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"Global food security and food safety:
The role of universities"

Adaptation Study at Altitudinal Gradients Hints Plant Response to Climate Stressors

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Abstract

Increasing global food demand due to population growth and rising of living standard of both rural and urban population in one hand and decreasing global food production due to urbanisation, degradation of cultivable land and climate change on the other are threatening future food security. Changes in two weather parameters, temperature rise and erratic rainfall, are introducing multiple biotic and abiotic stresses at different sensitive growth stages in most of the locally adapted and farmer preferred crops resulting in low productivity. In 2008, GIZ/BMZ funded RISOCAS project addressing Adaptation of African Agriculture to Climate Change aimed to investigate response of temperature and other weather parameters on crop growth and development. We conducted trials along three altitudinal and temperature gradients (Andranomanelatra, 1625 m asl; Ivory, 965 m asl and Ankepaka, 25 m asl) in Madagascar using 10 upland rice genotypes for two consecutive years (2008 and 2009) to examine responses of temperature on upland rice. Daily mean air temperature during upland rice growing season was 7 — 22 °C in the high altitude, 19 — 27 °C in the mid altitude and 17 — 29 °C in the low altitude. The relationship between mean air temperature and crop parameters showed that unit increment in air temperature decreased crop duration by 5 to 9 days and increased crop yield by 0.1 to 0.3 t/ha depending upon genotypes, indicating that rise in air temperature is favourable for upland rice cultivation at high altitudes, and expansion of upland rice growing area in high altitude regions (hills, mountains, highlands) can contribute to global food security to certain limit.

Keywords: Crop duration, thermal gradient, upland rice, yield components

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