



## **Decent wage is more important than absolution of debts: A smallholder socio-hydrological modelling framework**

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We present a framework to understand the socio-hydrological system dynamics of a small holder. Small holders are farmers who own less than 2 ha of farmland. It couples the dynamics of 6 main variables that are most relevant at the scale of a small holder: local storage (soil moisture and other water storage), capital, knowledge, livestock production, soil fertility and grass biomass production. The hydroclimatic variability is at sub-annual scale and influences the socio-hydrology at annual scale. The model incorporates rule-based adaptation mechanisms (for example: adjusting expenditures on food and fertilizers, selling livestock etc.) of small holders when they face adverse socio-hydrological conditions, such as low annual rainfall, higher intra-annual variability in rainfall or variability in agricultural prices.

We apply the framework to understand the socio-hydrology of a sugarcane small holder in Aurangabad, Maharashtra. This district has witnessed suicides of many sugarcane farmers who could not extricate themselves out of the debt trap. These farmers lack irrigation and are susceptible to fluctuating sugar prices and intra-annual hydro-climatic variability. We study the sensitivity of annual total capital averaged over 30 years, an indicator of small holder wellbeing, to initial capital that a small holder starts with and the prevalent wage rates. We find that a smallholder well being is low (below Rs 30000 per annum, a threshold above which a smallholder can afford a basic standard of living) and is rather insensitive to initial capital at low wage rates. Initial capital perhaps matters to small holder livelihoods at higher wage rates. Further, the small holder system appears to be resilient at around Rs 115/mandays in the sense that small perturbations in wage rates around this rate still sustains the smallholder above the basic standard of living. Our results thus indicate that government intervention to absolve the debt of farmers is not enough. It must invest in local storages that can buffer intra-annual variability in rainfall in tandem and good wages for alternative sources of income.