

## **Potential of farm level rainwater harvesting for enhancing resilience of dryland farming systems in India**

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The farm level rainwater harvesting which has huge potential for enhancing dryland farming systems resilience is yet to be fully harnessed. Here we have assessed the performance of small rainwater harvesting structures in different five rainfed agro-ecologies in India. Further we have taken a case of the state of Telangana in India and mapped the potential for context specific scaling up of rainwater harvesting through farm ponds at mandal (sub-district) level. The study uses farm level primary data on investments, water use, yield impacts and additional net returns due to farm ponds; perceptions of multiple stakeholders and results of experimental on-farm trials on use of harvested rainwater. The ex-ante study to assess the potential for scaling up farm ponds in the whole Telangana state uses eight years district level yield data of major crops from 2007 to 2015. The technical coefficients representing impact of supplemental/lifesaving irrigation through farm ponds were arrived at based on our above case study in five regions, published literature and stakeholders consultations. Accounting for differential benefits of farm ponds under different rainfall situations, we have used the average rate of additional net returns due to farm pond over the period from 2008 to 2105 considering normal, mild drought, drought and excess rainfall years. Stakeholders' consultation with participation from each district of Telangana state was organized to understand the perceptions and preferences of farmers in different regions of the state. The farmers cultivating less than 2 hectares of land were reluctant to adopt the farm ponds, hence only 5% of such landholders were assumed to be the potential adopters of rainwater harvesting structures.

The harvested rainwater in five different regions representing Tamilnadu, Andhra Pradesh, Karnataka, Maharashtra and Rajasthan was used for supplemental irrigation and recharging open-wells. In many instances, the rainwater harvesting through farm ponds significantly increased crop yields and had a multiplier effect on farm income under rainfed situation, but in some cases it was perceived by farmers as a waste of resources. Increased access to cash and fodder triggered an increase in income from livestock in some cases. The supplemental irrigation across case studies in the different regions resulted in a significant increase in crop yields (12 to 72 %) and cropping intensity as well as diversification into fruits and fodder production and in few cases aquaculture. The additional net returns due to farm ponds were estimated to be between US\$ 120 and 320 structure<sup>-1</sup> annum<sup>-1</sup>. The ex-ante analysis at mandal level in Telangana state indicated that one-fifth of the mandals in the state have potential to create more than 500 farm ponds in each to enhance farming systems resilience and income. We also mapped those one third of the mandals which do not need any farm pond to be created. A few mandals have very high potential with a scope for constructing more than 1000 farm ponds in each. The functional analysis highlighted the technical, capital, social and extension related determinants of adoption of farm ponds. Ex-post impact assessment of farm pond in different regions of India establishes their usefulness and the ex-ante analysis maps out its potential at mandal level in the Telangana state would contribute in prioritizing and better targeting of investments for scaling up of farm level rainwater harvesting in the rainfed regions.