AFRICAN CLIMATE CONFERENCE 2013 (ACC-2013)
(15-18 OCTOBER 2013, ARUSHA, TANZANIA)
MODELLING AND PREDICTING CLIMATE IMPACTS: ESTIMATING CLIMATE VARIABILITY AND CHANGE; CLIMATE IMPACTS PREDICTION SYSTEMS

Modeling the Climate change impact on agricultural production in the CILSS/ECOWAS region: preliminary results

Sheick K. Sangare*, Ablassé Bilgo, Seyni Salack, Benoit Sarr, Seydou Traoré, Sebastien Subsol, Pibgnina Bazié
Centre Régional AGRHYMET, 425 Boulevard de l'Université, BP 11011, Niamey, Niger

Rainfed agriculture is crucial in food security and economic growth in Africa It's affected by climate variability and change but in a very uncertain way. This study seeks to reduce uncertainty in the evaluation of impacts of the projected climate and CO_2-enrichment on crop production in the CILSS/ECOWAS region. It relies on a coherent methodology of plausible crop-climate ensemble scenarios (Salack et al., Poster) to access impacts of climate variability and change on cereals (millet, maize, sorghum), legumes (groundnut, cowpea) and tubers (cassava, yam) production. Comparison of models output for time horizon (2011-2050) provides strong basis for technical and strategic adaptation measures for the region.

1. Methodological Framework

- ⇒ On-farm experimental and management data for robust calibration and validation of models (ex. APSIM , DSSAT)
- ⇒ Three agro-ecological zonations of the region (Fig. 1a)
- ⇒ FAO harmonized world soil database and global land cover (Fig. 1b)
- ⇒ Carbone Dioxide fertility hypothesis (SRES A1B scenario)
- ⇒ Details about the crop-climate ensemble scenarios are exposed in Salack *et al.,* Poster.

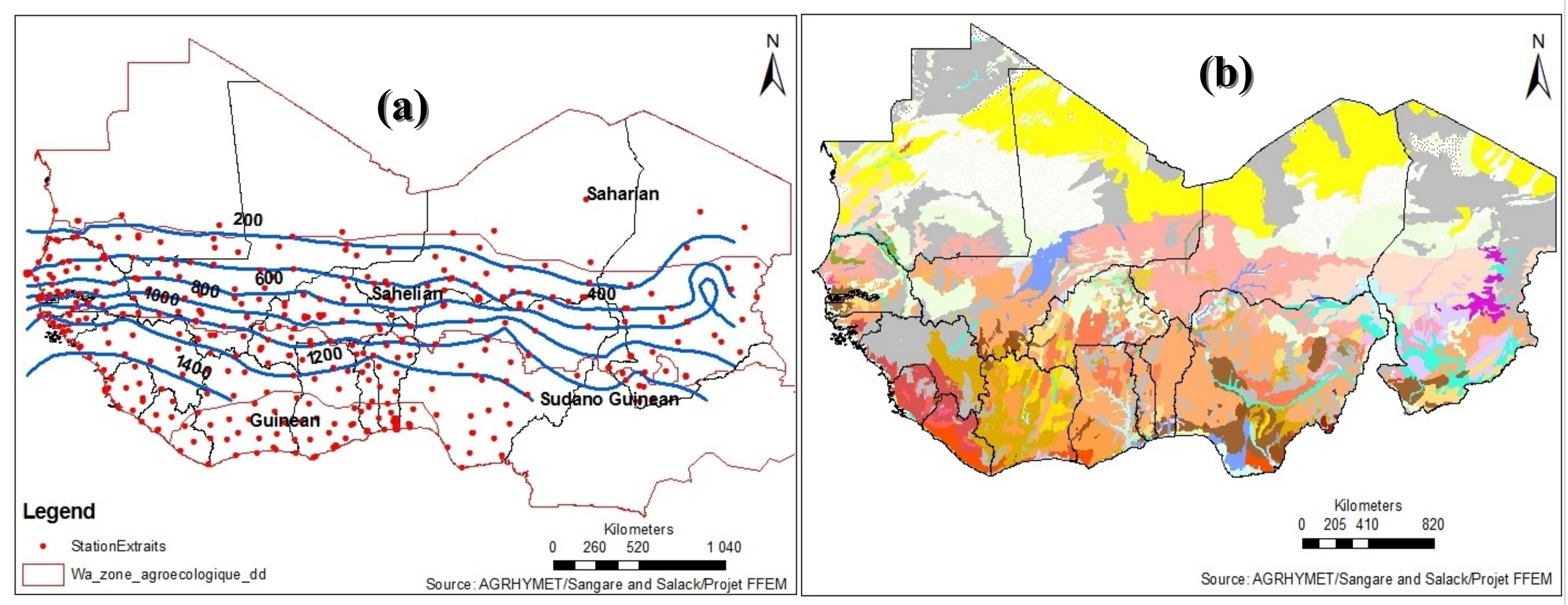

Fig.1. Maps of the CILSS/ECOWAS region with a) four agro-ecological zones (red line), isohyet (bleue line) and reference stations (red dots) over the region, and b) the FAO soil map.

2. Impacts on cereals (millet)

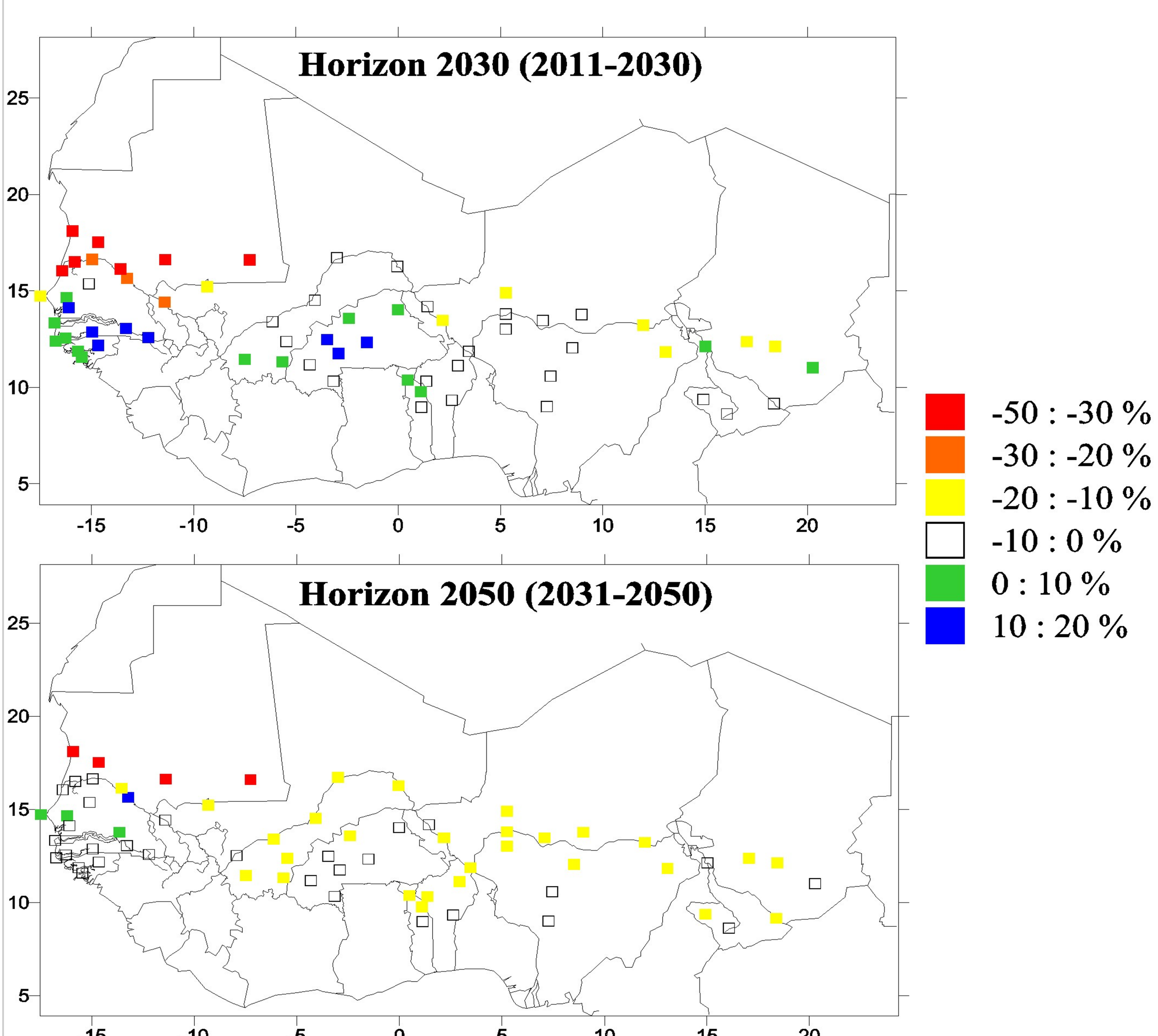

Fig.2. Combined impacts of rainfall-tmax-tmin changes on potential, using DSSAT.

- The signs and rates of change in millet yield show a strong spatial variability in the 2030s but exhibit a convergence and spatial coherence in the 2050s (fig. 1).
- Towards the middle of the century, production trend decreases (up to -15%) by starting with a stationary component in the first 2 decades (fig. 2).
- The same spatial variability applies to Groundnut yield (Table 1), with Sahel being the most impacted.

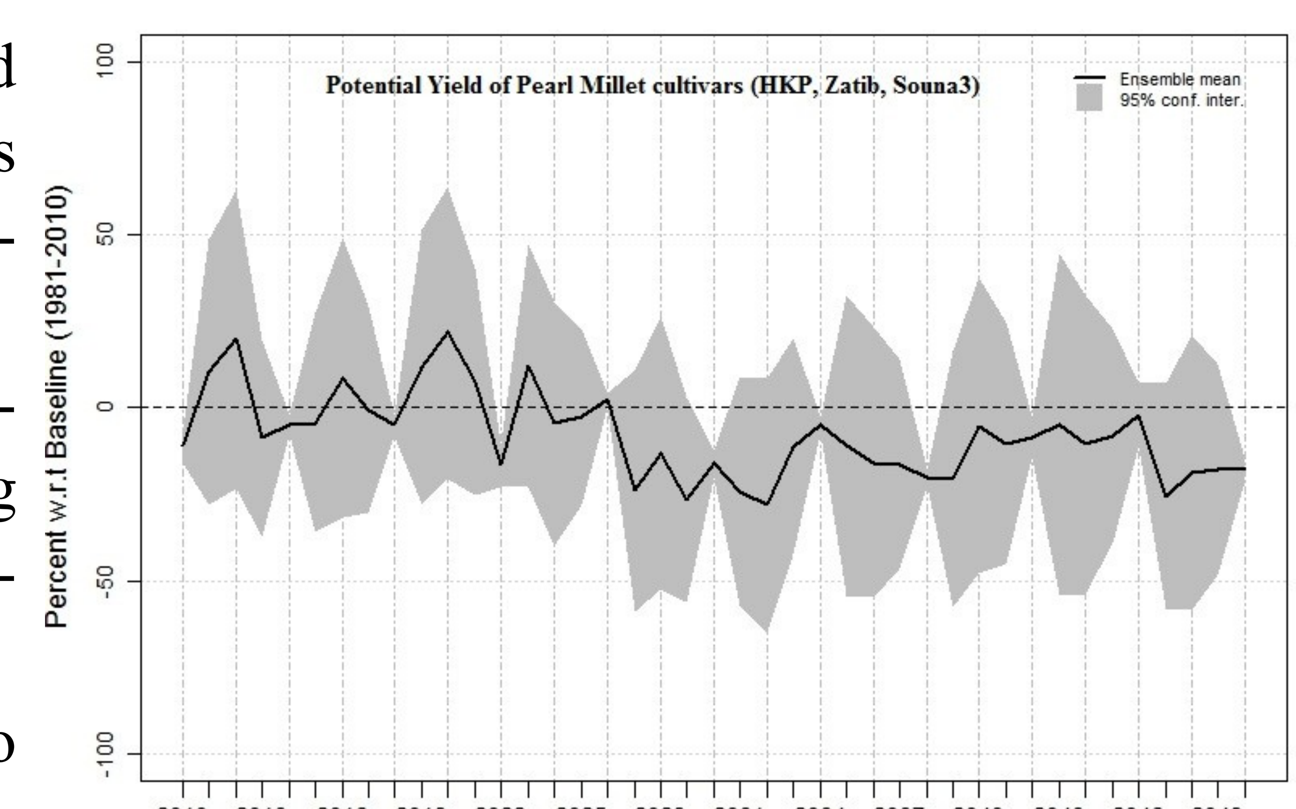

Fig. 3: Future variability of the interannual potential yield of millet cultivars in the CILSS/ECOWAS countries, using DSSAT.

3. Impacts on legumes (groundnut)

Table 1. APSIM-based prediction of the impacts range (per cent yield change) of climate change on potential groundnut yield aggregated over the CILSS/ ECOWAS sub-regions (agro-ecological zones).

Horizon	Sahel	Sudano Guinean	Guinean
2030 (2011-2030)	-20 % to 0%	-5 % to 15%	0 % to 10%
2050 (2031-2050)	-50 % to -20%	- 15 % to 0%	- 5 % to 0%

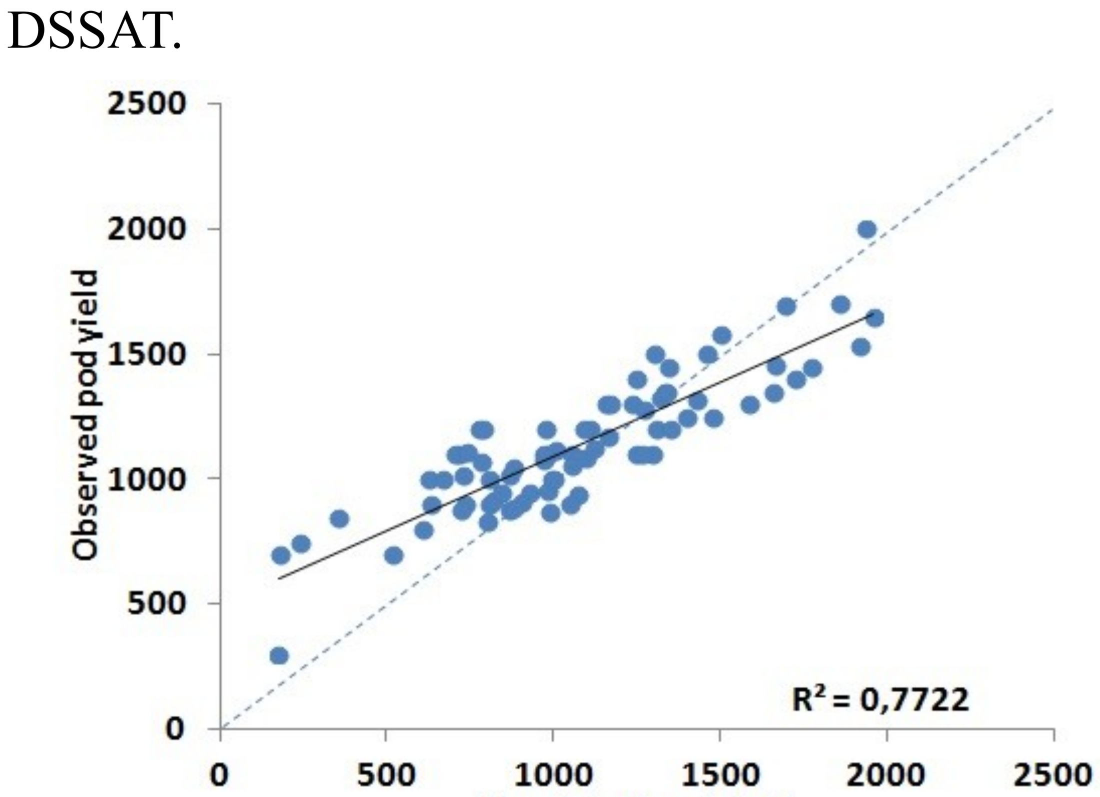

Fig. 4. APSIM calibration curve for groundnut pod

Acknowledgements:
The FFEM CC Project is funded by the "Fonds Français pour l'Environnement Mondial"

References:
1. Sangare S.K, Bilgo, A., Subsol, S., Traore, S., Bazié P. 2013. Modeling climate change impact on legumes and tuber crops in the CILSS/ECOWAS countries: I. Models Intercomparison. *In preparation*.
2. Salack, S., Sarr B., Sangare S.K., Ly M., *et al.* (ACC-2013): Crop-climate ensemble scenarios to narrow uncertainties in the evaluation of climate change impacts on agricultural production. (Poster).

Contact: Dr. S. SANGARE (*Agrometeorologist*), s.sangare@agrhymet.ne, sheick_khalil@yahoo.fr, Tel: (+227) 99 59 92 26