

Modeling Rainwater Harvesting in On-farm reservoirs

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Introduction

By 2050, more than 59% of the world population would live in areas with limited water storage in rivers and aquifers [1]. When competing demands for freshwater exist, domestic and industrial uses will likely reduce the water availability for agricultural purposes [2]. The World Bank's new water resources strategy emphasized on investments for increasing water resources [3]. Considering the monetary investments required, and adverse environmental effects of constructing large reservoirs, on-farm reservoirs (OFR) could be a more viable option to meet agricultural water demands.

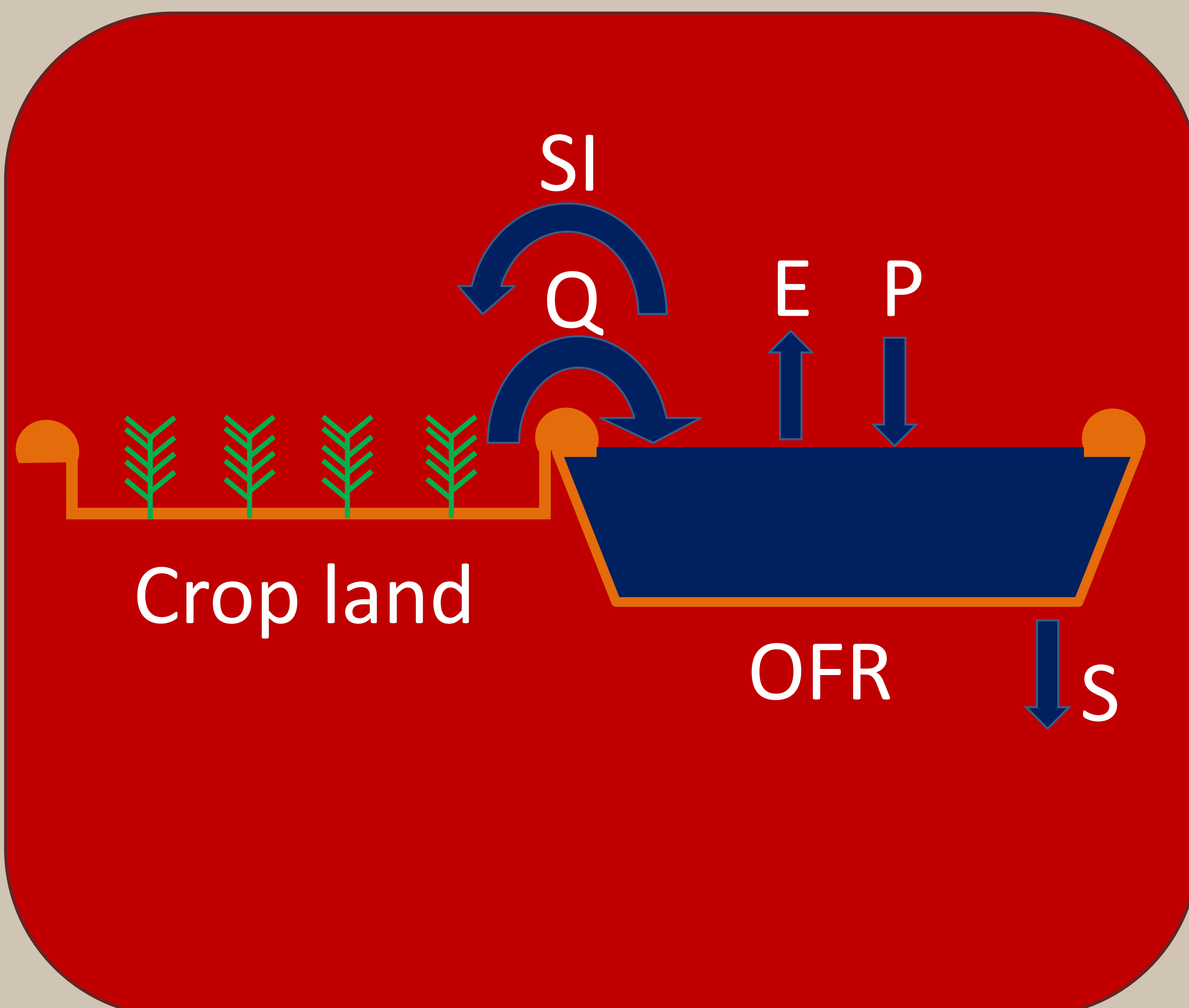
Objectives

Develop a water balance model for estimating the water storage in on-farm reservoirs (OFR)

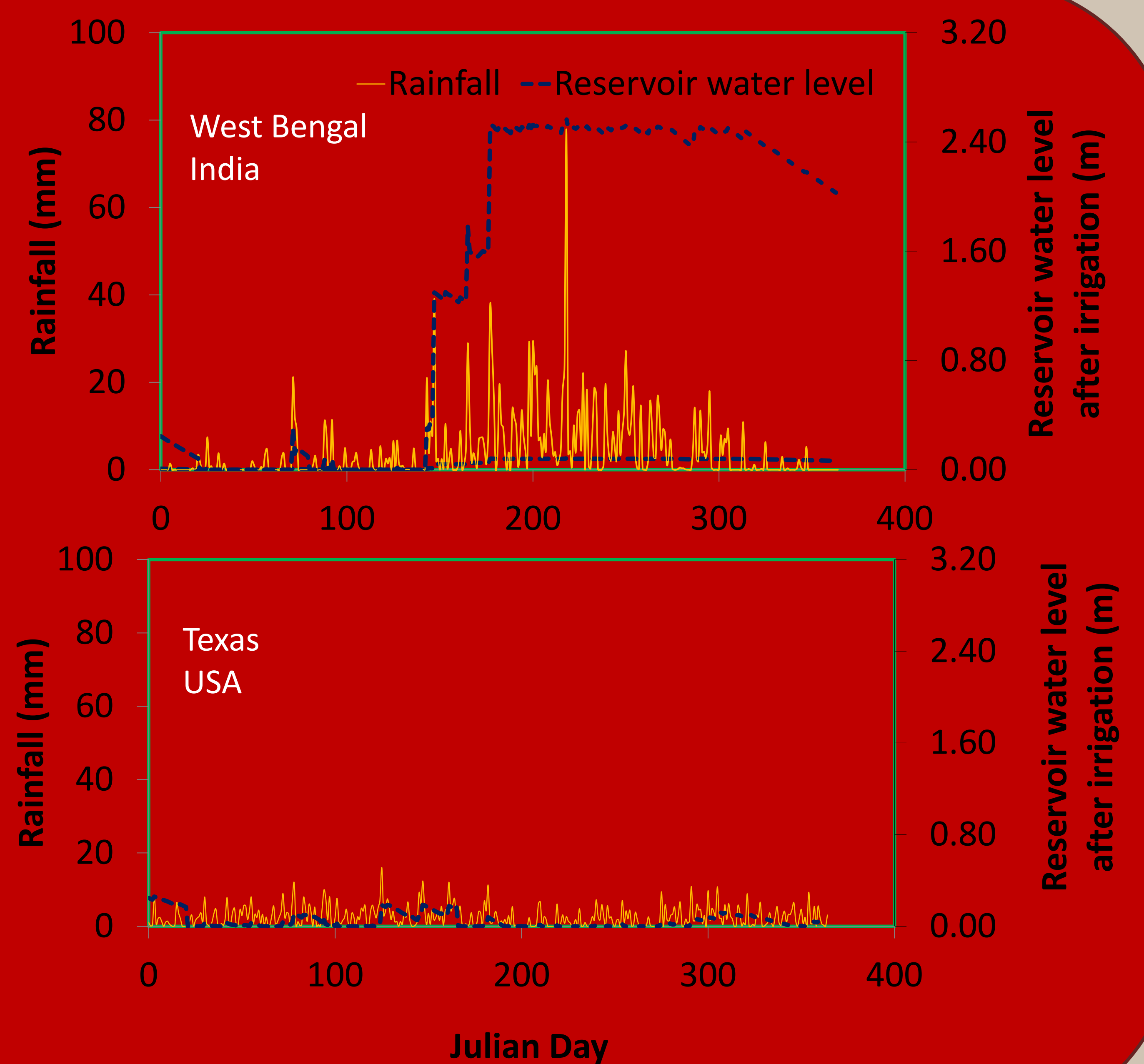
Methods

$$\frac{dv}{dt} = R - Q - E - S - SI$$

where dv/dt is the change in water volume in OFR, R is rainfall, Q is runoff, E is evaporation, S is seepage, and SI is supplemental irrigation to crop.



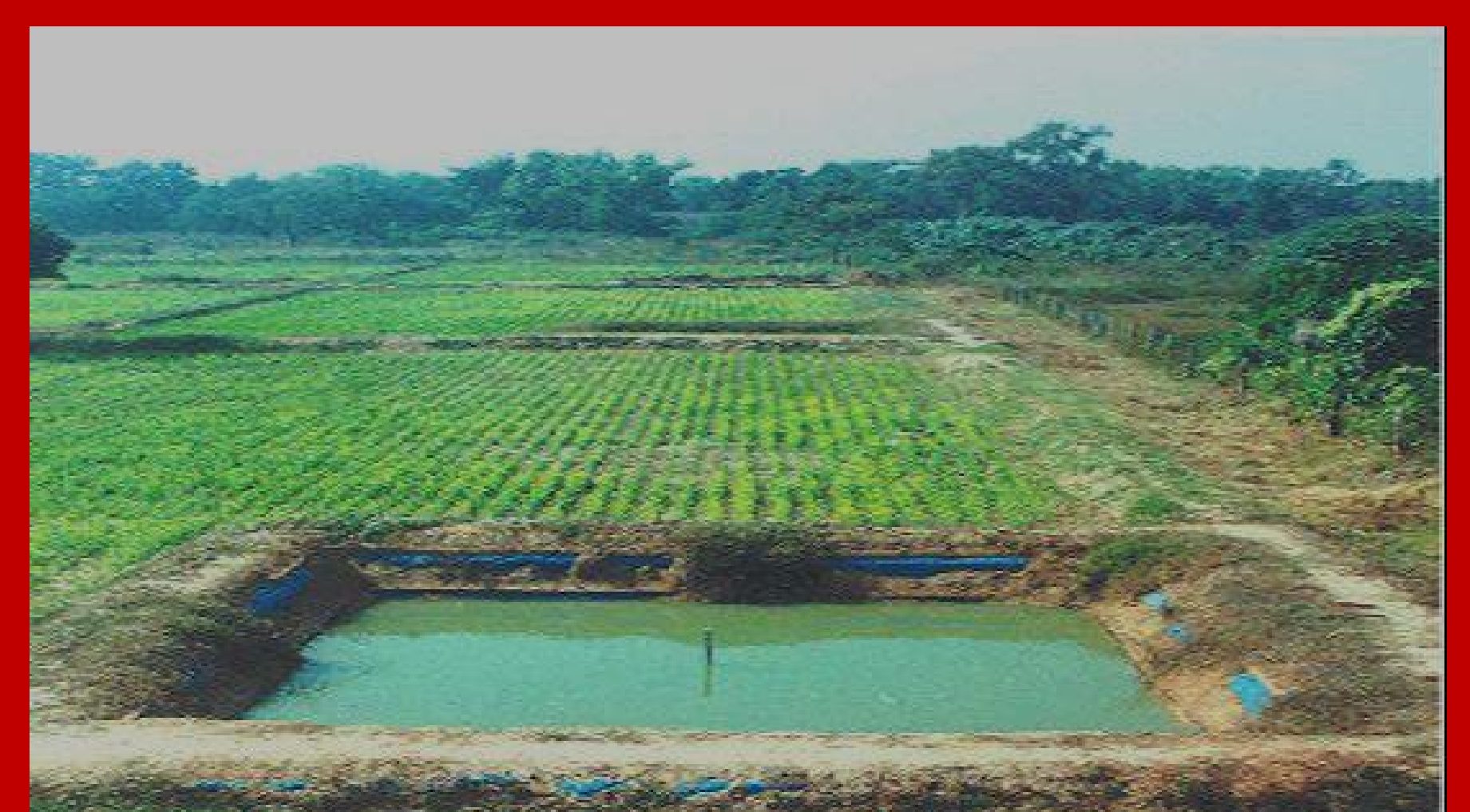
Results



Conclusion

Simulation of the water balance model for a year has shown that the OFR system can store water for providing supplemental irrigation to crops. Water availability is greater in India due to higher precipitation than in Texas.

OFR in crop land



Experimental OFRs were designed in West Bengal, India (4).

1. Rockström J, Falkenmark M, Karlberg L, Hoff H, Rost S, Gerten D (2009) Future water availability for global food production: The potential of green water for increasing resilience to global change. *Water Resour Res* 45: W00A12. doi:10.1029/2007WR006767.
2. van der Zaag P, Gupta J (2008) Scale issues in the governance of water storage projects. *Water Resour Res* 44: W10417, doi:10.1029/2007WR006364.
3. World Bank (2010) *Water Resources Sector Strategy: Strategic Directions for World Bank Engagement*, Washington, D. C.
4. Pandey PK, Panda SN, Panigrahi B (2006) Sizing on-farm reservoirs for crop-fish integration in rainfed farming systems in Eastern India. *Biosyst Eng* 93: 475–489