POLICYBRIEF

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Harnessing climate-informed digital crop intelligence technologies is key to building the resilience of food systems against climate change in the SADC region.

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Summary

Climate-informed crop intelligence technologies are vital for building the resilience of food systems against the impacts of extremes in climate variation and climate change. As a result, agricultural policymakers, practitioners, and planners have used them to make tactical and strategic decisions, including estimating agricultural inputs needed months before the crop-growing season, selecting potential management practices, estimating crop performance and yields under various seasonal climate forecast scenarios, and providing anticipatory options against climate change. They may also be used in crop insurance evaluation schemes since they track real-time crop growth and estimate yield loss. Such tools are especially important in the SADC region, where severe weather and climate shocks have become more frequent and stronger in recent years, with catastrophic effects on livelihoods, food security, agriculture, human habitations, and ecosystems. As a result, the regional partners developed a user-friendly crop capability prediction tool and then conducted a series of capacity-building training in the SADC region. This capacity-building activity, however, requires the full cooperation of relevant national and regional organizations, initiatives, and governments in the region to be sustainable and have a long-term impact.

Introduction

Extreme climate variations, including rising temperatures, droughts, floods, storms, unpredictable rainfall, and others, have significantly decreased agricultural productivity in Sub-Saharan African (SSA) countries. The extreme events and climate shocks exacerbated by climate change also occur more frequently and severely on the continent, with disastrous effects on livelihoods, agriculture and food security, human settlements, and ecosystems. In response, the United Nations Secretary-General (UNSG) requested the World Meteorological Organization (WMO) to lead initiatives with partners and provide every citizen across the globe access to reliable, accurate, and timely disaster early warning systems for enhanced resilience against climate variability and change.

The Southern African Development Community (SADC), which contains nearly a third of SSA's population, has recently been subjected to more frequent and severe perennial tropical cyclones, storms, and droughts. In 2021-22 alone, six major cyclones affected over 2.5 million people in Malawi, Madagascar, Mozambique, and Zimbabwe. During this period, 12 SADC Member States also experienced climate-related shocks that left 55.7 million people with food insecurity. The impact was

ACPC African Climate Policy Centre | World Meteorological Organization | Digitron Business Systems | CCARDESA | SADC | CGIAR | AICCRA Accelerating Impacts of CGIAR Climate Research for Africa

severe in the agriculture sector, which is predominantly rain-fed, even though a bigger portion of the population (about 70%) depends on it for food, income, and jobs. Given the reality of climate change and its consequences in the region, it is important to employ technologies, including the crop intelligence tool, to improve resilience and adaptability. In this context, Africa must commit $50 billion annually to various adaptation strategies to combat the effects of climate change and variability.

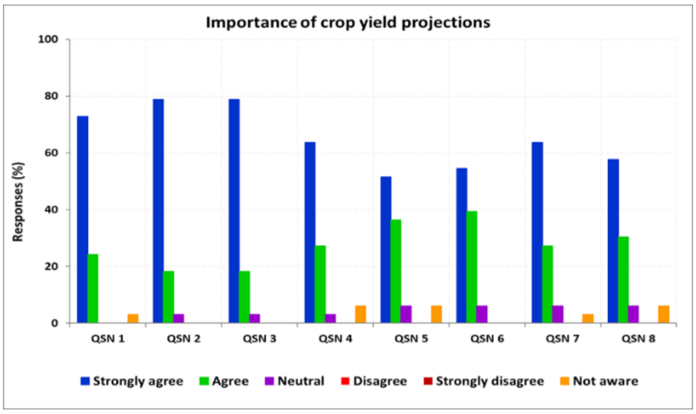
Climate-informed crop intelligence tools are vital in our efforts to plan and direct agriculture sector adaptation measures effectively. One such tool is the Climate–Agriculture–Modelling and Decision Tool (CAMDT). It was developed at International Climate for Society to prepare inputs for crop-yield simulation software – the Decision Support System for Agrotechnology Transfer (DSSAT). Agricultural institutions, policymakers, input providers, local cooperatives, and community-based groups utilize this seasonal climate forecast-driven crop yield modeling to manage their inputs more efficiently and effectively. The appropriate modifications of CAMDT also help to generate crop capability products that predict crop yields as early as the crop-growing season and assist the agriculture sector in adapting to the changing climate. Moreover, this tool has application in crop insurance assessment by predicting yield loss. Therefore, access to and use of such helpful tools is critical for making appropriate and effective decisions that prevent, limit, and/or manage climate risks in agricultural production systems.

The tool was developed in response to a request from a Member State

Due to the recent increases in the frequency and intensity of tropical storms, the ACPC has developed an analytical framework to evaluate the Socioeconomic Benefits (SEB) of Climate Information Services (CIS) in the disaster risk reduction sector. According to the study's findings, investing in CIS may have a benefit-to-cost ratio of 10, suggesting that ten dollars are obtained as an added benefit or avoided cost for every dollar invested. The study results were then presented during the "Building Back Better workshop from tropical Cyclone Idai and Kenneth," which caused significant loss and damage to the human/livestock, property, and infrastructure in Mozambique, Malawi, and Zimbabwe. The workshop was held in November 2019 in Harare, Zimbabwe, and attended by over 100 policymakers, planners, academics, practitioners, and other important stakeholders from the SADC countries.

In this workshop, the ACPC has been tasked to develop a user-friendly climate-informed crop prediction tool that supports decision-making in strengthening the resilience of the food systems against the impacts of climate change. This challenge comes from the Minister of Lands, Agriculture, and Rural Resettlement in the Zimbabwean Cabinet.

Accordingly, the ACPC and its regional partners commissioned a series of studies and developed a tool that translates the seasonal and sub-seasonal forecasts into better agricultural management. Three crops—rice, maize, and sorghum—were chosen to assess the efficiency of the crop capability prediction tool, and the results were satisfactory. This tool was later validated by various experts from SADC countries in November 2021 in Lilongwe, Malawi. At the end of the validation workshop, experts recognized the potential applications of this tool in crop yield prediction, forecasting crop deficits/surpluses, early warning actions with unprecedented time leads, and other fields. They advised regional partners to pursue rigorous regional capacity-building activity for maximum impact (Figure 1).



QSN1- Advance knowledge of crop yield projection
QSN2- It is important for early warning planning
QSN3- It is important for food security
QSN4- It is important for GDP projections
QSN5- It is important for investment planning
QSN6- It is important for relief efforts

Now, creating a cohort of trainers is essential

The combined seasonal crop–climate forecasting tool (CAMDT-DSSAT) helps inform decisions well ahead of the likely impacts of climate variability or climate change, increases crop production and farm profitability, and reduces climate risks. Therefore, hands-on training on using a crop capability prediction tool is critical to consciously build a critical mass of experts to support existing and future initiatives on agriculture and food systems resilience in the SADC region.

On this premise, AICCRA, in collaboration with the ACPC, WMO-ROA, Digitron-Zimbabwe, and CCARDESA, established a cohort of interdisciplinary trainers to enable them to analyze the impacts of extreme climate variations and climate change on agriculture and food security in SADC region. The acquired knowledge from the ToT workshops (both theoretical and practical) will be used to support early warning and anticipatory actions by providing evidence-based advice to policymakers and practitioners. It is, therefore, imperative to provide the much-needed skills to help communities improve their efficiencies in agricultural production systems by minimizing inputs, such as fertilizers, irrigation, or other applications.

This capacity-building initiative has been rolled out through the training of trainers (ToT) workshops. So far, two ToT workshops have been held in Zimbabwe and Mozambique. Our national partners in the respective countries were the Meteorological Services Department of Zimbabwe (MSDZ) and the Mozambique National Meteorology Institute (INAM). A range of experts from the National Meteorological and Hydrological Services, Ministry of Agriculture, Research Centres, Academic Institutions, and the private sector, including insurance companies, have attended these ToT workshops. In order to benefit the user community in making tactical and strategic decisions on inputs needed for agriculture and food security sectors, it is important to continue the capacity-building training for wider impacts.

Conclusion and recommendations

The climate-informed decision support tool is critical in our efforts to build the resilience of food systems against the impacts of climate change in the SADC region and beyond. Acknowledging the significant impacts of climate change on the agricultural sector of SADC countries and following the adoption of the Maputo Declaration by the SADC Ministers to enhance Early Warning and Early Action in the region, the following are recommended for better application and use of the crop prediction tool in the region:

Climate-informed crop prediction tools should be harnessed in the SADC region to make appropriate climate risk management and food security planning decisions. Results from the combined CAMDT-DSSAT crop models indicated that about 20-80% of the inter-annual variability of crop yields in SSA is associated with weather phenomena, while about 5-10% of agricultural production losses are attributed to climate variability. Therefore, the crop prediction tool can help drive efficiency in agricultural production systems by making sound farm- and policy-level decisions. It specifically helps policymakers, practitioners, and planners to better understand and predict the properties of agricultural production systems well ahead of the crop-growing season. It allows them to take appropriate pre-emptive actions against the impact of climate shocks. These tools also have potential in crop insurance mechanisms as they track real-time crop growth and predict yield loss. Continuous improvement of this tool is, however, needed to predict the crop yield accurately in diverse agroecologies and management practices.

Relevant stakeholders should support the ongoing capacity-building activity for efficient and resilient agricultural production systems in the region. With its numerous benefits in agriculture as well as early warning and early action initiatives, there is a need for sustained awareness creation and capacity-building training on the tool in the SADC region. This, however, requires strong collaborations and partnerships among different national and regional actors. In this regard, the Ministries responsible for Agriculture and Meteorology in the SADC Member States, the SADC Secretariat, CCARDESA, and development partners such as the World Bank shall be aware of the tool's existence and extend their hands to ensure its sustainability beyond the project implementation period. Such concerted efforts will build a critical mass of skilled workforce who can better undertake national and regional adaptation and mitigation initiatives in response to climate change.

FURTHER READING

- UNECA (2021). Manual for modified CAMDT/DSSAT crop yield prediction model. https://www.uneca.org/sites/default/files/ACPC/MANUAL_FOR_MODIFIED_CAMDT_CROP_YIELD_PREDICTION_MODEL_24_November_2021_Ver_compressed.pdf

- Han, E- J. and A. V. M. Ines (2017). Downscaling probabilistic seasonal climate forecasts for decision support in agriculture: A comparison of parametric and non-parametric approach. Climate Risk Management 18:51-65.

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