



Aquifer characterisation, artificial recharge and reuse of suddenly available water in South Bihar

Overview

Artificial recharge is increasingly used for short or long-term underground storage, where it has several advantages over surface storage, and in water reuse. Aquifer storage and recovery (ASR) has proven to be an effective means for storing large volumes of water at relatively low cost, without the need for construction of large surface reservoirs. A particular method for ASR, the Bhungroo® (or, the Straw), adapted and popularized by the Naireeta Services Private Ltd (NSPL), has attracted the attention of policy makers and scientists in India during the last few years. It helps to drain excess waters into the upper aquifers in the wet season through a recharge structure that is also used to pump out water during the dry season. The technology not only helps to drain temporarily waterlogged areas but, more importantly, creates water resources that are available for irrigation of crops during dry season.

Bihar suffers from the problem of waterlogging, with about 10 percent of the total geographical area of the state seasonally waterlogged. The traditional water management systems are in decline but still in use. Climate change is also exacerbating the seasonal and annual variability of rainfall. Canal irrigation is unlikely to emerge in this region as a major solution as most of the rivers are seasonal and remain dry except in the monsoon.

It is important, therefore, to find a modern solution to protect crops in the face of prolonged and regular seasonal droughts interspersed with short spells of excess water in the monsoon season that flood the fields and other depressions in this predominantly flat terrain. In this background, this project aims to demonstrate the technical viability of the Bhungroo® system in South Bihar.

ACIAR project number	WAC/2018/211
Start date and duration (years)	February 2019 (18 months)
Location	Bihar, India
Budget	AU\$153,200

Project leader(s) and Commissioned Organisation

Dr Prabhakar Sharma, Nalanda University

Partner country project leaders and their institutions

Naireeta Services Private Ltd

ACIAR Research Program Manager

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Research

The project will assess recharge capacity, benefits derived, and key social factors that help adoption of the Bhungroo® technology by the small-holder farmers.

The objectives of the project are to:

1. Study the rate of infiltration, quantity of storage/recovery and transmissivity processes of contamination associated with ASR;
2. Assess the effectiveness of the Bhungroo® (as part of ASR) technologies for conjunctive use in the agriculture sector in South Bihar;
3. Estimate user satisfaction, economic benefits, social acceptance and opportunities for spread of Bhungroo® technologies through government schemes and the market.

These objectives will be achieved through conducting the following activities in three main phases:

In Phase 1 (first six months), two villages near Rajgir in Nalanda district will be selected. The sites will be selected after community mobilization with the help of consultants from Naireeta Services, which will be followed by the aquifer characterization by using pumping test and flowing fluid electrical conductivity logging of the existing wells in the villages. Based on the collected data, the mapping of aquifer will be prepared for storage estimation and for continuous monitoring of expected groundwater table variation of the selected villages. The site-level activities will be complemented with an extensive literature review, a visit to MARVI sites in Gujarat/ Rajasthan, and an initiation workshop.

In Phase 2 of the project (second six months), ten Bhungroo® will be installed on the selected sites with the help of consultants (groundwater recharge technology experts and experts from Naireeta Services), which will be monitored throughout the year. Sites will be selected using hydro-geological factors, and also include beneficiary involvement through tangible contributions.

In Phase 3 of the project (third six months), temporal groundwater level and the recharged groundwater quality due to transport and migration of contaminant (if any) in the aquifers will be monitored. Subsequently, interns and local farmers will be trained for continuous monitoring and assessment of groundwater level and the selected water quality parameters (total dissolved solids, N, and P content in the recharged water) even after completion of the project.

A comprehensive manual for aquifer storage and recovery will be produced from this project, in addition to a number of peer-reviewed journal articles, reports, and news bulletins for local communities.

Anticipated outcomes

This project will deliver a demand-driven convergent water solution for suddenly available water. The Bhungroo®, will be optimized for use in the context of South Bihar. The convergent water solution will primarily address the irrigation needs of an agrarian community but can also provide drinking water security with appropriate safeguards. The project will also deliver a comprehensive aquifer map for recharge and estimation of the potential injection of surface water into the selected aquifer.

A model for implementation, including awareness, local capacity and chain of facilities, will be available in a manual to ensure sustainability of the technology and wider adoption in the region in areas with similar hydrological characteristics. Specific add-ons, such as solar pumps, filtration devices, flow meters, etc. may be integrated as per need. Piloting the Bhungroo® technology, and conducting a scientific, technical and socio-economic study of the same, will also help define a social enterprise model for sustainable scale-up of the solution in the region.

Impact pathway

This project will work with farmer beneficiaries from selected villages by making them co-participants in the process. The socio-economic background, land holding pattern and the willingness and active interest of farmers will be analysed before starting work. The sites for the installation of Bhoongroo will be selected in consultation with smallholder farmers. The rural mechanization process and the ownership pattern of agrarian equipment in the selected villages will be studied to understand the trajectory of technology use in the study area. Farmer satisfaction/ dissatisfaction/ opinion on the stated technological intervention, and day to day experience with the Bhungroo will be simultaneously studied.

The socio-cultural data collected during the project will be used to do a *post facto* analysis on the reasons for adoption of the technology among different social groups. The challenges and limitations will be analysed too. The data will be analysed to propose “models” for greater adoption of such technologies in rural areas of Bihar.