Application of crop models for climate change impact studies in Agriculture: Reliability of single-vs multi-model outputs

Raveendra H Patil
University of Agricultural Sciences, India

With the growing threats of climate change research efforts are being done to identify or develop adaptation strategies for the projected future climates using both the climate manipulative field experiments (e.g., FACE studies) and dynamic multi-process crop simulation models. Of these two methods, in the last two decades our dependence on process-based models has heavily increased to assess the impacts of CC on global food production. While these models were initially developed for a given locality and to simulate crop growth at plot or field level and in decision support system, later the use of same models were extended across regions and at multiple scales to assess the impacts of CC and identify adaptation strategies. This is done because crop models are being considered as efficient and effective tools, and modelers / modeling teams achieved reasonable success as they re-calibrated the models using newer datasets and applied the models across environments and production systems. This could be seen in the sudden increase in publications during the last 10-15 years (White et al., 2011).

However, with so much at stake under changing climate, the question now being asked is: are our current pool of models and modeling approaches taken into account all the complex interactions between crop, soil, environment and management as well as non-linearity in crop response to climatic factors? The answer certainly seems NO based on the recent multi-model inter-comparison studies (Palosuo et al., 2011; Rotter et al., 2012a). One of the reasons is most of the models currently being used were developed using control environment experiments and old crop cultivars prevalent during 1970s and 1980s, thus models in all probability, may not have incorporated the latest know-how on crop physiology and response to changing environment, thus may not represent modern crop cultivars and management practices properly. Furthermore, most of the modelling studies carried out until recently have failed to quantify the uncertainty of individual models, which is questioning the robustness of models as well as the reliability of model outputs in decision making process. There is a growing voice amongst the modelling community that the models need to be updated to reflect new research in crop physiology, agronomy and soil science (Rotter et al., 2012b; Asseng et al., 2013). This talk will go over number of case studies taken up in the past to indicate if single or multi model outputs are more reliable in assessing the impacts of climate change on agriculture.

Biography
Raveendra H Patil, also internationally known by the name Dr. Ravi Patil obtained his BSc (Agricultural Sciences; 1990-94), First Rank to the University (Four Gold Medals), MSc (Agronomy; 1994-96), First Rank to the University (Two Gold Medals), and PhD (Agroforestry Systems 1997-2000) from the University of Agricultural Sciences, Dharwad, India (www.uasd.edu). As an outstanding student Dr. Patil received University Merit Scholarship for B.Sc. degree program, ICAR Junior and Senior Research Fellowships for M.Sc. and PhD, respectively, and ASPREE R&D, Mumbai research fellowship for M.Sc. degree program. Soon after completing PhD, he joined UAS, Dharwad as Assistant Professor in Feb. 2000. Since then he has carried out teaching, research and extension activities at different campuses of the UAS Dharwad.

ravipatil2005@gmail.com, patilravi@uasd.in