

# Modelling choices and social interactions with a public good threshold: Investment decisions in a polder in Bangladesh

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## **(a) Purpose of study or research hypothesis**

In this paper we model farmers' decision making to invest in a pump. The farmers collaborate in the investment and operation and maintenance of the pump, which is a common good (non-excludable). In the theoretical model farmers decide to contribute or not on investing in a pump, and when a threshold is reached (i.e. enough farmers are willing to contribute to the investment), water variability and income expectations change for the next season. The objective of this paper is to provide knowledge to increase food production in Bangladeshi polders by simulating the investment in and use of (shared) pumps.

## **(b) Key issue(s) or problem(s) addressed**

In South West Bangladesh polders were developed 40 years ago. Since then the adjacent rivers have silted up and the polders subsided. Discharging the excess water with gravity is not sufficient to drain the polder. In the Netherlands polders face comparable situations, Dutch polders are drained with pumps. In this project is analysed whether pumped drainage can be transplanted to Bangladesh, where farmers face excess water in monsoon season, which prohibits growing crops in that season.

## **(c) Methodology or approach used**

We follow the Conumat model to define cognitive behaviour rules under uncertainty (individual maximizers vs heuristic-based agents) on the decision of investing or not in a water pump, and we visualise the interactions using an agent-based-model (ABM) to study the interactions with other farmers in the same polder, other nearby polders.

## **(d) Results or conclusions derived from the project**

Based on the literature, our hypotheses test the role of institutions (NGOs, and local groups) on building cooperation towards achieving investment in pump infrastructure. We examine differences in outcomes regarding the rules for cooperation (i.e. equal, proportional or progressive contributions). The role that social preferences play regarding the type of co-operator (e.g. altruists, conditional co-operators and free-riders); and uncertainty regarding climate change scenarios (i.e. the likelihood of too high water levels).

## **(e) Implications of the project relevant to congress themes**

Our study/results highlight the importance of institutions for building cooperation for adoption of new technologies. The role of setting clear rules for cooperation and the importance of considering individual preferences and human interaction on farmers decisions making. Finally, our model shows the sensitiveness towards a change in the probability of weather outcomes and the role of risk aversion on investment decisions.

**Keywords** : adoption, farmer behaviour , public good, collaboration, agent based model