Session 2.5 Crop Model Improvement and Genetics Applications

36. *Poster Presentation*

Title: **Enhancing EcoMeristem model to better predict rice crop performance in response to increasing atmospheric CO_2 concentrations**

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Abstract: Atmospheric CO_2 is expected to reach near 800 ppm in 2100, accompanied by a rise of temperature. This will considerably impact crop performance due to a direct impact on leaf C assimilation, and finally on yield components' elaboration (tillering, leaf area, panicle number, grain filling). Making crop models more predictive in future climate scenario is essential and implies firstly to better simulate the C gain generated by photosynthesis response to CO_2. Crop models commonly compute biomass production using light interception (εi) and use (εb) efficiencies (Monteith's approach). Few of them consider for so key crop architectural traits, leaf photosynthesis and stomatal conductance. EcoMeristem is a functional-structural crop model, simulating cereals' plant growth and phenotypic plasticity at the organ level in response to plant C and water status. It is thus relevant to capture yield components' regulation by climate parameters, particularly CO_2. However it was initially developed using εi and εb. Also, a light interception model accounting for key crop architectural parameters and leaf photosynthesis model inspired from FvCB model accounting for key climate change and leaf parameters, were recently implemented and confronted to experimental data on rice.
This study aims to compare the original and the novel version of EcoMeristem in the way they simulate the regulation of yield elaboration for a few morphologically contrasted rice genotypes in response to radiation, temperature and CO_2. Sensitivity analyses and simulation results will be presented and discussed with respect to the challenge of using crop modelling to support breeding in climate change context.

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37. *Poster Presentation*

Title: **Modeling sorghum and millet genotypes responses to several fertilizer applications in order to optimize fertilizers use according to climate**

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Abstract: In Sahelian and Sudano-Sahelian areas rainfall uncertainty together with poor soil fertility strongly affect productions of millet and sorghum which are the main staple foods as elsewhere in the semi-arid tropics of Asia and Africa. However recent researches have shown that meteorological information and forecasts could help to improve cereal production by allowing providing pertinent advises about sowing dates and inputs use. In particular coupling weather forecasts with crop models to simulate crop responses to different fertilization strategies might help to define the right moments for fertilizer applications.

Hence, we must improve our knowledge about Sahelian and Sudano-Sahelian millet and sorghum genotypes responses to different fertilizations patterns and crop simulation models capability to correctly simulate those Genotype*Water*Fertilizer interactions (GxWxF). That will then allow us assessing the impacts (virtual experiments) of different fertilization practices according to rainfalls seasons patterns.
The main objective of this research is to capture those G*W*F interactions for some contrasted millet and sorghum West-African varieties with DSSAT Cropping System Simulation model, and then to develop fertilization recommendations for farmers according to weather forecasts. The study relies on a set of agronomical trials in Senegal carried out in different locations with respectively 4 and 2 contrasted sorghum and millet genotypes submitted to 5 fertilization modalities derived from standard recommended one and including 2 unconventional late fertilizer applications.

First results from the 2015 trials (first year) will be presented at the conference as well as preliminary results from DSSAT calibration. These results will help to identify potentials improvements for the model.