STICS: a generic and robust soil-crop model for modelling agrosystems response in various climatic conditions

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The engineering of a climate smart agriculture will strategically depend on the quality of process-based agricultural models used to assess candidate solutions of adaptation and mitigation of climate change (CC). STICS is a dynamic soil-crop model which has been developed in France at INRA since 1996 (Brisson *et al.*, 1998, 2002, 2003, 2008). It simulates production and environmental impacts of cropping systems, including one, two intercropped or several successive crop cycles. It simulates both crop production (quantity, quality of annual, perennial, herbaceous and woody plants), and environmental outputs as water drainage, emissions of CO_2, N_2O, NO_3, NH_3 and soil C, N storages. The model performances have been recently evaluated over a large dataset covering 15 crops and a wide range of agropedoclimatic conditions in France (76 sites) representing 1809 various situations (Coucheney *et al.*, 2015). Model results showed a good overall accuracy and trends induced by contrasted environmental conditions and management practices were also well reproduced. The STICS traits (genericity, robustness, operationnality) enable its use for studying the effects of changes in a wide diversity of agro-ecosystems and with future climate scenarios. Currently, the STICS crop model is used into international model intercomparison exercises such as AgMIP (the Agricultural Model Intercomparison and Improvement Project) and in MACSUR (Modelling European Agriculture with Climate Change for Food Security). At national level, the model is integrated in several programs such as ISOP System-Pastures production evaluation for the Agriculture Ministry, PIREN-Seine research program (water catchment services), Veille Agroclimatique (to evaluate crop climatic conditions), CLIMATOR/ORACLE projects (CC impacts in agriculture)... The model can be used alone (java HCI) or integrated in modelling platforms (RECORD). STICS software and documentation are freely available (http://www6.paca.inra.fr/stics_eng).