Simulation of Optimal Decision-Making Under the Impacts of Climate Change

Climate change causes transformations to the conditions of existing agricultural practices appointing farmers to continuously evaluate their agricultural strategies, e.g., towards optimising revenue. In this light, this paper presents a framework for applying Bayesian updating to simulate decision-making, reaction patterns and updating of beliefs among farmers in a developing country, when faced with the complexity of adapting agricultural systems to climate change. We apply the approach to a case study from Ghana, where farmers seek to decide on the most profitable of three agricultural systems (dryland crops, irrigated crops and livestock) by a continuous updating of beliefs relative to realised trajectories of climate (change), represented by projections of temperature and precipitation. The climate data is based on combinations of output from three global/regional climate model combinations and two future scenarios (RCP4.5 and RCP8.5) representing moderate and unsubstantial greenhouse gas reduction policies, respectively. The results indicate that the climate scenario (input) holds a significant influence on the development of beliefs, net revenues and thereby optimal farming practices. Further, despite uncertainties in the underlying net revenue functions, the study shows that when the beliefs of the farmer (decision-maker) opposes the development of the realised climate, the Bayesian methodology allows for simulating an adjustment of such beliefs, when improved information becomes available. The framework can, therefore, help facilitating the optimal choice between agricultural systems considering the influence of climate change.