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RESEARCH ARTICLE

BASUTIRTHA INNOVATING RAIN WATER HARVESTING WITH MICRO IRRIGATION TECHNOLOGY RRR MODELS: PROSPECTS AND POTENTIALITY FOR WATER CONSERVATION AND MANAGEMENT

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Abstract

Today, global demand for water is outpacing population growth due to rapid urbanization and the rising needs of the agriculture, industry, and energy sectors. Global water stress has held at 18% since 2023, with one in ten people now living under high or critical water stress, and several regions exceeding a 75% stress level. This scarcity is projected to worsen as rising temperatures from climate change disrupt the water cycle. To ensure universal access to safe and affordable drinking water by 2030, we must invest in infrastructure, protect water-related ecosystems, and promote hygiene education. Improving water-use efficiency is also key to reducing overall water stress. At our current pace, however, the world will not achieve sustainable water management until at least 2049, and reaching water, sanitation, and hygiene (WASH) targets in schools by 2030 will require doubling our current rate of progress. Water Conservation and Management goal to promote research, innovation, and practical solutions for the sustainable use and management of water resources mainly ground water. Basutirtha Innovating Rain Water Harvesting with Micro Irrigation Technology RRR Models provide a innovated model for researcher, scientists, policymakers, engineers, and environmentalists to share knowledge, benefits and advancements in water conservation and management techniques, water quality assessment, resource planning, low cost RRR unit, useful and easiest operating system and climate resilient management practices. There are two innovated models i..Basutirtha Rain Water Harvesting with Micro Irrigation Technology RRR combo unit and ii. The Innovating Basutirtha Wall Garden.

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The models scope includes research such as water resource engineering, hydrology, irrigation management, wastewater treatment and reuse, rainwater harvesting, groundwater recharge, watershed management, and the socio-economic aspects of water use. It also welcomes interdisciplinary studies that integrate technology, policy, and low cost community-based approaches to address global and regional water challenges. Through the publication of model, research work, application, the innovated model seeks to contribute to the global effort toward sustainable water security and environmental stewardship. About 60% water will be conserved and 40% rain water will be ground water recharged and also 25% will be reused by the every models of a specific area and cultivation practices.

Introduction:-

Global water stress has held at 18% since 2023, with one in ten people now living under high or critical water stress, and several regions exceeding a 75% stress level. Today, global demand for water is outpacing population growth due to rapid urbanization and the rising needs of the agriculture, industry, and energy sectors. Global water stress has held at 18% since 2023, with one in ten people now living under high or critical water stress, and several regions exceeding a 75% stress level. This scarcity is projected to worsen as rising temperatures from climate change disrupt the water cycle. To ensure universal access to safe and affordable drinking water by 2030, we must invest in infrastructure, protect water-related ecosystems, and promote hygiene education. Improving water-use efficiency is also key to reducing overall water stress.

At our current pace, however, the world will not achieve sustainable water management until at least 2049, and reaching water, sanitation, and hygiene (WASH) targets in schools by 2030 will require doubling our current rate of progress. Water Conservation and Management goal to promote research, innovation, and practical solutions for the sustainable use and management of water resources mainly ground water.

Basutirtha Innovating Rain Water Harvesting with Micro Irrigation Technology RRR Models provide a innovated model for researcher, scientists, policymakers, engineers, and environmentalists to share knowledge, benefits and advancements in water conservation and management techniques, water quality assessment, resource planning, low cost RRR unit, useful and easiest operating system and climate-resilient management practices. There are two innovated models i..Basutirtha Rain Water Harvesting with Micro Irrigation Technology RRR combo unit and ii. The Innovating Basutirtha Wall Garden and Rack cultivation.

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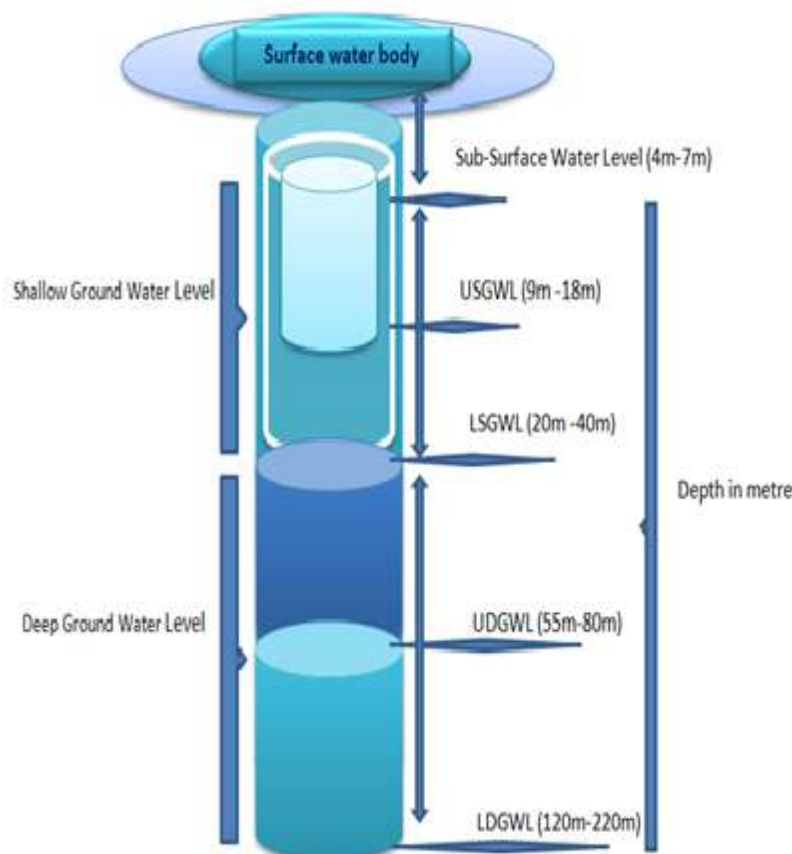


Fig: 1 Positioning places of water sources

Goals and Purpose:-

Water Conservation and Management goals to promote research, innovation, and practical solutions for the sustainable use and management of water resources mainly ground water. Basutirtha Innovating Rain Water Harvesting with Micro Irrigation Technology RRR Models provide a innovated model by me forresearcher , scientists, policymakers, engineers, and environmentalists to share knowledge, benefits and advancements in water conservation and management techniques, water quality assessment, resource planning, low cost RRR unit, useful and easiest operating system and climate-resilient management practices. There are two innovated models A- Basutirtha Rain Water Harvesting with Micro Irrigation Technology RRR combo unit and B-the Innovating Basutirtha Wall Garden.

1. To harvest the roof top rain water of any houses or building during rainy day
2. To recharge ground water table for balancing the local ground aquifer
3. To conserve water with the help of micro irrigation
4. To directly use of rain water for gardening purpose
5. To apply the reuse of water process for sustainable water management
6. To apply the low cost water saving model

Model-A: Basutirtha Innovating Rain Water Harvesting with Micro Irrigation Technology RRR Models:-

About the Model:Basutirtha Innovating model is the unique and applicable RRR Model of Rain Water Harvesting and Micro Irrigation Combo Unit. There are three in one model for water conservation and management, mainly Reduce of Water, Reuse of Water, and Recycle of water. The Unit consists of One Roof Top (any size), One Water Tank, One Ground Water Recharge line, Micro Irrigation line with Drip Irrigation, Auto Timing Water supply, Irrigation of Soil Moisture Sensor.

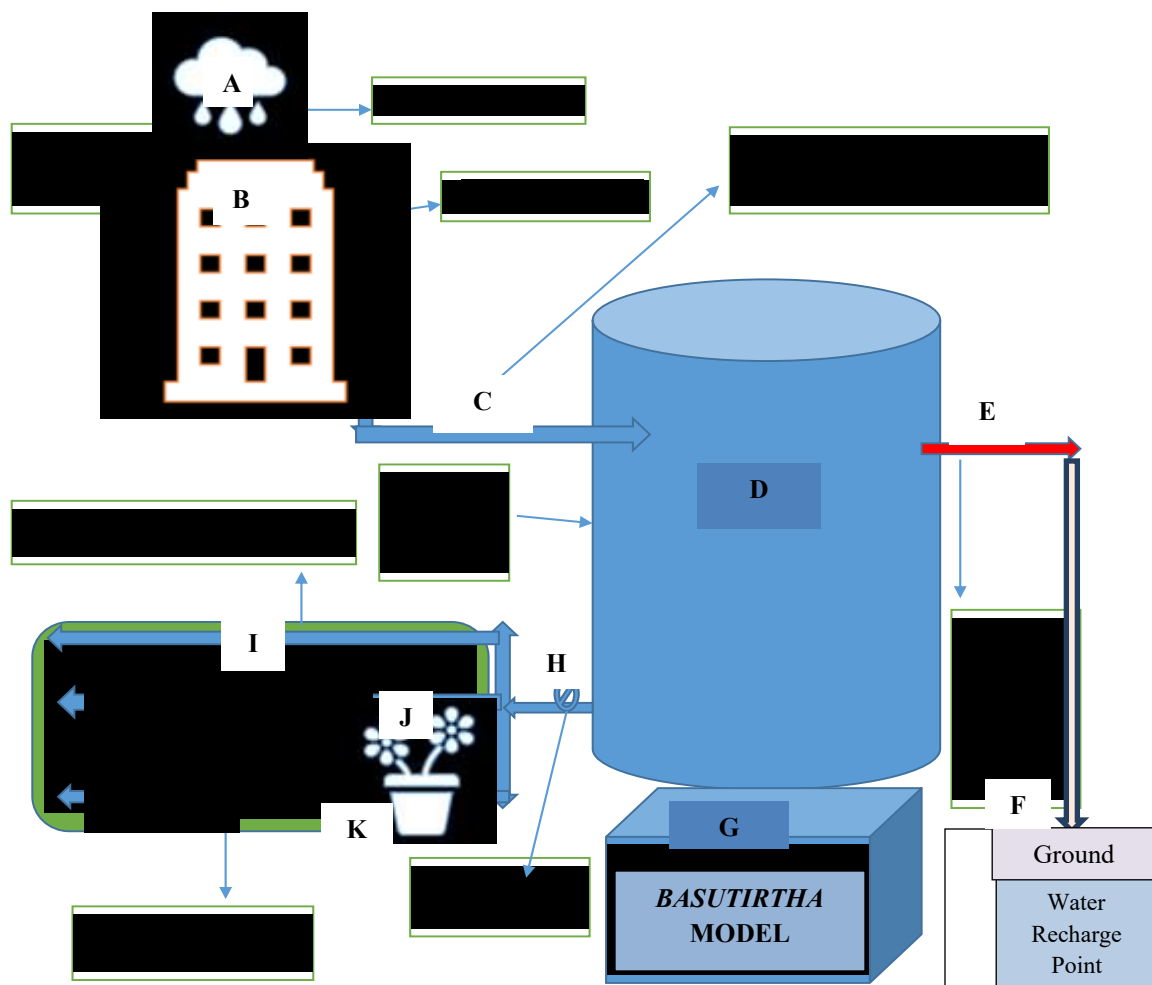


Fig 2: Model of *Basutirtha* Rain water harvesting with micro irrigation technology

Express the Model:-

Where,

- A – Denote that Rain water
- B- House Roof Top
- C- Out source water line
- D- Water tank
- E- Out let extra water line
- F- Ground Water Recharge point
- G- Stand of water tank
- H- Valve for water supply
- I-Drip Irrigation Line
- J- Timer irrigation point
- K- Soils moisture sensor point

Advantages:-

Basutirtha Innovating model is the unique and applicable RRR Model of Rain Water Harvesting and Micro Irrigation Combo Unit. This is the model very much applicable to conserve water and significantly more advantages sides for implementation in urban area and green city planning to save ground water. There RRR are explained that the First 'R' is mentioned that Reduce of usage water trough micro irrigation, especially drip irrigation and sensor

irrigation. Second 'R' means Reuse of water through vertically water flow from top layer to bottom layer and third letter 'R' is recycle of water, mainly extra overflow harvesting rain water to be recharged the aquifer and rising the ground water table.

Advantages of the models:-

- It is a combo RRR model for water management.
- This is the micro and macro rain roof water harvesting unit
- This model is most effective and useful to water conservation during dry season
- Water saving capacity is 60% and water will be conserved through Drip irrigation and 40% rain water will be recharged in ground water table and also 25% will be reused by the every models of a specific area and cultivation practices.
- Installation cost is very low and longevity is high
- Maintenance the garden, mainly labour cost is extremely low
- The requirement of time for irrigation and gardening purpose, need too few minutes.
- It is a Traditional and Technology based water supplying unit

Scientific analysis:-

This model more effective and useful in the dry season. Indian sub-continent is located at Tropical area and under the Monsoon climatic region and also semi desert or dry area, where water scarcity is very high and insufficient water supply in urban area very much occurs. Basutirtha rain water harvesting unit need to installation for that places.

Equation- 1: $AHRW \propto Ar.RF$

Equation-2: $ArW \propto Tp.rWd$

Where,

Equation - 1: $AHRW \approx$ Amount of Harvesting Rain Water = $Ar. RF$ = Total Area of Roof x Amount of Rain Fall

Equation- 2: $ArW \approx$ Amount of required Water = $Tp.rWd$ = Total no of Plants x required of Water in a day.

I have analysed that by an example;

Where, Roof top of house is 3000sq feet, Amount of rain water in a day during dry season is 2 inches. The Amount of Harvesting Rain Water is, 3000sq feet x 2 inches = 3000 x 4.68 litre=14,040 litre (1 inch rain fall =2.34 litre water for one square feet area). So, Amount of Rain water harvesting is about 14040 litre from 3000 sq feet roof top.
ii. Amount of required water for 100 plants, $Tp.rWd=100 \times 200\text{ml}$ per day (Micro irrigation methods) = 20000ml water =20 litres per day

Suppose, one house top area is about 3000sq feet and amount of rain fall in a day during dry season is about 2 inches or 5.08 cm and require amount of water for irrigation purpose for 100 plants is about 80 litre (100 plants x 800ml by traditional method) in a day. So, water require for a month (30 days) is about 2400 litre. But we can be used the Basutirtha Model, must be conserved water too much because the amount of rain water harvesting is 14040 litre in day during dry season, require of water 20 litre for 100 plants by micro irrigation system, as result 60 litre water per day will be saved. So, one time, rain water will be harvested in dry season, we can be supplied for 100 plants for one month by micro irrigation method which amount is about 600 litre.

The Innovating Basutirtha Wall Garden:-

It is another water conservation and sustainable agricultural practices in an urban area. Where the places are limited, labour crisis, insufficient of water and need to beautification that area for this model is highly appropriate to be installed. This model's motto is Water save, Time save and Cost save. There are three vertical layer, three irrigation valves for horizontal water supply and vertical water line.

Advantages:-

Basutirtha Innovating Wall Garden model is the unique and applicable model for Water save, Time save and Cost save This is the model very much applicable to conserve water and significantly more advantages sides for implementation in urban area and green city planning to save ground water.

Advantages of the models:-

- It is a Water save, Time save and Cost save model for water management.
- This is the one type of micro irrigation methods.
- This model is most effective and useful to water conservation and horticulture practices
- Water saving capacity is 60% - 70% and it is water reuse model
- Installation coast is very low and sustain
- Maintenance the garden , mainly labour cost is very low
- The requirement of time for irrigation and gardening purpose, need too few minutes.
- It is a Minimum Technology based water supplying unit



Basutirtha Rack garden on the Roof



Preparing the Basutirtha Innovating wall garden



Basutirtha Wall Garden and signatures of model

Methods and Scientific analysis:-

There are three layer, a) 1st layer or Top Layer: This layer is relatively high water required planted garden b) 2nd layer or Middle Layer: This is the minimum water required planted garden c) 3rd Layer or Bottom Layer: It is little water required planted garden.



Basutirtha Wall Garden Recognized by Govt. of West Bengal & RKM

Where,

A is the 1st knob for Horizontal irrigation line of top layer.

B is the 2nd knob for Horizontal irrigation line of middle layer

C is the 3rd knob Horizontal irrigation line of bottom layer

Time require:-

A Line for 5 minutes for 50 plants

B Line for 3 minutes for 50 plants

C Line for 1 minute for 50 plants



Installed the *Basutirtha* Rain Water Harvesting Unit in Different Institution for Water conservation

It takes two minutes less to supply water from Level A than from Level B. This is because the excess water from Level A flows vertically down to level B to contribute to its supply. Similarly, the excess water from Level B reaches Level C and supplements its supply. As a result, water is reused, and 25 % of water is conserved.

Water Require:-

This the wall garden is setup on 300sq feet area of wall at Jhargram Ramakrishna Mission, WB and 150 flowers trees are planted. Hence, required of water for gardening purpose in a day is about 120 litre by traditional method. But I have studied that by the research and applied the innovating *Basutirtha* methods which is my innovation model, that the required of water which amount is 22.5 litre every day. So, 97.5 litre water will be conserved per day. That's why *Basutirtha* wall garden is a Water save, Time save and Cost save model.

Conclusion:-

Basutirtha Innovating Rain Water Harvesting with Micro Irrigation Technology RRR Models provide a innovated model for researcher, scientists, policymakers, engineers, and environmentalists to share knowledge, benefits and advancements in water conservation and management techniques, water quality assessment, resource planning, low cost RRR unit, useful and easiest operating system and climate-resilient management practices. There are two innovated models A.-*Basutirtha* Rain Water Harvesting with Micro Irrigation Technology RRR combo unit and B-the Innovating *Basutirtha* Wall Garden. The models scope includes research such as water resource engineering, hydrology, irrigation management, wastewater treatment and reuse, rainwater harvesting, groundwater recharge, watershed management, and the socio-economic aspects of water use. It also welcomes interdisciplinary studies that integrate technology, policy, and low cost community-based approaches to address global and regional water challenges. Through the publication of model, research work, application, the innovated model seeks to contribute to the global effort toward sustainable water security and environmental stewardship. About 60% water will be conserved and 40% rain water will be ground water recharged and also 25% will be reused by the every models of a specific area and cultivation practices. So, *Basutirtha* Innovating Rain Water Harvesting with Micro Irrigation Technology RRR model and *Basutirtha* Wall Garden are innovating units and potentiality of the models is very much high to establish for water conservation and sustainable water management in the urban areas and water scarcity zones in contemporary world.

References and Bibliography:-

1. Irrigation and water resources department, First Edition, 2022: Uttar Pradesh Guidelines for Planning and Design of Micro Irrigation System
2. Prof. M. L. Meena, Prof. Yashodhara Varale, Dr. Krishan Kant Upadhyay, Dr. Prasenjit Talukdar, 2024:
3. Sustainable Water Management published by Bhumi Publishing
4. Sing, S. 1991 : Environmental Geography Published by Prayag Pustakalaya, Allahabad
5. Saxena, H.M . 2017: Environmental Geography Published by Rawat Publication, Jaipur
6. <https://waterapp.in/technology>
7. <https://www.researchgate.net>
8. <https://www.epa.gov/greeningepa/water-management-plans-and-best-practices-epa>
9. <https://connect4impact.worldbank.org/book-page/smart-water-management-system>