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Modelling choices and social interactions: adoption of mixed-mangrove aquaculture systems in Bangladesh

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Farmers in South-West Bangladesh face excess precipitation in monsoon season, which cannot be discharged to the silted-up rivers. In low lying polders, this leads to waterlogging. Consequently, the water level in the polder remains too high for rice production during the monsoon and the following season, and therefore it can only be grown in dry season (Rabi), which leads to reduced yearly yield and income.

This paper aims to analyse the decision-making process of buying a pump collectively to discharge water to the river more quickly. We model the effect of uncertainty regarding different climate change scenarios and test if an increasing probability of waterlogging would spur cooperation towards investment in a pump using an agent-based-model (ABM). Finally, we explore the role of social preferences in achieving cooperation towards investment in the pump.

We present a theoretical model that introduces farmers' decision making in the context of a threshold public good. We present an extension of the Consumat approach that includes farmer's prosocial behaviour characteristics in the choice of cooperation towards investing in the pump.

We find that farmers' income is significantly higher when the pump is present and reduces income variability considerably compared with a situation without a pump. Changes in the probability of waterlogging can significantly impact farmers income. Farmers capture higher benefits from an investment in a pump in a rainy scenario. Income is also during the dry scenario higher than a situation without a pump. Farmers seek cooperation faster when the probability of waterlogging increases. We do not find social preferences playing a role in the time of investment in the pump. Our research shows the complexity of promoting collective investments with public good characteristics. At the same time, it highlights the long term benefits that collective investments have on farmers livelihoods, especially under climate variability.

Keywords: voluntary contribution, public good, social influence, agent-based model, Bangladesh