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Rejuvenation of Left Bank Canal of Adhala Dam

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Abstract: *The project entitled Rejuvenation of adhala's left bank canal is strongaly focuses on Assesing the current condition of canal and proposed to government of maharshtra via chikani, ningaonbhojapur and rajapur and Restarting of canal with full efficiency to overcome the severe problem like ground water depletion, met demand of farmers compared to supply. futuristic need of water specially in the area which comes under dark shade region . the present study was undertaken to evaluate the existing condition of the canal system and to identify suitable measures for restoring its efficiency and functionality. The canal plays a vital role in supplying irrigation water to agricultural lands in nearby villages of canal head to tail end Nimgaon Bhagapur, Chikani, and Rajapur. However, over time, the canal has suffered from deterioration due to silt accumulation, weed growth, damaged embankments, erosion of side slopes, seepage losses, and discontinuity of water supply, particularly to tail-end regions. These issues have adversely affected irrigation efficiency and contributed to groundwater depletion in the command area*

Keywords: Canal Rejuvenation, Irrigation Management, Water Demand Analysis, Canal Rehabilitation, Groundwater Recharge, Water Resources Engineering

I. INTRODUCTION

Water is one of the most essential natural resources for the survival of all living beings and plays a vital role in agricultural, industrial, domestic, and overall national development. Irrigation networks form a fundamental basis for regional agricultural development by conveying water from reservoirs to crop fields. Irrigation projects such as dams and canals are the backbone of agriculture-based economies like India, where a large portion of the population depends on farming [1], [2].

The Adhala Dam is an important irrigation structure in Akole, Maharashtra, constructed to supply water to agricultural lands within its command area. The Left Bank Canal (LBC) of Adhala Dam plays a crucial role in distributing water from the reservoir to farmlands located on the left side of the canal. Over the years, the canal has experienced several problems such as silt deposition, vegetation growth, erosion of side slopes, encroachment along the canal, and damaged embankments. These issues have affected the supply of water, particularly to tail-end villages such as Chikani, NimgaonBhojapur, and Rajapur [3], [4].

The project "Rejuvenation of Adhala's Left Bank Canal" focuses on assessing the present condition of the canal and preparing a proposal for its restoration. The study aims to improve water conveyance from the head reach to the tail end, ensure equal distribution of irrigation water, increase groundwater levels through proper water management, and identify the gap between water supply and demand in the command area. The project also seeks to improve the socio-economic conditions of farmers dependent on canal irrigation [5], [6].

The study involves reconnaissance surveys, assessment of existing canal conditions, interaction with farmers regarding water availability, and collection of agricultural and irrigation-related data. Based on the observations and findings, suitable rehabilitation measures are proposed to restore the efficiency and functionality of the canal system and ensure reliable water supply to the command area. The rejuvenation of irrigation canals has been recognized as an effective approach for improving water conveyance efficiency, reducing losses, enhancing agricultural productivity, and promoting sustainable water resource management [7], [8].

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II. PROBLEM STATEMENT

The Adhala Left Bank Canal has undergone significant deterioration due to siltation, vegetation growth, seepage losses, embankment erosion, and encroachment. These issues have reduced canal efficiency and resulted in inadequate water supply, particularly in tail-end villages. Increased dependence on groundwater extraction has further contributed to declining water tables and reduced agricultural productivity. There is a need to restore the canal's hydraulic performance to bridge the gap between water demand and supply and ensure sustainable irrigation in the command area.

III. OBJECTIVES

- To assess the existing condition of the Adhala Left Bank Canal.
- To analyze irrigation water demand and supply within the command area.
- To identify factors affecting canal performance.
- To propose rehabilitation measures for canal rejuvenation.
- To improve water distribution efficiency and groundwater sustainability.
- Increase in Culturable Command Area, ultimately improving the socio-economic condition of farmers.
- Revenue generation for government through proper utilization/charges of canal water.

IV. LITERATURE SURVEY

Title:Canal Deterioration and Rehabilitation Strategies for Sustainable Irrigation Management
Authors: R. K. Gupta and P. K. Joshi
Summary:
This study investigates the major causes of deterioration in irrigation canal systems, including silt accumulation, embankment failures, vegetation growth, and seepage losses. The authors evaluated several rehabilitation techniques such as canal desilting, structural repairs, and modernization of water control structures. The results showed that rehabilitation measures significantly improved water conveyance efficiency and reduced water losses. The study concluded that periodic maintenance and rehabilitation are essential for sustainable irrigation management and improved agricultural productivity. The findings provide useful guidance for restoring aging canal networks and ensuring equitable water distribution to farmers.

Title:Assessment of Seepage Losses in Earthen Irrigation Canals of Maharashtra
Authors: S. S. Kulkarni, R. R. Patil, and V. M. Deshmukh
Summary:
The research focuses on quantifying seepage losses in earthen irrigation canals located in Maharashtra. Field investigations and hydraulic analyses were conducted to estimate water losses occurring during canal conveyance. The study found that seepage was one of the major contributors to irrigation inefficiency and groundwater imbalance. Various mitigation measures such as canal lining, maintenance of embankments, and regular inspection were recommended. The research demonstrated that reducing seepage losses can substantially increase irrigation efficiency and improve water availability within command areas.

Title:Rehabilitation and Modernization of Mula Right Bank Canal for Improving Irrigation Efficiency
Authors: A. N. Patil, S. P. Jadhav, and P. R. Shinde
Summary:
This paper presents a case study of rehabilitation and modernization activities carried out on the Mula Right Bank Canal in Maharashtra. The authors assessed the condition of canal structures, hydraulic performance, and water distribution practices. Rehabilitation measures included desilting operations, strengthening of canal banks, repair of outlets, and modernization of flow regulation structures.

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Title: Canal Modernization and Water Use Efficiency Improvement in Krishna Delta Irrigation System
Authors: K. S. Reddy and B. V. Rao
Summary:
This study evaluates modernization practices implemented in the Krishna Delta Irrigation System to improve water use efficiency. The research examined canal automation, rehabilitation of hydraulic structures, and improved water management strategies.

Title: Indian Standards for Canal Design and Lining
Authors: Bureau of Indian Standards (BIS)
Summary:
This standard provides guidelines for the planning, design, construction, and maintenance of irrigation canals to ensure efficient water conveyance and reduced losses. It includes recommendations for canal lining, slope stability, seepage control, and structural safety. Proper implementation of Indian Standard codes helps improve hydraulic efficiency, minimize seepage losses, and enhance the overall service life of canal systems. These standards serve as an important reference for designing sustainable and reliable irrigation infrastructure in India.

Title: Assessment of Bhojapur Canal and Its Irrigation Performance
Authors: Prof. C. S. Kadlag and A. Yadav
Summary:
This study evaluates the condition and irrigation performance of the Bhojapur Canal by assessing water distribution efficiency, canal carrying capacity, and irrigation demand within the command area. Field observations identified issues such as silt accumulation, seepage losses, structural deterioration, and unequal water distribution at tail-end regions. The study concluded that periodic desilting, structural rehabilitation, and proper canal maintenance are essential to improve irrigation efficiency and ensure reliable water supply to farmers.

IV. METHODOLOGY

A. Collection of Background Information and Project Data

The first step in the study involved collecting background information related to the Adhala Dam Left Bank Canal. Relevant data such as rainfall records, reservoir storage, canal dimensions, cropping patterns, soil characteristics, and command area details were collected. This information helped in understanding the present status of the canal system and formed the base for further analysis.

B. Reconnaissance and Preliminary Survey

A preliminary field visit was conducted to observe the general condition of the canal and surrounding command area. During the survey, major observations such as vegetation growth, silt accumulation, damaged canal sections, and water flow conditions were recorded. Photographs were also collected during site inspection for documentation.

C. Detailed Survey and Condition Assessment of Canal

A detailed survey was carried out to assess the physical condition of the canal. Parameters such as canal width, depth, embankment condition, seepage-prone areas, and obstructions were examined. This survey helped identify structural deterioration affecting canal performance.

D. Identification of Problems Affecting Canal Performance

Based on field observations and farmer interactions, the major problems affecting canal efficiency were identified as:

- Silt accumulation
- Vegetation growth
- Seepage losses
- Canal side encroachment
- Unequal water distribution at tail-end villages

These issues reduce the hydraulic efficiency and carrying capacity of the canal.

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Table 1: Demand and Supply Analysis for NimgaonBhojapur

Season	Demand (×10³ m³)	Supply (×10³ m³)
Rabbi	557.5	318.48
Hot Weather	250	504.76
Kharif	900	74.51

Table 2: Demand and Supply Analysis for Chikani

Season	Demand (×10³ m³)	Supply (×10³ m³)
Rabbi	810	374.68
Hot Weather	292	593.83
Kharip	1032	87.66

Table 3: Demand and Supply Analysis for Rajapur

Season	Demand (×10³ m³)	Supply (×10³ m³)
Rabbi	308.5	749.36
Hot Weather	1517	1187.67
Kharip	747.5	175.32

V. SYSTEM DESIGN

A. Dam Reservoir View

This scenic view looks across a large, serene reservoir bordered by a rocky, grassy shoreline in the foreground. A long, slender concrete pier or footbridge extends far out into the calm water, culminating in a distinctive circular water intake tower with a yellow trim and conical roof.

Fig 2:Dam Reservoir View

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B. Farmer Interaction Photograph

Fig 6:Culvert Inspection

This photograph represents interaction with local farmers from Chikani, NimgaonBhojapur, and Rajapur villages. The discussion helped in understanding irrigation water demand, cropping patterns, and the water shortage problems faced by farmers

C. Encroachment Photograph

Fig 4:Reservoir Bridge

This photograph shows encroachment along the canal boundary, which obstructs the smooth flow of water. Such encroachments reduce canal efficiency and create difficulties in maintenance and water distribution.

D. Measurement Photograph

Fig 5:Field Survey

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This photograph shows the field measurement of canal dimensions during site inspection. Measurements such as canal width, depth, and embankment condition were recorded to assess the carrying capacity and identify rehabilitation needs.

VI. EXPECTED OUTCOMES

The proposed rejuvenation of the Adhala Left Bank Canal is expected to achieve the following outcomes

1. **Restoration of Canal Carrying Capacity**
   - The canal will regain its original hydraulic efficiency through desilting, repair of damaged sections, and removal of obstructions.
2. **Reduction in Water Losses**
   - Seepage, leakage, and conveyance losses will be significantly reduced, resulting in improved water delivery efficiency.
3. **Improved Water Availability**
   - Adequate and reliable water supply will be ensured to the villages of Chikani, NimgaonBhojapur, and Rajapur, particularly during critical irrigation seasons.
4. **Bridging the Demand–Supply Gap**
   - The existing gap between agricultural water demand and available supply will be reduced through efficient canal operation and distribution management.
5. **Equitable Water Distribution**
   - Water availability at tail-end reaches will improve, ensuring fair distribution among all farmers within the command area.
6. **Enhancement of Agricultural Productivity**
   - Increased irrigation reliability will support higher cropping intensity, improved crop yields, and better farm income.
7. **Reduction in Groundwater Dependency**
   - Improved canal performance will reduce excessive dependence on borewells and groundwater extraction, promoting sustainable water resource management. .

VIII. RESULT

The results obtained from field surveys, demand–supply analysis, and farmer interactions clearly indicate that the present condition of the Adhala Left Bank Canal is inadequate to meet the irrigation requirements of the command area. Similar findings have been observed in previous canal rehabilitation studies, where desilting, structural repairs, and proper maintenance significantly improved water conveyance efficiency and irrigation performance.

Demand vs Supply Graph – Chikani

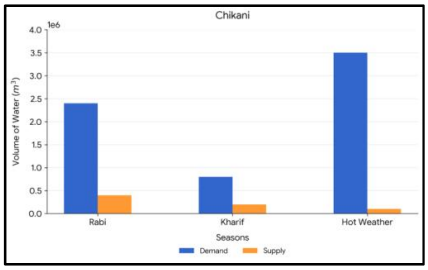

Fig 8: Graph 1

The demand versus supply analysis for Chikani village shows a significant gap between irrigation water demand and available water supply during different seasons. The shortage is more severe during the Hot Weather season, indicating increased dependency on groundwater sources for irrigation.

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Demand vs Supply Graph – Rajapur

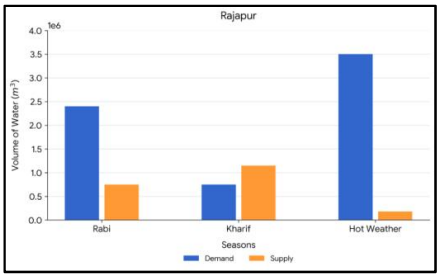

Fig 9: Graph 2

This clustered bar chart for Rajapur village compares seasonal Demand and Supply volumes of water in cubic meters (m^3) across Rabi, Kharif, and Hot Weather seasons. The graph indicates fluctuating water availability and highlights a noticeable water deficit, particularly during peak irrigation periods.

Demand vs Supply Graph – NimgaonBhojapur

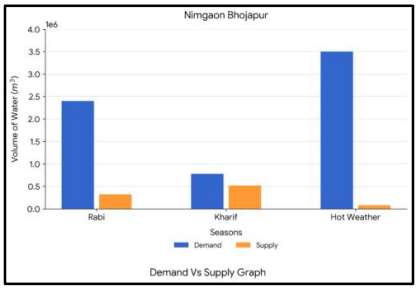

Fig 10:Graph 3

This clustered bar chart for NimgaonBhojapur village compares seasonal Demand and Supply volumes of water in cubic meters (m^3) during Rabi, Kharif, and Hot Weather seasons. The graph highlights a persistent water deficit across all three seasons, with varying levels of severity.

The observed water deficit, along with future uncertainties in groundwater availability, highlights the urgent need for canal rejuvenation. The proposed rehabilitation measures are technically feasible, economically viable, and environmentally sustainable. Therefore, rejuvenation of the Adhala Left Bank Canal can serve as an effective solution for improving water security, agricultural productivity, and long-term sustainability of the irrigation system.

IX. FUTURE SCOPE

The rejuvenation of Adhala's Left Bank Canal provides a strong foundation for sustainable irrigation development in the command area. In the future, advanced canal management techniques can be adopted to further improve water distribution efficiency and minimize conveyance losses. The implementation of automated gate control systems and real-time monitoring technologies can help optimize water delivery according to crop requirements and seasonal demands.

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