Economic impact of Climate Change on major South African field crops: A Ricardian Approach

by

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In memory of my Uncle Michel Bedibeu

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ABSTRACT

The vulnerability of agriculture to climate change has become an important issue because of reduced crop productivity from adverse changes in climate, especially in Africa.

This study employed a Ricardian model to measure the impact of climate change on South Africa's field crops and analysed potential future impacts of further changes in the climate. A regression of farm net revenue on climate, soil and other socio-economic variables was conducted to capture farmer-adapted responses to climate variations. The analysis was based on agricultural data for seven field crops (maize, wheat, sorghum, sugarcane, groundnut, sunflower and soybean), climate and edaphic data across 300 districts in South Africa.

Results indicate that production of field crops was sensitive to marginal changes in temperature as compared to changes in precipitation. Temperature rise positively affects net revenue whereas the effect of reduction in rainfall is negative. The study also highlights the importance of season and location in dealing with climate change showing that the spatial distribution of climate change impact and consequently *needed adaptations will not be uniform across the different agro-ecological regions of South Africa. Results of simulations of climate change scenarios indicate many impacts that would induce (or require) very distinct shifts in farming practices and patterns in different regions. Those include major shifts in crop calendars and growing seasons, switching between crops to the possibility of complete disappearance of some field crops from some regions.*

Keys words: Agriculture, Climate change, sensitivity, net revenue and adaptations.

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ABBREVIATIONS

AEM	Agronomic-Economic Models
AEZ	Agro-Ecological Zones
AGE	Applied General Equilibrium
ARC	Agricultural Research Council
^0C	Degree Celsius
CH_4	Methane
CO_2	Carbon dioxide
FAO	Food and Agriculture Organisation
GCMs	Global Circulation Models
GDP	Gross Domestic Product
CGE	Computable General Equilibrium
GHG	Greenhouse gases
GIS	Geographical Information Systems
ha	Hectares
IPCC	Intergovernmental Panel on Climate Change
ISCW	The Institute for Soil, Climate & Water
LUT	Land Utilization Types
m3	Cubic meters
mm	Millimetres
N_2O	Nitrous oxide
NOAA	National Oceanic and Atmospheric Administration
NWBSA	National Weather Bureau of South Africa
O_3	Ozone
ppm	Parts per million
SAM	Social Accounting Matrix
SAAGIS	South Africa Agricultural Geo-referenced Information System
t	Ton
UNFCC	United Nations Framework Convention on Climate Change
USA	United States of America