

POLICY BRIEF

A POLICY BRIEF ON THE INCLUSION OF CLIMATE-RELEVANT SCIENCE, TECHNOLOGY INDICATORS IN THE SADC AGRICULTURAL SECTOR

2022

CCARDESA SECRETARIAT

Ground Floor, Red Brick Building, Plot 4701, Mmaraka Road, Private Bag 00357,

Acknowledgements: Prof Amon Taruvinga – PhD



Executive Summary

A majority of the Southern Africa Development Community (SADC) citizens, especially those that reside in rural areas, largely depend on agriculture and natural resources for their livelihoods. However, in recent years, a general decline in the agricultural productivity of this subsector has been noted to be negatively affecting their livelihoods, food and nutritional security. Climate change and variability is identified as one of the major causes of this decline, because of the sensitivity of land based agriculture and natural resources to climate. Of interest to note is the fact that, if research and innovation are properly linked with development initiatives, they boost innovation in agriculture and food systems and make them more resilient to climate change and better responsive to development demands.

Against this background, the Centre for Coordination of Agricultural Research and Development for Southern Africa (CCARDESA), commissioned a study in seven SADC countries (Botswana, Eswatini, Mozambique, Namibia, Tanzania, Zambia and Zimbabwe). The objective of the study was to understand the level of inclusion of relevant climate, Science Technology and Innovation (STIs) in the agricultural industries of these countries and opportunities for mainstreaming climate STIs in different subsectors of the agricultural industry. The study provides interesting insights on the level of inclusion of climate STIs in these SADC countries and opportunities that can be targeted for mainstreaming climate STIs to enhance resilience of the SADC's agricultural industry to climate change.

Introduction

SADC regional policy makers at national level have been attempting to mainstream climate STIs into their agricultural policies. This is against a background where climate STIs are believed to be a catalyst for sustainable economic and social development. Policy makers' efforts have been negatively affected by lack of a clear understanding of the level of inclusion of climate STIs in their agricultural industries to enhance strategic targeting for mainstreaming. Thus far, CCARDESA commissioned a study towards understanding the level of inclusion of climate STIs in the agricultural sector of the SADC countries and flagged opportunities for possible mainstreaming climate STIs. Study results reveal a low inclusion of climate STIs in the agricultural industries of SADC countries. This scenario suggests a region whose agricultural industry is

vulnerable to climate change, yet the industry supports a majority of the region's population.

Approach

The Agricultural Innovation System (AIS) conceptual framework was used to identify the following six Agricultural Innovation System Domains which broadly cover the agricultural industry of the seven countries:

- **Domain 1:** Climate smart agricultural innovation outcomes and sectoral performance;
- **Domain 2:** Climate smart agricultural research and education system;
- **Domain 3:** Climate smart agricultural value chains;
- **Domain 4:** Climate smart bridging institutions (extension system);
- **Domain 5:** Climate smart agricultural policies, institutions and frame conditions;
- **Domain 6:** Beyond the system's borders (climate smart external environment).

The Domains were then used to track inclusion of climate STIs in the seven countries based on a series of classical and Agricultural Innovation Systems (AIS) oriented indicators as suggested by literature and country level experts drawn from across the Agricultural Innovation System.

Results

Figure 1 and 2 presents the estimated Climate Science Technology Innovation Indices (CSTII) and aggregate climate Domain Indicator Indices (CDII) for the seven targeted SADC countries. Moderate inclusion of climate STI in the agricultural sectors of the following countries is revealed; Botswana (51%), Tanzania (53%) and Zimbabwe (53%) and a low inclusion in the following countries; Eswatini (47%), Mozambique (43%), Namibia (49%) and Zambia (49%).

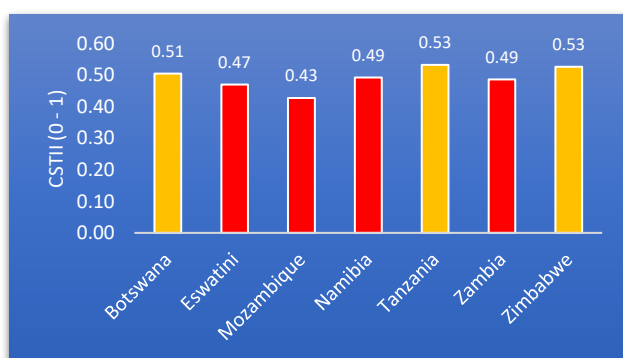


Figure 1: Climate STI Indices for all countries

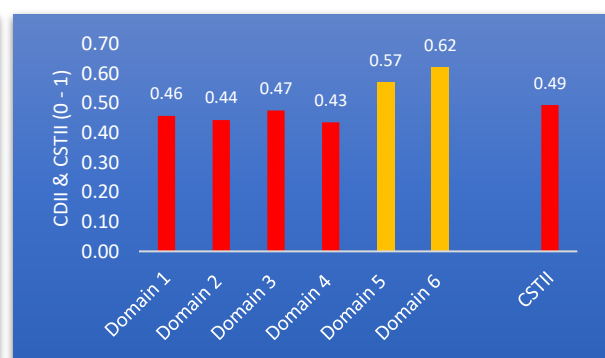


Figure 2: Average Climate Domain Indicator Indices for all countries

Figure 2 presents an aggregate image of all the seven countries in terms of how climate STIs are included in the six Agricultural Innovation System Domains. Results reveal low inclusion (<50%) in Domains 1 to 4, moderate inclusion (51-74%) in Domains 5 & 6 and an average climate STI index of 49% for the region, which imply low inclusion.

These findings suggests that SADC’s agricultural sector has a low inclusion of climate STIs. The regional agricultural industry is therefore highly vulnerable to climate change. This may lead to a decrease in the agricultural productivity as currently witnessed in a majority of these countries. The livelihoods, food and nutritional security of the bulk of the regional population that largely depend on land based agriculture and natural resources are likely to be negatively affected.

Opportunities

Figure 3 and 4 presents Domains that can be targeted for mainstreaming of climate STIs in the agricultural industry of the region based on their relative importance to the climate STI index. Neural multilayer perceptron network estimates indicate that, Domain 4 has the highest importance (100%), followed by Domain 2 (93%), Domain 3 (68%) and Domain 1 (13%) to enhance mainstreaming of climate STIs in the agricultural industry of the SADC region. From an agricultural policy and frame environment angle, Domain 5 has the highest importance (100%) followed by Domain 6 (9%) to enhance mainstreaming of climate STIs in the agricultural industry of the SADC region.

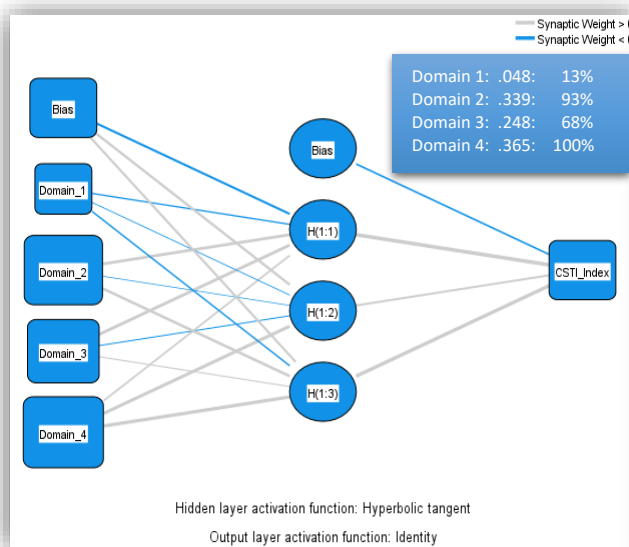


Figure 3: Neural multilayer perceptron network Domain indicators to promote climate STI index (Domain 1 – 4).

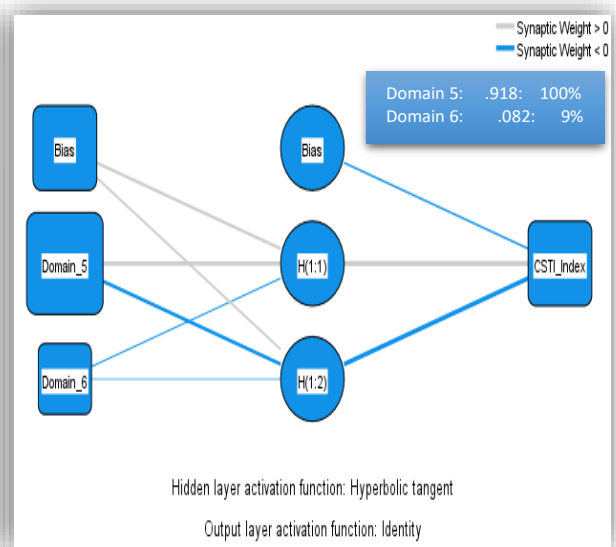


Figure 4: Neural multilayer perceptron network Domain indicators to promote climate STI index (Domain 5 – 6).

Conclusion

Overall, the study concludes that, the level of climate STIs inclusion in the agricultural industries of the seven SADC countries is low (49%). This is mainly caused by the low inclusion of climate STIs in Domains; 1 to 4, and a moderate inclusion in Domains; 5 and 6. Neural multilayer perceptron network estimates suggests that, mainstreaming of climate STIs in the agricultural sector of the region has a huge potential in the following Domains in their order of priority; 4, 2, 3 and 1. From a policy and enabling frame environment, mainstreaming exists largely in Domain 5.

Implications

The current status quo (low climate STIs inclusion), presents a regional agricultural sector highly vulnerable to climate change especially among the rural households who largely depend on land based agriculture and natural resources. This may lead to low agricultural productivity, food and nutrition insecurity, poor economic development, poverty, social instability and high income inequality in the region, as currently witnessed in some of these countries.

Recommendations

A successful strategy for climate STIs mainstreaming for the agricultural sector of the region should therefore target creating climate smart agricultural extension, research and education systems (Domains 4 & 2). This should be supported by climate smart agricultural policies and enabling frame environment (rural infrastructure). Focus for the climate smart extension system (Domain 4) should be on:

- Improvement in farmer to extension ratios;
- Improvement in qualifications (certificate, diploma, degree) and area of specialisation (crop, animal, agribusiness) of extension agents;
- Increase in expenditure on agricultural extension;
- Increase in the frequency of training and skills upgrades related to climate change and digital literacy for agricultural extension agents.

Focus for the climate smart education and research system (Domain 2) should be on:

- Reprioritisation of agricultural R&D spending allocations in favour of operations, programs and capital investments;
- Increase in climate smart crop and livestock breeding efforts;

- Constant review and upgrade of climate STIs coverage in the education system in-line with emerging trends;
- Regional and international student exchange programs in advanced training in climate change, science and technology;
- Regional and in-country science postgraduate training programmes for female agricultural researchers;
- Incentives for publications in climate change and STIs;
- Climate smart, science and technology related collaborations between academia and value chain actors;
- Increase in ICT devices and services available to the research and education system.

Focus for the climate smart agricultural policies and enabling frame environment (Domain 5) should be on:

- Effective enforcement of agricultural policies and regulations that promote climate change, science, technology and innovation in agriculture;
- Development of the regional countries' rural infrastructure (road networks, communication services - internet, mobile telephone services and access to cell phones);
- Appropriate linkage between the agricultural subsector and other economic sectors (manufacturing, service and commerce) to boost demand.

Mainstreaming Entities

At national level, a central national climate change promotion, coordination and monitoring Entity hosted in a strategic government department with financial and political influence (presidency or treasury) may be necessary. The Entity is expected to drive the mainstreaming of climate STIs and enforcement of policies currently available in most SADC countries but not enforced. At the regional level, a similar climate change promotion, coordination and monitoring Entity within the SADC framework will be necessary to support national Entities in the overall mainstreaming of relevant climate STIs at the regional level.