Abstract

Exponentially growing water demands and increasingly uncertain hydro- logic regimes due to changes in climate and land use are challenging the sustainability of agricultural water systems. These are called to adapt their strategies in order to secure food production against situations of unpre- dictable stress and avoid crop failures. Yet, the stratification of historical agreements, vested interests, and regulatory constraints creates policy in- ertia and delays the deployment of effective adaptation policies. In most cases, the current status quo of water rights and concessions is revised only after reiterated or dramatic failures. In this work, we study the evolution of agricultural systems under climate change accounting for these policy issues by means of a coupled human and natural system model. The model allows exploring the reciprocal interactions and co-adaptation of water supply and water demand under changing climate conditions, and to assess the cost of policy inertia for the farmers. The application to the pilot study of the Adda River basin (Northern Italy) shows that the dynamic co-adaptation of water supply and demand successfully overcomes the limitations of policy inertia and allows avoiding potential losses for an estimated value of more than 10 Me/year under projected climate conditions, while unilateral adap- tation of either the water supply or demand are demonstrated to be both less effective. Results also show that the impact of the different policy op- tions varies as function of drought intensity, with water demand adaptation over-performing water supply adaptation under severe drought conditions.