

SYNTHESIS REPORT



POLICIES AND PRACTICES FOR CLIMATE-SMART AGRICULTURE IN SUB-SAHARAN AFRICA

AUGUST 2017



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This report is a product of the collaboration between the Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN) and the Earth System Governance Project, on policies for climate-smart agriculture. The Earth System Governance Project is an international social science research network in the area of governance and global environmental change. This report synthesizes the findings of 15 scoping studies conducted by national consultants across Eastern and Southern Africa.

ABOUT FANRPAN

The Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN) is an autonomous regional stakeholder driven policy research, analysis and implementation network that was formally established by Ministers of Agriculture from Eastern and Southern Africa in 1997. FANRPAN was borne out of the need for comprehensive policies and strategies required to resuscitate agriculture. FANRPAN is mandated to work in all African countries and currently has activities in 17 countries namely Angola, Benin, Botswana, Democratic Republic of Congo, Kenya, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe.

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LIST OF ACRONYMS

ACBF	African Capacity Building Foundation
CSA	Climate-smart agriculture
COMESA	Common Market for Eastern and Southern Africa
EAC	East African Community
FANRPAN	Food, Agriculture and Natural Resources Policy Analysis Network
FAO	Food and Agricultural Organisation
GDP	Gross domestic product
IPCC	Intergovernmental Panel on Climate Change
IFAD	International Fund for Agricultural Development
ICRAF	The World Agroforestry Centre
ICT	Information and communications technology
NAPA	National Adaptation Programmes of Action
NEPAD	New Partnership for Africa's Development
NCCAP	National Climate Change Action Plan
NGO	Non-governmental Organisation
REDD	Reduced Emissions from Deforestation and Degradation
R&D	Research and development
SADC	Southern Africa Development Community
SPARC	Strengthening Policy, Agriculture and Research Capacity for Enhanced Food Security in East and Southern Africa
UNEP	United Nations Environment Programme

FOREWORD

AFRICA'S vulnerability to shocks from outside the continent is becoming more and more obvious. Increased droughts and floods linked to climate change are fuelling food insecurity, homelessness and disease. Increasing the region's resilience to external shocks must be a priority that requires a fundamental review by countries of their policies to ensure they meet the right priorities and can deliver the right results. In this regard, policies that promote sustainable agriculture are indispensable. This kind of agriculture is the foundation of food security, and has the potential to secure livelihoods and promote economic growth in rural populations. Progress for rural populations has become an urgent undertaking for Africa as one of the major avenues to address the disorderly migrations of the continent's youth. Such progress requires providing food and securing livelihoods and must be done in a manner which does not compromise the environment.

As one of the primary contributors to greenhouse gas emissions, agriculture must take responsibility for contributing to environmental sustainability. It is within this complex and intertwined context that climate-smart agriculture has a fundamental role to play in putting Africa on a sustainable development path.

This research report presents findings of a study commissioned by the Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN) under the 'Strengthening Policy Agriculture and Research Capacity for Enhanced Food Security in East and Southern Africa (SPARC)' project with funding from the African Capacity Building Foundation (ACBF). The findings from this assessment highlight a set of areas for action in terms of both policy and practice, and identify key barriers to the successful integration of climate-smart practices at the regional and national levels. The set of recommendations offer a useful starting point to policy decision-makers and practitioners as they seek to enhance and scale context-appropriate climate-smart actions.

We cannot comprehensively and strategically tackle the climate change conundrum in the agricultural context without understanding the so-called "lay of the land". The study, thus, makes an important contribution to understanding the scope and scale of climate-smart agriculture on the continent at an opportune time.

An effective policy reassessment cannot, of course, be achieved overnight. It is a long-term process that requires the evidence to be collected and studied so policies are put in place that meet the continent's ambitions at both national and regional level. The ACBF is committed to continuing to play its role of supporting institutions like FANRPAN in carrying out this crucial task.



Prof. Emmanuel Nnadozie,

Executive Secretary, the African Capacity Building Foundation

INTRODUCTION

Agriculture and food systems stand at the nexus of several great challenges. Food insecurity and malnutrition remains pervasive, whilst demand for food will continue to increase in the coming decades. As a sector, agriculture (predominantly rain-fed agriculture) will be hit hardest by climate change, yet at the same time food systems contribute up to a third of greenhouse gas emissions and must therefore help seek solutions to reducing global warming (Vermeulen et al, 2012).

Climate change is already a reality. The Fifth Assessment of the Intergovernmental Panel on Climate Change (IPCC) has shown that global climate change is already damaging crops and undermining food production capacity in much of the world, particularly in poorer countries (IPCC 2014). Climate change will affect food security, nutrition and well-being in several ways:





	Changing rainfall patterns	Rainfall declines to levels that cannot carry a crop to full maturity (rain failure). Rainy seasons are being altered, and downpours and flooding have become more common in many regions, leading to loss of soil cover, inundation of low-lying areas, destruction of crops, and population displacement.
	Changing weather patterns	Including increased temperatures, and a change in the frequency and predictability of extreme weather events (e.g. cyclones).
	Increasing spread of disease	Increases in the spread of vector-borne diseases for example, malaria especially in hitherto malaria-free highland areas.
	Decreased availability of arable land	Climate change reduces the land suitable for agriculture, potentially driving the clearing of native forests and pasturelands for crop cultivation, with a consequent significant increase in greenhouse gas emissions.

Figure 1: Impact of climate change on food security, nutrition and well-being

Sub-Saharan Africa is particularly vulnerable to the impacts of climate change. The vulnerability of African countries to climate change is compounded by strong dependence on rain-fed agriculture and natural resources, high levels of poverty, low levels of human capital, low levels of preparedness to climate change effects, and poor infrastructure in rural areas. Other key challenges include poor soil fertility, reduced soil organic matter, and increased occurrence of acidified soils, due in part to limited fallow periods and to poor cultivation and water management practices. The limitations of Africa's agriculture are further exacerbated by limited functioning of markets and prohibitive trade policies, constraining access to inputs (IFAD 2011). As a result, the average yields of grain crops in sub-Saharan Africa have stayed below 1 tonne per hectare since the 1960s, compared with average cereal yields of 2.5 t/ha in South Asia and 4.5 t/ha in East Asia (Gilbert 2012).

Smallholder farmers, with limited capacity to invest or manage risk due to poorly functioning credit and insurance markets, are constrained in their ability to increase yields and incomes, and thus are particularly vulnerable to impacts of climate change and current climate variability. Women farmers may suffer the most, as they are estimated to receive less than 5% of extension, and less than 1% of all available agricultural credit (IFAD 2007).

In the absence of interventions, Sub-Saharan African agriculture's yields could fall by as much as 50% by 2050. African agriculture is 96% rain-fed (World Bank 2008) and in addition, temperatures in Sub-Saharan Africa are already close to or beyond thresholds at which further warming reduces yields (Cline 2008). As such, Stern (2007) estimates that global climate change will lead to reductions in per capita consumption of 4-5% for Africa, greater than in other regions of the world.

Agriculture is fundamental to the elimination of poverty and inequality in Africa; inaction is not an option.

Studies show that agriculture remains one of the most effective pathways out of poverty. Gross domestic product (GDP) growth that originates in agriculture is approximately four times more effective in reducing poverty than GDP growth that originates in other sectors (World Bank 2008). The risk which climate change poses to the sector, therefore, has significant implications for the poverty-reducing capacity of growth and development, as it can severely limit the options available to countries as well as create or further exacerbate continuing poverty and inequality. Tackling climate change and making agriculture more adaptive and climate-smart is, therefore, fundamental to further growth, to the extent to which rural and poor rural people are included and benefit, and to the sector's capacity to contribute to sustained progress on human development.

The effects of climate change on African agriculture are severe and one of the most significant emerging challenges to household livelihoods. As such, it is imperative that efforts to address agriculture's, food security and rural development needs take climate change into consideration.

In this context, climate-smart agriculture (CSA) becomes vital from a food security and developmental perspective. It is an approach that can help reduce the negative impacts of climate change on food supplies, livelihoods and economies, and increase the adaptive capacity of farming communities to long-term climatic trends as well as to increasing variability in weather patterns (FAO 2010).

CSA is defined as agricultural approaches that sustainably increase productivity and system resilience while reducing greenhouse gas emissions (FAO 2010). But CSA is not a single specific agricultural technology or

practice that can be universally applied; it is a combination of policy, technology and finance that involves the direct incorporation of climate change adaptation and mitigation into agricultural development planning and implementation (FAO 2010).

Several strategies, policies, partnerships and investments have been initiated to put the CSA concept into practice, at the

global, regional and national levels. Given that the concept of CSA is still relatively young, impacts are difficult to quantify; regardless some early lessons have been learnt. This synthesis report summarises the findings of a regional comparative assessment of relevant policies and practices in 15 countries across Eastern and Southern Africa. The report positions the current policies and practices within the current knowledge base on CSA good practice in the international context, and makes recommendations as to how CSA can be strengthened in Africa.

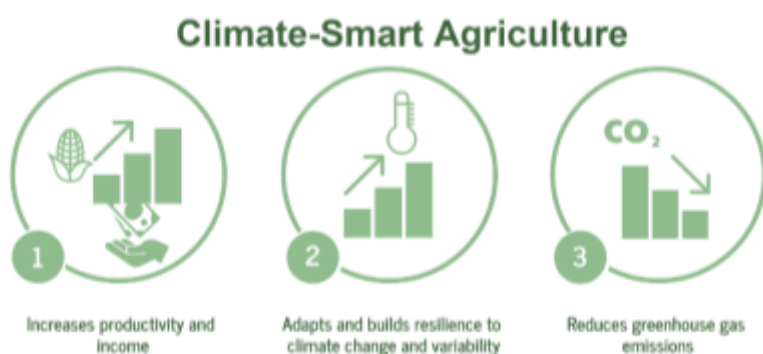


Figure 2: Climate-smart agriculture definition

KEY FINDINGS

EXPERTS AND FARMERS ALREADY SEE THE IMPACT OF CLIMATE CHANGE

A comparative assessment reveals that the onset impacts of climate change (particularly droughts, floods, and other alterations in rainfall patterns, with their associated impacts on crop yields and livestock) are already being perceived both by formal experts and by rural populations across Eastern and Southern Africa.

SEVERAL POLICY RESPONSES TO CLIMATE CHANGE & AGRICULTURE ARE IN PLACE

Eastern and Southern African countries generally have policies on agriculture and climate change – and do recognize the impacts of the latter on the former. Some countries have developed National Climate Change Policies (e.g. Madagascar, Malawi, Uganda and Zambia), while other countries have National Adaptation Programmes of Action (NAPA) in place (e.g. Democratic Republic of Congo, Tanzania, Uganda), and/or National Climate Change Response Strategies (Kenya, Tanzania, and Zimbabwe).

However, such policies often lack adequate instruments to achieve the goals they set. Furthermore, they are not sufficiently connected across sectors. There is a clear need for greater policy coherence to avoid conflicts and create synergies.

THE PROMOTION AND UPTAKE OF CSA PRACTICES REMAINS LIMITED

All countries have examples of both traditional and research-based agricultural practices that can be deemed climate-smart, but they are not mainstreamed and still receive limited support. Such practices include both agroecological techniques (e.g. mulching, intercropping, agroforestry, mixed farming) and agricultural biotechnology, such as high-yield and/or drought-tolerant crop varieties and livestock breeds.

SEVERAL CHALLENGES LIMIT UPTAKE OF CSA

Perverse incentives that hinder CSA implementation (i.e. larger subsidies or other policy incentives for practices that are *not* CSA) remain in place and need revision.



EASTERN AND SOUTHERN AFRICA HOLD GREAT POTENTIAL FOR CLIMATE-SMART AGRICULTURE,

but this potential needs to be further explored. The region has many traditional agricultural practices as well as research-based programmes and techniques that have CSA qualities.

CSA PROMOTION REQUIRES CONCERTED ACTION FROM MULTIPLE ACTORS,

including governments, non-state actors, the scientific community and farmers. This will allow for context specific approaches to be designed, implemented and monitored.

CLIMATE CHANGE MAY BRING AN OPPORTUNITY TO TRANSFORM AFRICAN AGRICULTURE

– not simply to change its material basis, but to shift its policies, institutions, and strategies in the direction of sustainability and of a food-secure future free from poverty.

Other challenges include limited material (including human resource) capacity, insufficient smallholder participation in governance, and persistent gender imbalances.

There are not only financial constraints but also limited access to technology for scaling up CSA practices. Many CSA practices – notably those based on biotechnology, but also suitable machinery for conservation agriculture or smallholder farming – remain expensive and dependent on foreign actors. This situation reveals an urgent need for South-South and North-South cooperation that promotes the *endogenous* technological development of Africa.

INCLUSIVE PROCESSES CAN IMPROVE POLICY DESIGN AND IMPLEMENTATION

For greater CSA uptake, it is also fundamental that smallholder farmers, particularly women and the youth, have greater participation in policy- and decision-making. Currently, most agricultural and climate change policies have been top-down and carried out through “one-way” extension services that tell farmers what to do not sufficiently listen to them. As a result, not only is there a government participation deficit, but also difficult implementation.

It is essential that institutions be revised to eliminate gender imbalances (e.g. ensuring the participation of women in decision-making and equal rights over land). Similarly, there is a need to incorporate the views, needs, interests and concerns of smallholders, who make up the majority of farmers in Africa.



KEY PRIORITIES FOR ACTION

Four key areas for action have been identified to promote climate-smart agriculture, namely (i) increased investment in material and human resources, (ii) the design of coherent, integrated policies, (iii) a focus on evidence-based, context-specific plans, that include the promotion of strategies to ensure equitable participation in governance, and (iv) capitalising on innovation as a pathway to promote CSA.

<p>INCREASED INVESTMENT IN MATERIAL AND HUMAN RESOURCES</p>	<p>Greater budgetary allocation and investment in CSA is needed</p>	<p>Increased, long-term public and private investment measuring up to the magnitude of the challenge and to the importance of agricultural development in those regions is needed.</p> <p>North-South and South-South cooperation have key roles to play boosting these investments.</p>
	<p>Investment should address the dual goal of CSA and socio-economic development</p>	<p>Cooperation for increased investment should take place with a view to promoting further human and technological development in Sub-Saharan Africa – not external dependence. This can be achieved through capacity enhancement and technology transfer that go beyond the exportation of technological products (e.g. machinery, improved seeds), to promote endogenous African scientific and technological development that builds on the local CSA <i>know-how</i> available.</p>
<p>COHERENT, EVIDENCE BASED POLICY MAKING</p>	<p>Policy frameworks that effectively prioritise and incentivize CSA</p>	<p>A first step is to revise existing policies (e.g. subsidies, tax breaks, credit) to eliminate perverse incentives, then to align them with CSA.</p> <p>There insufficient local, scientifically generated data and knowledge on CSA to inform evidence-based policy design.</p>
	<p>Coordination across ministries to create synergies</p>	<p>An additional step is coordination across different ministries and among different sectoral policies to reduce conflicts and create synergies towards CSA. This can be facilitated by the creation of intersectoral committees, think-tanks or communities of practice with multiple stakeholders, and eventually joint policies.</p>
<p>CONTEXT-SPECIFIC PLANS AND STRATEGIES FOR EQUITABLE PARTICIPATION</p>	<p>Prioritise strategies to ensure equitable participation in governance</p>	<p>This is a necessary strategy to improve social justice goals, but also the efficiency through greater social acceptability and uptake. This requires the meaningful inclusion of smallholder farmers and other weaker actors in agenda-setting, policy and decision-making regarding climate change adaptation and agricultural development</p>
	<p>Harness indigenous knowledge systems through bi-directional engagement</p>	<p>Eastern and Southern Africa needs “two-way” extension services to promote an exchange and the mutual strengthening of scientific <i>know-how</i> and the traditional agricultural knowledge available</p>
<p>CAPITALISE ON INNOVATION</p>	<p>Commit to the elimination of all gender imbalances</p>	<p>Cutting across all these measures is a need to revise gender-discriminating policies and institutions, particularly with respect to women’s rights over land, over other means of production, and their participation in decision-making. When these barriers stem from traditional norms, a way forward may be to obtain the support of traditional authorities such as monarchs or tribal chiefs, who may join the cause and become advocates.</p>
	<p>Harness trends in big data and ICT to understand change</p>	<p>Big data analytics and ICTs offer a viable option for increasing the systems level data available for effective prioritisation. Success should be measured using rigorous metrics, and sound monitoring and evaluation approaches need to be integrated into implementation efforts.</p>

Figure 3: Key Priorities for Action

OVERVIEW OF THE STUDY

The research project consisted of a comparative assessment of relevant CSA policies and practices in 15 countries across Eastern and Southern Africa.

The research was commissioned by FANRPAN to analyze the barriers and opportunities for promoting CSA in sub-Saharan Africa. This means agriculture that (i) increases productivity and income, (ii) adapts and builds resilience to climate change, and (iii) reduces greenhouse gas emissions where needed.

FANRPAN commissioned CSA Policy scoping studies through the work of national consultants and assessed the responsiveness of policy frameworks in 15 Eastern and Southern African countries (, Botswana, Democratic Republic of Congo, Kenya, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Uganda, Tanzania, Zambia and Zimbabwe).

The main objectives were to:

- Conduct a comprehensive review of the existing CSA policies at national level,
- Analyze gaps in the existing policy frameworks,
- Assess the CSA technologies, innovations and practice (as well as untapped opportunities),
- Identify key stakeholders in CSA,
- Identify relevant policy recommendations, and
- Develop and share policy recommendations at national and regional levels.

The study processes included review of existing documents and interviews with key informants from a wide range of organizations. In all countries, national policy dialogues were convened to a) share the draft CSA scoping study report outputs with stakeholders; b) validate the outputs from the draft CSA scoping study report; and c) solicit policy recommendations from stakeholders.

The draft reports were reviewed externally, and both recommendations from the national dialogues and external reviewers were incorporated into the CSA scoping study's final reports.

Based on the comparative assessment of those national scoping studies, this synthesis report now presents a regional picture of the challenges and opportunities for CSA promotion in Eastern and Southern Africa. It draws several observations as well as recommendations for policy-making and for targeted North-South and South-South cooperation.



MAPPING CSA IN SUB-SAHARAN AFRICA

The following four sub-sections of this report highlight thematically the findings from the 15 case studies, according to the (i) country context, (ii) the policy environment, (iii) CSA practices and obstacles to CSA.

CONTEXT

Climate-smart Agriculture in Africa. The New Partnership for Africa's Development (NEPAD) agency leads the implementation of the African Union-NEPAD Agriculture Climate Change Programme, which strives to have 25 million farm households practising CSA by 2025 (GACSA, 2016). A key continental initiative supporting this effort is the Africa CSA Alliance, a partnership between NEPAD and five international NGOs (CARE, Catholic Relief Services, Concern, Oxfam, and World Vision) which aims to reach at least 6 million farm households with CSA by 2021.

Regional cooperation for climate-smart agriculture is increasing. Recently a new CSA programme, known as VUNA ('harvest'), a £23 million DFID-funded programme, has been initiated in East and Southern Africa. VUNA aims to transform agricultural systems in East and Southern Africa by supporting smallholder farmers to adapt to climate change. The three Regional Economic Communities, Common Market for Eastern and Southern Africa (COMESA), East African Community (EAC), and Southern Africa Development Community (SADC) collaborate on a project that is supporting investments in national CSA programmes, and addressing the linkages between agriculture, forestry and land use and Reduced Emissions from Deforestation and Degradation (REDD). The goal is to bring significant livelihood and food security benefits to at least 1.2 million smallholder farmers.

Context is critical, there is no one size fits all. *"Many practices can be CSA somewhere but none are likely to be CSA everywhere"* (Todd Rosenstock, World Agroforestry Centre (ICRAF)). There is a real need for context specific research in multiple locations to identify CSA priorities; yet, singularly focussed research for development is still widespread in the African context. CSA requires identifying what is climate-smart for the biophysical, agricultural, and socio-economic context of a given locale. This will allow for effective targeting and prioritisation to ensure success of CSA strategies, policies, partnerships and investments.

MAPPING CONTEXT FOR THE 15 COUNTRY CASE STUDIES.

Table 1 on pages 16-17 maps the context of the 15 countries in the study to aid in the identification of context-relevant approaches to CSA. The table provides the following quantitative data: Rural population (as % of total population)¹, Stage of Development², Agriculture's contribution to GDP^{3,4}, Poverty Rate⁵, the country's ranking on the Food Security Index⁶. Two qualitative descriptions point out the specific climate and socio-economic vulnerabilities identified in the country studies.

Several trends are noted across all the countries in the study. In the first instance, no African country scored highly on the Global Food Security Index. South Africa, the continent's most food secure nation state, was ranked 47th out of 113 globally. Secondly, none of the countries in the study are fully innovation driven

¹ <http://reliefweb.int/sites/reliefweb.int/files/resources/assr.pdf>

² http://www3.weforum.org/docs/WEF_ACR_2015/Africa_Competitiveness_Report_2015.pdf

³ <http://data.worldbank.org/indicator/NV.AGR.TOTL.ZS?end=2016&start=2016&view=bar> for those that have 2016 figures

⁴ http://www3.weforum.org/docs/WEF_ACR_2015/Africa_Competitiveness_Report_2015.pdf

⁵ Based on World Bank data: Percentage of population below the international poverty line of \$1.90 per day <http://wdi.worldbank.org/table/1.2>

⁶ Based on the <http://foodsecurityindex.eiu.com/Index> which covers 113 countries, including 28 from Africa

economies; and only Mauritius is transitioning to an innovation driven economy. Thirdly, rural populations account for at least one third of the national population, and in all but two cases more than half of the population resides in the rural area. Poverty rates and agriculture's contribution to GDP differ widely between the countries.

It should be noted at this point that the Food Security Index examines the status quo in terms of affordability, availability and quality/safety; it does not account for risk in the event of climate change. For this reason, quantitative data need to be interpreted and responded to along with an understanding of climate change vulnerability and its potential impact on the socio-economic conditions.

Based on these statistics, the country contexts for each of the 15 case studies could be grouped in the following manner:

INNOVATION LED

GROUP 1: Innovation driven, low poverty: Mauritius

- Large rural population
- Transitioning to innovation driven economy
- Less than 1% of the population below the international poverty line
- Less than 5% of GDP from primary agriculture

EFFICIENCY DRIVEN (OR TRANSITIONING TO)

GROUP 2a: Efficiency driven, medium-sized rural population: South Africa, Botswana

- Medium-sized rural populations (less than 50%)
- Less than 20% of the population below the international poverty line
- Less than 5% of GDP from agriculture
- High ratings on Food Security Index (relative to African countries); within top 50% of countries globally

GROUP 2b: Efficiency driven, large rural population, high poverty: Namibia, Swaziland

- Large or very large rural populations (higher than 50%)
- More than 20% of the population below the international poverty line
- Less than 10% of GDP from agriculture

FACTOR DRIVEN & LARGE TO VERY LARGE RURAL POPULATIONS (>50%)

GROUP 3a: Factor driven, large rural populations, high poverty and positive food security: Kenya, Zimbabwe

- Less than 33% of the population below the international poverty line
- Less than 15% of GDP from agriculture
- High ratings on Food Security Index (relative to African countries); within in top 50% globally (for Kenya)

GROUP 4b: Factor driven, large rural populations, high poverty and inadequate food security: Lesotho, Zambia, Uganda

- High to Very High poverty rates (based on the international poverty line)
- Agriculture contributes less than 20% to GDP
- Mid-range to high scores on the Food Security Index (only available for Zambia)

GROUP 3c: Factor driven, large rural populations, high poverty and low food security: DRC, Malawi, Madagascar, Mozambique, Tanzania

- High to Very High poverty rates (based on the international poverty line)
- Agriculture contributes more than 20% to GDP
- Scored in the lowest 50% of Food Security Index ratings.

TABLE1: MAPPING THE CONTEXT FOR CLIMATE-SMART AGRICULTURE

	Rural population (as % of total)	Stage of Development	Agriculture cont. to GDP	Poverty Rate	Food Security Index	Climate Vulnerabilities	Socio-economic Vulnerabilities
Botswana	42.6%	Transitioning to efficiency driven	2.5% in 2013	18%	2 nd in Africa 54 th globally	Endemic droughts becoming more frequent	High imports of cereals; Dependent on other exports to afford cereal imports Dual agricultural economy
Democratic Republic of Congo	57.5%	Factor driven	21% in 2016	77%	23 rd in Africa 107 th globally	Droughts and floods are increasing Rain patterns changing Soil fertility compromised	Political instability and conflict threaten food security.
Kenya	74.5%	Factor driven	35% in 2016	33%	5 th in Africa 83 rd globally	Highly affected by drought Smallholder farmers highly vulnerable to change in rainfall Pastoralists highly vulnerable to increased water shortages leading to livestock mortality	Smallholder farmers produce 75% of total agricultural output and 70% of the marketed agricultural produce, in addition to employing most of its rural population.
Lesotho	72.7%	Factor driven	7.8% in 2012	60%	Not available	Vulnerable to hail and early frosts Chronic drought	Perennially dependent on international community for assistance
Madagascar	64.9%	Factor driven	25% in 2016	78%	20 th in Africa 104 th globally	Vulnerable to extreme weather events and changing rain patterns	Lack of sustainable financing mechanisms and poor governance
Malawi	83.7%	Factor driven	28% in 2016	71%	21 st in Africa 105 th globally	Periods of severe drought combined with high population growth High reliance on wood for fuel, depleting forests faster than regeneration High degradation of land and increased greenhouse gas emissions	Rising inflation and climate changes increase Malawi's dependence on international aid

	Rural population (as % of total)	Stage of Development	Agriculture cont. to GDP	Poverty Rate	Food Security Index	Climate Vulnerabilities	Socio-economic Vulnerabilities
Mauritius	60.3%	Transitioning to innovation driven	3.3% in 2013	0.5%	Not available	Average rainfall decreasing Frequent extreme weather events, and the high risk of sea level rise Climate change expected to change sugarcane phenology	Narrow resource and livelihood base, high dependence on external markets, increasing population,
Mozambique	67.8%	Factor driven	25% in 2016	69%	24 th in Africa =108 th globally	Recurrent droughts and floods Large dependence on rain-fed agriculture	High proportion of GDP linked to agriculture; majority of food producers are subsistence farmers
Namibia	53.3%	Efficiency driven	7.1% in 2013	23%	Not available	Pasture land degradation Severe droughts and flooding	Agriculture supports the livelihoods of 70% of the country's population.
South Africa	35.5%	Efficiency driven	2.4% in 2013	17%	1 st in Africa 47 th globally	Vulnerable to impacts of climate change on rainfall	Dual agricultural economy
Swaziland	78.7%	Efficiency driven	7.5% in 2011	42%	Not available	Erratic rainfall and increased temperatures	Majority of population rely on smallholder agriculture for livelihoods
Tanzania	68.4%	Factor driven	31% in 2016	47%	14 th in Africa 94 th globally	Drought proneness and tsetse infestation Most agriculture is rain-fed	The vast majority of the population living in poverty relies on agriculture for their livelihoods
Uganda	83.9%	Factor driven	24% in 2016	35%	4 th in Africa 81 st globally	Drought Pest epidemics	Majority of population rely on smallholder agriculture for livelihoods
Zambia	59.1%	Factor driven	17.7% in 2013	64%	19 th in Africa 102 nd globally	Droughts and erratic rainfall	Primarily subsistence farming
Zimbabwe	67.6%	Factor driven	11% in 2016	21%	Not available	Erratic rainfall, droughts, low soil fertility	Weak governance

POLICIES

Several strategies, policies, partnerships and investments have been initiated to put the CSA concept into practice, at the global, regional and national levels. Given that the concept of CSA is still relatively young (emerging in 2010), impacts are difficult to quantify; regardless some early lessons have been learnt. Two-thirds of the countries in the study had climate-related policies in place, and one incorporated several elements of CSA (without having a direct climate-related policy).

Context matters in policy design. While principles for CSA and related sustainable development and food security policies may be similar, as discussed above, context-specific policy differences between agriculture-dependent economies, urban economies and economies in transition are needed. There should also be differences based on water and land availability, for example between countries that are land or water-scarce and countries that have abundant land and water resources. When policies are not context-specific, their impact is restricted.

Coherence in policy is key. CSA contributes to a cross-cutting range of development goals. It needs to be implemented using an integrated, cross-sectoral approach to agriculture and food security that links it to other aspects of sustainable development, poverty reduction and economic growth. CSA policies and programmes, as with all cross-sectoral development programmes, need to be developed so that they are aligned among all levels of government. In the 15 cases studies, although the impacts of climate change are generally recognized, there is poor policy coherence.

Disconnects occur between policy and incentives. From the 15 studies, there is a clear lack of adequate economic or regulatory incentives to stimulate CSA even when climate change adaptation and agricultural development are enshrined in public policy and recognized as national or regional priorities. Current policies generally provide an umbrella and overall goals, but often without specific policy instruments to realize them. In addition, there is insufficient cross-sectoral coordination, and sometimes conflicts. For instance, normally different ministries or departments handle climate and agricultural policies, and they are usually *not* synergistic or streamlined. In many cases, there are perverse incentives that hinder the promotion of CSA practices. A mix of regulations and incentives are needed to promote the widespread uptake of effective CSA practices. It will be important to remove policies and disincentives that discourage the adoption of CSA, and introduce incentives that promote uptake, for example rural credit programmes, input and output pricing policies, including subsidies, support for investments with public good benefits, property rights, research and extension services.

Arguably these issues also amount to problems of governance. A 2012 consultation by the United Nations Environment Programme (UNEP) with world experts has identified today's most urgent need as "Aligning Governance to the Challenges of Global Sustainability" (UNEP 2012). Clearly, the African context is among those where such a need is most pressing. As Smith and Vivekananda (2009: 9) suggest, dealing with the complexities of climate change and development requires "social adaptation to social consequences", including action on policies and governance.

Table 2 on the following pages maps (i) the existence of climate-smart agricultural policies and strategies, (ii) evidence of cross-sectoral synergy and (iii) incentives for adoption.

TABLE 2: MAPPING CSA RELATED POLICIES

	Climate-smart agriculture Policy	Cross-sectoral synergy	Incentives for adoption
Botswana	<p>CSA Framework Programme</p> <p>National Master Plan for Arable Agriculture and Dairy Development</p> <p>Integrated Support Programme for Arable Agriculture Development</p> <p>Livestock Management and Infrastructure Development programme</p>		<p>Capacity development and technology support</p> <p>Tax exemption for agricultural products and farming inputs</p> <p>A Young Farmers Fund issues loans at lower interest rates and longer repayment periods to encourage youth participation in agriculture.</p>
Kenya	<p>Kenya Climate-Smart Agriculture Programme (2015–2030)</p> <p>National Climate Change Action Plan (NCCAP)</p> <p>CSA principles also integrated into several other policies</p>	<p>CSA Programme provides opportunity for coordination between several ministries, yet to be realised</p>	<p>Not identified in study</p>
Malawi	<p>National Climate Change Policy</p> <p>Agricultural and Food Security Policy</p>	<p>Not identified</p>	<p>Limited to none</p>
Mauritius	<p>There is no specific and separate CSA policy as such, but many of the existing and proposed agricultural policies, plans and activities include elements of CSA</p>	<p>Insufficient</p>	<p>Provision of free composters to farmers and households</p> <p>Food Security Fund (33 million USD)</p>
Mozambique	<p>National Adaptation Program of Action for Climate Change</p>	<p>Limited cognisance of climate changes in other sectoral policies</p>	<p>Not identified</p>
Namibia	<p>Vision 2030 and the Fourth National Development Program (NDP4) aim to gradually diversify crop production and adapt farming to climate change</p> <p>CSA Framework Programme</p>	<p>Not identified</p>	<p>Not identified</p>

	Climate-smart agriculture Policy	Cross-sectoral synergy	Incentives for adoption
South Africa	<p>National Climate Change Response Policy, which describes climate response strategies for different sectors (including agriculture)</p> <p>A Climate Change Sector Plan for Agriculture, Forestry and Fisheries was gazetted as Notice 7 of 2013, and it is the precursor of an anticipated policy on CSA.</p>	<p>Integrated through the national response policy, but lack of synergy in implementation</p> <p>Some policy conflicts</p>	Limited incentives
Tanzania	<p>National Climate Change Strategy</p> <p>National Adaptation Plan of Action</p>	No robust framework to coordinate activities	Not identified
Uganda	<p>Uganda's National Climate Change Policy</p> <p>National Agriculture Policy</p> <p>National Land Use Policy</p>	Policy making neglected to take a multi-stakeholder approach	No economic incentive to practice CSA
Zambia	<p>Disaster Management Act</p> <p>National Climate Change Policy</p> <p>National Climate Change Response Strategy</p> <p>Climate change issues successfully become a concern for policies in other sectors, such as agriculture.</p>	Need for greater coordination to avoid duplication and build effective synergies	Not identified
Zimbabwe	Climate Change Response Strategy formulated by the Ministry of Environment, Water and Climate, which recognizes agriculture as a key sector	The ministry responsible for agriculture not yet had the drive to mainstream CSA in its policies	Lacking

MAKING CSA A REALITY: PRACTICES AND OBSTACLES

A wide range of climate-smart approaches were noted across countries. All countries included in the study had adopted a range of practices and technologies to promote CSA. A selected sample of these are detailed in Table 3 on page 22. Most strategies focus either on increasing productivity, or adaptation.

There are often trade-offs amongst the three goals of CSA – sustainable productivity, resilience, and mitigation – so identifying priorities is imperative when selecting which CSA practice to implement. Identifying priorities should include assessing value-for-money, climate-smartness, development impact, and scaling potential. One major problem in the priority setting process, is that decision-makers do not have structures in place that link policy, science and stakeholder engagement to plan, implement, and monitor CSA to achieve impact at the scale needed.

Thus, although the impacts of climate change are generally recognized, there is poor policy coherence (as detailed in the section above). This means a lack of adequate economic or regulatory incentives to CSA even when climate change adaptation and agricultural development are enshrined in public policy and recognized as national or regional priorities.

Limited systematic and comprehensive data hinders prioritisation. The lack of policy coherence is exacerbated by the fact that research on the technical issues of climate change and agriculture remains limited, and there is therefore insufficient local, scientifically generated data and knowledge on CSA. Girvetz *et al.* (2017) discuss the concept of CSA plans which enable a comprehensive approach to prioritisation and implementation of CSA options. CSA Plans focus on four components – (i) situation analysis, (ii) targeting and prioritising, (iii) programme design, and (iv) monitoring and evaluation. To formulate CSA strategies and interventions reliable information, including good quality data, documented vulnerabilities is required. In addition, national capacities to implement CSA interventions and current barriers to adoption need to be systematically assessed.

There is insufficient participation from smallholders, particularly women, in governance and implementation. The norm has been top-down policy-making and, most frequently, “one-way” extension services where smallholder farmers are told what to do but seldom heard, let alone taken on board in policy- and decision-making. As such, policies and practices have frequently failed to meet the needs, views, preferences and interests of poorer farmers, leading to low social acceptability and uptake. Women, in particular, continue to be systematically disadvantaged even though they play vital roles in Africa’s agriculture. Discriminatory patriarchal traditional institutions have persisted even in contexts where legislation enshrines gender balance. These limitations are clearly demonstrated in Table 3 on page 22.

The success of CSA efforts will depend on the sustainability of financing. Although several major commitments have been made, many of the efforts are funded for short periods. However, in the context of CSA a long-term perspective is needed. There is also significant scope for more involvement of the private sector at the regional and national levels.

TABLE 3: ALIGNING PRACTICES, TECHNOLOGIES, RESEARCH PRIORITIES AND ENGAGEMENT (SELECTED EXAMPLES)

	Practices and Technologies	Extension and farmer engagement	Participatory and inclusive processes
Democratic Republic of Congo	Irrigation management Production and dissemination of drought-tolerant seed varieties	Personnel training, extension services around drought-tolerant seeds. Difficulty has been the excessively academic nature of training, which hinders communication with local trainers and farmers.	
Kenya	National Accelerated Agricultural Input Access Programme Index based livestock insurance project in northern Kenya Kenya Adaptation to CC in Arid and Semi-Arid Lands Project	Initiatives that fail to take context into account have limited uptake.	Multiple stakeholders participate in the Climate Change Working Group, but participation of smallholder farmers and local actors limited. Gender issues pose barriers to the majority of smallholders in CSA uptake
Lesotho	Developing drought-tolerant crops and cultivars Conservation agriculture Investments in increasing soil organic matter in cropping systems Mixed-species forestry or agro-forestry	Adoption of R&D very low	One of the main barriers to CSA implementation in Lesotho is gender imbalance. Women are severely hampered in their access to land and associated livestock, even from inheritance.
Malawi	Minimum Tillage Use of herbicides Agro forestry and tree planting	Farmer organizations such as the National Smallholder Farmers Association of Malawi have shown interest in such CSA practices. Interest mostly from women	Women's weak position in Malawian society means that, generally, they have less access to income and credit and no voice in decision-making
Mauritius	Mixed-cropping, Mulching, Crop rotation Pit planting Biological control of insect and other pests Traditional knowledge for controlling pests Adjusting planting dates to rainfall patterns Collecting and storing rain or irrigation water in ponds in the fields	Uptake has been limited because such practices tend to be labour-intensive, and labour is expensive in Mauritius. Extension services are not sufficiently equipped to disseminate research findings to farmers to support their adaptation strategies	

CONCLUSION

Climate-smart agriculture (CSA) is a pressing need across the world, notably in Africa. The livelihoods, food security and economic development of millions of rural households depend on the ability to overcome poverty while adapting to climate change. In addition, farming can and should be made climate-friendlier, as part of a broader effort towards sustainable agriculture. This includes adopting techniques and strategies that minimize the emission of greenhouse gases while providing for food security and other socio-economic needs.

Climate change is not a future reality, it is already here. This study has revealed that the onset impacts of climate change – particularly droughts, floods, and other alterations in rain patterns, with negative consequences on agriculture – are already being perceived both by formal experts and rural populations in the 15 countries. Yet, the promotion and the uptake of CSA practices remain limited.

All countries have examples of both traditional and research-based agricultural practices that can be deemed climate-smart, but they are not mainstreamed and still receive limited support. Such practices include both agroecological techniques (e.g. mulching, intercropping, agroforestry, mixed farming) and from agricultural biotechnology research and development (R&D), such as high-yield and/or drought-tolerant crop varieties and livestock breeds.

The challenges identified pose important barriers to the advance of CSA in Eastern and Southern Africa, but they are not insurmountable. Overcoming those challenges requires concerted, focused action from public and private actors, both domestically and at the international level.

All in all, Eastern and Southern Africa hold great potential for CSA, but this potential needs to be further explored. The region has many traditional agricultural practices as well as research-based programmes and techniques that have CSA qualities. However, barriers remain both in material terms and in the policy realm. CSA promotion thus requires concerted action from multiple actors, but perhaps most notably from governments themselves – and from non-state actors who can work as advocates of CSA.

Big data analytics and ICTs offer a viable option for increasing the systems level data available for effective prioritisation and evaluation. While the interest in CSA is extremely positive and provides a favourable enabling environment for scaling-up CSA, success should be measured using rigorous metrics, and sound monitoring and evaluation approaches need to be integrated into implementation efforts.

To the same extent that climate change poses an enormous challenge to African agriculture, it may bring about an opportunity to transform it – not simply to change its material basis, but to shift its policies, institutions, and development strategies in the direction of sustainability and of a food-secure future free from poverty.

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