Tropentag, October 6-8, 2009, Hamburg

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

Temperature Effects on the Phenology of Upland Rice Grown Along an Altitude Gradient in Madagascar

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Abstract

In Madagascar, rice is cultivated on 1.3 M ha of which 29 % are upland rice, growing from the coastal area up to the higher altitude. High altitude rice cultivation is constraint by a short vegetation period due to low temperatures and thus by the time the crop needs to complete its cycle. Climate change is assumed to result in a rise in mean temperatures of 2–5 degrees depending on the simulation scenario. Thus, rice cropping in higher altitudes may become more favourable as long as precipitation is not a limiting factor. In order to match rainy season with crop duration in higher altitudes rice genotypes are needed that posess an early vigour, a short duration and a certain degree of drought resistance. In order to study this problem FOFIFA and CIRAD as partners in the RISOCAS project of the University of Hohenheim, Germany, initiated Mini Rice Gardens ($1m^2$ plots) with 5 monthly staggered planting dates for 10 contrasting upland rice genotypes on three locations along an altitudinal gradient (Andranomanelatra 1625 m, Ivory 965 m and Ankepaka 25 m asl) resulting in 15 different thermal environments. At all sites genotypic phenological responses were studied by closely observing the time and temperature requirements to panicle initiation, booting, heading, flowering, and physiological maturity. In addition leaf appearance (phyllochron) and senescence, plant height, panicle exertion, grain yield and yield components, harvest index and spikelet sterility were observed for each genotype and planting date. In all ten varieties crop duration was longer in the higher altitude as compared to lower altitude. The poster shows genotypic differences in crop duration and the effects of planting date on the duration of the different phenological phases. Temperature effects on sterility as well as the effects on leaf appearance will be discussed in order to judge the agronomic fit of a potential upland rice ideotype for higher altitude cropping in a changing climate.

Keywords: Climate change adaptation, crop duration, ideotype, mini rice garden, RISOCAS

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