Research Application Summary

Climate change and implication on food and agriculture in Africa

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Abstract

Climate of any specific location determines the crops that can be grown, the farming system that can be adopted, the sequence and timing of farming operations as well as the livestock systems that are being practised. Most of agricultural productions in Africa are largely rain-dependent, yet the continent has arid or semi-arid climate with drought being common phenomena year after year. Rainfall is therefore the most important climate parameter in such agricultural system. IPCC has reported that climate change is real and Africa is the most vulnerable continent not only due to its low coping capacity and high level of vulnerability but also due to evidences of climate change signal. The need for adaptation in Africa is therefore no option to sustainable agriculture and food security in the future. Key issues addressed in this paper include recent impacts of climate extremes on agriculture and food security in Africa; Tomorrow's Climate (Climate change) in the years 2030, 2050, 2070, 2100, 2300 and the potential implications on agriculture and food security in Africa; Building resilient climate smart systems for climate proofing food and agriculture in Africa; and Roles of universities and research institutions.

Key words: Africa, Agriculture, climate hange

Résumé

Climat de n'importe quel endroit donné détermine les cultures qui peuvent être cultivées, le système agricole qui peut être adoptée, la séquence et le calendrier des activités agricoles ainsi que les systèmes d'élevage qui sont pratiquées. La plupart des productions agricoles en Afrique sont en grande partie dépendante de la pluie, encore continent a un climat aride ou semi-aride, avec la sécheresse étant des phénomènes année commune après année. La pluie est donc le paramètre climatique le plus important dans le système agricole tels. Le GIEC a déclaré que le changement climatique est réel et l'Afrique est le continent le plus vulnérable, non seulement en raison de sa faible capacité d'adaptation et le niveau élevé de vulnérabilité, mais aussi en raison de preuves de signal de changement climatique. La nécessité d'une adaptation en Afrique est donc

pas d'option pour l'agriculture durable et la sécurité alimentaire à l'avenir. Les principales questions abordées dans le présent document comprennent les impacts récents des extrêmes climatiques sur l'agriculture et la sécurité alimentaire en Afrique, le climat de demain (changement climatique) dans les années 2030, 2050, 2070, 2100, 2300 et les répercussions possibles sur l'agriculture et la sécurité alimentaire en Afrique; construire des systèmes intelligents résilientes au changement climatique pour l'alimentation et l'agriculture climate proofing en Afrique, et les rôles des universités et des instituts de recherche.

Mots clés: l'Afrique, l'agriculture, changement climatique

Current climate patterns in Africa

Evidences from climate observations and other sources show that climate extremes are already threatening most of agriculture systems in Africa (Fig. 1). Intergovernmental Panel on Climate Change (IPCC) has noted that Africa is one of the most vulnerable regions to the negative impacts of climate change. Figure 2 gives some of the observed recent patterns of climate over Africa. The figure shows evidence of warming trends: Changes in space-time patterns of the rainfall and changes in climate extremes e.g. frequency, severity, on set / cessation

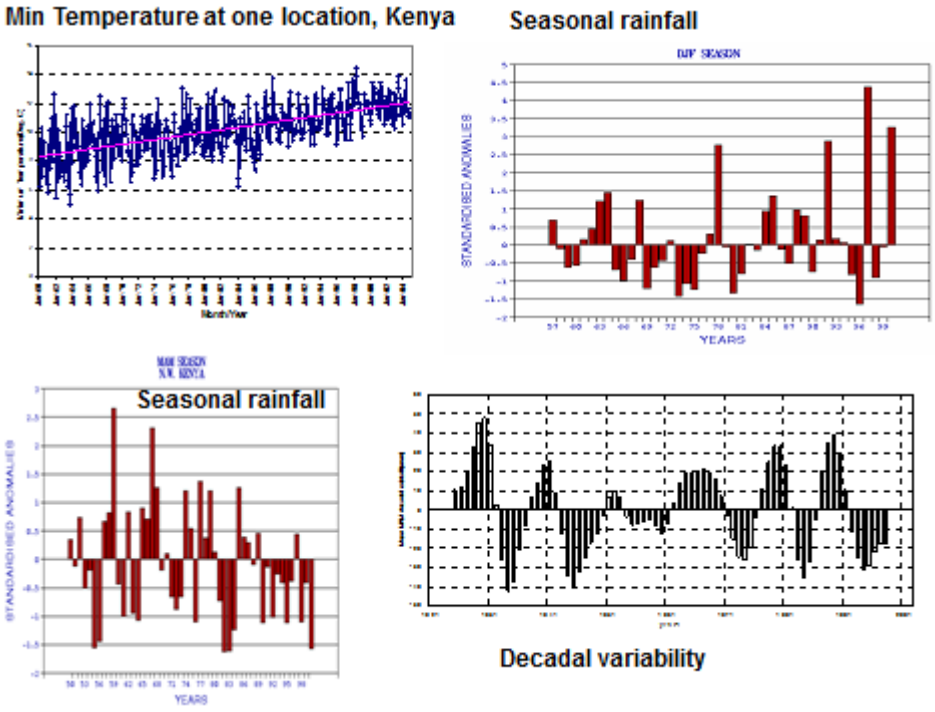


Figure 1. Examples of Climate variability.

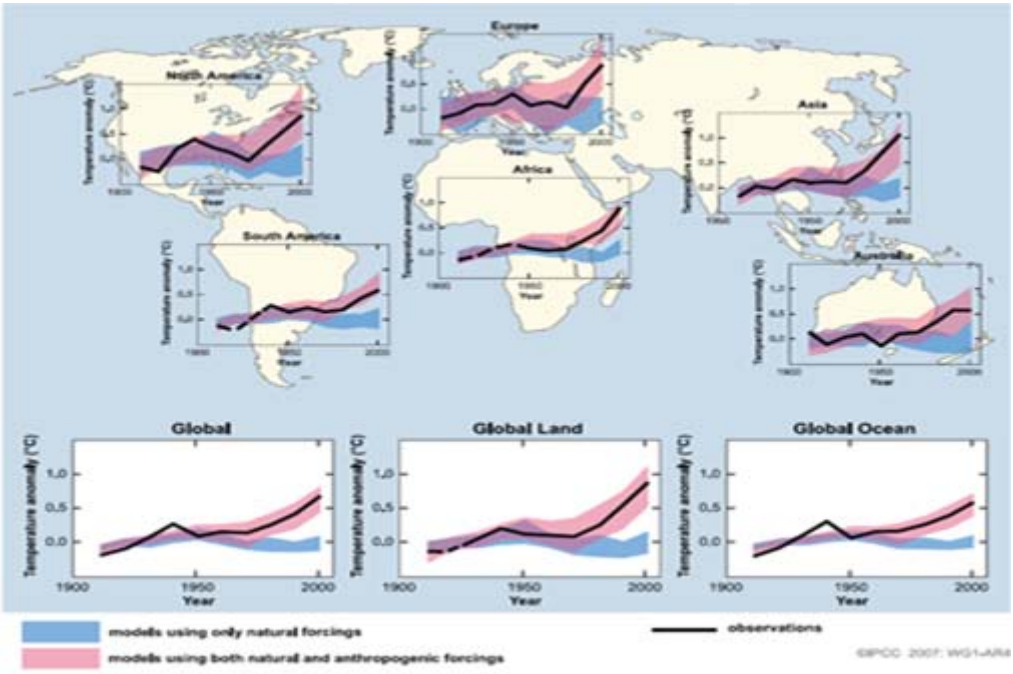


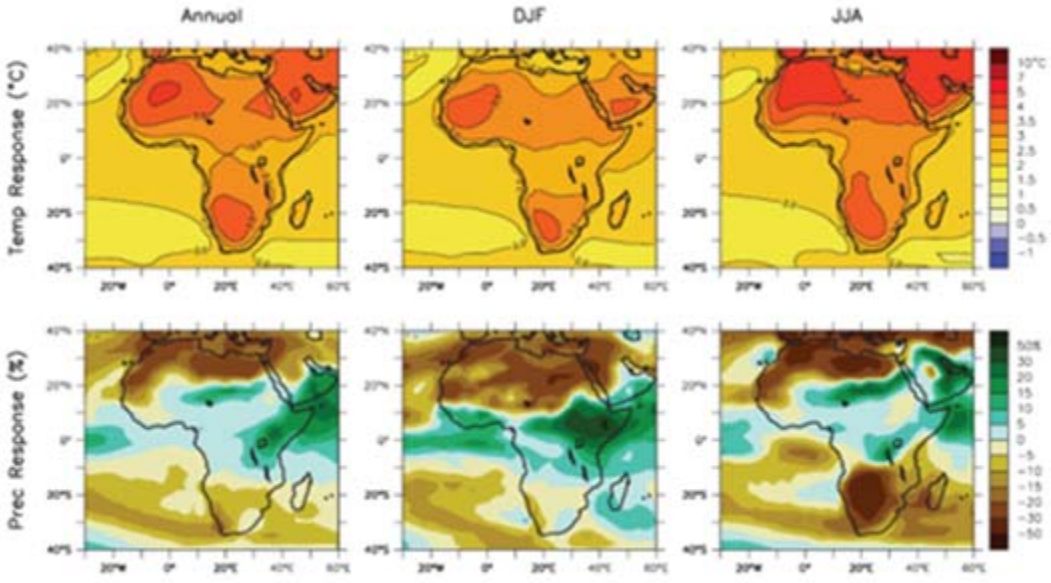
Figure 2. Some of the recent climate patterns in Africa.

dates, etc. There are however serious data and knowledge gaps in Africa.

Climates of Africa Tomorrow

Climate change being addressed by the United Nations Framework Convention on Climate Change (UNFCCC) are linked to human (anthropogenic) activities that have been associated with environment degradation including increase in atmospheric concentration of carbon dioxide and other greenhouses gases. Human activities polluting the environment include pressure from increasing population of the world, industrialization, deforestation, transportation, settlement, water, energy, and many other basic needs of mankind. Some of these gases were not traceable in the atmosphere before industrial revolution period and have been associated with the beginning of mass industrial production. Figure 3 show recent projections of potential patterns of African climate tomorrow based on some global models. Projection of climate change scenarios at regional and local scales that are more useful for impacts and vulnerability studies still has many challenges and regional capacity building is required in this important area.

Some potential impacts of climate change are highlighted in Figure 4. IPCC has reported that climate change is real and



Temperature and precipitation changes over Africa.
Differences between 1980 - 1999 and 2080 -2099, averaged over 21 GCMs

Figure 3. Future temperature and precipitation changes over Africa (IPCC, 2007).

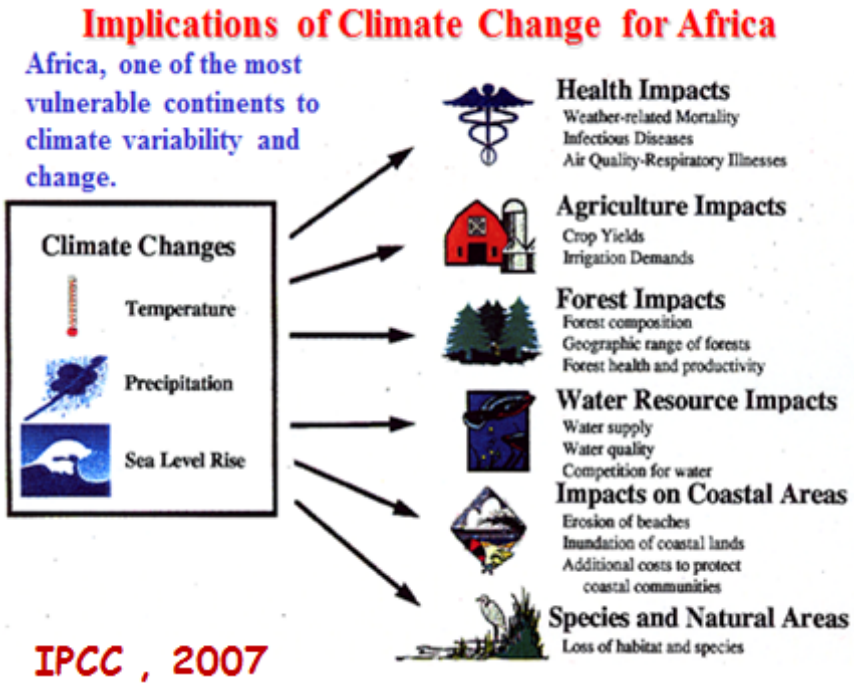


Figure 4. highlights some potential impacts of climate change (IPCC, 2007).

due to its low coping capacity and high level of vulnerability, Africa is the most vulnerable continent. The need for science and knowledge solutions for adaptation and sustainable agriculture / food security tomorrow is critical to the survival of the society livelihoods.

Gaps and Roles of universities and research institutions

Key gaps and potential roles of the universities and research institutions include:

- Development and diffusion of Science and Technology innovations required to address the regional climate changes needs and gaps including regional climate science/local scenarios required for climate risk reduction (impacts, vulnerability, mitigation and adaptation such as Geoengineering
- Limited resources for research and poor investments in science and technology
- Lack of observations and data
- Lack of realistic regional/local scenarios; monitoring, and Early Warning Systems
- Capacity (human, technical, computing, etc.) is very weak
- Poor policies and lack of implementation for the existing ones
- Enhancement of education, awareness, networking
- Weak national Institutions
- Roles of local/indigenous knowledge often neglected
- Non use of available opportunities
- No integration of climate risk, climate change, disaster risk reduction and sustainable development agenda at all levels
- Collaborations and cooperation among all stake holders

Reference

IPCC, 2007: Climate Change 2007. The physical science basis. Contribution of working group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.