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Developing Rice and Sorghum Crop Adaptation Strategies for Climate Change in Vulnerable Environments in Africa – RISOCAS

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Abstract

Climate change in Africa affects staple crop productions systems by increasing climate variability and weather extremes. To avoid negative impacts for food production and security, crop adaptation strategies are required that comprise varietal development and crop management. The RISOCAS project, a collaboration between the University of Hohenheim, The Africa Rice Center (WARDA), CIRAD and two national partners IER and FOFIFA, focuses on irrigated rice, rainfed sorghum and rainfed upland rice as representatives for mayor cereal cropping systems in Sub-Saharan Africa. Responses of a wide range of contrasting genotypes to existing environmental gradients covering the range of expected climate change scenarios allow the assessment of adaptation potential within the existing genetic variability in each crop. Gradients cover oceanic to continental climate with 2 sites in Senegal as representative environments for irrigated rice production in the Sahel, a latitudinal rainfall gradient representing environments for low altitude dryland sorghum production with 3 sites in Mali and an altitudinal temperature gradient for rainfed upland rice on 3 sites in Madagascar. With 5–12 staggered planting dates at each site genotypes are subjected to a large number of climatic environments. Meteorological and phenological observations, growth and yield analysis are combined with physiological measurements including a field plot water balance and studies on microclimate effects on the canopy structure. Using these data valuable traits for better adapted cultivars will be identified and ideotype concepts for varietal selection will be developed. For this, existing phenological and agronomic crop models will be adapted, calibrated, and validated with field data. In particular the models RIDEV, IMPATIENCE, and SARRAH as well the architectural model ECOMERISTEM will be used to extrapolate the varietal responses and adaptation potentials for different climate change scenarios. The poster illustrates a concept of trait analysis for genotype responses to multiple environments on a supra-regional scale in order to support the parameterisation of models so far validated on regional to local scales only. RISOCAS will deliver models to propose crop ideotypes in the context of climate change scenarios and develop a basis for tactical and strategic decision making to adapt African cereal cropping systems to climate change.

Keywords: Climate change, crop adaptation strategies, modelling, rice, sorghum, Sub-Saharan Africa

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