strengthening service roads, and constructing structures such as division boxes and side walls along field irrigation channels. In addition to canal maintenance works, the project also supported the development of community farm ponds in Dy-95 to store rainwater and canal water for use during critical irrigation periods. Demonstrations of soil

reclamation techniques were also carried out in areas affected by salinity. These interventions were implemented directly by WUCS members rather than contractors, reinforcing local ownership and accountability in irrigation management.

## Technological Support for Water Management

The participatory interventions were complemented by the introduction of modern irrigation monitoring technologies. These included the installation of water level sensors and flow meters to track canal water availability and improve water distribution planning. Weather stations and satellite-based data were also used to support irrigation scheduling and crop water requirement estimation.



Photo:2 Technological monitoring and participatory governance for irrigation

These technological tools were integrated into a decision support system that provided irrigation advisories and improved coordination between engineers and farmers. The combination of technological monitoring and participatory governance enabled more efficient management of irrigation water within the distributory system.

## Community Participation and Women's Involvement

Another important feature of the project was the promotion of women's participation in irrigation governance. Women's groups were formed within WUCS structures to encourage their involvement in decision-making related to water conservation, crop management, and sustainable agricultural practices. These initiatives contributed to broader community engagement in irrigation management and strengthened the social base of participatory institutions. Overall, the participatory interventions implemented in Dy-95 demonstrate how institutional strengthening, infrastructure improvements, and technological support can be integrated to enhance community participation in irrigation governance.

## FINDINGS

### **Institutional Outcomes of Participatory Irrigation Management**

The implementation of LWM interventions in Dy-95 produced several notable outcomes related to irrigation governance, infrastructure improvement, and farmer participation. The findings from field observations and project documentation suggest that strengthening WUCSs and involving farmers directly in irrigation management contributed to improvements in water distribution and institutional accountability.

### **Improved Canal Functioning and Water Flow**

Prior to the project interventions, several sections of the distributory canals were obstructed by dense vegetation, accumulated silt, and debris. In particular, the uncontrolled growth of thorny bushes such as *Prosopis juliflora* along canal banks restricted water flow and made canal maintenance difficult. Through the Community Participatory Packages implemented by WUCS members, extensive clearing of vegetation was carried out along approximately 11.5 kilometres of canal length in Distributory-95. The removal of these obstructions significantly improved water flow within the canal system, enabling irrigation water to reach previously underserved tail-end farms.

### **Enhanced Participation and Institutional Responsibility**

The project interventions also resulted in stronger farmer participation in irrigation management. Capacity-building activities revitalized four WUCS in the TLBC command area and improved their ability to participate in water governance processes. For the first time in more than two decades, WUCS members collectively mobilized and collected over Rs.2 lakhs in water taxes in one year, indicating increased responsibility and institutional ownership among farmers. The strengthened WUCS institutions also improved transparency in water allocation decisions, as farmers were able to participate more actively in discussions regarding water distribution schedules and infrastructure maintenance.

### **Improved Water Access for Tail-End Farmers**

The Dy-95 historically faced severe water shortages, particularly for tail-end farmers who depended heavily on rainfall for irrigation. The project interventions addressed these challenges through a combination of canal desilting, vegetation removal, improved monitoring of water flows, and promotion of farm ponds for supplemental irrigation. These measures helped improve water availability for tail-end farmers and reduced the vulnerability of cropping systems to irregular water supply. <sup>2</sup>

### **Strengthening Participatory Irrigation Governance**

The experiences from Dy-95 demonstrate that when farmer institutions receive adequate technical support, financial resources, and training, they can play an effective role in managing irrigation infrastructure and facilitating collective action among water users. The CPP model provided a practical mechanism for involving farmers directly in infrastructure maintenance and decision-making, thereby strengthening participatory irrigation governance.

**DISCUSSION**

**Implications for Participatory Irrigation Governance**

The experience from Dy-95 of the TLBC provides valuable insights into the practical functioning of participatory irrigation management in canal command areas. While the PIM framework in India was designed to decentralize irrigation governance, its success has often been constrained by weak institutional capacity, inadequate financial resources, and limited farmer participation. The interventions implemented under the LWM Pilots demonstrate how these challenges can be addressed through a combination of institutional strengthening, community participation, and technical support.<sup>3</sup>

One of the key lessons from the Dy-95 experience is the importance of empowering WUCS’s with both decision-making authority and operational resources. In many irrigation systems, WUCS exist only as nominal institutions without the financial or technical capacity to undertake meaningful activities. The project interventions addressed this gap by providing training, facilitating participatory planning, and allocating financial resources for implementing community-driven infrastructure improvements. These measures helped transform WUCS from passive institutions into active participants in irrigation management.

Another important aspect of the intervention was the emphasis on participatory planning and execution.

Through the CPP’s, WUCS members were directly involved in identifying local problems, prioritizing interventions, and implementing canal maintenance works. The decision to execute works through WUCS rather than contractors further reinforced community accountability and transparency in project implementation. The integration of technology with community-based management also played an important role in improving irrigation governance. The installation of water level sensors, flow monitoring devices, and weather stations provided objective data that supported better water management decisions. When combined with participatory decision-making processes, these technological tools enhanced transparency in water allocation and reduced conflicts among farmers.<sup>4</sup>



Figure 2 Transition from State Managed Irrigation to Participatory Governance

## **Integrated Policy Lessons and Implications from LWM Pilot Experience**

The experience from the Land and Water Management (LWM) pilot interventions implemented in Distributary-95 provides important insights for strengthening participatory irrigation governance in canal command areas. The pilot demonstrated that effective irrigation management requires a combination of institutional strengthening, community participation, infrastructure maintenance, and technological support.

One of the most important lessons from the pilot is the effectiveness of the Community Participatory Package (CPP) approach. Through this approach, WUCS members undertook activities such as clearing vegetation, desilting canals, repairing pipe outlets, strengthening service roads, and constructing small canal structures. These activities significantly improved canal functioning and water flow within the distributory system. A second important lesson relates to the role of capacity building in strengthening farmer institutions. The pilot interventions demonstrated that structured training initiatives such as Farmer Water Schools can improve farmers' understanding of irrigation scheduling, water conservation, and collective decision-making. Training programs also strengthened the ability of WUCS members to maintain financial records, participate in irrigation planning, and coordinate with irrigation officials.

Another important policy lesson concerns improving water access for tail-end farmers. In many canal irrigation systems, farmers located at the tail reaches face irregular water supply and higher production risks. The interventions in Dy-95 demonstrated that targeted measures such as improved canal maintenance, removal of vegetation obstructions, promotion of farm ponds for supplemental irrigation, and crop diversification strategies can help address tail-end inequities. These measures improved water access and reduced vulnerability of farmers to irrigation shortages. The experience also suggests the need for greater convergence between irrigation management and other rural development programs. Activities such as canal desilting, weed removal, drainage improvement, and minor infrastructure works could be supported by programs such as MGNREGA and PMKSY. Such convergence would not only improve irrigation system maintenance but also generate rural employment while strengthening agricultural productivity.<sup>5</sup>

Eventually, the sustainability of participatory irrigation governance depends on strengthening the institutional capacity and financial viability of WUCS. Incentives such as performance-based grants support for water cess collection, and continued training programs can encourage farmer institutions to assume greater responsibility for irrigation management. Strengthening these institutions is essential for ensuring long-term sustainability of participatory irrigation management initiatives. Figure 2 illustrates the broader transition from traditional state-managed irrigation systems to participatory irrigation governance, where farmer institutions empowered supported by technical and financial resources play a central role in managing irrigation infrastructure and ensuring equitable water distribution.

## **CONCLUSION AND POLICY IMPLICATIONS**

The case of Distributary-95 in the Tungabhadra Left Bank Canal command area highlights the potential of participatory irrigation management to improve irrigation governance and agricultural outcomes in canal command areas. The LWM pilot interventions demonstrated that strengthening farmer

institutions, promoting participatory planning, and implementing targeted infrastructure improvements can address several long-standing challenges in canal irrigation systems. Community-driven initiatives such as the CPP model proved particularly effective in improving canal maintenance and restoring water flow in distributory systems. By involving WUCS members directly in the identification and execution of canal improvement works, the project strengthened local ownership of irrigation infrastructure and improved the accountability of irrigation management processes. Institutional strengthening also played a critical role in revitalizing WUCS institutions. Training programs enhanced the ability of WUCS members to participate in irrigation governance, manage financial resources and coordinate maintenance activities. Increased farmer participation in water management decisions and renewed collection of water taxes indicate the gradual strengthening of collective responsibility among water users.

The project further demonstrates that combining community participation with technological innovations can significantly enhance irrigation system performance. Monitoring technologies, weather information systems, and data-based irrigation advisories supported better water allocation decisions and improved water-use efficiency in the distributory command area. From a policy perspective, the experience from Dy-95 suggests that irrigation reforms should focus not only on physical infrastructure development but also on strengthening local governance institutions. Providing financial resources, technical support and decision-making authority to farmers can improve irrigation management outcomes. In addition, integrating modern monitoring technologies with participatory governance structures can enhance transparency and accountability in water distribution. By strengthening farmer institutions, promoting community-led infrastructure maintenance, and integrating technological tools for irrigation management, canal irrigation systems can move toward more sustainable, equitable and participatory governance models.

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