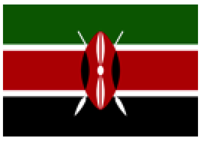
Potato Kenya



Climate change risks and opportunities

Potatoes in Kenya

Agriculture in Kenya contributes to the national economy, food security, and employment of rural households. Climate change and weather variability affect agricultural production negatively and it is expected to worsen in the future. Climate-smart agriculture (CSA) practices present an opportunity to reduce such losses, build resilience in the agriculture sector, improve productivity and farmer incomes, and contribute to climate change mitigation (CIAT & World Bank, 2017). In Kenya, potato is grown by about 800,000 farmers cultivating about 161,000 hectares per season with an annual production of about 3 million tonnes in two growing seasons. Beyond the farm, the industry employs about 3.3 million people as market agents, transporters, processors, vendors and exporters (Muthoni, Nyamongo, & Mbiyu, 2017).

Past trends in temperature

The temperature trend (from 1961-2005) for both the short (October, November, December, (OND)) and long rain season (March, April, May, (MAM)) show that temperature in Kenya has been increasing by more than 0.8°C (Figure 1). In particular, the rate of increase has been by more than 1°C over north-eastern and north-western parts of the country during the long and short rainy season respectively.

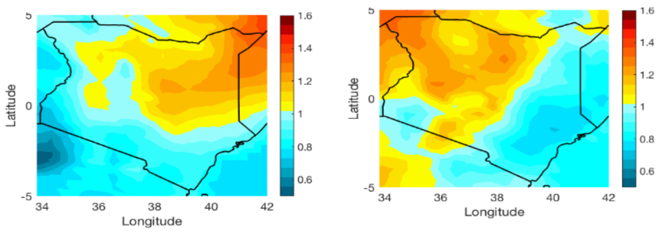


Figure 1. Temperature trends (1961-2005), March April May (MAM) (long rains, LEFT) and temperature trends (1961-2005) – October, November, December (OND) (short rains, RIGHT)

Climate change in future[1]

Temperature

During both the long and short rainy seasons, the model projection for mid-century (2050's) shows a temperature rise all over Kenya (Figure 2). The temperature is expected to rise by about 2.8°C - 3°C over western, southwestern, central, northern and north-eastern parts of Kenya during MAM (Figure 2). The temperature is also expected to rise over the south-eastern part of Kenya by about 2.5°C during the same long rainy season. During the short rainy period, the temperature is expected to rise by about 2.5°C and 2°C in the western and eastern part of the country respectively.

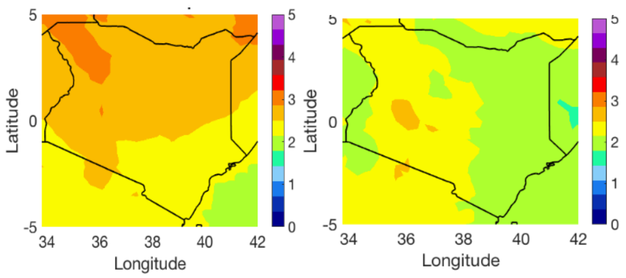


***Figure 2**. Projected seasonal mean changes in temperature for 2050s under the RCP8.5 emission scenario (worst case scenario), relative to the reference period (1961-2005). During both the short (October, November, December; RIGHT) and long (March, April, May; LEFT) rainy season, temperature is likely to rise by more than 2°C with the highest increase of 3°C over north-western Kenya during the long rainy season (MAM).*

Precipitation

The seasonal mean rainfall in the short rainy season is projected to significantly increase in the north-western part of Kenya by as much as 50% for mid-century (Figure 3). In the north-eastern, central and eastern part of the country, the seasonal mean rainfall is also expected to increase by up to 30-40% during the short rainy season.

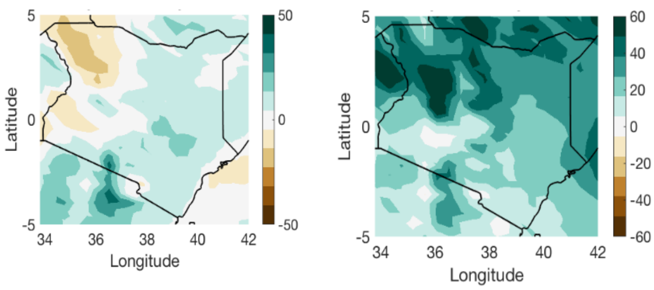


***Figure 3**. Projected seasonal mean changes in rainfall (in percentage) for mid-century under the RCP8.5 emission scenario, relative to the reference period (1961-2005). The mean rainfall during the short rainy season (RIGHT) is projected to significantly increase in the northern part of Kenya by 40-50% for the 2050s. However, during the long rainy season (LEFT), the seasonal mean rainfall is expected to decrease by 10-20% over north-western and western parts of Kenya.*

The increase in the seasonal mean rainfall accompanied by an increase in the number of consecutive wet days (2-3 days) over western and north-eastern part of the country (Figure 4) can translate into enhancement of extreme rainfall and resultant extreme events of flooding in the region.

[1] For this work on climate change projections, dynamically downscaled daily rainfall, maximum, minimum and mean temperature from the Rossby Center (SMHI) regional climate model (RCA4) are used. The regional model (RCA4; Dieterich et al., 2013) was used to downscale four Global Circulation Models (CanESM2, EC-EARTH, MPI-ESM-LR, GFDL-ESM2M) from the Coupled Model Inter-comparison Project Phase 5 (CMIP5). The regional model was run at a grid resolution of 0.44 x 0.44 over the African domain and all other details about the simulation can be found in Dieterich et al. (2013). The global models (GCMs) projections were forced by the Representative Concentration Pathways (RCPs), which are prescribed greenhouse-gas concentration pathways (emissions trajectory) and subsequent radiative forcing by 2100. In this study, we used RCP4.5 and RCP8.5, which are representatives of mid-and high-level of emission scenarios respectively

However, in the long rainy season, the seasonal mean rainfall decreases by about 10-20% in the north-western and western part of Kenya. Similarly, the consecutive wet days are expected to decrease by 1-2 days in the western and north-western parts of the country.

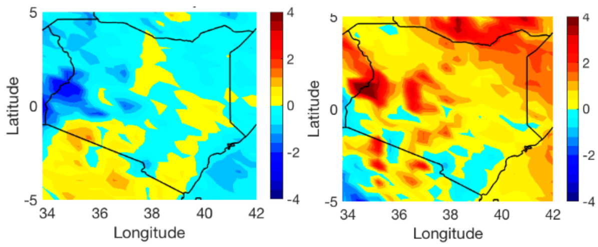


Figure 4. *Projected seasonal mean changes in consecutive wet days for mid-century under the RCP8.5 emission scenario, relative to the reference period (1961-2005). For the northern part of Kenya, the longest wet spell is likely to increase by about 2-3 days in the 2050s during the short rainy season (RIGHT). However, the length of the longest wet spell is expected to decrease by 1-2 days in the north-western and western part of the country during the long rainy season (LEFT).*

The projection of the longest consecutive dry days (CDD) for both the short and long rainy season show that dry spells will decrease for mid-and-end of the century in most parts of Kenya. Specifically, the reduction in the longest dry spell is about 4-5 days in the northern half of the country for OND, 1-2 days for MAM (Figure 5). The fact that the decrease in consecutive dry days combined with the previous finding of an increase in seasonal mean rainfall and consecutive wet days in OND reinforces the probability of extreme flooding events.

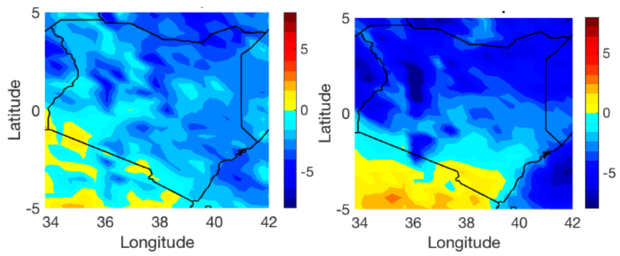


Figure 5*. Projected seasonal mean changes in consecutive dry days (in percentage) for mid-century under the RCP8.5 emission scenario, relative to the reference period (1961-2005). Dry spells are expected to decrease for the 2050s in most parts of Kenya, with the maximum decrease in northern half of the country by about 4-5 days during the short rainy season (RIGHT). Dry spells are also expected to decrease in the north-eastern and eastern part of the country by about 1-2 days in the long rainy period (LEFT).*

In Summary, during both the short (OND) and long (MAM) rainy seasons, the model projections for 2050s show that a high temperature rise (particularly during MAM) is expected in all parts of Kenya ranging from 2.0°C to 3°C. An increase in seasonal rainfall and consecutive wet days in the short rainy season could reinforce the probability of extreme events of flooding in the north-eastern and north-western part of the country. However, a decrease in seasonal rainfall and a likelihood of more dry days in western Kenya during the long rainy season could have an implication of more incidences of agricultural drought in the region by 2050s.

Climate change impact (modelling study)

Climate change is likely to considerably erode existing opportunities for potato yield increases, especially during the long rainy seasons. In future, during the long rainy season, yields under optimum management conditions are likely to decrease by up to 2 tonnes per hectare in Narok, Bomet, Kirinyaga and Embu. In large parts of Laikipia and Nyeri, yields under optimum conditions are likely to decrease by up to 4 tonnes per hectare. Unlike the long rainy season, yields in the short rainy season in the future are likely to increase in all areas except large parts of Meru. Despite this, yields in the long rainy season should be generally higher than yields in the short rainy season (Figure 6).

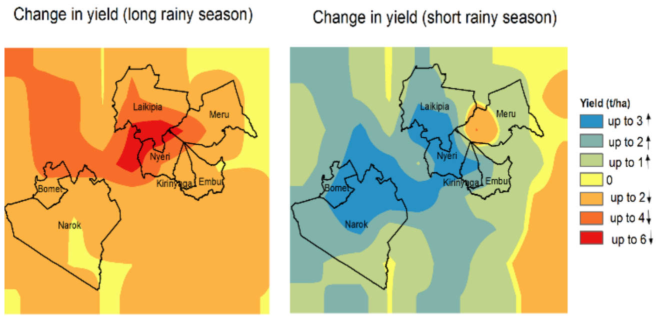


Figure 6*. Change in potato yield under RCP 8.5 (2050s) compared to current climatic conditions. Red/orange areas indicate where yields are likely to decrease in the future and blue areas indicate where yields are likely to increase (Duku, forthcoming)*

Stakeholders' perceptions of climate change and its impact on potatoes (field survey results)

Two thirds of the interviewed smallholder farmers feel that extreme rainfall has changed compared to 10 years ago. The majority of the interviewed female and male smallholder farmers who have perceived a change, see a decrease in extreme precipitation due to climate change. Concerning drought and temperature, most smallholder farmers (92.9% for males, 100 % for women) experienced an increase in droughts. Most of the smallholder farmers (86%) perceive an increase in extreme high temperature change. A large majority of smallholder farmers experienced a decrease in water availability (Figure 7). Most of the stakeholders experienced a decrease in crop productivity due to climate change (Figure 8).

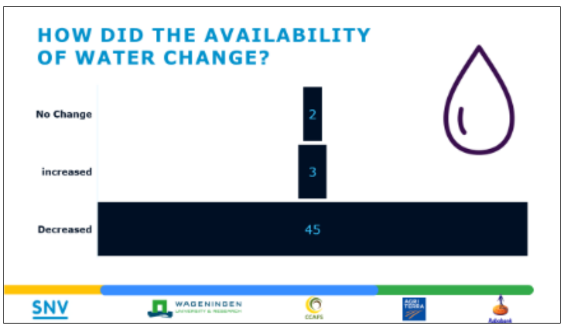


Figure7. *Smallholder farmers' perceptions of changes in water availability due to climate change – Climate change field survey potatoes. 2019. (SNV forthcoming)*

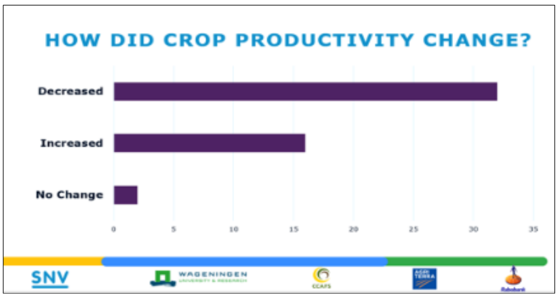


Figure 8. *Stakeholder perceptions of effect of climate change on crop productivity (Climate change field survey potatoes, 2019 (SNV, forthcoming)*

Climate Risk Assessment workshop (29 -30 April, 2019)

The Climate Risk Assessment workshop brought together approximately 45 participants representing the different stakeholders of the potato value chain. The majority of the participants were male and female smallholder farmers (Figure 9).

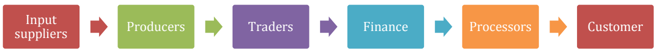


Figure 9. *Value Chain Actors present at the Climate Risk Assessment Workshop*

Stepwise participants shared and discussed experiences with climate change, its impact on their business and the effectiveness of current coping strategies (Photo 1).

Photo 1. *Day 1 - discussing climate change, impact on business, coping strategies and their effectiveness (processor, bank, traders) (Source: CRA workshop potatoes, 29 & 30 April 2019)*

Based on insights into climate change projections and participants' adaptive capacity, different adaptive strategies were discussed to anticipate and prepare for future conditions.

Adaptation strategies (examples)

- Development of tolerable varieties
- Find use for waste products from potatoes
- Give trainings on crop insurance and its costs and benefits
- Data centralisation for profiling farmers (e.g. on risk)
- Support agricultural machinery providers (against post-harvest losses

Adaptation strategies with potential benefit for the value chain were further explored from a business perspective. Climate smart business ideas were discussed to address high climate related risks and to improve the viability of the value chain.

Climate smart business ideas addressing climate change risks (examples)

- Finance: An app where all financial and insurance services are combined
- Input suppliers: Production of certified potato seeds using aeroponics and hydroponics
- Traders: Setting up a climate smart agriculture centre
- Farmers: A mechanisation facility so farmers can increase CSA production

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Project Information

The Climate Resilient Agribusiness for Tomorrow (CRAFT) project (2018 - 2022), funded by the Ministry of Foreign Affairs of the Netherlands, will increase the availability of climate smart foods for the growing population in Kenya, Tanzania and Uganda. The CRAFT project is implemented by SNV (lead) in partnership with Wageningen University and Research (WUR), CGIAR's Climate Change Agriculture and Food Security Programme (CCAFS), Agriterra and Rabo Partnerships in Kenya, Tanzania and Uganda

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