Analysis of the SARRAH crop model's sensitivity to scale : from plot to degree-size pixel

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SARRAH is a generic crop model developed by Cirad and CERAAS for local and regional, diagnostic applications. It is sensitive to soil water resources and climatic variables affecting the crop at the plot level. In the context of the PROMISE project on climate predictability and its agronomic impact, a preliminary study indicated that simulated climate for about 250 x 250 km pixels (2.5 Lat. and Long. square) was ill suited for applications of SARRAH due to scale related problems. In particular, rainfall aggregated over a large area gave markedly smoother distributions than would be expected at the plot level, thus giving inaccurate simulations of the dynamics of soil water stock, wetting front and crop response. In order to study scale related problems, the millet version of SARRAH was applied to four different representations of rainfall data obtained from stations in Senegal and from GCM scenarios (Arpege Model from CNRM) :

- non-aggregated, daily outputs of the individual rainfed stations falling into a 1-degree pixel;

- averaged daily rainfall outputs of these stations ;

- the same averaged outputs, disaggregated "ex-post" using an empirical model generating plot-scale distributions from aggregate data. This empirical model had previously been developed on the basis of data originating from the Rep. of Niger;

- Hind cast and For cast rainfall scenarios from Arpege GCM model.

Furthermore, fields survey data on crop yield obtained from national agricultural statistics and a research centre (CERAAS) were compared with simulated yields at field, village and administrative level. Different possibilities of adapting spatially and temporally aggregated weather data to crop model requirements, or adapting the crop model to aggregated weather data, are discussed.

Friday I (Talk)