



Climate change and African food crops

Rain-fed crops in southern Africa will be severely impacted by climate change, causing yield reductions. Traditional African crops and hardier new varieties offer advantages over conventional maize varieties.

Climate change, soil moisture and crop water requirements

Global warming and associated changing rainfall patterns, rainfall reductions, and increasing dry spells and drought, will reduce soil moisture. This, along with rising temperatures and increased evapotranspiration, can result in crop water deficits at critical times in crop development, leading to declining yields. Crops will need 5% to 20% more water in a warming world, to maintain current yields. Where the most crops aren't irrigated, food production will drop.



Even small temperature increases (less than 2°C) may reduce crop yields.

CO₂ fertilisation

Higher CO₂ levels in the atmosphere may stimulate growth and improve water efficiency in plants. This may increase yields in some crops.

Warming and heat stress

In the warm to hot tropics and subtropics, global warming holds few benefits for crop productivity. Even small temperature increases (less than 2°C) may reduce crops yields. Greater heat stress, particularly during sensitive flowering and early seed-development periods, will reduce yield significantly (Easterling *et al.*, 2007).

Opportunities

The indigenous African cereal crops sorghum and millet, as well as hardier new varieties of other crops specifically bred for African conditions (e.g. NERICA rice), may buffer African farmers against the risk of crop failure under future climate change. Research and development, extension to farmers, and the development of markets and agro-processing facilities for these crops and varieties should be prioritised.

References

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The Regional Climate Change Programme (RCCP)

The RCCP aims to contribute to the achievement of Southern Africa's climate change adaptation needs, socioeconomic development and poverty alleviation objectives, including the Millenium Development Goals.

Climate change requirements and sensitivities of common food crops

The climatic requirements and sensitivities of the most common food crops in southern Africa are listed below.

Overall risk refers to the expected combined impact of warming, more erratic rainfall and periods of soil moisture stress, and increasing concentration of atmospheric CO₂. (Summarised from OneWorld, 2010)

Crop	Description of climate change sensitivity	Overall risk
Maize Principle staple food, 80% of crop production	High temperature: Reproductive processes sensitive to heat stress; low yields Moisture stress: High water requirement; rainfall must be favourably distributed through the season; highly susceptible to droughts and erratic rainfall Elevated CO ₂ : Weak positive growth and yield responses	High
Sorghum Most important indigenous African cereal	High temperature: Can produce well under higher temperatures Moisture stress: Higher water use efficiency than maize; lower water requirement; suitable for semi-arid areas; well able to cope with drought and other stresses Elevated CO ₂ : Unknown, but likely moderate positive growth and yield responses crop	Low
Millet Traditional African cereal crop in semi-arid regions	High temperature: Tolerant of high temperatures Moisture stress: Lower water requirement; can be grown in areas with recurrent droughts and erratic rainfall Elevated CO ₂ : Unknown, but likely moderate positive growth and yield responses	Low
Rice Low production – 4% of southern African cereal production	High temperature: Generally tolerant of high temperatures, but flowering and seed set sensitive to heat stress Moisture stress: Conventional cultivars have a high water requirement; moisture stress during critical periods reduces yield; drought intolerant; NERICA cultivars more resistant to drought and other stresses Elevated CO ₂ : Stronger positive growth and yield responses	High / Medium
Wheat Temperate cereal grown as winter wheat in Southern Africa	High temperature: Does not tolerate heat stress Moisture stress: Moderately high water requirement; evenly distributed; moisture stress during flowering and seed set reduces yield Elevated CO ₂ : Stronger positive growth and yield responses	High
Cassava Starchy tuberous crop. Requires processing because of toxins	High temperature: Tolerant of high temperatures Moisture stress: Lower water requirement; considerable drought tolerance; increasingly grown as a staple crop and as a famine reserve because of its hardiness Elevated CO ₂ : Positive growth and yield response but concern that toxin concentrations increase	Medium / Low
Sugar cane Widely grown in tropical and subtropical regions, important cash crop	High temperature: Tolerant of high temperatures Moisture stress: Sensitive to dry spells and drought—strong reductions in yield Elevated CO ₂ : Weaker positive growth and yield responses	Medium
Fruit and nut crops Wide range grown across the region	High temperature: Variable – flowering and seed set sensitive to heat stress; apples and pears require minimum winter cold Moisture stress: Generally require regular inputs of water, can survive drought but strong reductions in yield; cashew, macadamia and pineapple more drought resistant Elevated CO ₂ : Unknown	Variable