Assessing flood hazard and crop yield loss relationship using hydrodynamic simulation and remote-sensing data: an alternative approach for data-scarce regions

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In developing countries, flood damage to agriculture is considered as a major concern as large populations live in rural areas and mainly rely upon agriculture threatened by extreme flooding as an adverse impact of the monsoon rainfall. However, understanding of flood impact on agriculture remains limited as the existing methods are mostly focused on the urban sectors, and agricultural damage data for establishing a flood-loss relationship is limited. Therefore, an alternative approach is needed for such regions where damage data is scarce, and the budget becomes the main constraint. This study is aimed to propose a framework to establish an understanding of flood-crop loss relationship using hydrodynamic simulation and remote-sensing data. MODIS remote-sensing data was used to estimate crop yield loss spatially due to the advantage of extensive area coverage, consistent in spatial and temporal resolution, relatively lower cost, which is suitable for developing countries. Then a free source 2D hydrodynamic model was used to simulate each flood parameter, which is depth, duration, and velocity as hazard parameters. The percentage of crop yield loss based on a linear multiple regression model derived from Vegetation Indices parameters and city-level statistic was used as a crop damage proxy. In the results, the relationship between the damage and flood hazard parameters could be obtained, showing a high relationship between flood and damage parameter which can be potentially used to assess the absolute estimation of monetary damage. This study can be extended towards a rapid flood damage assessment and forecasting in term of food security affected by flood disaster.