Impact of Rainwater Harvesting on Irrigation in Pallathadka Hamlet

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Pallathadka is a hamlet in Kasaragod District of Kerala state, India – a state that receives nearly 3000 mm rainfall annually (Pullare et al, 2015). Kasaragod district is home to a tropical environment, which is under threat by rapidly changing climate; water shortage for drinking and irrigation are increasingly becoming common during the summer months, whereas monsoon months have witnessed severe floods and landslides (Varma, 2019). Studies have long predicted negative impact on economy and welfare of Indian society if higher evaporation was not compensated by increases in rainfall (Chattopadhyay & Hulme, 1997). In a developing country like India, the impact of a changing climate easily extends to food security, job security and eventually Gross Domestic Product (GDP). The far-reaching consequences of climate change are well documented, and despite slow and uncertain government involvement, Indian society has shown awareness and progress about climate change (Crabtree, 2018). Central and State governments in India are responding with climate change policy measures, but scholars have argued that sustainable development measures are equally necessary to address climate change issues (Swart et al, 2003). In Kasaragod district, especially, tropical climate exists, and the region's agriculture is influenced by Southwestern Monsoons which brings about 75% of the annual rainfall.

In the study area of Pallathadka hamlet, farmers grow cash crops such as coconuts, betel nuts, and pepper, year-round, which require constant water supply. These farmers have increasingly faced water scarcity in the summer months since the 2000s. There are no municipal water connections in the hamlet. Each household sources water from well, borewell, water pumps, tunnels or a river that is situated in the Southern section of the hamlet. Pallathadka has many smaller hills (In the local dialect, the name Pallathadka means The Hill by the riverside), thus most of the rainwater is lost through runoff water. The Increasing number of legal and illegal borewells have caused the region's groundwater reserve to be at an all-time low (Joy et al., 2013). The local government has encouraged rainwater harvesting in recent years to increase the groundwater reserve and to tackle the summer water shortage.

The method of using tunnels (horizontal wells) and water aquifers for harvesting rainwater has traditional roots in Kasaragod, although its prevalence has diminished in practice in the last few decades (Mathrubhumi News, 2019). Historically, a small number of farmers practiced rainwater harvesting by collecting stormwater runoff from the hill slopes in specially carved tunnels. The tunnels used to harvest rainwater typically have a width of 50 cm to 75 cm and a height of around 2 m. The length varies from few metres to 100 metres. These tunnels are located at the foothills and cut across the slope horizontally for the maximum yield. The yield varies from 1 m3/day to 50 m3 /day in summer (Balakrishnan, 2013). This method is now making a comeback as a climate adaptation strategy in Kasaragod district and Pallathadka hamlet. In recent years, special awareness programs, government incentives and practical need for water supply have all nearly doubled the practice of rainwater harvesting among Pallathadka's farmers (Correspondent, 2019). Thus, this study was carried out to investigate whether rainwater harvesting has eased the summer water shortage in Pallathadka hamlet.

The primary researcher in the study examined the existing sources of water for 21 years (1998-2018) to identify whether rainwater harvesting has any impact on the availability of water for farming during the summer months. We collected data on monthly rainfall and temperature, annual count of rainwater harvesting projects over 21 years, and water sources for all farming households in the hamlet. The drought records filed to report crop damage with the Government were then tallied with the corresponding rainwater harvesting projects (RHPs) in the hamlet. We also analysed electricity usage during the summer months to see if farmers with RHPs used their water reserves efficiently.

We found that, on average, 60% of farmers with RHPs did not experience shortage of water for irrigation, and 34% of farmers with RHPs reduced water use during the drought period but did not face significant crop damage/loss, and only 6% with RHPs were affected, in that they had some visible crop damage/loss. The results are aggregated over 21 years for farmers with RHPs. Over this period of time, farmers with RHPs maintained the annual average electricity use, whereas farmers without RHPs had reduced usage of water pumps in the summer months, which meant lower electricity use, but greater crop loss or lower yield. The study concluded that having RHPs greatly reduces the impact of drought and provides water supply evenly throughout the year, suggesting that RHPs can be used for proactive climate adaptation strategies. The authors recommend that the local and state government introduce effective awareness initiatives and financial incentives, so more famers would adapt rainwater harvesting, potentially resulting in better availability of water for farming and a significant increase in the region's groundwater reserves.

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