

Sesame Uganda



Sesame in Uganda

Uganda's agricultural sector is an important catalyst for economic growth, poverty alleviation, and food security. Nevertheless, the economic losses from the impacts of climate change on the agricultural sector by 2050 are estimated to be about US\$1.5 billion (Zinyengere et al., 2016). 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 2010, Uganda was the fifth largest producer of sesame globally, and production peaked at about 216,000 megatonnes in 2012 (FAOSTAT, 2018). The average yield of sesame is about 700 kilograms per hectare (FAOSTAT, 2018).

Past trends in temperature

The temperature trend (from 1961-2005) for the first rainy season (March, April, May) show that temperature in the central and northern sesame growing areas of Uganda has been increasing by about 1°C (Figure 1). During the second rainy season (October, November, December), the temperature has increased by about 1.4°C over the northern and central sesame growing areas of the country. The rate of warming has been slightly higher in the second rainy season (OND) as compared to the first season (MAM) by about 0.4°C.

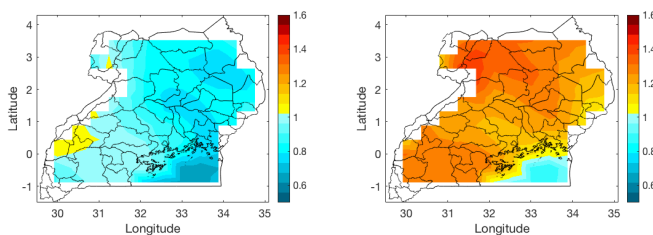


Figure 1. Temperature trend from 1961-2005 for the first (OND, LEFT) and second rainy season (MAM, RIGHT). **NOTE:** During both the second (October, November, December) and first (March, April, May) rainy season temperature has increased by about 1°C in sesame growing areas of Uganda.

Climate change risks and opportunities

Climate change in future¹

Temperature

During both the second and first rainy season, the model projections for mid-century (2050's) show that temperature in the sesame growing areas of Uganda is expected to rise by more than 2°C (Figure 2). The temperature is expected to rise by about 2.8°C over the northern and central sesame growing of the country especially during the first rainy season (Figure 2). During the second rainy period, the temperature is expected to rise by about 2.0°C to 2.4°C over the northern and central sesame growing areas of the country. Figure 2 shows that the expected rate of warming over northern sesame growing areas of the country is expected to be higher in the first season (MAM) as compared to the second (OND) by about 0.4°C -0.8°C.

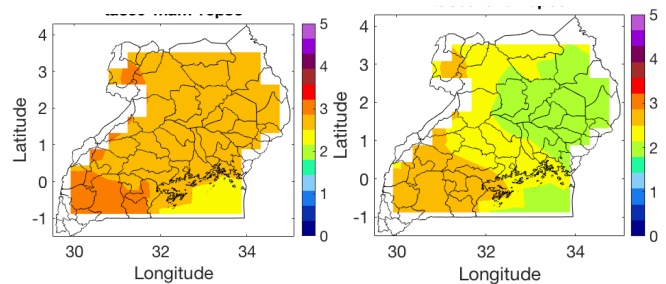


Figure 2. Projected seasonal mean changes in temperature for 2050s under the RCP8.5 emission scenario (business as usual case scenario), relative to the reference period (1961-2005). During both the second (October, November, December; RIGHT) and first (March, April, May; LEFT) rainy season, temperature is likely to rise by more than 2°C with the highest increase of 2.8°C over northern sesame growing areas of Uganda during the first rainy season (MAM).

Precipitation

The seasonal mean rainfall in the second rainy season (OND) is projected to increase in most of the northern sesame growing areas of by as much as 20-30% for mid-century under the business as usual scenario (Figure 3). However, the seasonal mean rainfall in the first rainy season (MAM) is expected to slightly decrease over the northern sesame growing areas of the country by 2050s (Figure 3). The central sesame growing areas of the country will continue to get a normal seasonal rainfall during the first rainy season.

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

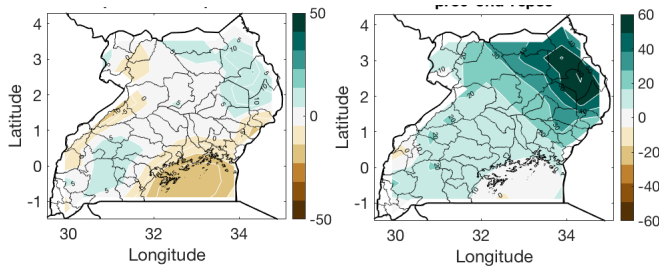


Figure 3. Projected seasonal mean changes in rainfall (in percentage) for mid-century (2050s) under the RCP8.5 emission scenario (business as usual scenario), relative to the reference period (1961-2005). Note: The seasonal mean rainfall in the first rainy season (RIGHT) is projected to increase by about 20-30% over the northern sesame growing areas of Uganda. However, the seasonal rainfall is expected to slightly decrease over the northern sesame growing areas of the country (LEFT).

The increase in the seasonal mean rainfall in northern and central sesame growing areas of Uganda during the second rainy period accompanied by an increase in the number of consecutive wet days by about 1-2 days (Figure 4) could lead into enhancement of rainfall in the region. However, the length of the longest wet spell in the sesame growing areas of the country during the first rainy season is expected to decline by 1-2 days. The decline in the longest consecutive wet days coupled with the slight decrease in seasonal mean rainfall in the first rainy season could lead to lack of rainfall and water scarcity in the sesame growing areas of the country.

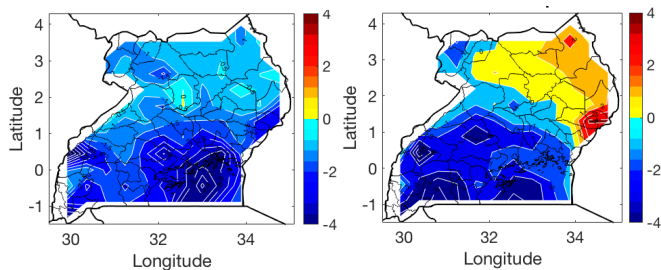


Figure 4. Projected seasonal mean changes in consecutive wet days for mid-century under the RCP8.5 emission scenario, relative to the reference period (1961-2005). For the northern sesame growing area of Uganda, the longest wet spell during the first rainy season (RIGHT) is likely to increase by about 1-2 days in the 2050s. However, the length of the longest wet spell in the northern sesame growing areas of the country is expected to decrease by 1-2 days in the first (LEFT) rainy seasons.

Drought

The projection of the longest consecutive dry days (CDD) for the second rainy season show that dry spells are expected to decrease by about 3-5 days over the northern and central sesame growing areas of the country (Figure 5). The decline in the dry spell coupled with the increase in wet spell and seasonal rainfall in the northern and central sesame growing areas of Uganda can reinforce the possibility of wet events that leads to flooding in the region. On the other hand, during the first rainy season, the consecutive dry days

are expected to slightly increase (~1-2 day) over northern and central sesame growing areas of the country. The increase in the consecutive dry days and the decline in the longest consecutive wet days coupled with the decrease in seasonal mean rainfall in the first rainy season could lead to shortage of rainfall and water scarcity in the northern and central sesame growing areas of the country.

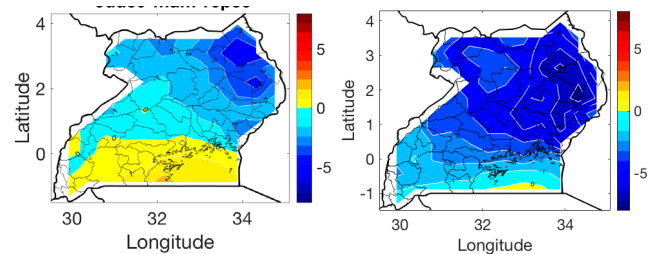


Figure 5. Projected seasonal mean changes in consecutive dry days for mid-century (2050s) under the RCP8.5 emission scenario, relative to the reference period (1961-2005). Dry spells are expected to decrease by 3-5 4 days over the northern sesame growing areas of the country during the second rainy season (RIGHT). A slight decrease (~1-2 day) on the dry spell is expected over the northern sesame growing areas of Uganda for the first rainy season (LEFT).

In summary, during both the first and second rainy season, the model projections for 2050's show a temperature rise in the northern and central sesame growing areas of Uganda. While rainfall is expected to increase in the northern sesame growing areas of Uganda during the second rainy season, the first rainy season is expected to suffer from a first dry spell and a decrease in seasonal rainfall.

Climate change impact (modelling study)

Climate change is likely to considerably erode existing opportunities for yield increases in sesame especially during the second rainy seasons. Currently, the average yield of sesame is about 700kg/ha. Under current climatic conditions farmers can more than triple this with optimum nutrient management practices and biotic control. However, due to climate change impact in future (i.e. 2050s), in the second rainy season, yields under optimum management conditions are likely to decrease by up to 1000kg/ha in Gulu, Apac, Lira, Kitgum and large parts of Pader. In the first rainy season all these areas are likely to experience yield decreases as well. However, the sesame production in Apac and Gulu will be affected the most.

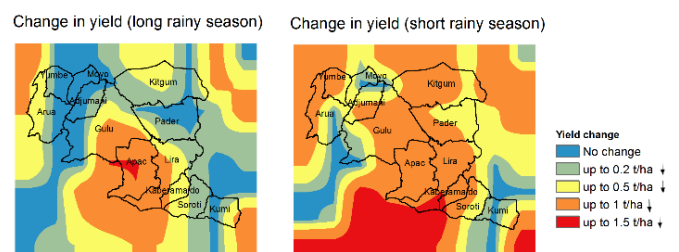


Figure 6. Projected change in yield (long rainy season and short rainy season) for mid-century under the RCP8.5 emission scenario, relative to the reference period (1961-2005). The maps show yield changes in t/ha, with red indicating a decrease and blue indicating no change.

Figure 6. Change in sesame yield under RCP 8.5 (2050s) compared to current climatic conditions. Yields were simulated under optimum nutrient management conditions and biotic control (Duku, forthcoming)

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

A field survey on climate change and its impact amongst different stakeholders in the sesame value chain in northern Uganda was carried out in April 2019. The survey showed that 42% of the stakeholders reported a delayed start to the first rainy season compared to ten years ago. Majority of the respondents, however, consider the start of the first rainy season to have become more unpredictable (Figure 7). Over 90 % of all male and female respondents reported a decrease in sesame productivity (Figure 8). In addition to drought, changes in start of the rainy season etc., respondents attributed the reported decrease in productivity to the impact of climate change on the increased incidence of pests and diseases.

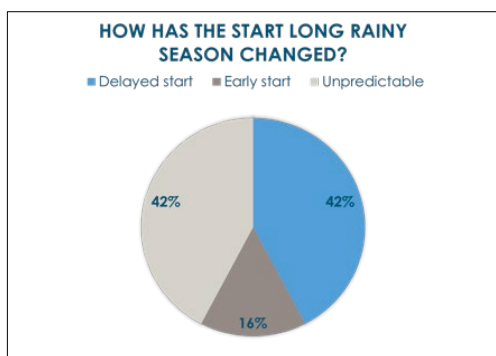


Figure 7. Stakeholders' perception of changes in the start of the first rainy season due to climate change - Climate change field survey, April 2019 (SNV, forthcoming)

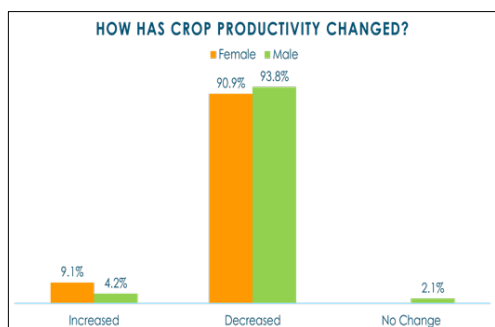


Figure 8. Stakeholders' perception of changes in sesame productivity due to climate change - Climate change field survey, April 2019 (SNV forthcoming)

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

The Climate Risk Assessment workshop brought together 72 participants representing the different stakeholders of the sesame value chain. The majority of the participants were male and female smallholder farmers. Stepwise they shared and discussed

experiences with climate change, its impact on their business and the effectiveness of current coping strategies. 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)

- Water harvesting
- Drought-tolerant seeds
- Plot channels for water drainage
- Irrigation
- Planting trees

Adaptation strategies with potential benefit for the value chain were further explored from a business perspective.

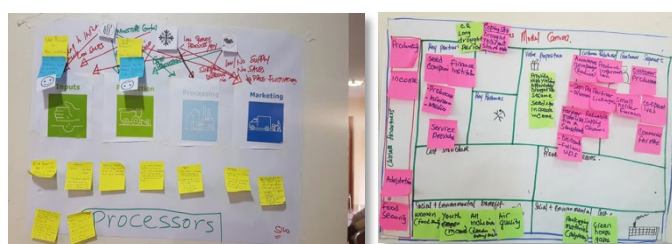


Photo 1 and 2. Results of discussion on impact of climate change on business (LEFT) and (RIGHT) Exploring climate smart business ideas using business canvass model (Source: CRA workshop sesame, 29-30 April 2019)

Adaptation strategies with potential benefit for the entire 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 high-medium climate change risks (examples)

- Bundled services which provide access to drought-tolerant varieties, relevant information, finance and creation of market linkages
- Provide available and affordable water for production
- Provide high yielding varieties to insured farmers

References:

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2. Duku, C. (forthcoming). *Impact of climate change on soybeans in Uganda*.
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5. Zinyengere, N., Araujo, J., Marsham, J. and Rowell, D. (2016). *Africa's climate - helping decision-makers make sense of*

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Acknowledgement

This document was developed by Confidence Duku, Teferi Demissie (CCAFS), Annemarie Groot, Monserrat Budding-Polo (Wageningen Environmental Research) with contributions from: George Oroma (SNV), the Ugandan SNV team, Agriterra, and RaboBank. It highlights activities and examples of results of a climate risk assessment for the sesame value chain implemented in the period January - April, 2019.

The assessment was carried out in the context of the **Climate Resilient Agribusiness For Tomorrow (CRAFT)** project.

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 Project (CCAFS), Agriterra, and Rabo Partnerships in Kenya, Tanzania and Uganda

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