



Ground Water Recharge and its Effective Use Through Micro-irrigation for Crop Production in Coastal Gujarat

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Abstract

Groundwater, a reliable resource for drinking purpose and agricultural crop production, has become a major natural resource contributing to the water supply system. Due to its continued withdrawal, it requires replenishment through recharge. Artificial recharge of ground water through recharge bores is an important strategy that helps in improving both the ground water level and quality. In the absence of assured irrigation supply, majority of the crops in Bharuch district of Gujarat used to face water shortages leading the crop failure or reduced crop yields. To tackle this problem, Regional Research Station of CSSRI installed artificial groundwater recharge structures in 15 farmers' fields in Bharuch, Amod, Valia, Ankleshwar, Netrang and Jhagadia Talukas in coastal Gujarat region. The performance of these structures was evaluated in terms of rise in groundwater levels, improvement in its quality and enhancement of farmers' income during 2008 to 2010. Subsequently Micro Irrigation Systems (MIS) were implemented in 10 sites, including five at groundwater recharge project sites and the effect of MIS on crop production in divergent crops like sugarcane, cotton, banana, water melon and cotton was studied. Detailed results at two sites indicated that enhanced availability and reduction in groundwater salinity due to recharge interventions resulted in increase in crop yields and consequently farmers' income to the tune of 14, 38, 50 and 100 % in papaya, banana, soybean and mango, respectively. The ground water with improved quality, when used with MIS also resulted in substantial increase of crop yields leading to B/C ratio of 4.35, 2.94, 2.84 and 1.22 in water melon, Bt. Cotton, banana and sugarcane, respectively and more importantly water productivity of more than 12 kg/cum in high water demanding sugarcane.

Key words: Ground water recharge, Micro irrigation system, Water productivity, Watertable decline

Introduction

"Water is the Elixir of Life and Cleanser of Sins". This is a pivotal component in agriculture and its conservation and judicious use are of paramount importance. Water is a renewable resource, to a point. The current population of the world is using water at such alarming rates with which nature cannot cope up. Water scarcity, a major problem in most arid regions of the world, is adversely affecting food security, natural ecosystems, plant and human health (Seckler *et al.*, 1999). Water scarcity is resulting from a number of factors, the foremost being depletion of groundwater, currently the most reliable resource in terms of quantity and quality for drinking and agricultural crop production. Though groundwater is an important source of irrigation in India, its availability is non-uniform in space and time. Rainwater harvesting and artificial groundwater recharge interventions can play an important role in augmenting

groundwater and also to improve its quality. Rainwater harvesting is essential considering our increasing dependence on groundwater to meet water demands of different sectors (irrigation, domestic, industry and recreation) and diminishing natural recharge due to falling watertables and rapid urbanization.

Natural recharge of groundwater occurs by infiltration of precipitation or excess irrigation water into the soil and movement in the form of moisture through the vadose zone down to the saturated zone. Artificial recharge is the process by which the groundwater reservoir is augmented at a rate exceeding that under natural conditions or replenishment (Bhattacharya, 2010). It is accomplished by constructing simple civil structures, including among others tubewells and open wells (Gururaja Rao *et al.*, 2010) which are getting increasingly accepted due to failure or delay in arrival of natural or artificially recharged water to deeper aquifer zones with surface methods. By demarcating and preserving the

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