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SUSTAINABLE WATER SUPPLY BY REJUVENATING DRY WELLS THROUGH CLUSTER APPROACH IN ROOF TOP RAIN WATER HARVESTING IN RURAL DISTRICT BANDA, INDIA- SDG GOAL 6.1

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Abstract- Bundhelkhand region within India, spread across 2 states and 14 districts, is amongst most backward region in country with 1/3rd of population living below poverty line. Banda district within Bundhelkhand region is mostly rural, depends on farming for their livelihood but have poor rainfall (average annual rainfall of 902 mm) leading to widespread poverty. This results into rapidly drying hand pumps due to ground water depletion in backdrop of almost absent culture of rain water harvesting. Women's can be observed fetching water from long distances particularly in summer season in many villages of Banda district.

Akhil Bhartiya Samaj Seva Sansthan (ABSSS), a local civil society organization with financial support from WaterAid India started a learning project on low cost method of rapid recharge of ground water in rural areas through roof top rain water harvesting. The project worked on using a cluster of houses for installation of roof top rain water harvesting system and collecting the rain water from these cluster of houses to direct recharge through abandoned dried up dug wells in the villages after installation of a filter in between. The objective of the project was to quickly recharge the first strata of ground water so that the dried up wells are again recharged and can be used up as safe source of water when deep bore hand pumps for drinking water supply goes dry in summer season thereby reduce drudgery of women.

The key learnings of the project is that clustering the small roof tops in rural areas and direct recharge of dried up and abandoned wells , we can recharge the wells in short term and develop them as sanitary well for safe source of water supply particularly in summer months when deep bore hand pumps goes dry. The learnings from the project help to achieve Sustainable Development Goal 6.1 in context of Banda and Bundhelkhand in rural and urban areas.

Keywords – Rural roof top rain water harvesting, Drought, Bundhelkhand, Banda District , Ground Water Recharge , Community action, Water Security, SDG 6.1 , Safe Water.

INTRODUCTION

Banda district is part of Bundhelkhand region in Uttar Pradesh India Total geographical area of the district is 4460 sq. km. District headquarter is at Banda having 04 tehsils and 8 blocks. Geologically the area comprises Precambrian Bundelkhand granites unconfirmably overlain by Vindhyan are quaternary alluvium. The main and major drainage of the district are Yamuna, Ken and Baghain which are part of Yamuna river system. Physiographically the area can be divided into three physiographic units– (1) Alluvial Plain (2) Marginal Alluvial (3) High Land (Hard rock) area. The average annual rainfall is 902.00 mm. The climate is typical subtropical penetrated by long and intense summers. About 80% of the annual rainfall is received from south-west monsoon. May is the hottest month with mercury shooting upto 47.0 degree C. With the advance of monsoon by mid-June, temperature starts decreasing. January is usually the coldest month with temperature going upto 5.8 degree C. The relative humidity is highest in August about 85% and lowest in April. In Banda district loose sediments as well as black cotton soil is found. Black cotton soil is prominent in the central part. Four major type of soil a) Rakar, b) Mar c) Kabar and d) Padua are dominant in the district. On the basis of hydrogeological information ground water occurs in unconfined conditions in shallow depths and confined conditions in deeper depth in alluvium. The thickness of alluvium varies from 45.00 to 200.00 mbgl in the district. Granites (Bundelkhand) has also good potential and yield at economical discharge. Ground water occurs in fractures and joints in the hard rock. The potential fractures are encountered from around 28.00 to 96.00 meters in some places.
As per the depth to water level data of 27 permanent ground water monitoring stations in the year 2009, pre monsoon water level ranges from 2.75 mbgl (Khurand) to 26.95 mbgl (Bhitar Kerdera). In the post monsoon period, depth to water level varies from 0.95 mbgl (Girwan) to 22.50 mbgl (Pailani). Water level fluctuation varies from 0.0 in Rolyhdyajue to 8.02 m at Naraini. It is observed that the hilly and rocky area the fluctuation is higher than the plain. Fluctuation is more where less order streams are found. Long term water level trend records in the area from 27 national hydrographic

stations (2000-2009) in ten years show that (except Mataudh) all other wells are showing declining trend. The falling trend ranges from 0.0979 m/yr (Girwan) to 1.5087 m/yr at Paprenda. In the northern alluvium area, the triangle of Banda-Baberu-Tindwari covered by alluvium and is suitable for artificial recharge practices. Recharge wells and percolation tanks can be made in the central part consisting of marginal alluvium. Check dams should be constructed in hard rock area.

Context

In promotion of roof top rain water harvesting in rural areas, the past attempts have failed for many reasons in Banda district. Some of these reasons were lack of knowledge among local communities about low cost roof top rain water harvesting, higher costs of technical options for having roof top rain water harvesting systems by each householdand affordability, lack of incentives from government for roof top rain water harvesting, poor ground water regulation and overall lack of clarity in institutions responsible for rain water harvesting.

WaterAid India started promotion of household level rain water harvesting through a well-designed campaign titled ***Ghar Ghar Aakash Ganga Abhiyaan*** in 2016 with its partner Sharmik Bharti in Kanpur and Fatehpur.The learnings from this project and challenges in upscaling resulted in designing modified module which can be financed from public funds for promotion of roof top rain water harvesting in rural areas for ground water recharge.

It is in this background and context that Akhil Bhartiya Samaj Seva Sansthan (ABSSS), a local civil society organization with financial support from WaterAid India started a learning project on low cost method of rapid recharge of ground water in rural areas through roof top rain water harvesting. The project worked on using a cluster of houses for installation of roof top rain water harvesting system and collecting the rain water from these cluster of houses to direct recharge through abandoned dried up dug wells in the villages after installation of a filter in between. The objective of the project was to quickly recharge the first strata of ground water so that the dried up wells are again recharged and can be used up as safe source of water when deep bore hand pumps for drinking water supply goes dry in summer season thereby reduce drudgery of women.

Designing and implementation of low cost appropriate roof top rain water harvesting using unutilised water infrastructure:

This paper presents the two models of roof top rain water harvesting using unutilised or dried up wells and filtered waste water Hand Pumps from mixed with rain water respectively.

About the technology-

In the first type of interventions, roof top rain water harvesting was undertaken by 3-5 households clusters and the roof top rain water was passed through a sand filter before being sent to recharge to a dried or abandoned well after its cleaning , repair and sanitisation. In the second type of interventions, the waste water from hand pump and roof top rain water from a cluster of 3-5 houses has been passed through a filter chamber and then sent to a percolation pit. These two types of interventions were carried out in 3 sites in 3 villages in Banda district

Where-

Mahuee and Gajni Gram Panchayat (Tindwari block) and Fatpurwa (badokhar khurd block)in Banda Districtin Uttar Pradesh, India

Relevance-

Cluster Rain Water Harvesting methods are solutions for rural areas that fits well on account of smaller roof areas in each individual households, economy of investments on account of using existing unutilised water infrastructure such as wells and soak pits, requiring lesser land areas within households for recharge structures and possibilities of connecting through community recharge schemes under public schemes such as Mahatma Gandhi National Rural Employment Guarantee Scheme.

Challenges/ cautions-

- Can be applied in certain contexts where dense settlements are there and unutilised water infrastructure at cluster level is readily available.
- Filters needs to be cleaned at least once every year to keep the system functioning well.
- A monitoring system for measuring rain water harvested to keep the motivation level high for operation and maintenance may be required.

Scalability-

The successful execution of project suggests that the model can be scaled up in all water scace areas in similar conditions in entire Bundhelkhand. Some part of these projects can also be financed from schemes such as MNREGS such as converting abandoned well into a recharge well and construction of percolation pit for waste water emerging out from Hand Pumps along with rain water harvested from roof tops.

Pipes connected in one end with roof and other with chamber

After Filter Chamber pipes coming to recharge pit

Digging of recharge pit nearby India Mark II handpump

Recharge pit nearby India Mark II handpump

Chamber pipes connected to Rechargepit

RECOMMENDATIONS:

Based on cluster based roof top rain water harvesting action research project, the following recommendations are being made.

1. The cluster based roof top rain water harvesting projects can be integrated with National Rural Drinking Water Programme (NRDWP) under Source Sustainability measures for recharge of existing dried well or through percolation tanks near Hand Pumps integrating the waste water from Hand Pumps with basic filtration.
2. Converting Existing dried wells/ abandoned Wells into Recharge Structures can be undertaken under MNREGS Projects using roof top rain water from cluster of households.
3. Monitoring systems for amount of rain water harvested annually should be integrated into design of roof top rain water harvesting to keep households interested in upkeep of RWHT systems and the contribution in recharge by them.

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