Measuring the impact of climate change on South African agriculture: The case of sugarcane growing regions

by

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Abstract

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This study utilized the Ricardian approach that captures farmer adaptations to varying environmental factors to analyze the impact of climate change on South African Sugarcane production. Two production systems, irrigated and dryland were taken for the study. A total of 11 districts, two from the irrigated and nine from the dryland-farming zone were selected for the study. Data for the period 1976/77 to 1997/98 were pooled over districts and net revenue per hectare was regressed on climatic and control variables. The results indicated that climate has a non-linear and significant impact on net revenue per hectare.

Based on the Inter Governmental Panel on Climate Change (IPCC) benchmark warming scenario of increasing temperature by 2°C and precipitation by 7%, which is associated with the doubling of CO_2, it was found that climate change reduces net revenue per hectare in the South African sugarcane production. Moreover, the result of increasing temperature by 2.75°C(associated with the doubling of CO_2 under South Africa) across all seasons, by keeping other factors constant, indicated that both the irrigated and dryland farming zones were equally damaged by this scenario. Increasing precipitation levels by 7% across all seasons, keeping other factors constant benefited the irrigated farming whereas it damaged the dryland farming.

Additionally, the partial impacts of increasing a given season's temperature by 2.75°C or rainfall by 7% indicated that the seasonal effects of temperature and rainfall are differently distributed across seasons and production zones. Finally, the likely impacts of climate change on South African sugarcane production were analyzed based on the critical damage point analysis. The results indicated that sugarcane production in South Africa is more sensitive to future increases in temperature than precipitation as a consequence of climate change.

While the consensus is that arid and semi-arid regions are more vulnerable to warming, management options, such as irrigation, are thought to provide an adaptation mechanism. This however was not the case for sugar farming in South Africa, as irrigation did not reduce the harmful impacts of climate change significantly.

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" I will bless the Lord at all times: his praises shall continually be in my mouth."

Psalm 34:1

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