6-7 January 2020 – Montpellier

BOOK OF ABSTRACTS

XIIth Stics users seminar

https://www6.paca.inrae.fr/stics_eng/

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Book of abstracts

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Calibration and evaluation of the STICS soil-crop model for sorghum-cowpea intercrop in sub-Saharan Africa

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Introduction

Intercropping is an entry point for sustainable agricultural intensification, particularly for the variable rainfall conditions that prevail across sub-Saharan Africa. However, deriving relevant recommendations for intercropping management requires field experiments. The time, cost and technical skills required to study the temporal production of intercropping systems using field experiments is likely to limit the number and duration of multi-years trials (Lobell et al., 2009). To address such limitations, crop simulation models have been used to assess the agronomic and environmental performances of cropping systems under diverse climatic conditions, including hypothetical future climate (Boote et al., 1996). Intercropping has not been modelled extensively and models that simulate these cropping systems, such as STICS, have not often been evaluated for tropical conditions and for species grown by farmers in sub-saharan Africa. The objective of this study was to evaluate the performance of STICS model adapted for West African conditions to simulate the growth and productivity of sorghum-cowpea cropping systems.

Material and method

We used the STICS soil-crop model and data from field experiments conducted at the N'Tarla Agronomic Station in Mali in 2017 and 2018. Two varieties of sorghum (local and improved) with different photoperiod sensitivity were grown as sole crop or intercropped with cowpea. Two sowing dates and two levels of mineral fertilization were also investigated. Model simulations were evaluated using observed data for phenology, leaf area index (LAI), biomass, yield and soil moisture. The performance of the model was evaluated using root mean square error (RMSE) and model efficiency (EF).

Results

So far, the calibration has been performed for sole crops only. After calibration, the model satisfactorily simulated sorghum phenology (RMSE = 3.38 days for flowering and 3.41 for maturity). Cowpea phenology was less well simulated (RMSE = 13.27 days for flowering and 9.30 for maturity). Model simulation were satisfactory for soil moisture (RMSE = 14%, EF = 0.72) and aboveground plant biomass (RMSE = 39, EF = 83). With current calibration, the model underestimated the leaf area index with RMSE of 49% and EF of 0.46.

Conclusion

Our work provides a first calibration and evaluation of the sole crops involved in the sorghum cowpea intercropping under rainfed conditions in southern Mali. The next step of the work will be to calibrate the intercropping treatments.

Keywords: Crop model, Biomass, Leaf area index, Water use efficiency

References

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