

# Experimental Study of Watershed Management Structure in rural area.

Mr. S.K. Gorde<sup>1</sup>Mr. G. P. Walhekar<sup>2</sup>Mr. R D. Vikhe<sup>3</sup>

1. *Head, Department of Civil Engineering, P. Dr. V. Vikhe Patil Institute of Technology & Engineering (Polytechnic), Loni, Pravara.*
2. *Lecturer, Department of Civil Engineering, P. Dr. V. Vikhe Patil Institute of Technology & Engineering (Polytechnic), Loni, Pravara.*
3. *Lecturer, Department of Civil Engineering, P. Dr. V. Vikhe Patil Institute of Technology & Engineering (Polytechnic), Loni, Pravara.*

## Abstract

Watershed management in rural areas focuses on the sustainable use and conservation of water resources within a defined watershed. This process aims to balance water needs for agriculture, domestic use, while preventing soil erosion, water contamination, and habitat. Effective watershed management structures involve the development of strategies to regulate land use, control pollution, and promote community participation in decision-making. K.T. weir, contour bunding, farm pond, cement plug are watershed management structure are used in rural area. It includes interventions like soil and water conservation techniques, reforestation, water storage systems, and the protection of wetlands. Integrated planning, education, and policy enforcement are key elements in ensuring long-term water security and environmental sustainability in rural area.

**Key words-** Rural watershed management structure, K.T.Weir, farm pond, contour bunding, cement plug

## I) Introduction:-

Watershed management is the process of managing the land, water, and resources within a watershed to ensure the sustainability and health of the ecosystem. A watershed is an area of land that drains all the rainwater and other precipitation to a common outlet, such as a river, lake, or ocean. Proper watershed management in rural areas is crucial for maintaining soil fertility, water quality, and overall environmental health. In rural areas, watershed management often involves addressing challenges like soil erosion, floods, and pollution, which can directly impact the livelihoods of local communities, agriculture, and natural habitats. Effective watershed management can help in maintaining the ecological balance, conserving water resources, improving agricultural productivity,

## II) Key Components of Watershed Management in Rural Areas:

Soil Conservation  
Water Resource Management  
Community Participation  
Pollution Control  
Flood Management

## III) Importance of Watershed Management in Rural Areas:

**Improved Agricultural Productivity:** Proper watershed management can improve irrigation systems, reduce soil erosion, and promote soil health, which leads to better crop yields.

**Enhanced Water Quality:** Protecting water sources from contamination ensures that clean water is available for drinking, sanitation, and agriculture.

**Sustainable Livelihoods:** Through sustainable water and land management practices, rural communities can improve their income, reduce poverty, and enhance food security.

**Climate Change Mitigation and Adaptation:** Proper watershed management can help rural areas adapt to climate change by reducing the impacts of flooding, droughts, and extreme weather conditions.

#### IV) Different watershed management structure in rural area-

##### 1) K.T. Weir:-

A K.T. Weir is a traditional water management structure widely used in rural areas, particularly in India, for watershed management and improving water availability in dry and semi-arid regions. The weir functions as a water storage structure that helps in managing the flow of water from streams, rivers, or other natural water sources, and it provides a means to store water for irrigation, domestic use, and livestock during dry periods.

##### 1.1 Importance of K.T. Weir in Watershed Management

**Water Conservation:** The primary function of a K.T. Weir is to conserve water by controlling the natural flow of water in a stream or river. This helps in maintaining a stable water supply for the area, particularly in regions that experience erratic rainfall.

**Flood Control:** It helps in regulating floods by controlling the discharge of excess water, thus preventing damage to crops and infrastructure.

**Groundwater Recharge:** By creating a barrier that holds water for longer periods, it promotes the recharge of groundwater, which is crucial in areas with low rainfall and declining water tables.

**Sustainable Irrigation:** The water stored in the weir is used to irrigate agricultural lands during the dry season, ensuring sustainable farming practices.

**Improved Livelihood:** It supports rural livelihoods by providing water for agriculture, which is a major source of income in rural areas.

##### 1.2 Components of a K.T. Weir

**Weir Wall:** A structure built across the river or stream to restrict the flow of water.

**Sluice Gate:** A control mechanism that regulates the release of water stored behind the weir.

**Reservoir:** The water storage area that accumulates behind the weir.

**Outlet:** A channel through which water is released into the downstream areas for irrigation or domestic use.

**Spillway:** A part of the weir that allows excess water to flow over the top safely, preventing the structure from being damaged during heavy rains.



Fig-1 K.T. Weir

##### 1.3 Working of a K.T. Weir

**Water Storage:** During the rainy season, the weir blocks the natural flow of water in a stream or river, leading to the formation of a reservoir behind the weir. This water is stored and used throughout the year, especially in dry seasons.

**Water Release:** The sluice gate or outlet is used to release water for irrigation, domestic needs, or for replenishing groundwater levels. This controlled release helps in managing water use efficiently.

**Excess Water Control:** In cases of heavy rainfall, excess water flows over the weir through the spillway, which prevents flooding and ensures the weir's safety.

##### 2) Gabion Structures

Gabion structures are widely used in watershed management for controlling soil erosion, managing water flow, and stabilizing streambeds. A "gabion" is a large wire mesh cage or box filled with stones, rocks, or other materials, primarily used for civil engineering, erosion control, and construction. Gabion structures play a critical role in rural watershed management by stabilizing banks, preventing soil erosion, reducing runoff, and improving the landscape's ecological health. They are commonly used in rural areas where water resources and soil protection are vital to the agriculture-based economy.

##### 2.1 Components of a Gabion Structure:

**Wire Mesh Baskets:-**These are the framework that holds the stones together. The mesh is made from steel or another strong material to withstand pressure and weathering.

The baskets can be rectangular, cubic, or other shapes depending on the specific design.

**Stones or Rocks:-**The baskets are filled with large rocks, stones, or sometimes concrete rubble. These materials are often locally sourced and are key to the structure's stability.

The stones interlock with each other, creating a solid and durable barrier.

**Foundation:-**Gabions are usually placed on a level and solid foundation, which may be a bed of gravel or concrete,

depending on the site's condition.

**Top Layer:-**Sometimes, the top layer of the gabion may be covered with smaller rocks or earth to promote plant growth, especially if the structure is meant to blend with the natural landscape.



**Fig-2- Gabion Structures**

### 3) Contour bunding:-

Contour bunding is a type of watershed management structure used to control soil erosion and manage water runoff. It involves the creation of bunds (or embankments) along the contours of the land, typically on slopes. These bunds are designed to reduce water flow speed, allow water to spread evenly across the land, and prevent soil from being washed away during heavy rainfall.

#### 3.1 Key points regarding of contour bunding in watershed management:-

**Soil Conservation:** It helps in preventing soil erosion by stabilizing the soil along the contours.

**Water Harvesting:** The bunds capture runoff water, allowing it to infiltrate the soil rather than being lost as surface runoff.

**Improved Fertility:** By reducing erosion, nutrients in the soil are preserved, leading to improved land fertility.

**Flood Control:** They help in reducing the speed of water flow, which can lessen the impact of floods downstream.



**Fig-3- Contour bunding**

### 4) Farm pond:-

A farm pond is a small, artificial water body created by digging a pond in a farmer's field or land, typically with the aim of storing water. These ponds are primarily used to collect and store runoff water during the rainy season for use during dry periods. They are usually designed to be shallow, with low embankments, and can vary in size depending on the local needs and available land.

#### 4.1 Key points of Farm Ponds in Watershed Management:-

##### **Water Conservation:**

**Storage of Rainwater:**

Farm ponds capture and store rainwater runoff, reducing surface water loss and improving groundwater recharge.

**Reliable Water Supply:**

These ponds provide a steady water source for irrigation, reducing dependency on erratic rainfall patterns.

**Improved Agriculture:**

**Irrigation Support:** Farm ponds help farmers irrigate crops during the dry season or drought conditions, ensuring stable crop production.

**Livestock Support:** They provide water for livestock, supporting animal husbandry, which is often a vital part of rural livelihoods.

**Reduction in Soil Erosion:**

**Soil Retention:** By controlling runoff, farm ponds help reduce soil erosion and sedimentation, which can degrade land quality.

**Increased Soil Fertility:** Water stored in farm ponds can also help irrigate fields during periods of low rainfall, maintaining soil fertility.

**Groundwater Recharge:-**Farm ponds help in groundwater recharge by allowing water to infiltrate the soil. This reduces the risks of wells running dry and improves the availability of groundwater for domestic and agricultural use.

**Flood Control:-**In regions prone to flooding, farm ponds help capture excess runoff, reducing the risk of flash floods in rural areas. They act as temporary water storage facilities, alleviating the pressure on nearby drainage systems.



Fig-4- Farm pond

**5) Cement Plug: -**

it is the types of bund constructed across a natural stream of water to create a storage of water on its upstream side. This cement plug is constructed as a wall of stones and this wall is stream strengthened by cement mortar. These plugs are built using local stones, clay and bushes and cement mortar across small gullies and streams running down the hill slopes carrying drainage to tiny catchments during rainy season.



Fig-5-Cement Plug

**REFERENCES**

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**Author**



**1. Mr. S.K. Gorde**

The Author has pursued his degree in civil Engineering. The total experienced is 15 years in teaching as well as 01 year on construction site. He has also Guide the other Project. He is doing practice on Building Construction site.



**2. Mr. G. P. Walhekar**

The Author has pursued his degree in civil Engineering. The total experienced is 08 years in teaching as well as 02 year on construction site. He has also Guide the other Project. He is doing practice on Building Construction site. Also working as Chartered engineer.



**3. Mr. R D. Vikhe**

The Author has pursued his degree in civil Engineering. The total experienced is 07 years in teaching as well as 01 year on construction site. He has also Guide the other Project. He is doing practice on Building Construction site.

