

## Sensitivity analyses of crop yields and changes in climate variables simulated with iGAEZ

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Changes in the diurnal temperature ranges (DTR) is widely considered as responsible for significant impact on crop yields in addition to changes in mean temperature. There is a nonlinear impact of changing DTR, in other words, an U-shaped relationship with regard to crop yields for major crops. Because of methodological uncertainties, analysis of crop yields in responses to DTR change can safely be ignored. The objective of this study is to evaluate the influence of which a minimum temperature, average temperature, maximum temperature has on a yield using iGAEZ model. Simulated yields on each grid cell for 1980-1999, in three leading producers of wheat, rice and maize, were combined with climate datasets to evaluate the relationships between temperature and simulated crop yields. Generalized additive model were evaluated to analyze changes in DTR and crop yields. Results differ among crops or region as to whether there was a clear positive/negative response of yields to daily temperature indices - DTIs (including DTR,  $T_{max}$ ,  $T_{min}$  and  $T_{ave}$ ). However, the effects of DTIs were statistically significant using generalized additive model for all crops and regions. To evaluate whether future changes in DTIs are relevant for impact assessment, yield responses to projected changes in DTIs by 2080-2099, from 18 climate models under SRES A2, B1 scenarios, were estimated. Among DTIs, DTR changes did significantly affect yield responses in several cases, such as in South Asia maize and rice yields under B1 scenario. The decreasing/increasing trend of DTIs have an important implication for estimating future impact of climate changes.

Keywords: diurnal temperature ranges, climate change, crop yield, iGAEZ