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Design and Fabrication of a DIY Drip Irrigation System using Greywater Filteration

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ABSTRACT: This project focuses on the development of an eco-friendly mulching sheet using agricultural waste materials such as cocopeat and natural fibers. Starch is used as a biodegradable binder to form the sheet structure, and a wax coating is applied to improve water resistance and durability. The aim of this project is to replace plastic mulching sheets with a sustainable alternative that controls weed growth, retains soil moisture, and improves soil health. The prepared sheet is cost-effective, biodegradable, and suitable for garden and small-scale agricultural applications. This innovation promotes environmental sustainability by reducing plastic usage and utilizing renewable agro -waste resources.

KEYWORDS: Greywater, Drip Irrigation, Filtration, Water Conservation, Sustainable Agriculture, DIY Irrigation System.

I. INTRODUCTION

Agriculture requires a large amount of water for crop growth and productivity. However, due to increasing population, climate change, and limited water resources, water scarcity has become a major challenge.

Efficient irrication methods are necessary to conserve water and improve crop yield. Drip irrigation is one of the most efficient irrigation methods, as it supplies water directly to the root zone of plants in a controlled manner. This reduces water loss due to evaporation and runoff.

Greywater is wastewater generated from domestic activities such as washing clothes, bathing, and kitchen use. Instead of disposing of greywater, it can be filtered and reused for irrigation purposes.

II. LITERATURE SURVEY

Several researchers have proposed different IoT based solutions to improve agricultural productivity and reduce manual effort. The following studies provide an overview of existing technologies and methodologies used in smart farming and indoor agriculture.

R. Sharma (2018) developed a drip irrigation system to improve water efficiency in agriculture. The study showed that drip irrigation reduces water consumption and increases crop yield compared to traditional irrigation methods.

S. Kumar (2019) proposed a greywater filtration system using sand, gravel, and charcoal layers. The filtration system effectively removed impurities from greywater and made it suitable for irrigation purposes.

M. Patel (2021) studied the reuse of domestic greywater for irrigation. The results showed that filtered greywater can be safely used for irrigation and helps in conserving freshwater resources

A. Verma (2022) developed a DIY irrigation system using simple materials such as pipes, filters, and storage tanks. The system was cost-effective and suitable for home gardening and small-scale agriculture.
From these studies, it is clear that drip irrigation and greywater reuse are effective methods for water conservation. These technologies help in reducing water wastage, improving irrigation efficiency, and promoting sustainable

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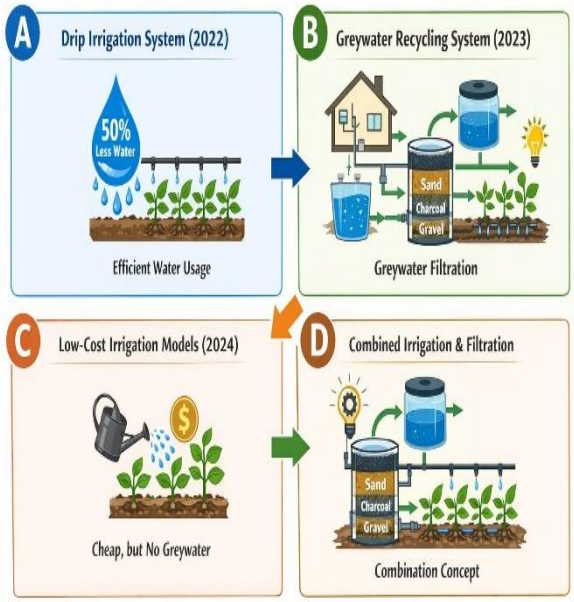
agriculture. This project focuses on designing a DIY drip irrigation system using greywater filtration to provide an economical and eco-friendly irrigation solution.



III. PROJECT DESCRIPTION

This project focuses on the design and fabrication of a low-cost DIY drip irrigation system using greywater filtration for efficient water reuse and conservation. Greywater is wastewater generated from domestic activities such as hand washing, bathing, and laundry Instead of being wasted, this greywater can be filtered and reused for irrigation purposes.

The system consists of three main units: the greywater collection unit, filtration unit, and drip irrigation unit. Greywater is first collected from household sources and directed into a filtration container. The filtration unit contains layers of gravel, sand, and charcoal, which remove suspended particles, dirt, soap residues, and impurities from the greywater. After filtration, the cleaned water is stored in a storage tank.

From the storage tank, water flows through PVC pipes or drip tubes connected to drip emitters. These emitters deliver water slowly and directly to the root zone of plants. This method ensures efficient water utilization, reduces evaporation loss, and promotes healthy plant growth. The system is designed to be simple, economical, and easy to construct using locally available materials. It does not require complex equipment or high operational costs.

The fabrication process involves assembling the filtration unit, connecting pipes, installing emitters, and ensuring proper water flow through the system. This project helps in conserving freshwater, reducing water wastage, and promoting sustainable agricultural practices. It is especially useful for home gardens, small farms, and water-scarce areas.

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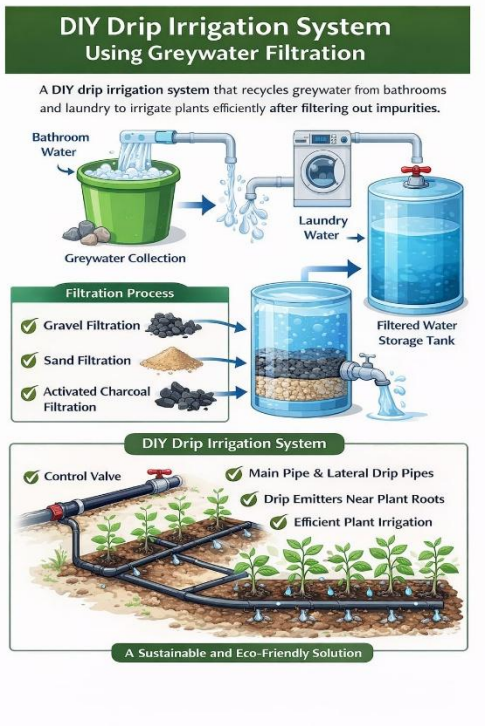
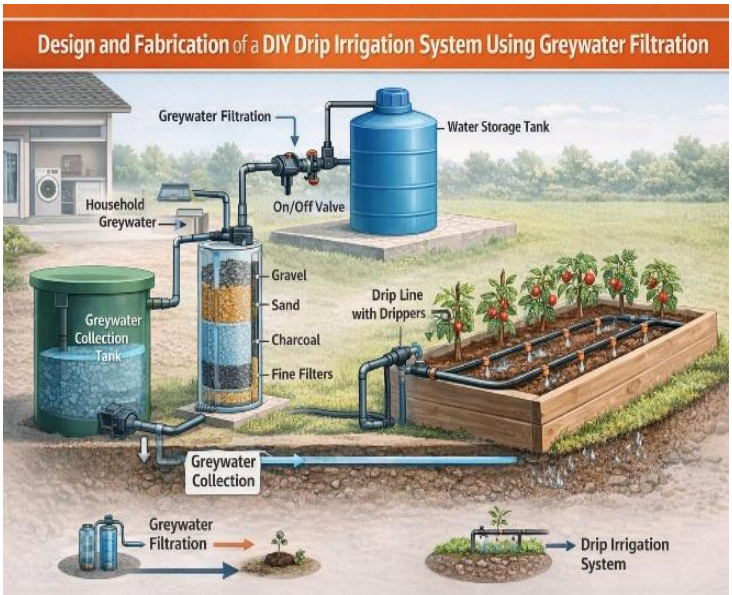


The DIY drip irrigation system using greywater filtration provides an eco-friendly and efficient solution for irrigation and water management.

IV. WORKING PRINCIPLE

Greywater is collected from household sources
Water passes through filtration layers
Impurities are removed
Filtered water stored in tank
Water flows through drip pipes
Plants receive controlled water supply



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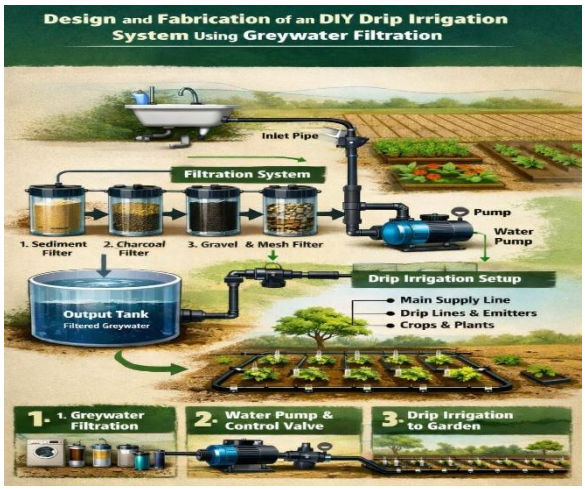
V. ALGORITHM

Collect greywater
Filter water
Store filtered water
Open valve



VI. RESULT

Water saved effectively
Reduced water wastage
Low-cost system implemented
Suitable for small-scale use
Eco-friendly irrigation

VII. DISCUSSION

The system is simple and affordable. It reduces freshwater usage and promotes reuse of wastewater. However, regular maintenance of the filter is required to ensure efficiency.
Future improvements may include automatic sensors and solar-powered pumps.

VIII. SCOPE

Home gardening
Small farms
Urban agriculture
Water conservation projects

IX. CONCLUSION

The DIY drip irrigation system using greywater filtration is an effective and sustainable solution for water management. It reduces water wastage, supports plant growth, and promotes eco-friendly farming practices.

The fabricated system effectively removes impurities using multi-stage filtration (gravel, sand, and charcoal), making the water suitable for irrigation.

The drip irrigation method ensures controlled and uniform water distribution directly to plant roots, improving water efficiency and plant growth while minimizing losses due to evaporation and runoff.

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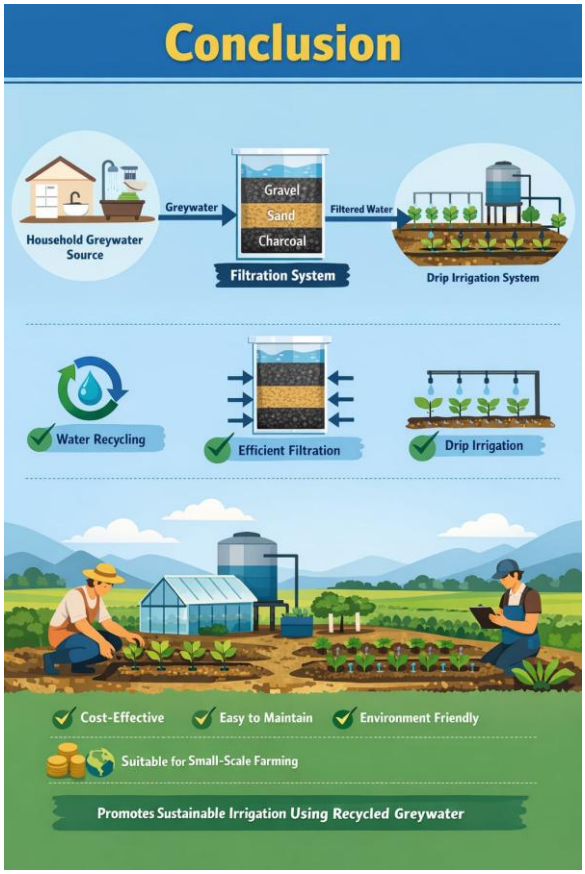
This project proves that a low-cost, easy-to-build system can be implemented for small-scale farming and home gardening. It is especially useful in water-scarce regions and contributes to environmental conservation.



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