Tropentag, October 6-8, 2009, Hamburg

"Biophysical and Socio-economic Frame Conditions
for the Sustainable Management
of Natural Resources"

Responses of Sorghum Varieties to Climatic Variability — a Case Study Within the Risocas Project

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Abstract

Cropping systems in West Africa are expected to be seriously affected by climate change, particularly in terms of rainfall amount and distribution and temperature. In order to adapt to the required changes in land use and management, the search for 'climate-ready' crops is one of the options to sustain food production especially of subsistence farming systems within the Sudano-Sahelian zone. In order to evaluate responses of Sorghum [*Sorghum bicolor* (L.Moench)] varieties to water availability and temperature, 10 selected West African sorghum varieties were sown at three sites and with staggered sowing dates along a latitudinal gradient in Mali. Varieties differed in growth type and the degree of photoperiod sensitivity. Fertiliser was applied in order to avoid nutrient disorders and chemicals to protect plants from diseases and insects. This experimental approach was used in pursuit of ideotypes with general or specific adaptations to both temporal and spatial climate variability. Plants were harvested regularly during the growth period and biomass partitioning, number of leaves, leaf area and plant height recorded. Growth data were supplemented with measurements of leaf gas exchange, light interception of the canopy and root production in the topsoil. Data for the calculation of field water balances were collected by measuring the temporal dynamics of soil water content down to a soil depth of 100 cm, bare soil evaporation and maximal rooting depth. Sowing date and sites influenced plant architecture in terms of height, number of leaves on the main culm, leaf area as well as the cycle duration. The response of these parameters to the main and interactive effects of varieties, sites, and sowing dates is summarised. The implications for modelling phenology, leaf development, biomass accumulation and partitioning, water use, radiation use, yield components, and yield is discussed.

Keywords: Climate change, radiation-use efficiency, water-use efficiency

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