**Tropentag, September 20-22, 2023, hybrid conference**

"Competing pathways for equitable food systems transformation: Trade-offs and synergies"

# Model-based climate change adaptational potential and productivity of some cowpea genotypes and its sensitivity to bias adjustment

Grace Adusei[1], Moses Kwame Aidoo[2], Amit Kumar Srivastava[1], James Yaw Asibuo[3], Thomas Gaiser[1]

[1] *University of Bonn, Inst. Crop Sci. and Res. Conserv. (INRES), Germany*
[2] *Cocoa Research Institute of Ghana, Physiology and Biochemistry Division, Ghana*
[3] *Council for Scientific and Industrial Research, Crops Research Inst., Ghana*

**Abstract**

Grain legumes are essential for the protein supply to an ever-growing population in Africa. However, little is known about the adaptive capacity of major grain legumes under future climatic change for the evaluation of climate change impact and adaptation. This study assessed the adaptation potential of some cowpea genotypes to future climate change in the moist (Kumasi-Ghana) and dry savannah (Ouagadougou-Burkina Faso) biomes of W-Africa based on a validated process-based cowpea crop model using the output of four GCMs (Global Circulation Models) for two Shared Socio-economic Pathways (SSPs i.e., ssp126 and 585). In addition, it assesses the sensitivity of the cowpea model to bias-corrections of the GCM outputs. In the comparison of future socio-economic pathways with historic time series, the use of bias-corrected climate model output slightly increased the rate of the phenological development of the genotypes in the future period except in Ouagadougou, in the ssp585 scenario. Without bias correction, this increase in the rate of phenological development in the future scenarios was less pronounced. With bias correction, the total aboveground biomass and yield of all genotypes were reduced in both shared socio-economic pathways. The change in the average water stress and phosphorous stress were genotype specific. Despite a general yield decline in both SSPs, the genotypes Asontem and GH6060 exhibited the best adaptational potential to future climate change in the moist and dry savannah biomes by the higher accumulation of total aboveground biomass, and higher yield, tolerance to high temperature as well as high water use and photosynthetic efficiency due to higher atmospheric $CO_2$ concentrations, despite faster phenological development

**Keywords:** Bias-correction, climate change, cowpea productivity, crop model, environmental stress

**Contact Address:** Grace Adusei, University of Bonn, Inst. Crop Sci. and Res. Conserv. (INRES), Bonn, Germany, e-mail: aduseigrace@yahoo.com