



Food and Agriculture
Organization of the
United Nations

Eastern Africa Climate-Smart Agriculture Scoping Study:

ETHIOPIA, KENYA AND UGANDA

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CONTENTS

PREFACE	v
ACKNOWLEDGEMENTS	vi
ACRONYMS	vii
EXECUTIVE SUMMARY	xi
1 INTRODUCTION	1
1.1 Background	1
1.2 Objective	2
1.3 Methodology and Approach	2
1.4 Scope of the Study	2
2 THE EASTERN AFRICAN CONTEXT	3
3 WHAT IS CLIMATE-SMART AGRICULTURE?	6
4 COUNTRY STUDY 1: ETHIOPIA	11
4.1 Overview of the Agriculture Sector in Ethiopia	11
4.2 CSA Technologies and Practices: Adoption and Implementation	13
4.3 CSA Stakeholders, Programmes and Projects in Ethiopia	16
4.3.1 Government Programmes	16
4.3.2 Development Agencies and Non-Governmental Organizations	20
4.3.3 Research and Academic Institutions	23
4.3.4 Private Sector	24
4.4 Key Policies Relevant to CSA in Ethiopia	25
4.5 Gender Issues for CSA in Ethiopia	28
4.6 Constraints to CSA Promotion and Adoption in Ethiopia	29
4.7 Opportunities for CSA Promotion in Ethiopia	29
5 COUNTRY STUDY 2: KENYA	31
5.1 Overview of the Agriculture Sector in Kenya	31
5.2 CSA Technologies and Practices: Adoption and Implementation	33
5.3 CSA Stakeholders, Programmes and Projects in Kenya	36
5.3.1 Government Programmes	36
5.3.2 Development Agencies and Non-Governmental Organizations	39
5.3.3 Research and Academic Institutions	44
5.3.4 Private Sector	45
5.4 Key Policies and Institutions Relevant to CSA in Kenya	45
5.5 Gender Issues for CSA in Kenya	50
5.6 Constraints to CSA Adoption in Kenya	52
5.7 Opportunities for CSA Promotion in Kenya	53

6	COUNTRY STUDY 3: UGANDA	55
6.1	Overview of the Agriculture Sector in Uganda	55
6.2	CSA Technologies and Practices: Adoption and Implementation	57
6.3	CSA Stakeholders, Programmes and Projects in Uganda	58
6.3.1	Government Programmes	58
6.3.2	Development Agencies and Non-Governmental Organizations	60
6.3.3	Research and Academic Institutions	65
6.3.4	Private Sector	65
6.4	Key Policies and Institutions Relevant to CSA in Uganda	67
6.5	Gender Issues for CSA in Uganda	72
6.6	Constraints to CSA Adoption in Uganda	73
6.7	Opportunities for CSA Adoption in Uganda	74

7	SUB-REGIONAL OVERVIEW	75
7.1	Summary of Sub-regional Findings	75
7.2	Challenges to CSA Adoption and Promotion in Eastern Africa	79
7.3	Opportunities for CSA Promotion in Eastern Africa	81
7.4	Recommendations	82

References		85
Annexure 1:	Summary of Hudumakwa Mkulima (HKM) 25 Project in Kenya	87
Annexure 2:	Selected Case Studies of Integrated Watershed Management in Uganda	88
Annexure 3:	Faith-Based CSA-Related Activities by UFNEA Uganda	89
Annexure 4:	Conservation Agriculture Training Conducted by Makobu Enterprises in Ethiopia (2012 – 2014)	93

LIST OF FIGURES

Figure 1:	Steps in undertaking the study	2
Figure 2:	Agricultural greenhouse gas emissions (CO ₂ equivalent) in seven Eastern African countries	4
Figure 3:	Importance of smallholder farming systems in Ethiopia	12
Figure 4:	GHG emissions in Ethiopian agriculture in 2012 (FAOSTAT, 2015)	13
Figure 5:	GHG emissions in Kenyan agriculture in 2012 (FAOSTAT, 2015)	32
Figure 6:	GHG emissions in Ugandan agriculture in 2012 (FAOSTAT 2015)	56

LIST OF TABLES

Table 1:	Summary of key policies relevant to CSA in Ethiopia	27
Table 2:	Summary of the key CSA-related policies in Kenya	49
Table 3:	Summary of the key CSA-related policies in Uganda	71
Table 4:	Summary of the key CSA-related policies in Eastern Africa	76
Table 5:	CSA-Related Programmes, Policies and Strategies in Eastern Africa	76
Table 6:	CSA Promotion Methods in the Sub-Region	78
Table 7:	Training in Farming God's Way (FGW), Islamic Farming (IF) and conservation agriculture (CA)	90

LIST OF BOXES

Box 1:	Conservation agriculture principles, practices and technologies in Ethiopia	15
Box 2:	FAO MICCA Project in Kenya	43
Box 3:	Farmer field schools (FFS) in climate-smart agriculture	50
Box 4:	Women's success story from the FAO MICCA project in Kaptumo, Kenya	51
Box 5:	Faith-based climate-smart agriculture activities by UFNEA Uganda	62
Box 6:	Evaluating climate-smartness of national agricultural investment plans	69

PREFACE

One of the main challenges to achieving food security in Eastern Africa has been related to unfavourable weather and climate conditions, including the occurrence of droughts and floods as well as increasingly unreliable rainfall and gradually increasing temperatures.

Climate-smart agriculture, as defined and presented by FAO at the Hague Conference on Agriculture, Food Security and Climate Change in 2010, contributes to the achievement of sustainable development goals. It integrates the three dimensions of sustainable development (economic, social and environmental) by jointly addressing food security and climate challenges. CSA is composed of three main pillars – sustainably increasing agricultural productivity and incomes; adapting and building resilience to climate change; and reducing and/or removing greenhouse gas (GHG) emissions, where possible.

This study was commissioned by the FAO Sub-regional Office for Eastern Africa under the auspices of the project “FAO Technical Support to the COMESA-EAC-SADC Programme on Climate Change Adaptation and Mitigation in Eastern and Southern Africa (OSRO/RAF/307/COM)”. The study had the major objective of identifying and documenting CSA initiatives, technologies, practices and stakeholders in the Eastern African Sub-region with a special focus on Ethiopia, Kenya and Uganda, so as to produce a report that would enable stakeholders to understand the opportunities and constraints associated with adopting particular CSA technologies and practices, the scale of CSA adoption and the drivers and bottlenecks to CSA adoption in the sub-region as stipulated in the terms of reference.

There is opportunity to use this information to inform agricultural related policies, programmes and projects in the sub-region with the aim of sustainably increasing agricultural production and productivity; building resilience to climate-related hazards; and contributing to climate change mitigation.

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This report has been prepared by Esther Njeru, working as an independent consultant for FAO in conjunction with Edward Kilawe and Sebastian Grey of the FAO Sub-regional Office for Eastern Africa (FAOSFE). Acknowledgement is given to Amare Mengiste of FAO Ethiopia (FAOET), Wilson Ronno and Barrack Okoba of FAO Kenya (FAOKE) and Martin Ameu of FAO Uganda (FAOUG), the FAO national focal persons on CSA who assisted in organizing various aspects of the study in their respective countries.

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ABBREVIATIONS/ACRONYMS

ACT	African Conservation Tillage Network
AEATRI	Agricultural Engineering and Appropriate Technology Research Institute
AGP	Agriculture Growth Project
AGRA	Alliance for a Green Revolution in Africa
ASALs	Arid and Semi-Arid Lands
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
ATA	Agricultural Transformation Agency
AU	African Union
CA	conservation agriculture
CAADP	Comprehensive Africa Agriculture Development Programme
CAWT	Conservation Agriculture with Trees
CBO	community-based organization
CCAFS	CGIAR Research Program on Climate Change, Agriculture and Food Security
CCU	Climate Change Unit
CDM	Clean Development Mechanisms
CGIAR	Consultative Group for International Agricultural Research
CIMMYT	International Maize and Wheat Improvement Centre
CIAT	International Center for Tropical Agriculture
COMESA	Common Market for Eastern and Southern Africa
CRGE	Climate Resilient Green Economy
CSA	climate-smart agriculture
DRSRS	Department of Resource Surveys and Remote Sensing
EAC	East African Community
EAAF	East African Farmers Federation
EIAR	Ethiopian Institute for Agricultural Research
ESA	Eastern and Southern Africa
EU	European Union
FANRPAN	Food, Agriculture and Natural Resources Policy Analysis Network
FAO	Food and Agriculture Organization of the United Nations
FFSs	Farmer Field Schools
FH	Food for the Hungry
FSP	Food Security Program
GHG	greenhouse gas

GIZ	German Society for International Cooperation
GoE	Government of Ethiopia
GoK	Government of Kenya
HABP	Household Asset Building Program
icipe	International Centre for Insect Physiology and Ecology
ICRAF	World Agro-forestry Centre
ICRC	International Committee for the Red Cross
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IDRC	International Development Research Consortium
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IGAD	Inter-Governmental Authority on Development
IITA	International Institute for Tropical Agriculture
ILRI	International Livestock Research Institute
ISFM	Integrated Soil Fertility Management
KACCAL	Kenya Adaptation to Climate Change in Arid Lands
KALRO	Kenya Agricultural and Livestock Research Organization
KARI	Kenya Agricultural Research Institute
KEFRI	Kenya Forestry Research Institute
KENAFF	Kenya National Farmers Federation
KES	Kenya Shillings
KMD	Kenya Meteorological Department
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
MALF	Ministry of Agriculture, Livestock and Fisheries
MDGs	Millennium Development Goals
MENR	Ministry of Environment and Natural Resources
MERET	Managing Environmental Resources to Enable Transitions to More Sustainable Livelihoods
MTP	Medium Term Plan
MTIP	Medium Term Investment Plan
MUCCRI	Makerere University Centre for Climate Change Research and Innovations
NAAIAP	National Accelerated Agricultural Input Access Programme
NAIPs	National Agriculture Investment Plans
NAMAs	Nationally Appropriate Mitigation Actions

NAPA	National Adaptation Programs of Action
NAPs	National Adaptation Plans
NARO	National Agriculture Research Organization
NARS	National Agriculture Research Station
NCCAP	National Climate Change Action Plan
NCCRS	National Climate Change Response Strategy
NEPAD	New Partnership for Africa's Development
NAFSIPs	National Agriculture and Food Security Investment Plans
NGO	non-governmental organization
PACJA	Pan African Climate Justice Alliance
PIF	Policy and Investment Framework
PSNP	Productive Safety Net Program
RECs	Regional Economic Communities
REDD+	Reducing Emissions from Deforestation and Forest Degradation
SADC	Southern African Development Community
SG2000	Sasakawa Global 2000
SIDA	Swedish International Development Cooperation Agency
SLM	sustainable land management
SLMP	Sustainable Land Management Program
SRA	Strategy for Revitalising Agriculture
UFNEA	Uganda Faiths Network on Environmental Action
UNCCD	United Nations Convention to Combat Desertification
UN	United Nations
UNDP	United Nations Development Programme
UNECA	United Nations Economic Commission for Africa
UNFCCC	United Nations Framework Convention on Climate Change
WB	World Bank
WFP	United Nations World Food Program
WV	World Vision





EXECUTIVE SUMMARY

This study was commissioned under the auspices of the project “FAO Technical Support to the COMESA-EAC-SADC Programme on Climate Change Adaptation and Mitigation in Eastern and Southern Africa (OSRO/RAF/307/COM)”. The study had the major objective of identifying and documenting climate-smart agriculture (CSA) initiatives, technologies, practices and stakeholders in the Eastern African Sub-region with a special focus on Ethiopia, Kenya and Uganda, so as to produce a report that would enable stakeholders to understand the opportunities and constraints associated with adopting particular CSA technologies and practices, the scale of CSA adoption and the drivers and bottlenecks to CSA adoption in the sub-region as stipulated in the terms of reference.

Climate-smart agriculture, as defined and presented by FAO at the Hague Conference on Agriculture, Food Security and Climate Change in 2010, contributes to the achievement of sustainable development goals. It integrates the three dimensions of sustainable development (economic, social and environmental) by jointly addressing food security and climate challenges. CSA is composed of three main pillars – sustainably increasing agricultural productivity and incomes; adapting and building resilience to climate change; and reducing and/or removing greenhouse gas (GHG) emissions, where possible.

The farming systems in the three countries covered by the study are found to be similar, with the rain-fed mixed cropping system by small-scale farmers taking the lead. In terms of CSA practices, the study found that CSA is not one practice or even any set of practices, but rather a broad approach to addressing climate change while at the same time achieving national food security and agricultural development goals.

“Climate-smart agriculture (CSA) integrates the three dimensions of sustainable development (economic, social and environmental) by jointly addressing food security and climate challenges.”

However, the study found that there are proven practical techniques and practices that can be called “climate-smart” across the three countries. Such practices include mulching, intercropping, minimum/reduced/zero tillage, crop rotation, integrated crop and livestock management, agroforestry, improved grazing and improved water management, together with innovative practices such as better weather forecasting, use of drought- and flood-tolerant crops, and crop and livestock insurance.

The study moreover found that many of the practices that sequester carbon are also beneficial for adaptation. For example, the use of cover crops and the addition of compost and manure to soils result in healthier soils and lead to increased and more stable production and productivity while at the same time supporting improved soil carbon sequestration. These CSA practices are having a widespread impact on food security, are helping farmers to adapt to climate change and are contributing to climate change mitigation. These practices show the potential of agriculture to adapt to a changing climate, to be more resilient and protect farmers against future changes in weather patterns, pests and diseases, and to slow the rate of climate change.

The study found that while a number of CSA-related programmes and projects are ongoing and a number of different CSA practices are being used in various parts of these countries, these CSA systems are not widely spread across the sub-region, partly because of limited financial resources, capacity, knowledge and policy support. However, various CSA interventions have been implemented and continue to be implemented, with variable success, using different approaches by individual farmers as well as national, regional and international organizations in the Eastern Africa sub-region. Various stakeholders have been involved in the promotion of CSA initiatives across the three countries, including government departments, the community-based organizations (CBOs), the private sector, research institutions and lead farmers. Despite the fact that there is no particular CSA guiding policy, the Climate Resilient Green Economy (CRGE) Strategy in Ethiopia, the National Climate Change Action Plan (NCCAP) of Kenya and the Agriculture Sector Development Strategy (ASDS) of Uganda are key documents leveraging support for CSA at national level, both technically and financially.

The study also showed that various models and approaches have been used to promote CSA in the Eastern Africa sub-region. The study examined some gender and social issues, especially with regard to planting season, where it was found that men plough the land while women plant/sow the seeds. Weeding activities were initially women's roles but with the use of herbicides for weed control, women are set free to engage in other family chores.

There are numerous opportunities to promote CSA in the Eastern African sub-region. This entails the inclusion of CSA in new agriculture-related policies like the soil fertility management policy under preparation in Kenya and inclusion into the university curriculum like in the

case of MUCCRI in Kampala where climate change scholarships targeting the youth are being offered.

Since CSA is not a new concept, benchmarking is one of the key recommendations highlighted by most stakeholders. This could take the form of establishing a detailed inventory of contextualized CSA practices in the sub-region. This can be further consolidated through exchange visits to places where CSA practices and technologies have been successful within the country, or to degraded places for farmers to witness the negative effects of climate change. Coordination emerged as a major issue hindering rapid adoption of CSA. A positive note is that national CSA task forces are in place in all three countries to enhance coordinated efforts in CSA as well as to promote sustainability of existing CSA programmes and projects.



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INTRODUCTION

1

1.1 Background

Under the five-year COMESA-EAC-SADC Programme on Climate Change Adaptation and Mitigation in the Eastern and Southern Africa Region, FAO was identified as an implementing partner to assist in mobilizing additional resources for investment in climate-smart agriculture (CSA); develop national and regional policies and institutions supporting the upscaling of CSA; and provide technical support to stakeholders for CSA field implementation.

FAO activity areas within the project include:

- (i) the formulation of specific investment programmes on CSA in the framework of the Comprehensive Africa Agriculture Development Programme (CAADP) National Agricultural Investment Plans;
- (ii) the establishment and/or expansion of CSA coordination and promotion of platforms in Eastern and Southern African (ESA) member states;
- (iii) the *in situ* assessment of CSA models at country level and scaling up of best practices;
- (iv) conducting a regional synthesis of the status of CSA and sharing among partners;

- (v) the development of suitable dissemination materials to enhance adoption of climate-resilient practices on a larger scale;
- (vi) the integration of HIV, gender and nutrition in project activities; and
- (vii) the development of a common robust regional CSA monitoring and evaluation (M&E) system.

“FAO was identified as an implementing partner to assist in mobilizing additional resources for investment in climate-smart agriculture.”

This study was conducted under the auspices of activity area (iv), in order to give an in-depth understanding of the various CSA practices, initiatives and interventions in Eastern Africa, with a special focus on three countries – Ethiopia, Kenya and Uganda.

1.2 Objective

The study had the major objective of identifying and documenting climate-smart agriculture initiatives, technologies, practices and stakeholders in the Eastern Africa Sub-region with a special focus on Ethiopia, Kenya and Uganda, so as to produce a report that would enable stakeholders to understand the opportunities and constraints associated with adopting particular CSA technologies and practices, the scale of CSA adoption and the drivers and bottlenecks to CSA adoption in the sub-region as stipulated in the terms of reference.

1.3 Methodology and Approach

The four main steps in undertaking this study were planning, data collection, data analysis and report writing, as shown in Figure 2. Study methodology primarily involved the collection of primary and secondary data on climate-smart agriculture from various sources. The study involved the following:

- *Literature review* of available local and international literature on climate-smart agriculture – this required a desk review and gathering of information from available sources which included reports and documents on CSA in the sub-region, CSA meeting and conference proceedings, annual progress reports for some CSA projects, organizational databases and the Internet. This moreover involved a review of current policy documents, guidelines, strategies and manuals related to CSA. These documents were reviewed over the entire period of the study and key issues were identified for further questioning and consideration. Information from the desk review was also used to inform the design of the data collection tool (structured questionnaire).
- Use of a *structured questionnaire* for information

gathering – a structured questionnaire was designed and used to ensure that all relevant information was captured from the various stakeholders. The questionnaire was either filled out directly by the respondent or filled in by the interviewer during discussions with the respective stakeholders.

- *In-depth key informant interviews* (KIIs) with key stakeholders in the three countries – KIIs were conducted with officials and experts from relevant government ministries and departments as well as from various international, national, community-based, civil society and private sector organizations. The interviews were structured according to a discussion guide based on the terms of reference for the report. The KIIs helped with identification of the roles and responsibilities of organizations at national, regional and local levels as well as with identification of existing constraints and opportunities for CSA promotion and upscaling.

1.4 Scope of the Study

The study targeted government departments, private sector institutions, NGOs, development partners and civil society organizations involved in current and past climate-smart agriculture initiatives in the Eastern Africa sub-region, with a special focus on Ethiopia, Kenya and Uganda. The study aimed to look at the key climate-smart agriculture practices for the sub-region with a focus on documentation of the key practices and technologies, key stakeholders, relevant government policies and programmes, some ongoing projects and opportunities, challenges and recommendations for upscaling of CSA. The study was not meant to be a comprehensive documentation of all of the above, but rather to give an idea of the current status of climate-smart agriculture in the three target countries.



Figure 1: Steps in undertaking the study



THE EASTERN AFRICAN CONTEXT

2

At the global level, the world would need to raise agricultural production by 70 percent by 2050 in order to feed the projected world population of nine billion (Miller *et al.*, 2010). At the same time, climate change is expected to have a negative impact on at least 22 percent of the cultivated area for the world's most important crops, and on as much as 56 percent of all crops in sub-Saharan Africa by 2050 (Campbell *et al.*, 2011).

In addition to the necessity of building resilience to climate change impacts in agriculture, it is recognized that more than 30 percent of the world's greenhouse gas emissions come from land-use activities – 17 percent from forest conversion and 14 percent from agricultural production (soil erosion and cultivation, livestock and manure, and rice cultivation being some of the main sources) (Smith *et al.*, 2007). Moreover, land-based carbon sequestration efforts, through photosynthesis and soil carbon sequestration, currently offer a substantial opportunity for large-scale removal of greenhouse gases from the atmosphere. Agricultural soil carbon accounts for 89 percent of this sequestration potential, representing an estimated potential of between 5.5-6 gigatons of CO₂e per year, which roughly equals agriculture's total annual

contribution to global emissions (Smith *et al.*, 2007). Even with herculean mitigation efforts within land-use sectors and elsewhere, climate change will continue to have a significant impact on agricultural production for decades to come, and agricultural adaptation efforts would need to be scaled up significantly.

In Africa, agriculture constitutes the mainstay of most national economies, is frequently the largest contributor to the gross domestic product (GDP) and is also a main source of rural employment, hence it is essential for pro-poor economic growth in most African countries. With the region's population projected to double by 2050 to over two billion people, sustainably improving agricultural productivity is pivotal to addressing the intertwined challenges of food security, poverty eradication and economic development in the context of a changing climate.

In Eastern Africa, some positive strides have been made towards ending hunger and malnutrition. Even though progress has been made towards meeting the MDG target of halving the proportion of people suffering from hunger, the sub-region remains in a precarious food security

situation having experienced a 20 percent increase in the number of hungry people in the period from 1992 to present. Eastern Africa still has the greatest number of undernourished people on the African continent.

One of the main challenges to achieving food security in the sub-region has been related to unfavourable weather and climate conditions, including the occurrence of droughts and floods as well as increasingly unreliable rainfall and gradually increasing temperatures. Eastern Africa is among the regions in the world most affected by climate change and is also among the most vulnerable regions. In the sub-region approximately 75.5 million people are economically involved in agriculture, either in full-time employment or as a main household livelihood. Additionally, approximately 95 percent of the food in the sub-region is grown under rain-fed agriculture and is highly vulnerable to adverse weather conditions such as droughts, dry spells and uneven or erratic rainfall. The agriculture sector in Africa is being called on to increase food production to meet the demand of a growing population.⁴ This formidable challenge is further

exacerbated by climate change, which will have significant impacts on the various dimensions and determinants of food security.

While recognizing the vulnerability of agriculture to climate change, and the fact that the agriculture and land-use sectors are the main contributors to greenhouse gas emissions in Eastern Africa, agriculture and land-use are the sectors with the greatest potential to reduce emissions and support countries to develop their economies along low emission pathways through more efficient agricultural production systems, contributing to carbon sequestration and directly reducing agricultural greenhouse gas emissions. Figure 2 below indicates the major GHG emission sources in agriculture in seven Eastern African countries and highlights those areas with the greatest opportunities for climate change mitigation in the sector.

Through the Comprehensive Africa Agriculture Development Programme (CAADP) under the New Partnership for Africa's Development (NEPAD) of the

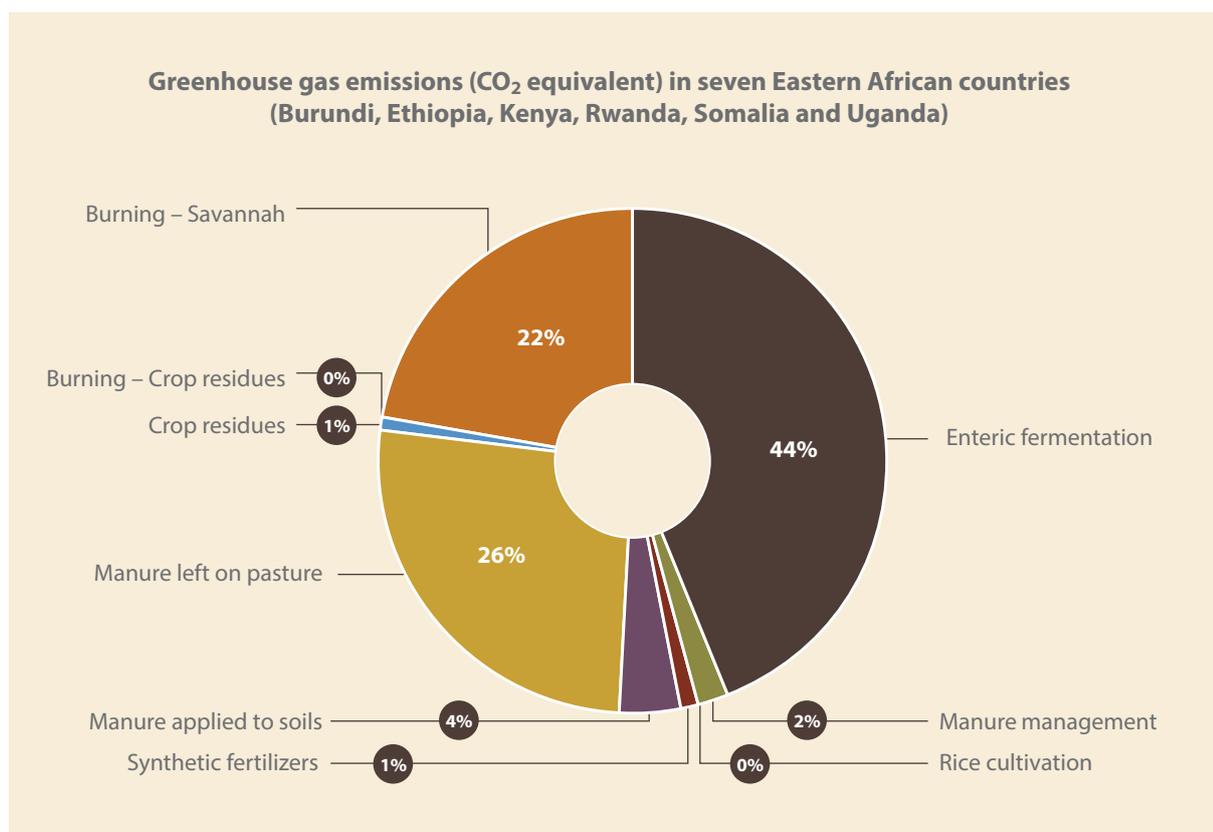


Figure 2: Agricultural greenhouse gas emissions (CO₂ equivalent) in seven Eastern African countries

⁴ Africa Climate-Smart Agriculture Alliance, June 2014

African Union (AU), a number of countries prepared National Agricultural Investment Plans (NAIPs) to provide opportunities to integrate the scaling-up of practices that potentially benefit development, food security and climate change adaptation and mitigation into an existing continental and country-owned sustainable agriculture development framework. African policy-makers are being challenged to ensure that agriculture contributes to addressing food security, development and climate change (adaptation and mitigation). Approaches that seek to maximize the benefits and minimize the trade-offs across these multiple objectives (which are closely linked within the agriculture sector) require more integrated and coordinated planning, policies and institutional arrangements, as well as financing and investment. Such approaches and their related enabling requirements can be referred to as climate-smart agriculture (CSA),⁵ a term that emerged in 2010 to describe agricultural systems designed to simultaneously improve food security and rural livelihoods and support climate change adaptation and mitigation efforts (FAO, 2010; World Bank, 2010).

In the next 20 years, increasing the productivity and incomes from smallholder crop, livestock, fishery and forestry production systems will be key to achieving global food security. Most of the world's poor are directly or indirectly dependent on agriculture, and experience has shown that growth in agriculture is often the most effective and equitable strategy for reducing poverty and increasing food security. Climate change multiplies the challenges of achieving the needed growth and improvements in agricultural systems, and its effects are already being felt. Climate-Smart Agriculture (CSA) is an approach to dealing with these interlinked challenges in a holistic and effective manner.

Source: Climate-Smart Agriculture:
What is it? Why is it needed?
<http://www.fao.org/3/a-i4226e.pdf>



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5 Identifying opportunities for climate-smart agriculture investments in Africa, FAO Rome, April, 2012. p 9



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WHAT IS CLIMATE-SMART AGRICULTURE?

3

Climate-smart agriculture is an approach to help guide actions to transform and reorient agricultural systems to support development and food security effectively and sustainably under a changing climate. “Agriculture” is taken to cover crops, livestock production, fisheries and forests. Climate-smart agriculture is not a new production system, but a means of identifying which production systems and enabling institutions are best suited to respond to the challenges of climate change for specific locations, in order to maintain and enhance the capacity of agriculture to support food security in a sustainable way.

The CSA concept was first launched by FAO in 2010 in a background paper prepared for the Hague Conference on Agriculture, Food Security and Climate Change (FAO, “Climate-Smart” Agriculture Policies, Practices and Financing for Food Security, Adaptation and Mitigation, 2010), in the context of national food security and development goals, to address three main objectives (Climate-Smart Agriculture Sourcebook, 2013), namely to:

- sustainably increase food security by increasing agricultural productivity and incomes;
- build resilience and adapt to climate change; and

- develop opportunities for reducing greenhouse gas emissions measured against expected trends.

“Climate-smart agriculture is an approach to help guide actions to transform and reorient agricultural systems to support development and food security effectively and sustainably under a changing climate.”

The concept of climate-smart agriculture emerged to describe agricultural systems that provide agricultural benefits as well as climate change adaptation and mitigation benefits, and improved watershed and ecosystem management (FAO, 2010). While newly framed as a concept for the climate change and agricultural development communities, climate-smart agriculture can include many of the field- and farm-based sustainable agricultural land management approaches already in the literature and in wide use, such as conservation tillage, agroforestry and residue management, among others.

Sustainably increasing agricultural productivity and incomes

Around 75 percent of the world's poor live in rural areas and agriculture is their most important source of income. Experience has shown that growth in the agricultural sector is highly effective in reducing poverty and increasing food security in countries with a high percentage of the population dependent on agriculture (World Bank, World Development Report, 2008).

Increasing productivity as well as reducing costs through increased resource-use efficiency are important means of attaining agricultural growth. "Yield gaps" indicating the difference between the yields farmers obtain on farms and the technically feasible maximum yield, are quite substantial for smallholder farmers in developing countries (FAO, The State of Food and Agriculture, 2014).

Similarly, livestock productivity is often much lower than it could be. Reducing these gaps by enhancing the productivity of agro-ecosystems and increasing the efficiency of soil, water, fertilizer, livestock feed and other agricultural inputs, offers higher returns to agricultural producers, reducing poverty and increasing food availability and access. These same measures can often result in lower greenhouse gas emissions compared with past trends.

Source: Climate-Smart Agriculture: *What is it? Why is it needed?* (<http://www.fao.org/3/a-i4226e.pdf>)

Climate-smart agriculture thus includes proven practical techniques such as mulching, intercropping, conservation agriculture, crop rotation, integrated crop-livestock management, agroforestry, improved grazing and improved water management.⁶ It includes innovative practices such as better weather forecasting, early-warning systems and risk insurance. It is about getting existing technologies off the shelf and into the hands of farmers and developing new technologies such as drought- or flood-tolerant crops to meet the demands of the changing climate. As the links between climate change adaptation and mitigation and agriculture have become better understood, policy efforts to support agricultural adaptation and mitigation have intensified.



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6 Climate-smart Agriculture Sourcebook, FAO 2013

Building resilience to climate change

According to the recently released fifth assessment report of the Intergovernmental Panel on Climate Change (IPCC), the effects of climate change on crop and food production are already evident in several regions of the world, with negative effects more common than positive ones, and developing countries highly vulnerable to further negative impacts from climate change on agriculture (IPCC Summary for Policymakers, IPCC Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects, eds Field, C. B. *et al.* Cambridge Univ. Press, 2014).

In the medium and long term, average and seasonal maximum temperatures are projected to continue rising, leading to higher average rainfall. These effects are not evenly distributed, with globally wet regions and seasons getting wetter and dry regions and seasons getting drier (Porter, J. R. *et al.* in Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects, eds Field, C. B. *et al.* 485–533. IPCC, Cambridge Univ. Press, 2014).

There is already an increase in the frequency and intensity of extreme events, such as drought, heavy rainfall and subsequent flooding and high maximum temperatures. The increased exposure to these climate risks, already being experienced in many parts of the world, poses a significant threat to the potential for increasing food security and reducing poverty amongst low-income, agriculture-dependent populations. It is possible to reduce and even avoid these negative impacts of climate change – but it requires formulating and implementing effective adaptation strategies. Given the site-specific effects of climate change, together with the wide variation in agro-ecologies and farming, livestock and fishery systems, the most effective adaptation strategies will vary even within countries.

A range of potential adaptation measures have already been identified which can provide a good starting point for developing effective adaptation strategies for any particular site. These include enhancing the resilience of agro-ecosystems by increasing ecosystem services through the use of agro-ecology principles and landscape approaches. Reducing risk exposure through diversification of production or incomes, and building input supply systems and extension services that support efficient and timely use of inputs, including stress-tolerant crop varieties, livestock breeds and fish and forestry species are also examples of adaptation measures that can increase resilience.

Source: Climate-Smart Agriculture: *What is it? Why is it needed?* (<http://www.fao.org/3/a-i4226e.pdf>)

In addition, many others within the scientific community are engaged in the discourse on agricultural practices for climate change mitigation and adaptation, but without using the climate-smart terminology (Smith *et al.*, 2007). One of the key pillars of the climate-smart framework as introduced by FAO in 2010 is “adopting an ecosystem approach, working at landscape scale and ensuring inter-sectoral coordination and cooperation”. Therefore, in addition to appropriate on-farm practices, climate-smart agriculture requires investment across landscapes – climate-smart landscapes – to maintain healthy watersheds and ecosystem services to support adaptation, achieve net mitigation across all land uses, and supply the full range of agricultural products. A climate-smart landscape approach includes a spatial understanding of land uses and their interactions as well as a process for coordinating the institutional diversity of stakeholders (Scherr, Shames and Friedman, 2012).

Investing in climate-smart agriculture at a landscape scale will have a large price tag. For example, in order to achieve food security for a growing population, an estimated net US\$83 billion a year will be required in developing countries and US\$11 billion in sub-Saharan Africa alone (Miller *et al.*, 2010), while it is estimated that agricultural adaptation costs for sub-Saharan Africa, the Near East and North Africa will need to be around US\$3 billion per year (Branca *et al.*, 2012). Climate mitigation costs through better land and water management in Africa are estimated to be between US\$2.6 – 5.3 billion per year until 2030, with an additional US\$8.1 – \$16.2 billion per year to avoid 75 percent of total deforestation on the continent.⁷

⁷ Coordinating Finance for Climate-Smart Agriculture – Seth Shames, Rachel Friedman and Tanja Havemann, August 2012

Developing opportunities to reduce greenhouse gas emissions compared with expected trends

Agriculture, including land-use change, is a major source of greenhouse gas emissions, responsible for around a quarter of total anthropogenic GHG emissions. Agriculture contributes to emissions mainly through crop and livestock management, as well as through its role as a major driver of deforestation and peatland degradation. Non-CO₂ emissions from agriculture are projected to increase due to expected agricultural growth under business-as-usual growth strategies. There is more than one way agriculture's greenhouse gas emissions can be reduced. Reducing emission intensity (e.g. the CO₂eq/unit product) through sustainable intensification is one key strategy for agricultural mitigation (Smith, P. *et al.* in *Climate Change 2014: Mitigation of Climate Change* Ch. 11. IPCC, Cambridge Univ. Press, 2014). The process involves implementation of new practices that enhance the efficiency of input use so that the increase in agricultural output is greater than the increase in emissions (Smith, P. *et al.* in *Climate Change 2014: Mitigation of Climate Change* Ch. 11. IPCC, Cambridge Univ. Press, 2014).

Another important emissions reduction pathway is through increasing the carbon-sequestration capacity of agriculture. Plants and soils have the capacity to remove CO₂ from the atmosphere and store it in their biomass – this is the process of carbon sequestration. Increasing tree cover in crop and livestock systems (e.g. through agroforestry) and reducing soil disturbance (e.g. through reduced tillage) are two means of sequestering carbon in agricultural systems. However, this form of emissions reduction may not be permanent – if the trees are cut or the soil plowed, the stored CO₂ is released. Despite these challenges, increasing carbon sequestration represents a huge potential source of mitigation, especially since the agricultural practices that generate sequestration are also important for adaptation and food security.

Source: *Climate-Smart Agriculture: What is it? Why is it needed?* (<http://www.fao.org/3/a-i4226e.pdf>)

To support CSA, policy and financing systems will need to adapt so that these multiple objectives – adaptation and mitigation as well as rural development, food security and ecosystem services – can be achieved simultaneously. Countries are beginning to recognize this reality, as agriculture is prominently represented in National Adaptation Programmes of Action (NAPAs) and National Adaptation Plans (NAPs) as well as beginning to become more prominent in Nationally Appropriate Mitigation Actions (NAMAs). However, national policies throughout the world still largely separate climate and agriculture. Therefore, CSA addresses the challenges of building synergies among climate change mitigation, adaptation and food security which are closely related within agriculture, and minimizing their potential negative trade-offs. CSA seeks to enhance the capacity of the agriculture sector to support food security in a sustainable manner, incorporating the need for adaptation and the potential for mitigation into development strategies. The specific conditions, circumstances and capacities within countries will define opportunities and barriers to implementation, and hence policy choices (FAO, 2011). CSA builds on existing efforts to achieve sustainable agriculture intensification to achieve sustainable productivity increases, thereby supporting the achievement of national food security and sustainable development goals.



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Some examples of climate-smart agriculture production systems include:

- Soil and nutrient management – practices that increase organic nutrient inputs and retention and reduce the need for synthetic fertilizers;
- Water harvesting and use – pools, dams and retaining ridges to harvest water and irrigation systems to use it efficiently;
- Agroforestry – using trees and shrubs in crop and livestock production and land management systems;
- Conservation agriculture – incorporating practices such as minimum tillage, direct seeding, mulching and crop rotation;
- Livestock production efficiency and resilience – improvements in animal husbandry and application of contextually appropriate practices in nutrition, reproduction and health control.

Source: *Africa Climate-Smart Agriculture Alliance* (<http://africacsa.org>)

Lastly, there is no blueprint for CSA and ultimately the specific contexts of countries and communities would need to shape how it is implemented. CSA production technologies are therefore aimed at maximizing food security benefits and, at the same time, delivering significant climate change mitigation and adaptation co-benefits (Branca *et al.*, 2011). However, care must be taken when formulating policies in support of CSA to avoid compromising policy efficiency. For developing countries like Ethiopia, Kenya and Uganda, which are highly dependent on agriculture and with a large share of food-insecure people in the agriculture sector, the main objective of CSA is to improve food security, incorporating adaptation and mitigation as required to meet this objective.

“CSA production technologies are aimed at maximizing food security benefits and, at the same time, delivering significant climate change mitigation and adaptation co-benefits.”



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COUNTRY STUDY 1: ETHIOPIA

4

4.1 Overview of the Agriculture Sector in Ethiopia

Ethiopia depends greatly on the agriculture sector, which contributes approximately 42 percent of national GDP, while 80 percent of the country's population depend on the sector for their livelihoods. Chronic food insecurity affects 10 percent of the population and even in average rainfall years these households cannot meet their food needs and must rely partly on food assistance. Overall, the agriculture sector is highly vulnerable to the impacts of climate change. Droughts periodically reverse agricultural sector performance gains, with devastating effects on household food security and poverty levels. Vulnerability to droughts is greatest in the pastoral areas of the lowlands and the densely populated, food-insecure districts of the highlands. Drought-induced famines are further exacerbated by limited coping mechanisms and inadequate contingency planning for drought mitigation and the threat of climate change⁸.

The farming systems in Ethiopia can be classified into five major categories – the highland mixed farming system, the lowland mixed agriculture, the pastoral system, shifting cultivation and commercial agriculture (Befekadu and Berhanu, 2000). Over 95 percent of the annual gross total agricultural output of the country is said to be generated from smallholder farmers with an average farm size ranging from 0.5 to 2 hectares.

“Ethiopia depends greatly on the agriculture sector, which contributes approximately 42 percent of national GDP, while 80 percent of the country's population depend on the sector for their livelihoods.”

8 Identifying opportunities for climate-smart agriculture investments in Africa

Farming system	Smallholder agriculture	Commercial agriculture
Highland mixed agriculture	95% of the annual gross total agricultural output of the country Average farm size ranging from 0.5-2 hectares	Commercial farms contribute to only 5% of gross total agricultural output
Lowland mixed agriculture		
Pastoral and agropastoral farming		
Shifting cultivation		

Figure 3: Importance of smallholder farming systems in Ethiopia

The existence of diverse agro-ecological conditions enables Ethiopia to grow a large variety of crops which include cereals like teff, wheat, maize and barley; pulses like horse bean, field peas, lentils, chickpeas and haricot beans; oil seeds like sesame, linseed, Niger seed and rapeseed; and different types of fruits and vegetables (Central Statistical Agency of Ethiopia, 2012). Even though the country is known to produce various types of crops, food insecurity is still a major challenge.

Ethiopia has the largest livestock population in Africa and the tenth largest in the world. Livestock is an integral part of the farming systems in the country. It is the source of many social and economic values such as food, draught power, fuel, cash income, security and investment in the highland, lowland and pastoral farming areas. As in the case of crops, the sector makes a significant contribution to GDP and is also a major source of foreign currency. The government of Ethiopia has given top priority to the agricultural sector and has taken a number of steps to increase productivity. However, the agricultural sector is also characterized by low productivity and low value addition. Overall, the high dependence of the country on agriculture, which is sensitive to weather variability and climate change, is a cause for concern.

Ethiopia's annual GHG emissions were estimated at 150 Mt CO₂e in 2010, with 50 percent and 37 percent of these emissions coming from the agricultural and forestry sectors respectively. In agriculture, livestock production accounted for more than 40 percent of the emissions, while in forestry the main culprit was deforestation for expansion of agricultural land, which accounted for over 50 percent of forestry-related emissions, followed

by fuelwood consumption at 46 percent of the forestry-related emissions. Figure 4 indicates the major GHG emissions sources within the agriculture sector for Ethiopia⁹. The largest proportion of emissions result from enteric fermentation followed by manure left on pasture, both of which are related to livestock production.



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9 FAOSTAT, 2015

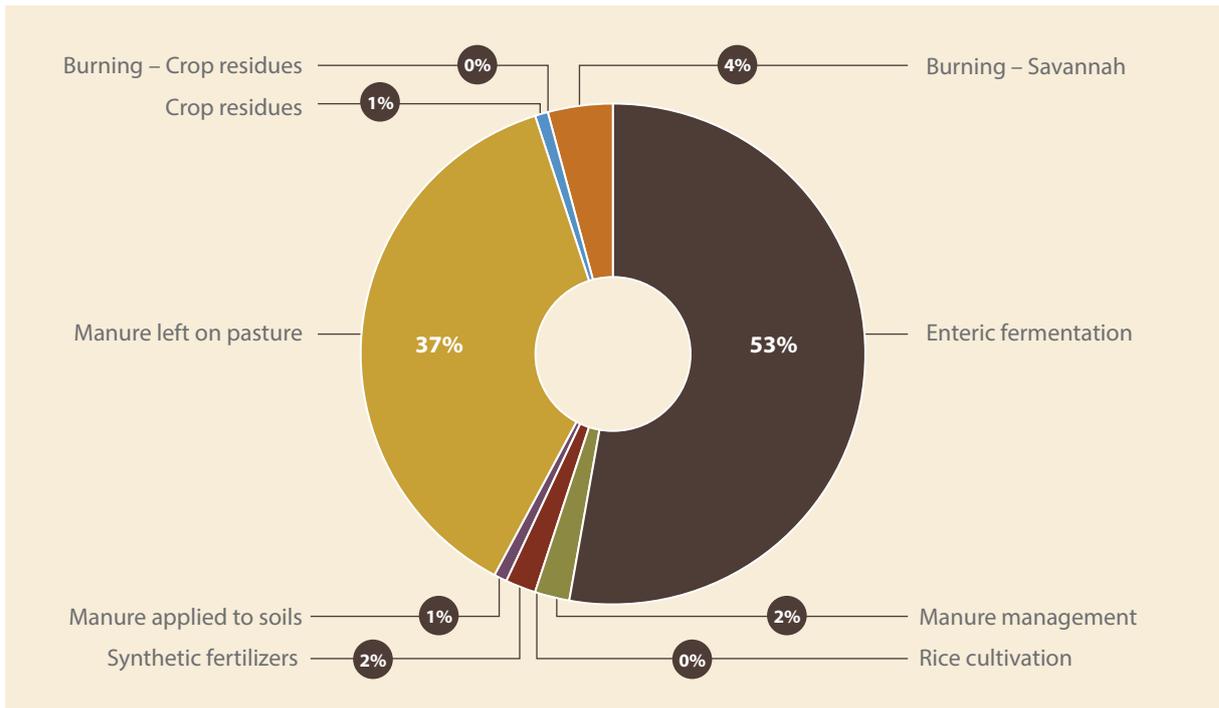


Figure 4: GHG emissions in Ethiopian agriculture in 2012 (FAOSTAT, 2015)

4.2 CSA Technologies and Practices: Adoption and Implementation

CSA practices in Ethiopia include sustainable land management (SLM), conservation agriculture (CA), integrated soil fertility management (ISFM), agroforestry, crop residue management, composting, integrated watershed management (IWM), crop rotation and intercropping, use of effective micro-organisms, promotion of improved livestock feed and rangeland management.

- Integrated watershed management:** In Ethiopia, integrated watershed management is conducted through various projects and programmes which include the SLM Programme (SLMP1 and SLMP2), MERET project, Productive Safety Nets Programme – Public Works (PSNP-PW) and numerous NGOs. In the example of Gilgel Gibe 1 Dam in the Omo River basin, an assessment of siltation and nutrient enrichment of the dam found that siltation and nutrient enrichment were the major problems in this reservoir (Devi *et al.*, 2007). In addition, river bank erosion during flash floods and events of landslides upstream of Gilgel Gibe River and its tributaries are important sources of suspended sediments, which get into the reservoir of Gilgel Gibe I hydroelectric plant.

Such phenomena pose major threats to the economic use and lifespan of the dam. To this end, different parties have been raising their concerns over the danger facing Gilgel Gibe I Dam at different times. Prompted by such concerns, several stakeholders have been involved in one way or another with the dam and its watershed, each looking at the problems from its own perspective and trying to address them in its own way.

Other examples of watershed management activities include gully reclamation at Yeku Watershed in Amhara region and scaling up an integrated watershed management approach through social protection programmes in Ethiopia as well as the MERET (Managing Environmental Resources to Enable Transitions to More Sustainable Livelihoods Coordination Unit) and PSNP (Productive Safety Net Programme) schemes. A local-level participatory planning approach has ensured success for social protection schemes that provide payment in exchange for work to build public assets. The successful MERET programme, which concentrated on integrated watershed management, has informed the broader Productive Safety Net Programme, heralded as a leading example in the fight for food security and inclusive development.¹⁰

10 A New Dialogue: Putting People at the Heart of Global Development; Hunger • Nutrition • Climate Justice • 2013

- Integrated soil fertility management:** Some soil fertility-related programmes currently under way by the Ministry of Agriculture include national soil fertility mapping, management of vertisols and acidic soils, collection of information on soils from various stakeholders and implementation of research on recommended soil fertility management practices. A number of NGOs and development partners are also undertaking agricultural development activities related to soil fertility improvement. The main activities being promoted include training and promotion of appropriate fertilizer application, composting, crop rotation and intercropping, all conducted with a focus on improving food security. As a result, large numbers of farmers have adopted improved fertilizer application, compost preparation and application as well as intercropping. As part of integrated soil fertility management, promotion of composting was set as a target in the climate change component of the Growth and Transformation Plan (GTP).
- Conservation agriculture:** While soil conservation practices such as reduced tillage have long been practised by farmers in Ethiopia, the promotion of conservation agriculture technology began in earnest in 1998 through joint promotion and demonstration of the technology on 77 farmers' plots by Sasakawa Global (SG2000), Makobu Enterprises and regional agricultural development bureaus. On average, the yields of the 1998/99 conservation agriculture demonstration plots were similar to the average yield of conventional tillage plots. During this introductory period, further trials were carried out between 1999 and 2003 at Jima, Bako and Melkasa research centres on maize, sorghum and teff. These indicated that conservation tillage plots gave higher yields compared with conventional tillage (Tesfa, 2001; Worku, 2001; Tolesa, 2001). The studies also indicated lower production costs for conservation agriculture fields. Since the initial trials and introduction, conservation agriculture has been promoted by different organizations including FAO, the Agricultural Transformation Agency (ATA), CIMMYT and a number of NGOs such as Ethiopia Wetland, FH Ethiopia, Self Help Africa, AGRA, Canadian Foodgrains Bank and Wolayita Terepeza Development Association, among others. Despite many organizations having conducted or being involved in the promotion of conservation agriculture, in general adequate data on conservation agriculture adoption in Ethiopia is not well documented and available at all levels.
- Biogas and biomass fuel production:** Biogas has been promoted as a means of managing manure from which a large amount of GHG emissions emanate, as well as for domestic energy production. The National Biogas Programme of 2007 that was spearheaded by SNV had the goal of constructing 14 000 biogas plants in the four selected regions over a period of five years. Most biogas systems are small scale and utilized for domestic lighting and cooking by households connected to the biogas digester. At present, the Livestock and Irrigation Value Chains for Ethiopian Smallholders (LIVES) Project being implemented by the International Livestock Research Institute (ILRI) seeks to use dairy waste management interventions to contribute to rural electrification by introducing alternative energy sources such as biogas. The project has introduced a new biogas package which includes biogas electric generators, biogas pumps/compressors, desulfurizers, dehydrators, biogas storage bags and above-ground plastic digesters. The generator converts biogas to electricity, enabling use of modern electric-powered innovations to alleviate the challenges of livestock production, marketing and human development in the rural communities of Ethiopia. Livestock development technologies that could be powered by the biogas-generated electricity include small-scale milk machines, small-scale milk coolers as well as incubators and mobile phone-based advisory services. Rural communities could also access more information through television and other communication technologies powered by electricity from biogas.



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Box 1: Conservation agriculture principles, practices and technologies in Ethiopia

Although soil tillage has in the past been associated with increased fertility, it has recently been recognized that this process leads to a reduction of soil organic matter in the long term. Soil organic matter not only provides nutrients for the crop, but it is also a crucial element for the stabilization of soil structure. Therefore, most soils degrade under prolonged intensive arable agriculture. This structural degradation of the soils results in the formation of crusts and compaction and ultimately leads to soil erosion and reduced agricultural productivity. As a result, the conservation agriculture components that are currently under promotion include:

Reduced tillage: In Ethiopia land preparation is mainly carried out to get rid of weeds, while it also helps in breaking compacted soils and improving moisture infiltration. Moisture infiltration is much better in soils that are less tilled but not compacted by the effect of overgrazing. Conservation agriculture using reduced tillage in Ethiopia has been demonstrated on maize, wheat, teff, sorghum, faba bean and onion and has shown successful results. Upscaling of conservation technology is currently under way.

Crop residue management: The success of conservation agriculture in Ethiopia is highly dependent on crop residue management. By providing protective cover for the soil, crop residues increase soil infiltration. Research has shown that when 35 percent of the soil surface is covered with uniformly distributed residues, splash erosion will be reduced by up to 85 percent. Approximately two tons of maize residues per hectare are necessary to obtain 35 percent soil cover. This has been established as the minimum amount required for achieving a substantial reduction in relative soil erosion (Tolesa, 2001). In many parts of the country, however, crop residues have traditionally been used for multiple purposes including fuel, building materials and animal feed, which conflict with their use in conservation agriculture. Among these, livestock-related use (feed) is probably the most widespread in the country.

Crop rotation and intercropping: In a system with reduced mechanical tillage based on mulch cover and biological tillage, alternatives have to be developed to control pests and weeds. Practising crop rotation and intercropping has many advantages, which include reduced risk of pest and weed infestations; better distribution of water and nutrients through the soil profile; exploration for nutrients and water of diverse strata of the soil profile by roots of many different plant species, resulting in a greater use of the available nutrients and water; increased nitrogen fixation through certain plant-soil biota; improved balance of nitrogen, phosphorus and potassium (N-P-K) from both organic and mineral sources; and increased formation of organic matter. Better nutrient management through crop rotation can decrease nitrogen fertilizer use by up to 100 kg N per hectare per year, substantially lowering related greenhouse gas (GHG) emissions (nitrous oxide has a global warming potential 310 times greater than CO₂) as well as reducing the costs of production. Reduced use of synthetic fertilizer also leads to reduced greenhouse gas emissions from the manufacturing process and transportation. However, in most parts of the Ethiopian farming system farmers hardly practise crop rotation and monocropping is the dominant cropping system.

- **Agroforestry:** Agroforestry, an old agricultural activity traditionally practised in many parts of Ethiopia, involves the integration of trees and shrubs into farmland either through planting or natural regeneration. While traditional practices such as the intercropping of Moringa trees in farmer fields do exist, the government of Ethiopia in 2011 also announced a national programme to plant over 100 million *Faidherbia albida* trees in farmers' fields as part of the activities outlined in the Climate Resilient Green Economy (CRGE) Strategy. Organizations such as ICRAF are also conducting research into agroforestry including field trials of different tree species as well as planting densities and tree-crop combinations and their impact on agricultural yields and the physical environment. In addition, research is ongoing into the use of conservation agriculture with trees (CAWT), a technology which combines agroforestry and conservation agriculture. Other tree species that have been used in agroforestry in Ethiopia include *Calliandra* and *Cajanus* species.

“Organizations such as ICRAF are conducting research into agroforestry including field trials of different tree species as well as planting densities and tree-crop combinations and their impact on agricultural yields and the physical environment.”

- **Small-scale irrigation:** Ethiopia has embarked on the promotion and implementation of small-scale irrigation across the country. Consequently, the area under small-scale irrigation infrastructure increased from 853 000 hectares in 2009 to 2 084 760 hectares in 2013, while the area under irrigated crop production stood at 1 231 660 hectares in 2013 (MoA, 2014). There is a need to ensure that appropriate training in agronomy and water management is given along with support to develop irrigation infrastructure.
- **Crop diversification and improved variety popularization:** As part of ensuring food security, the Government of Ethiopia (GoE) as well as international organizations and NGOs are involved in the development and popularization of new crops and crop varieties, both at community and household level. Initiatives like the Eastern Africa Agricultural

Productivity Project (EAAPP), SLM Programme and Agricultural Growth Programme (AGP) are conducting crop variety popularization activities.

- **Traditional CSA practices:** Various types of traditional CSA practices have been implemented and adopted in Ethiopia. Such practices include Derashe Traditional Conservation Agriculture, Konso Cultural Landscape, Hararghe Highland Tradition Soil and Water Conservation, Hararghe Cattle Fattening, Hararghe Small-Scale Traditional Irrigation, Ankober Manure Management, and Traditional Agroforestry in Gedeo, East Shewa, East Wollega and West Gojam zones.

4.3 CSA Stakeholders, Programmes and Projects in Ethiopia

4.3.1 Government programmes

The Ministry of Agriculture: The Ministry is in charge of the formulation and implementation of agricultural policy. The Ministry has undertaken CSA-related projects through its Extension, Natural Resources Management, Livestock, Pastoral and Agropastoral and Soil Fertility directorates.

- **Sustainable Land Management Programme (SLMP):** The SLM II Programme covers six regions, 90 new and 45 existing woredas and 937 kebeles. Direct and indirect beneficiaries of the project include an estimated 1.85 million people. SLM II introduced measures to address risks related to climate change variability and to maximize greenhouse gas (GHG) emission reductions so as to meet the Growth and Transformation Plan (GTP) and the Climate Resilient Green Economy (CRGE) goals while reducing land degradation and improving land productivity of smallholder farmers. SLMP2 has a large sub-component on climate-smart agriculture, which is integrated within the component on watershed management, specifically subcomponent 1.1 that focuses on natural resource management and climate-smart agriculture. Within this subcomponent, CSA systems/practices will be introduced at homestead level based on the needs of local farmers and the suitability of local conditions. Climate-smart agriculture in SLMP-II refers to proven practical techniques – such as mulching, intercropping, conservation agriculture, no-till, crop rotation, cover cropping, integrated crop-livestock management, agroforestry, improved grazing and improved water management – and innovative practices such as the use of drought-resistant food crops.

In an effort to implement this programme in many parts of the country, reports indicate that to date about 1 708 100 hectares of land were treated under area closures, and appropriate physical and biological soil conservation methods were applied to 2 076 000 hectares of land. At present one of the key activities will be the development of a CSA implementation manual for the country that will incorporate key practices such as conservation agriculture, agroforestry and integrated soil fertility management. There is also a carbon-monitoring component in SLMP2 which has the objective of developing tools for determining carbon sequestration benefits from different farming practices, thus assisting in monitoring their climate-smartness. This component has been included primarily because one of the big questions posed in implementing climate-smart activities was related to how different activities supported the CSA pillar on climate change mitigation. The programme is managed by the SLM Coordination Unit of the Natural Resources Management Directorate of the Ministry of Agriculture.

- **Drought Resilient and Sustainable Livelihoods Programme (DRSLP):** Initiated in 2013, this programme seeks to improve livelihoods and resilience of the pastoral production system in the Afar and Somali regional states of Ethiopia. The project includes livestock markets and trade, livelihood support, drought risk management, knowledge management and research, livestock resilience, the Household Asset Building Programme (HABP), livelihoods diversification and natural resources management

activities such as water resource development, rangelands management, and soil and water conservation and capacity-building activities.

- **Food Security Programme (FSP) (2010-2014):** This programme has four major components – the Productive Safety Net Programme (PSNP); Household Asset Building Programme (HABP); Complementary Community Investment (CCI) programme; and the Voluntary Resettlement (VR) programme. The PSNP began in 2005 as a joint programme by the Government of Ethiopia and a consortium of donors in response to chronic food insecurity in rural Ethiopia. The programme operates as a safety net, targeting transfers to poor households in two ways – through public works (PW) and direct support (DS). The PSNP reaches more than seven million people and is currently operating in 319 woredas in the country. The HABP provides credit and agricultural extension services to support vulnerable households to engage in both farm and non-farm activities. The HABP has demonstrated the value of combining social protection with livelihoods diversification activities to improve household resilience. These programmes are being strengthened through a programme known as the Climate-Smart Initiative (CSI), which enables them to contribute to climate resilience by focusing on fine-tuning of existing PSNP and HABP livelihood activities to make them more climate-smart. The CSI is financed by the World Bank and Care Ethiopia and implemented by a consortium of partners such as Farm Africa, ICARDA and ILRI.



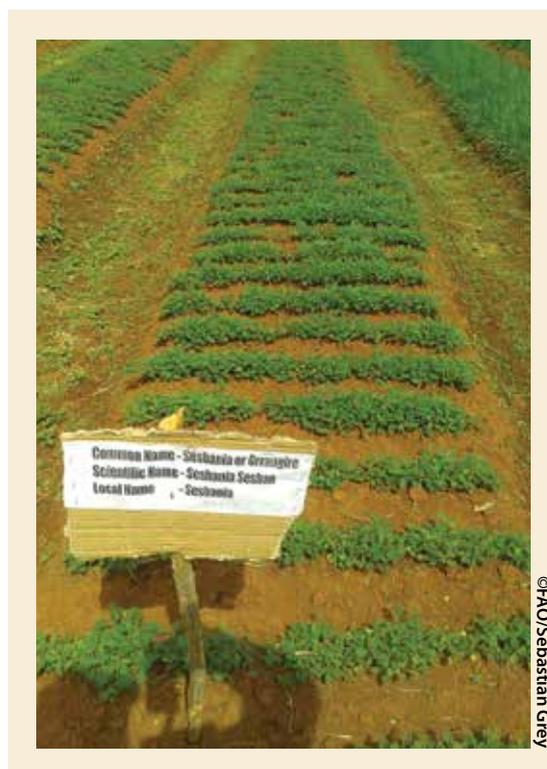
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- **Agricultural Growth Project:** The Agricultural Growth Project (AGP) of Ethiopia is aimed at increasing agricultural productivity and market access for key crop and livestock products in targeted woredas, with increased participation of women and youth. It has three components: agricultural production and commercialization; small-scale rural infrastructure development and management; and AGP management, monitoring and evaluation (M&E). The AGP Coordination Unit in the Ministry of Agriculture is responsible for the implementation of this project.
- **MERET Project:** The Managing Environmental Resources to Enable Transitions (MERET) to More Sustainable Livelihoods Coordination Unit is a World Food Programme (WFP) supported project initiated in the 1980s. This marked the beginning of large-scale soil and water conservation in Ethiopia. The main objectives are to increase the ability of food-insecure households to meet their necessary food needs and improve livelihoods through land rehabilitation, proper natural resources management, productivity enhancement, asset creation and diversification of livelihoods. MERET operates in five regions and one administrative council in 72 woredas (Tigray [17], Amhara [23], Oromia [16], SNNP [12], Somali [3] and Diredewa [1]), covering 500 sub-watersheds. Beneficiaries number about 1,5 million per annum (of which 40 percent are women). The major activity components are water harvesting, reforestation, seedling production, soil fertility management and construction of farmland terraces. The project is run by the MERET Coordination Unit in the Natural Resources Management Directorate of the Ministry of Agriculture. The Ex-Ante Carbon-Balance (c-balance) Analysis for the Agricultural Growth Project (AGP) in Ethiopia showed that the net effect of AGP is to create a carbon (C) sink of 5.9 MtCO₂e over 20 years, which represents the balance between the GHG emitted (mainly as a consequence of the increased use in agro-chemicals and of the infrastructure planned) and C sequestered (essentially through scaling-up of best practices). The adoption of sustainable agricultural practices could therefore be seen as complementary to the intensification of crop production, not only for the relevant agronomic implications, but also from a climate change mitigation point of view.

Ministry of Environment and Forests: The Ministry of Environment and Forests (MoEF) is responsible for environmental and forest development in the country. It has a regulatory role and coordinates activities within line ministries, agencies and non-governmental organizations which include policy issues such as implementation,



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institutional coordination, legislative framework and monitoring and evaluation. The Ministry is implementing a number of CSA-related activities. Most prominently it is implementing REDD+ activities aimed at reducing emissions from deforestation and forest degradation, and enhancing the role played by conservation and sustainable management of forests in climate change mitigation. This was one of the early priorities in the CRGE. The country has thus been taking steps towards the undertaking of REDD+ readiness studies, conducting national forest assessments, setting reference levels, identifying safeguards, testing forest management models and developing national forest monitoring and measurement reporting and verification (MRV) systems, among other assessments that can inform the country's national REDD+ strategy and programme. In May 2013, the Government of Ethiopia recognized the Oromia REDD+ programme as a national REDD+ pilot programme. The Oromia state region comprises 60 percent of Ethiopia's high forests and 15 million hectares of woodland. The overall goal of the REDD+ Pilot Programme in the Oromia state region is to reduce deforestation and forest degradation and increase carbon absorption in land, while contributing to reducing poverty among Oromia's rural population. This programme will

contribute directly to Ethiopia's Climate Resilient Green Economy Strategy and will be fully aligned with the national REDD+ strategy.

Agricultural Transformation Agency (ATA): This government agency was established to transform the agriculture sector and realize the interconnected goals of food security, poverty reduction and human and economic development. The agency is currently working on numerous climate-related proposals, policies and activities, including a study on conservation agriculture and identification of climate-resilient agricultural activities. Plastic rain gauges have been established in 28 woredas as part of a CSA initiative to monitor rainfall with the aim of harvesting rain water. ATA also has a project funded by DANIDA on greening the transformation agenda to integrate CSA initiatives across the various government departments. In past years, ATA trained 327 experts and 750 development agents (DAs) in conservation agriculture in selected woredas in the country. ATA also supported 6 000 farmers in seven woredas to practise conservation agriculture in 2013. Their target for 2014 was to have 50 000 farmers practising conservation agriculture in 57 woredas across the country.



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4.3.2 Development Agencies and Non-Governmental Organizations

World Vision Ethiopia (WVE) has been implementing a carbon credit project since 2006. The Humbo Assisted Natural Regeneration Project is a community-managed afforestation and reforestation initiative in Humbo state region, covering 2 728 hectares. The project is funded by the World Bank Bio Carbon Fund under the Clean Development Mechanism (CDM) of the United Nations Framework Convention on Climate Change (UNFCCC). The project was developed by World Vision Australia. It is World Vision's first climate change mitigation project and also one of the first registered Clean Development Mechanism (CDM) forestry projects in Africa. The aim is to regenerate the degraded native forests with indigenous biodiverse species. The forests act as a carbon sink to mitigate climate change, while at the same time building environmental, social and economic resilience to land degradation and future climate change impacts. Over the 30-year crediting period it is estimated that over 870 000 tons of carbon dioxide equivalent will be removed from the atmosphere, making a significant contribution to mitigating climate change as a direct result of the project.

Sasakawa Global (SG2000) has been implementing the Crop Productivity Enhancement (CPE) programme since 1996, with five thematic areas – productivity; post-harvest and post-processing; public-private partnerships; human resource management; and monitoring and evaluation. SG2000 supports over 250 farmer training centres in 60 woredas where CSA is one of the key activities. Currently, SG2000 is promoting high-yielding crop varieties as well as quality protein maize in 24 maize-dominant districts of the country. SG2000 has also been one of the key organizations involved in the introduction and promotion of conservation agriculture in Ethiopia as well as in other Eastern African countries.

Food for the Hungry Ethiopia (FHE) has been implementing the Benishangul-Gumuz (BSG) Food Security and Economic Growth (FSEG) project since 2010. This five-year programme began in January 2010 and continued up to June 2015. The project was implemented by a consortium of seven partners – Save the Children International SCI-led agency; CHF (formerly Canadian Hunger Foundation); Canadian Physicians for Aid and Relief (CPAR); Food for the Hungry Ethiopia (FHE) Oxfam Canada, World Vision and the International Network for Bamboo and Rattan (INBAR). The Benishangul-Gumuz area was initially covered with trees and shrubs, but was later integrated into a forest with minor reduction of stem density and

grass clearing which, upon abandonment during the shifting cycle, would rapidly regenerate to get back to its original state. Currently, with new immigrants, there is a dominance of an intensive mixed-crop farming and livestock production system with intensive cultivation. This farming system has led to clearance of trees and shrubs, as well as intensive soil disturbance that is causing rapid soil degradation. The ultimate goal of the FSEG project is improving food security and strengthening the capacity of the region to support its own economic growth, while the ultimate outcome is improved food security and economic growth for women and men in the Benishangul-Gumuz region. Some key activities included livelihood diversification, distribution of tree seedlings, introduction of improved crop varieties and market support to enable sale of produce.

“Currently, with new immigrants, there is a dominance of an intensive mixed-crop farming and livestock production system with intensive cultivation.”

The Canadian Foodgrains Bank (CFGB) is a partnership of 15 Canadian churches and church-based agencies working together to end global hunger. CFGB has established programme areas in Ethiopia, Kenya and Tanzania, where conservation agriculture has been locally adopted and proven to improve soil health, the profitability of farmers and overall system resilience. The CFGB network is well known for delivering an extensive large-scale conservation agriculture programme in sub-Saharan Africa. The programme, in partnership with eight NGOs (known informally as a CA Hub), is currently operating in Afar, Oromia, Somali and SNNP regional states of Ethiopia.





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CARE Ethiopia has been implementing the Climate Smart Initiative that builds on the Productive Safety Net Programme (PSNP) and the Household Asset Building Programme (HABP). In 2005, the Government started a major new initiative – the Productive Safety Net Programme. The Productive Safety Net Programme and the Household Asset Building Programme (HABP) are two important and interlinked food-security programmes within the MoA. Recognizing the huge implications of climate change for food security, the PSNP and HABP partners commissioned the Climate Smart Initiative (CSI). The CSI is aimed at strengthening the PSNP and the HABP in relation to predicted climate change, and considering how the existing programmes may evolve after their end-dates in 2014. Making the safety net climate-smart will involve systematically integrating the implications of climate change into the current PSNP and HABP, and determining how a next-generation resilience-building programme could enable the Ethiopian Government to manage risks related to climate change. The project is implemented by Farm Africa in partnership with ICARDA and ILRI, working with over 2 800 farmers in Bale zone to pilot new varieties of chickpea, lentil and faba bean.

Alliance for a Green Revolution in Africa (AGRA): AGRA has been implementing a project on soil health called *Enhancing Income of Smallholder Farmers through Integrated Soil Fertility Management*. The project is

implemented in 40 woredas of the four main regions of Ethiopia – Amhara, Oromia, Tigray and SNNP Regional States. It has a number of components, which focus on addressing acidic soils; new fertilizer scaling-up; P-fertilizer application on soil test base; and conservation agriculture.

International Centre for Insect Physiology and Ecology (icipe): Icipe has been implementing the Climate-Smart Push-Pull Technology Promotion project. This technology is promoted jointly by icipe and the Jima Zone Agricultural Office. The project started in 2013 in Boterbecho woreda and is operating in nine kebeles. So far 1 080 farmers have participated in the demonstration of green leaf desmodium and Brachiaria grass used biologically for the control of maize stalk borer.

Farm Africa is implementing a joint project on climate-smart agriculture with SOS Sahel, Self Help Africa and Vita in 15 woredas of SNNP Regional State in Southern Ethiopia. The landscape approach is employed with the aim of sustainable land management. Activities include promotion of agroforestry; small-scale irrigation; soil and water conservation; small ruminant rearing; cut-and-carry livestock feed promotion, and promotion of value chain crops like pepper. Farm Africa is also supporting the Climate-Smart Initiative for PSNP beneficiaries in partnership with CARE International as well as the Bale REDD+ project being implemented jointly with SOS Sahel.

Climate Change Forum – Ethiopia (CCF-E): The CCF-E is a multi-stakeholder group that meets regularly to discuss national responses to climate change. The CCF-E serves a broader coordination function by bringing together government, national and international NGOs, academia and research institutes as well as bilateral, regional and multilateral donors to meet and cooperate on a wide array of climate change-related issues. The NGO is also implementing climate change adaptation agricultural activities in woredas like Lume, Dugda and Adama. Climate change-related activities of the NGO include biological soil conservation, physical soil conservation, water harvesting, small-scale irrigation and promotion of horticulture crops for livelihood diversification.

“The main aim of the Africa Climate-Smart Agriculture Alliance is to support the rapid scaling-up of climate-smart agriculture to six million farming households across Africa, through the collaborative efforts and practical, on-the-ground experience of Alliance members in agricultural research and implementation.”

Africa Climate-Smart Agriculture Alliance (ACSAA): The ACSAA, also known as the AU-NEPAD-INGO Alliance for Scaling-Up Climate-Smart Agriculture in Africa, was announced in June 2014 at the African Union (AU) Summit in Malabo. The main aim of the alliance is to support the rapid scaling-up of climate-smart agriculture to six million farming households across Africa, through the collaborative efforts and practical, on-the-ground experience of Alliance members in agricultural research and implementation. The Alliance is coordinated by a pan-African steering committee that is convened by NEPAD and comprises international NGO members Care International, Concern Worldwide, Catholic Relief Services, Oxfam and World Vision; and technical members FAO, FANRPAN, FARA and CGIAR. The Alliance is unique in that NGOs are explicitly recognized for their involvement with communities and thus their ability to promote CSA at grassroots level. The Alliance is closely linked with NEPAD’s programmes on agriculture and climate change, which are targeting having 25 million farmers practising CSA by 2025. Three “fast-start” countries have been identified for Alliance activities (Ethiopia, Niger and Zambia), and activities are expected to expand to other countries in the future. Concern Worldwide has been selected as the interim

convener for Ethiopia. FAO will be supporting technical aspects of the work in Ethiopia, as well as in other pilot countries and in Africa as a whole. A major ongoing area of work at continental level is the development of a CSA Practical Guide for Sub-Saharan Africa which will be rolled out and adapted to the sub-regional and country contexts.

Food and Agriculture Organization of the United Nations (FAO): FAO has over the years provided support to the piloting of conservation agriculture and other climate-smart practices in Ethiopia. For example, FAO has in the past supported the Ministry of Agriculture in demonstrating conservation agriculture to 600 smallholder farmers on 24 demonstration plots in 12 woredas of Amhara, Tigray, Oromiya and SNNP regions. FAO also introduced conservation agriculture equipment including jab planters and oxen-drawn seed and fertilizer planters in those same woredas in 2010. FAO supported the training of 72 extension agents in conducting conservation agriculture farmer field schools, of which 32 were also trained in conservation agriculture equipment assembly and operations. In addition, FAO organized an experience-sharing visit to Zambia for Ethiopian government staff so as to create awareness and bring back learning on conservation agriculture from that country.

At present FAO, with funding from COMESA through the project titled *FAO Technical Support to the COMESA-EAC-SADC Programme on Climate Change Adaptation and Mitigation in Eastern and Southern Africa*, is supporting the National Conservation Agriculture Taskforce (NCATF). The NCATF was formed in March 2014 at a National Conservation Agriculture Taskforce Formation Workshop. The role of the NCTAF includes supporting conservation agriculture coordination at national level, leading promotion of conservation agriculture implementation, providing technical support to federal and regional conservation agriculture implementing institutions, mobilizing resources and identifying issues for policy decisions and interventions. The task force falls under the Natural Resources Management Directorate of the Ministry of Agriculture and is composed of members representing different conservation agriculture stakeholder groups which include government, NGOs, research institutions and the private sector. FAO expects to provide further support to the scaling-up of CSA in the country through conducting awareness raising events, supporting climate-smarting of Ethiopia’s Agriculture Sector Policy and Investment Framework (PIF) and conducting various other CSA promotional activities as per government priorities.

4.3.3 Research and Academic Institutions

International Maize and Wheat Improvement Centre (CIMMYT): CIMMYT has been implementing the Sustainable Intensification of Maize-Legume cropping systems for food security in Eastern and Southern Africa (SIMLESA) project. SIMLESA started operating in Ethiopia in 2010 to increase farm-level food security and income through conservation agriculture technologies that ensure sustainability and productivity. The programme is currently operating in eight federal and regional research centres in 17 districts. The aim of the programme is to improve farm-level food security and productivity, in the context of climate risk and change, through the development of more resilient, profitable and sustainable farming systems that overcome food insecurity for significant numbers of farmers. The programme promotes the use of maize-legume technologies of adapted varieties and develops comprehensive agronomic packages that increase productivity and sustainable intensification of maize-legume cropping systems. CIMMYT is also undertaking, or is involved in, a number of other projects with a CSA component, which include the Conservation Agriculture and Smallholder Farmers in Eastern and Southern Africa (CASFESA) project funded by EU-IFAD; the Farm Mechanization and Conservation Agriculture

for Sustainable Intensification (FACASI) project; and the Adoption Pathways Programme.

International Crops Research Institute for the Semi-Arid Tropics (ICRISAT): ICRISAT has a “breeding for resistance” programme for short-season varieties in the dryland areas of Ethiopia. The project is aimed at promoting local production of nitrogenous fertilizers by conversion of atmospheric nitrogen gas into chemical fertilizers. The breeding project uses a farming model known as TOA-MD that calculates the benefits of each crop production. This model takes into account the farm size and inputs required to produce a certain crop and this saves the farmer time and money. The “breeding for resistance” programme also looks at climate models (about 20 Atmospheric Ocean General Climate Models [AOGCMs]) and their effects on crop production. Other crop simulation models used as initiatives for supporting climate-smart agriculture are:

- DSSAT model: Decision Support System for Agro-technology Transfer;
- APSIM: Agriculture Production System Simulator; and
- EPIC: Environmental Policy Integrated Climate.



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World Agroforestry Centre (ICRAF): ICRAF stresses the importance of growing trees and shrubs on farms and in rural areas, combined with crops and livestock, to create profitable, productive, healthy and sustainable landscapes. Over three billion people worldwide use fuelwood and other solids for cooking, boiling water, light and heat. Planting the right trees provides easy access to fuel and reduce pressure on forests. ICRAF is implementing a project on creating a Climate-Resilient Watershed for Transforming Lives and Landscapes in the Geregera Watershed. The project is funded by Irish-Aid, whose goal was to enhance food security and ecosystem resilience through integrating climate-smart agriculture in watershed-management practices. The Geregera Watershed is located in the eastern zone of Tigray region, with an area size of 1 382 hectares. The watershed is characterized by its undulating topography.

Another initiative being implemented by ICRAF is the Creating an Evergreen Agriculture in Africa project for food security and environmental resilience. This is a more intensive form of farming that integrates trees with crops and livestock production. The vision is sustaining a green cover on the land throughout the year. Evergreen agriculture takes into account the role of *Faidherbia albida* trees in Ethiopian agriculture. *Faidherbia albida* trees smarten agricultural systems to create resilience to climate change, eradicate food insecurity and improve community livelihoods. Evergreen agriculture allows a glimpse into a future with more environmentally sound farming, where much of our annual food crop production occurs under a full canopy of trees.¹¹

Ethiopian Institute of Agricultural Research (EIAR): EIAR, along with the seven regional research institutes, higher learning institutions (HLI), NGOs and private companies that make up the country's national agricultural research system, is involved in a number of CSA-related programmes and projects, including the SIMLESA and FACASI programmes, as well as conducting research on evaluating the potential for climate change mitigation and adaptation of conservation agriculture through modelling and on-station experiments and development of agro-weather tools for climate-smart agriculture.

CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS): The CCAFS has been supporting a number of CSA initiatives in Ethiopia. These include the establishment and piloting of climate-smart villages in Borana Zone in southern

Ethiopia. CSA activities promoted in these climate-smart villages include agroforestry, intercropping, use of drought-resistant varieties and integrated soil fertility management. Innovative methods for access to climate-smart information will also be tested.

International Livestock Research Institute (ILRI): The Livestock and Irrigation Value Chains for Ethiopian Smallholders (LIVES) Project being implemented by ILRI seeks to use dairy waste management interventions to contribute to rural electrification by introducing alternative energy sources such as biogas. The project has introduced a new biogas package which includes biogas electric generators, biogas pumps/compressors, desulfurizers, dehydrators, biogas storage bags and above-ground plastic digesters. The generator converts biogas to electricity, enabling use of modern electric-powered innovations to alleviate the challenges of livestock production, marketing and human development in the rural communities of Ethiopia. Livestock development technologies that could be powered by the biogas-generated electricity include small-scale milk machines, small-scale milk coolers as well as incubators and mobile phone-based advisory services. Rural communities could also access more information through television and other communication technologies powered by electricity from biogas. In addition, the project has also tested the packaging and transportation of the biogas produced in PVC plastic bags.

4.3.4 Private Sector

Makobu Enterprises: Makobu Enterprises is a privately owned business which has joined hands with SG2000 to facilitate training in conservation agriculture across the country. While SG2000 was responsible for undertaking and monitoring training, Makobu Enterprises imported and made available key inputs required for conservation agriculture, such as herbicides and seeds. Makobu Enterprises has also been implementing a project on Efficient Clean Cook Stoves (ECCS) and ethanol, which encourages the use of ethanol energy as a local by-product, thus minimizing the cutting down of trees. The company also promotes the use of selective herbicides (Roundup) for weed control in large-scale commercial farming. The company has expressed its desire to work more closely with Ministry of Agriculture structures in a public-private partnership (PPP) arrangement in order to scale up conservation agriculture to parts of the country the company has not yet reached.

11 World Agroforestry Centre. 2009. Creating an Evergreen Agriculture in Africa for Food Security and Environmental Resilience.

4.4 Key Policies Relevant to CSA in Ethiopia

Ethiopia has a consistent set of policies and strategies for agriculture and rural development that reflect the importance of the sector to the economy and livelihoods of its people. While the country does not have a stand-alone climate-smart agriculture strategy or programme, significant efforts have been made to develop policies and strategies pertinent to climate change. Some policies, laws and strategies relevant to climate-smart agriculture in Ethiopia are the Climate Resilient Green Economy Strategy (2011), National Adaptation Program of Action (NAPA), Ethiopian Programme of Adaptation to Climate Change (EPACC) of 2011, the Agriculture Sector Policy and Investment Framework (PIF, 2010), Rural Development Policy and Strategy (2003), the Growth and Transformation Plan (GTP), CAADP Compact and the National Environmental Policy of Ethiopia (1997), among others.

“Ethiopia has a consistent set of policies and strategies for agriculture and rural development that reflect the importance of the sector to the economy and livelihoods of its people.”

Climate Resilient Green Economy (CRGE) Strategy: The CRGE Strategy was developed in 2011 and launched at the 17th Conference of the Parties to the United Nations Framework Convention on Climate Change in Durban in 2011. It takes an economy-wide approach to greenhouse gas reduction. According to this strategy, Ethiopia aims to achieve carbon-neutral middle-income status before 2025. The strategy is based on four pillars, of which the first two (shown below) are mainly related to CSA.

- Agriculture: improving crop and livestock production practices for greater food security and better income for farmers, while reducing emissions.
- Forests: protecting and re-establishing forests for their economic and ecological values, including carbon stocks.

Established within the Natural Resources Management Directorate of the Ministry of Agriculture, the CRGE Coordination Unit is mainly responsible for mainstreaming climate adaptation and mitigation strategies into the regular activities of each sector. The CRGE Coordination Unit is implementing a pilot programme known as Agriculture Sector Fast-Track CRGE in 27 woredas of the four main regions of the country.

Ethiopian Programme of Adaptation to Climate Change (EPACC): EPACC aims to build a climate-resilient economy through adaptation initiatives implemented at sectoral, regional and local community levels. The EPACC replaced the NAPA in 2011 and takes a more programmatic approach to adaptation planning. It outlines 29 components that include objectives around mainstreaming climate change within government policies and plans. In response, the country has prepared sectoral and regional programmes of adaptation to climate change.

The Agriculture Sector Programme of Adaptation to Climate Change was formulated in 2011 with the following objectives:

- to realize the commitment of the country to UNFCCC, that demands the integration of climate change into sectoral policies and development efforts;
- to have a working climate change adaptation plan that, after implementation, minimizes the vulnerability of the agriculture sector and the community to climate change hazards, and increases the strength of the sector to tolerate predicted climate change impacts; and
- to mainstream and incorporate climate change adaptation into the social system and existing development efforts from bottom to top levels, making use of the mobilization and coordination of the people (FDRE, 2011).



National Adaptation Program of Action (NAPA): As a Party to the UNFCCC, Ethiopia prepared its NAPA in 2007. The NAPA represented the first step in coordinating adaptation activities across government sectors. The NAPA document for Ethiopia identified immediate and urgent adaptation activities that address current and anticipated adverse effects of climate change, including extreme climate events. It provides a framework to guide the coordination and implementation of adaptation initiatives in the country through a participatory approach, building synergies with other relevant environmental and related programmes and projects.

Growth and Transformation Plan (GTP): In 2010 Ethiopia developed a Growth and Transformation Plan (GTP) for the period 2010/11-2014/15. The GTP recognizes that the environment is a vital pillar of sustainable development, and states that building a 'Green Economy' and ongoing implementation of environmental laws are among the key strategic directions to be pursued during the plan period. The GTP addresses climate change as a crosscutting issue under the strategic priority of environment and climate change. It outlines building a climate-resilient green economy as a strategic priority for the country.

Ethiopia's Agricultural Sector Policy and Investment Framework (PIF) 2010-2020: The PIF provides a strategic framework for the prioritization and planning of investments that will drive Ethiopia's agricultural growth and development. It is designed to operationalize the CAADP Compact signed by the Government and its development partners. The PIF states that climate change is a crosscutting issue that will be addressed in all areas of the PIF and that a number of instruments need to be considered for adapting to climate change, including research on new crops and farming systems suited to hotter/drier conditions, water harvesting, agroforestry, improved short-term and long-term weather forecasting, and risk management measures to cope with increasing climatic variability. Mitigation measures such as carbon sequestration through conservation agriculture and reforestation should also be considered. In this way, climate change issues will be mainstreamed into the PIF by undertaking carbon accounting studies of all key investments and identifying opportunities for adaptation and mitigation. The policy framework is based on the concept of the Agricultural Development-Led Industrialisation (ADLI) Strategy that was introduced in the 1990s and was meant to be the cornerstone for economic recovery and agrarian transformation. Under this strategy, ensuring improvements in the performance

of smallholder agricultural producers was accorded primary focus. The PIF falls within the mandate of the Rural Economic Development and Food Security (RED & FS) Sector Working Group. The platform brings together government and development partners under three thematic technical committees – Agricultural Growth, Sustainable Land Management and Disaster Risk Management and Food Security (DRMFS).

“A number of instruments need to be considered for adapting to climate change, including research on new crops and farming systems suited to hotter/drier conditions, water harvesting, agroforestry, improved short-term and long-term weather forecasting, and risk management measures to cope with increasing climatic variability.”

Comprehensive Africa Agricultural Development Programme (CAADP) Compact: The programme has been endorsed by the African Heads of State and Government as a framework for the restoration of agricultural growth, food security and rural development in Africa. One of the pillars of CAADP is extending the area under sustainable land management and reliable water control systems, and CSA falls under this pillar. Ethiopia developed a CAADP Compact in 2009 and this provides the consensus around the goals and priorities that Ethiopia has set to accelerate agricultural growth, improve food security and thereby improve livelihoods, and the partnerships and assistance required to achieve these goals. In Ethiopia, government programme and project activities were aligned with the CAADP pillars. Accordingly, the Sustainable Land Management Programme, which has been financed by the World Bank and other donors, is implementing Pillar I of CAADP, which is improving natural resource management and utilization.

Environmental Impact Assessment Proclamation: An Environmental Impact Assessment (EIA) is a tool used for the assessment of environmental projects to ensure that the environmental implications are taken into account before decisions are made. In Ethiopia, the EIA Proclamation of 2002 and the procedural guidelines developed by the Environmental Protection Agency (EPA) set the framework for EIA processes. With regard

to development projects, the proclamation stipulates that no person shall commence implementation of a proposed project identified by directive as requiring EIA without first passing through an environmental impact assessment process and obtaining authorization from the competent organization.

Environmental Policy of Ethiopia: The Government of Ethiopia (GoE) issued an Environmental Policy in 1997. The aim was to rectify the economic and social costs of environmental damage from widespread mismanagement of environmental resources, and to provide overall guidance in the conservation and sustainable utilization of the country’s environmental resources. The policies consider the vulnerability of the country to climate variability and aim to promote a climate-monitoring programme, take appropriate mitigation measures, develop the energy sector, actively participate in protecting the ozone layer and maximize the standing biomass in the country through a combination of reforestation, agroforestry, rehabilitation of degraded areas, re-vegetation, control of free-range grazing (in the highlands) and seeking financial support for offsetting carbon dioxide emissions from such activities.

Ethiopia Nationally Appropriate Mitigation Actions (NAMA): Ethiopia has reaffirmed its commitment to the Copenhagen Accord and has submitted a statement to the UNFCCC highlighting potential NAMAs in various areas including agriculture and forestry. In forestry this includes enhanced reforestation actions and sustainable forest management, reclamation of degraded lands, controlled grazing and area closures, and creation of forest buffers to halt desertification. In agriculture this includes composting and practising of agroforestry.

International climate change policy regime: Ethiopia is a signatory to a number of multilateral agreements that have a bearing on the sustainable development efforts of the country. As a result, Ethiopia has signed and/or ratified many of the international conventions and protocols related to climate change and land degradation including the United Nations Framework Convention on Climate Change (UNFCCC), the Convention on Biological Diversity (CBD) and the United Nations Convention to Combat Desertification (UNCCD). In June 2015, Ethiopia became the first least developed country to submit its Intended Nationally Determined Contribution (INDC) to the UNFCCC. Ethiopia’s INDC represents the

Table 1: Summary of key policies relevant to CSA in Ethiopia

Policy	Year	Intention or goal
Environmental Policy of Ethiopia	1997	Overall guidance in the conservation and sustainable utilization of the country’s environmental resources.
Environmental Impact Assessment Proclamation	2002	Ensure that the environmental implications are taken into account before decisions are made.
National Adaptation Program of Action (NAPA):	2007	The NAPA represented the first step in coordinating adaptation activities across government sectors.
CAADP Compact	2009	One of the pillars of CAADP is extending the area under sustainable land management and reliable water control systems.
Growth and Transformation Plan (GTP)	2010	The GTP recognizes that the environment is a vital pillar of sustainable development.
Agriculture Sector Policy and Investment Framework (PIF)	2010	The goal of the PIF is to “contribute to Ethiopia’s achievement of middle-income status by 2020”. The development objective is to “sustainably increase rural incomes and national food security”. This objective embodies the concepts of producing more, selling more, nurturing the environment, eliminating hunger and protecting the vulnerable against shocks.
Agriculture Sector Programme on Adaptation to Climate Change (APACC)	2011	The Agriculture Sector Adaptation Plan to Climate Change.
Ethiopian Programme of Adaptation to Climate Change (EPACC)	2011	More programmatic approach to adaptation planning.
Climate Resilient Green Economy Strategy	2011	Aims for carbon-neutral middle-income status by 2025.

country's targets to contribute to global GHG mitigation efforts and represents a 64 percent emissions reduction target from the business-as-usual scenario by 2030. The INDC is based on the CRGE and places emphasis on the forestry sector for the country's GHG reductions. The INDC also reflects the need to reduce vulnerability and build resilience to climate hazards in key sectors of the economy. Important to note is that the INDC's implementation is highly conditional to financial and technical support from the global development and climate financing community and the estimated costs are \$150 billion in the period up to 2030.

4.5 Gender Issues for CSA in Ethiopia

In Ethiopia, the majority of the poorest people are composed of women, the disabled and those living with HIV/AIDS, who are also the most vulnerable to climate change. Climate variability and change affects women as it makes fuelwood and water more difficult

to access, roles which are primarily those of women. This forces rural women to walk longer distances to fetch water and collect fuelwood. CSA practices can have many benefits for women. These practices can reduce and spread their workload over time and reduce their burden of fetching water for crops. The practices can enable early planting of crops, make women less dependent on oxen or mechanical tillage equipment, increase crop productivity and production of different crops, and increase food security and nutrition among women and vulnerable groups. Studies on the gender implications of CSA practices for example conservation agriculture in the FACASI project are ongoing. Other programmes such as the NEPAD Gender Climate Change Agriculture Support Programme (GCCASP) are also being rolled out in Africa of which Ethiopia is one of the pilot countries where the programme will assist small-holder women farmers to address the challenges posed by climate change. More gender-focused work on CSA is needed in the country.



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4.6 Constraints to CSA Promotion and Adoption in Ethiopia

- Food insecure farmers find it costly to invest in better land and agricultural management systems which often have slow returns on investments. Many climate-smart agriculture practices that require establishment and maintenance costs can take considerable time before farmers benefit from them. Limited access to markets and capital compounds the issues related to investments in improved agricultural practices and limits the ability of farmers to invest in practices that will raise their income in the long run and improve the sustainability and resilience of their production systems.
- There are practices that are difficult to integrate into existing farming systems because they impact on other elements of the farming system. For example, the timing of a practice may lead to labour constraints; high investment or maintenance costs may exceed the capacity of asset-poor farmers; and competition for crop residues may restrict the availability of feed for livestock and biogas production.
- There is a general lack of quality agricultural inputs, particularly in rural communities where quality agrochemicals, farm implements and equipment, seeds, tree seedlings and other inputs necessary for practising climate-smart agriculture are either not readily available or unaffordable. In many cases low-quality inputs and implements are used, resulting in suboptimal results which can ultimately have a negative impact on the promotion of climate-smart practices.
- There is a general lack of knowledge on climate-smart practices and misconceptions about what climate-smart agriculture is. Some believe that CSA is merely conservation agriculture, when in fact it is a range of sustainable farming practices.
- There is often competition between crops and livestock for mulch, which is usually required as animal fodder. Live mulch is almost always a food preference for livestock when it is available. Overgrazing and a lack of strong rangeland management bylaws and regulatory measures result in land degradation and a further lack of availability of mulch.
- Increased population, land fragmentation and inadequate land tenure systems that do not encourage investment in the land mean that farmers are unwilling to make significant investments in sustainable agricultural practices that may or may not produce immediate or short-term results.
- While extensive CSA-related research is being done in the country, many of the technologies are

still not reaching the broader farming population. Constraints to wide dissemination, access to and operationalization of research findings need to be examined and addressed.

- A large number of short-term to medium-term programmes and projects are conducted in a fragmented manner by a wide number of stakeholders that are unsustainable in the long run. There is a need for harmonization in the approach to climate-smart agriculture promotion as well as strengthening of climate-smart agriculture coordination mechanisms.
- The current extension system is not geared towards climate-smart agriculture and while efforts are ongoing to address this issue, it will take considerable effort and time to change the mindset of farmers so that they move from unsustainable practices to more sustainable climate-smart agricultural practices.
- The livestock subsector, where a considerable proportion of the agricultural GHG emissions emanate and where the potential for the reduction of agricultural GHG emissions is greatest, has unfortunately not received the focus and attention the sector warrants, especially from a GHG mitigation perspective.

“The livestock subsector, where a considerable proportion of the agricultural GHG emissions emanate and where the potential for the reduction of agricultural GHG emissions is greatest, has unfortunately not received the focus and attention the sector warrants, especially from a GHG mitigation perspective.”

4.7 Opportunities for CSA Promotion in Ethiopia

- For smallholder farmers in Ethiopia, the possibility for greater food security and increased income – together with greater resilience to weather variability and climate shocks rather than mitigation benefits – will be significant drivers for adopting climate-smart agriculture practices. For intensive mechanized agricultural operations, the opportunities to reduce emissions and costs associated with the efficient use of energy and resources will be of greater interest. There are a number of other opportunities for supporting the promotion and adoption of climate-smart agriculture practices in the country.

- There is great willingness and commitment on the part of government to reduce poverty; improve agricultural production and productivity (as one of the mainstays of the economy); and ensure food security while addressing climate change. Ethiopia is one of the countries that have consistently invested more than 10 percent of their national budget in agriculture.
- Ethiopia has appropriate national policies and strategies such as the Climate Resilient Green Economy (CRGE) Strategy, with some structures already in place to support their implementation. In addition, some of these policies have been implemented through large agricultural government programmes which incorporate climate-smart agriculture, such as the Sustainable Land Management Programme and the Productive Safety Nets Programme.
- The current emphasis on the promotion of integrated watershed management to improve agricultural productivity and promote sustainable land management provides a good opportunity for large-scale implementation and promotion of climate-smart practices.
- The presence of private sector companies, international development organizations and numerous NGOs involved in CSA-related activities presents an opportunity for upscaling CSA across the country.
- The existence of a large national research network through the Ethiopian Institute of Agricultural Research as well as the presence of a number of CGIAR institutes, many of whom have either country offices or regional offices in Ethiopia, presents a great opportunity to enhance, increase coverage of and disseminate research technologies and findings related to climate-smart agriculture.
- Ethiopia's large agricultural extension system, with an estimated 8 500 farmer training centres and over 45 000 development agents stationed at kebele level throughout the country, provides an opportunity for large-scale awareness raising, training and support for farmers on climate-smart agriculture. The extension service itself needs to wholly embrace the different climate-smart agriculture practices appropriate for different locations and build the necessary capacity in these practices.



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COUNTRY STUDY 2: KENYA

5

5.1 Overview of the Agriculture Sector in Kenya

According to the Ministry of Agriculture, Livestock and Fisheries (MALF)¹², agriculture is the main economic sector, accounting for over 25 percent of the gross domestic product (GDP), over 65 percent of Kenya's total exports and providing more than 18 percent of formal employment. Production is carried out on farms averaging 0.2–3 hectares, mostly on a commercial basis. This small-scale production accounts for over 75 percent of the total agricultural output and over 70 percent of marketed agricultural produce. Growth of the national economy is therefore highly correlated to growth and development in agriculture. However, Kenya's agriculture is 98 percent rain-fed and predominantly small-scale, especially in the medium to high-potential areas, covering about 15 percent of the country. Therefore, productivity in the sector is directly influenced by climatic conditions. The livestock subsector employs 50 percent of the agricultural labour force and is the mainstay for over 10 million Kenyans living in the Arid and Semi-Arid Lands

(ASALs). According to the 2009 livestock census, the country had a livestock population of 17.5 million cattle; 27.7 million goats; 17 million sheep; and 31.8 million domestic birds, among other livestock kept in the country. Kenya's national forest cover is approximately 6.9 percent, much lower than the internationally suggested minimum of 10 percent. The fisheries and aquaculture subsector also plays an important role in food and nutrition security and is composed of both freshwater and marine fisheries, which contribute about 0.5 percent of the country's national GDP.

“According to the 2009 livestock census, the country had a livestock population of 17.5 million cattle; 27.7 million goats; 17 million sheep; and 31.8 million domestic birds, among other livestock kept in the country.”

12 Kenya Climate-Smart Agriculture Programme 2015-2025

Farming systems in Kenya fall under four distinct categories:

- **Small-scale mixed farming:** Kenya's agriculture is predominantly small-scale farming, mainly in the high and medium potential (rainfall) areas. The sector accounts for over 75 percent of the total agricultural output and 70 percent of the marketed agricultural produce.
- **Large-scale farming:** This is rapidly dying out except for the horticultural sector, where large-scale farms are being converted from rain-fed production of coffee, grains and livestock to intensive horticultural production especially under greenhouse conditions. These farms account for over 80 percent of the exported horticultural produce.
- **Pastoralism:** This is the main production system in the arid and semi-arid lands of the country. Farmers rear cattle, goats, sheep and camels, among other livestock. They experience droughts, water shortages and high livestock mortality on account of rain failure in approximately three out of five years.
- **Irrigation farming:** Production under irrigation is a relatively limited system used only in a few areas. It is developed mainly in the form of schemes and large-scale irrigation of crops like rice, coffee, flowers, pineapples and other horticultural crops.

Large commercial farms account for over 40 percent of irrigated land, while the smallholder farmers and government-managed schemes account for 42 percent and 18 percent of irrigated land respectively (MTIP 2012-17).

Overall, dependence on rain-fed agriculture and declining soil health have increased the vulnerability of farming systems and exposed rural households to food insecurity and poverty. Kenya is now increasingly seeing changes in the onset, duration and intensity of rainfall across the country, while the frequency and intensity of the extreme weather events such as drought and floods are on the rise, with devastating impacts on the national economy and the livelihoods of the people. Drastic and innovative measures are needed to help farmers adjust to these changes in emerging and projected weather patterns. In addition, agriculture is the largest source of GHG emissions in the country and is responsible for approximately one-third of Kenya's total GHG emissions, with livestock methane emissions and land-use change being the main emitters within the sector. Figure 5 indicates the major GHG emissions sources within the agriculture sector in Kenya¹³. As can be seen, the largest proportion of emissions results from enteric fermentation followed by manure left on pasture, both of which are related to livestock

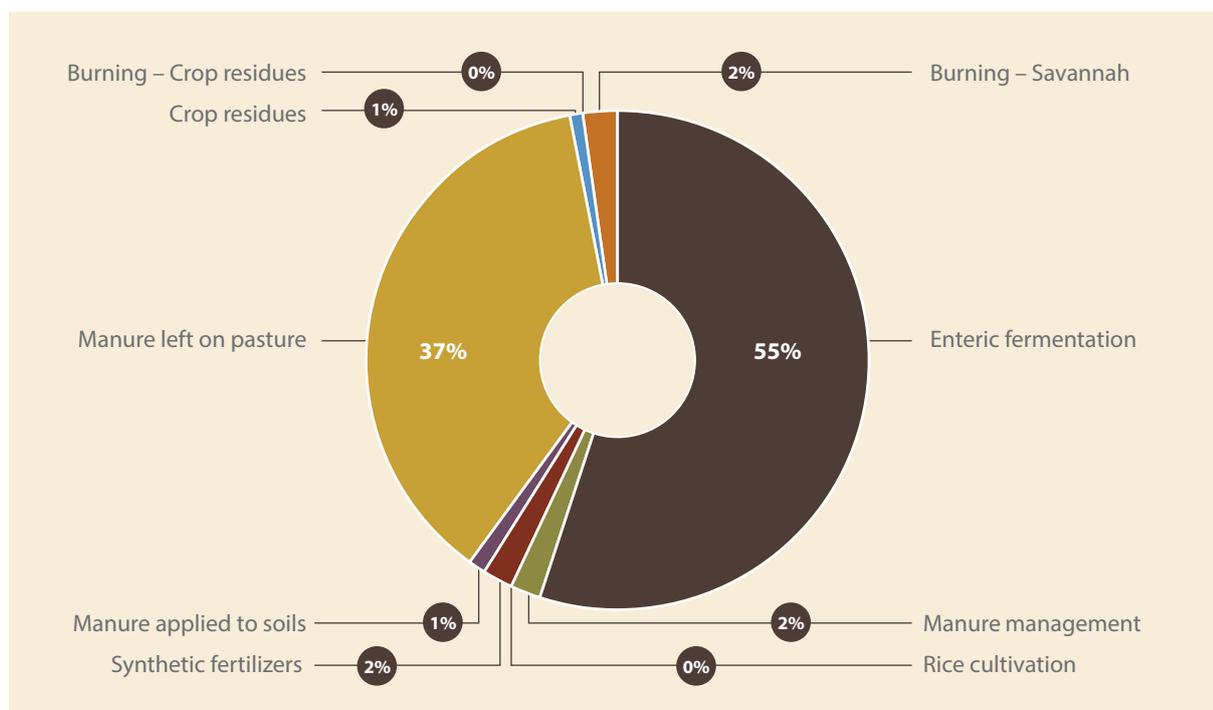


Figure 5: GHG emissions in Kenyan agriculture in 2012 (FAOSTAT, 2015)

13 FAOSTAT, 2015

production. In addition, it is estimated that agricultural GHG emissions in the country are expected to rise from 20 MtCO₂e in 2010 to 27 MtCO₂e in 2030. Forestry, on the other hand, accounted for GHG emissions of 19.6 MtCO₂e in 2010, approximately 32 percent of national emissions. This was mostly on account of deforestation for fuelwood, charcoal production and clearing of land for agriculture.

5.2 CSA Technologies and Practices: Adoption and Implementation

Common climate-smart agriculture practices in Kenya include conservation agriculture, agroforestry (also called “conservation agriculture with trees” and “evergreen agriculture”), greenhouse farming, biogas production, beekeeping, integrated aquaculture systems and integrated soil fertility management.

- Conservation agriculture:** Conservation agriculture is an approach to farming that can sustainably increase yields from cereal, legume, fodder and cash crops. The various practices that constitute this approach follow key principles that aim to conserve the soil, rain water and soil nutrients, and stabilize land production while reducing production costs. Kenya is a leader in conservation agriculture in Eastern Africa and has managed to increase the amount of land under conservation agriculture from 15 000 hectares in 2009 to 33 000 hectares in 2012, with the figure steadily increasing each year. Conservation agriculture principles promoted in Kenya include minimal soil disturbance; crop rotation and associations; and crop residue management/mulching. The country is also host to large conservation agriculture equipment manufacturers and importers such as Ndume Limited, an agricultural implements and machinery manufacturing company that is based in Gilgil. However, on the whole, uptake is still low compared with Southern African countries. Key stakeholders in the promotion of conservation agriculture include the FAO, Conservation Agriculture with Trees Task Force and African Conservation Tillage Network (ACT).
- Agroforestry:** Agroforestry projects are being implemented by a number of organizations such as the Ministry of Environment and National Resources (MENR), Ministry of Agriculture, Livestock and Fisheries, Kenya Forestry Research Institute (KEFRI)

and a number of NGOs, UN agencies and CGIAR centres such as ICRAF. In recent years conservation agriculture with trees (CAWT) has also emerged as a key CSA practice being scaled up across the country. The incorporation of trees and shrubs into farms and rangelands has the potential to provide added benefits to conservation agriculture, which include maintaining vegetative soil cover, faster nutrient cycling and nitrogen fixation, weed suppression, enhancing soil structure, supporting carbon sequestration and biodiversity conservation as well as providing food, fuel, fibre and income from tree products. The government target is to achieve 10 percent tree cover on all farmland. Many climate-smart agricultural practices that reduce climate vulnerability also reduce emissions and improve agricultural production potential. Agroforestry has been estimated to have the potential to abate 4.2 Mt CO₂e by 2030, while offering climate-resilience benefits of improved soil quality, improved water retention in the soil, reduced erosion and perennials that are better able to withstand climatic changes.

“The incorporation of trees and shrubs into farms and rangelands has the potential to provide added benefits to conservation agriculture which include maintaining vegetative soil cover, faster nutrient cycling and nitrogen fixation, weed suppression, enhancing soil structure, supporting carbon sequestration and biodiversity conservation as well as providing food, fuel, fibre and income from tree products.”



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- Livelihood diversification:** This encompasses agricultural practices such as beekeeping and honey production and awareness campaigns regarding the importance of balancing stocking rates within the available land resources as a way of ensuring sustainable livelihoods. Other livelihood diversification activities promoted include integrated aquaculture as well as rearing of diversified poultry such as quails, guinea fowls and ostriches; fruit production; and fodder and hay production for livestock feeds. Practices such as beekeeping can be combined with community forestry, thus bringing added economic benefits to forest conservation. Aquaculture can be practised as a means to improve income and enhance resilience of livelihoods to weather variability and climate change. At the same time, aquaculture ponds can be part of an integrated farming system whereby animal manure can be used to fertilize the ponds while the slurry produced from the ponds can be used as organic fertilizer in nearby crop fields.

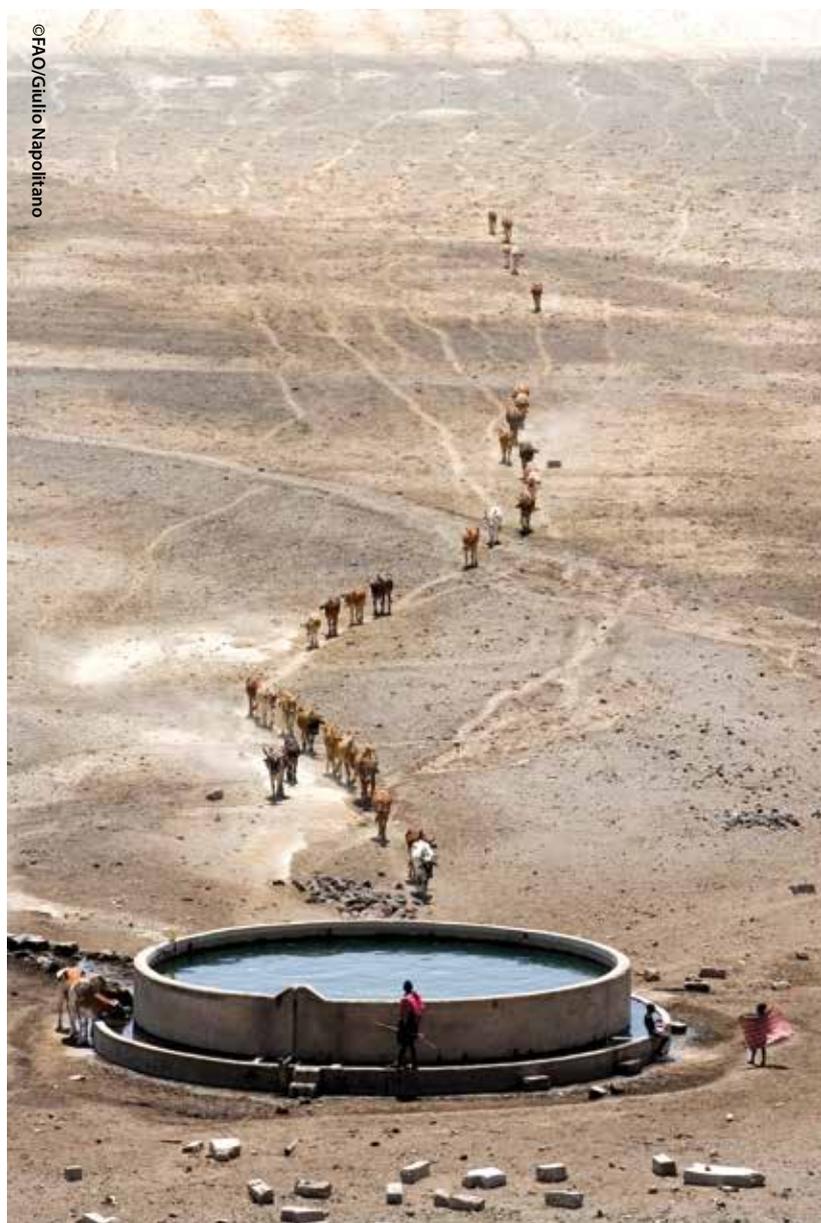


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- Integrated soil fertility management:** A number of methods to improve soil fertility management are practised in Kenya with the aim of improving land productivity, reduce production costs and conserve water. Specific practices include compost production and manure management.

- Biogas and biomass fuel production:** Biogas has been promoted as a means of managing manure from which a large amount of GHG emissions emanate, as well as for domestic energy production. Biogas projects in Kenya are being implemented by a number of research and development organizations such as GIZ, SNV and the Kenya National Farmers Federation. To make the most out of biogas systems there may be a need to combine them with sustainable intensification of livestock as well as animal confinement to ensure efficient collection of manure. At the same time, biogas slurry can be used as organic fertilizer to manage soil fertility. Most biogas systems are small-scale and utilized for domestic lighting and cooking by households connected to the biogas digester.

- Small-scale water harvesting:** This includes big concrete structures as well as small dams with linings for water harvesting which are being constructed in the arid and semi-arid areas of the country in particular. Water-harvesting structures can be utilized for crop and livestock production as well as for aquaculture. Types of water-harvesting techniques promoted include zai pits, shallow retention ditches, road



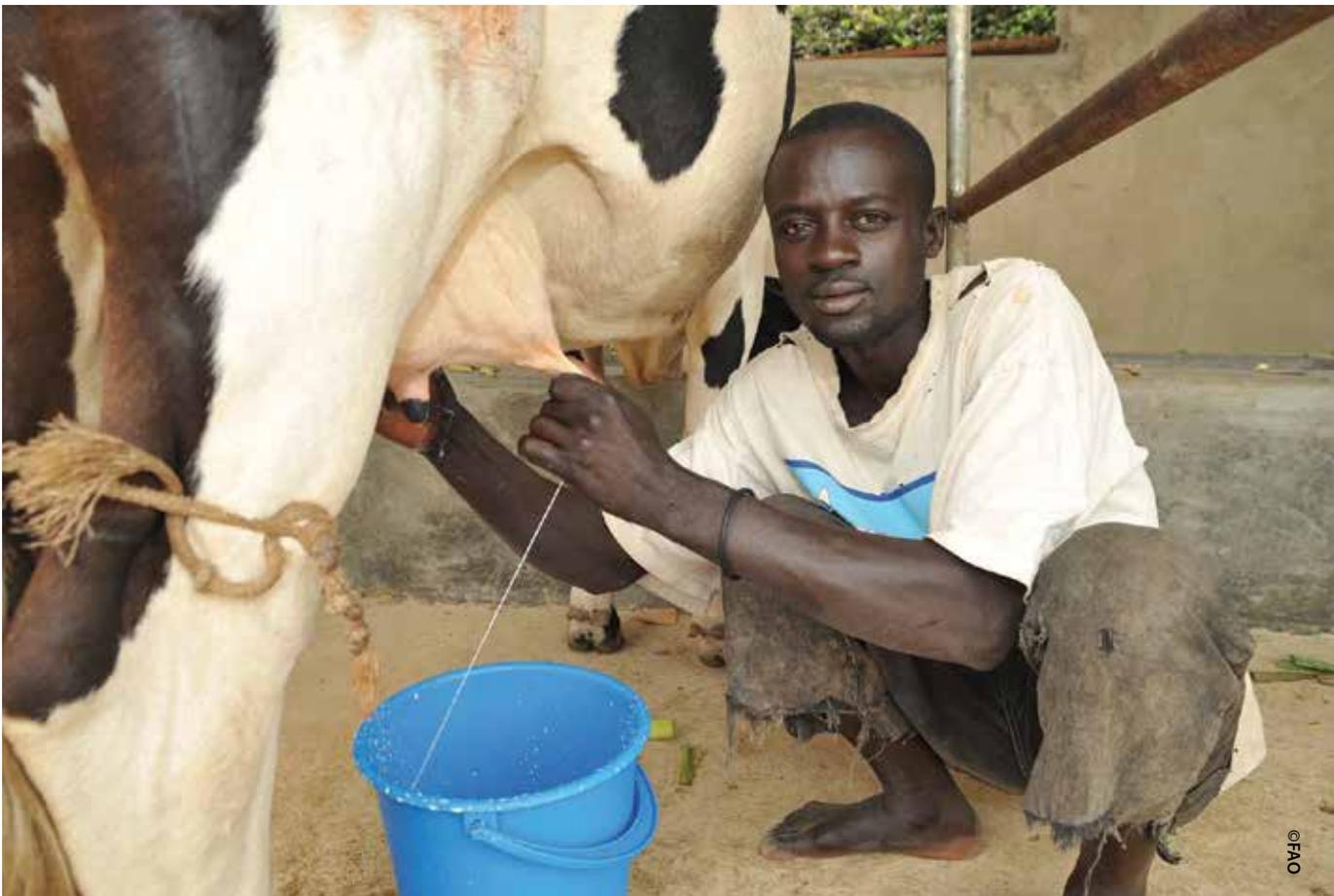
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runoff harvesting, rock catchment harvesting, roof rainwater harvesting, ponds, dams and water pans. Some practices such as zai pits require little financial investment and support direct water retention in the field. Others such as roof rainwater harvesting structures and ponds require greater financial investment. Water harvesting can be combined with low-cost drip irrigation technologies to provide even further benefits in terms of water and soil conservation.

- **Greenhouse farming:** Greenhouse farming enables the farmer to improve crop production by regulating and optimizing the plant environment. The greenhouse can also protect crops from outside weather conditions. Greenhouse farming can support resilience to external weather and climate while improving crop productivity and increasing income and profit.
- **Dairy herd management:** Dairy herd management can result in improved milk productivity, improved efficiency and reduced emissions intensity. Dairy herd

management involves managing livestock nutrition so as to ensure that feed is broken down as efficiently as possible and with minimal production of methane gas. Rotational grazing is one simple strategy that is promoted that allows for maintenance of forages at a relatively higher growth stage. This enhances the quality and digestibility of the forage, improves the productivity of the system and reduces CH₄ emissions per unit of live weight gain (LWG). Improving animal breeds through selective breeding (cross breeding, introduction of more suitable breeds and use of indigenous breeds) is also practised with the aim of improving productivity as well as resilience to environmental conditions, including climate.

“Dairy herd management involves managing livestock nutrition so as to ensure that feed is broken down as efficiently as possible and with minimal production of methane gas.”



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5.3 CSA Stakeholders, Programmes and Projects in Kenya

There are a number of CSA-related research and development projects in the country that are being implemented by different stakeholders.

5.3.1 Government Programmes

Ministry of Agriculture, Livestock and Fisheries (MALF): The Ministry has a number of CSA-related projects which include the following:

- **Adaptation to Climate Change and Insurance (ACCI) Project:** This has been cited as the first project in the country to address climate-smart agriculture. Through climate modelling and crop simulation, adaptation and mitigation options were identified and piloted in western Kenya over a period of 3.5 years from 2011 to 2014. Some of the CSA practices implemented included drought-tolerant traditional crops/varieties; weather insurance for high-risk crops; conservation agriculture; agroforestry, on-farm crop diversification; and integrated soil fertility management.
- **Njaa Marufuku Kenya (NMK), 2008-2013:** In this project, grants were given to different groups of youth, women and men in schools and community-based organizations (CBOs) to undertake activities geared towards ensuring food security. During the period 2008-2013, 3 578 farmer groups, 64 schools and 96 CBOs benefited from the grants.
- **National Accelerated Agricultural Input Access Programme (NAAIAP, 2007-2012):** NAAIAP was a government response to the 2006 Fertilizer Conference held in Abuja, Nigeria. Initiated in 2007 for a period of five years, the programme was fully funded by GOK and had two components – Kilimo Plus and Kilimo Biashara, covering over 150 districts. Farmers would begin with a starter pack (Kilimo Plus) and later graduate to Kilimo Biashara. Altogether 500 000 input vouchers were issued to over 100 districts (100 percent subsidy). Kilimo Biashara was supported through the Agriculture Credit Guarantee Scheme (ACGS) by four banks – Equity Bank, Family Bank, Cooperative and KWFT Banks for a total of KES500 million to offer affordable loans to farmers with a 12 percent interest rate. The goal was to reach 2.5 million resource-poor small-scale farmers through the promotion, access and use of improved farm inputs in order to

increase agricultural productivity for small-scale farmers with one hectare of land through provision of basic farm inputs and mobilization of farmers' resources for re-investment in agriculture. NAAIAP promoted the use of fertilizers and quality seeds among food-deficit farmers. Each farmer received 50 kg of planting fertilizer, 50 kg of top dressing fertilizer and 10 kg of hybrid seed. Farmers were expected to obtain high yields and therefore open up more land for crop production. Other farmers under the same programme received improved planting cassava and sweet potato cuttings. In the case of fisheries, the farmers received assistance in the development and stocking of fishponds and purchase of feeds for the fish. Under the NAAIAP and fisheries programme, farmers also gained access to credit through local banks with funding leveraged by government.

“One of the water-harvesting technologies is the construction of water pans/earth dams which are excavated for community use in agricultural production and raising of tree seedlings for environmental conservation.”

- **Water harvesting for food security (WHFFS):** This project promotes rainwater harvesting to ensure that water is available for irrigation and livestock use, particularly in the ASALs. One of the water-harvesting technologies is the construction of water pans/earth dams which are excavated for community use in agricultural production and raising of tree seedlings for environmental conservation. From 2008 to 2013, a total of 143 400 farm families benefited.
- **Traditional High Value Crops (THVC):** This project included enhanced financial and technical support for the Orphaned Crops Programme. Under these programmes certified seeds for drought-tolerant traditional crops were distributed to farmers for bulking. During the five-year period (from 2007/8 to 2012/13), a total of over 1.6 million farmers benefited from these high-value seeds. In addition, promotion of agricultural produce postharvest processing, storage and value-addition was conducted, for which the Government put up grain stores and provided mobile grain driers in the grain-producing areas of the country. In total, 13 grain storage structures have

been constructed across the 47 counties under this programme – Kirinyaga, Embu, Makueni, Tharaka Nithi (2), Meru, Uasin Gishu (2), Trans Nzoia, Nandi, Narok and Kakamega (2). In terms of the above-mentioned interventions, around 2 397 980 farmers were covered by the four programmes of NMK, NAAIAP, WHFFS and THVC during the last five years (2007/8 to 2012/13).

- **Index-Based Livestock Insurance (IBLI) Project in Northern Kenya:** This project is being implemented in collaboration with a number of commercial partners, which include the Equity Bank of Kenya, UAP Insurance and Swiss-Re (Swiss Reinsurance). The project provides livestock insurance to over 2 000 households in Marsabit Sub-county to help livestock herders sustain their livestock-dependent livelihoods during incidences of drought. The programme uses satellite imagery to determine and predict potential loss of livestock forage and issues insurance pay-outs to participating members when incidences of drought occur. Being a first-of-its-kind initiative in Africa, the project is said to hold enormous potential for benefiting livestock keepers in the region and across the continent. The impact of this pilot project is currently under assessment to determine its benefits before it can be scaled up to other sub-counties in the country.
- **Kenya Adaptation to Climate Change in Arid and Semi-Arid Lands (KACCAL) Project:** This is a World Bank-designed project aimed at improving the ability of participating sub-counties and communities in the arid and semi-arid lands to plan and implement climate change adaptation measures.
- **Kenya Agricultural Carbon Market Programme (KACMP):** This programme is being implemented in Western Kenya and parts of the Rift Valley with assistance from the World Bank. It is aimed at facilitating farmers to adopt sustainable land-management practices to abate carbon emissions while practising agriculture.
- **Strengthening Capacity for Climate Change Adaptation in Land and Water Management Project:** Implemented by KARI and covering approximately 12 000 households, the project is funded by the Swedish International Development Agency (SIDA) and the Kenyan government. The objective is to reduce the impact of climate change and variability on smallholder agriculture through sustainable land and water management technologies and contribute to the improvement of food security and ecosystem resilience in the selected watersheds and sub-counties of Kenya. The project promotes strategic livelihood practices that will enhance carbon storage, ecosystem resilience and sustainable livelihood options.



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- Agricultural Productivity and Climatic Change in the Arid and Semi-Arid Lands of Ijara, Trans Mara and Tana Delta Project:** This is a research project funded by the International Development Research Consortium (IDRC) and the Government of Kenya. The project is implemented by KARI in partnership with the Kenya National Farmers Federation (KENAFF), Kenya Meteorological Department (KMD), Moi University, the Ministry of Agriculture, Livestock and Fisheries and the Ministry of Environment and Natural Resources. The objectives are to:

 - assess and document climatic risks and vulnerabilities of the communities and agrosystems and establish coping strategies in the project area;
 - identify and pilot-test innovations/options/strategies that would work best through participatory approaches;
 - develop information-sharing initiatives on climate change and variability and best-bet adaptation strategies;
 - build capacity of KARI scientists and stakeholders to address the challenges of climate change and variability; and
 - inform and influence the climate change adaptation policy/decision-making process through scientific action and research-based results.
- Green houses pilot project under the Comprehensive Africa Agriculture Development Programme (CAADP):** The programme was launched by the New Partnership for Africa's Development (NEPAD). The pilot activities are implemented in Kwale, Kakamega and Trans Nzoia counties, supported by the COMESA Climate Change Initiative.
- Economic Stimulus Fisheries Project:** The project is aimed at increasing fish production among smallholder fishers by assisting the farmers – and especially youths and school-going children – to develop fish ponds, harvest water from runoffs or rivers and then provide them with fingerlings and feeds. The government produces the fingerling stocks from fisheries research centres, while the private sector provides the feeds. The producers receive training on fish production, consumption and marketing. This has resulted in increases in fish on the market, even in non-traditional fishing areas like the central and eastern parts of the country. Funds for this project are availed through the Economic Stimulus Program and the Youth Enterprise Fund. It serves as a good example of a public-private partnership programme.
- Conservation Agriculture – Sustainable Agriculture for Rural Development (CA-SARD) Project:** The project, funded by the German Ministry of Agriculture and FAO, introduced conservation agriculture into the country on a pilot basis in 2004. Its development objective was to improve food security and rural livelihoods of small-scale and medium-scale farmers in Kenya (and Tanzania) by promoting conservation agriculture. In Kenya, the project was piloted in five districts (Mbeere, Laikipia, Nakuru, Bungoma and Siaya) in two phases. The CA-SARD project advanced conservation agriculture interventions and made enormous progress, specifically by adopting farmer field school (FFS) methods, training support staff and farmers, bringing in advanced conservation agriculture equipment and forging links with the private sector.¹⁵



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The Ministry of Environment and Natural Resources (MENR) has been the designated Ministry responsible for national climate change issues in Kenya. The Ministry hosts the Climate Change Unit. MENR activities have included leading the development of the National Climate Change Policy Framework for Kenya as well as the piloting of NAPAs in selected agro-ecological regions of the country. Other projects include the following:

- Natural Resource Management Programme:** This programme will support the realization of Vision 2030 in general and, specifically, in the areas of environmental planning and governance, with the assumption that an enabling policy and regulatory framework for environmental and natural resource management, including climate change, is developed and implemented with a poverty orientation.

15 Conservation agriculture as practised in case studies of Kenya's Laikipia and Siaya Districts.

- **National Environmental Education and Awareness Initiative:** The aim is to educate and raise awareness of environmental challenges among all Kenyans and to encourage the participation of all stakeholders in environmental conservation and management. This includes education on issues such as deforestation and climate change.
- **Kenya Water Security and Climate Resilience Project:** This \$155 million project funded by the World Bank aims to achieve water security and climate resilience for economic growth and development. The project has two main objectives – to increase availability and productivity of irrigation water for project beneficiaries; and to enhance the institutional framework and strengthen capacity for water security and climate resilience for the country. While investments in water are required for economic growth and development, water infrastructure in the form of large dams will act as a buffer against the most severe hydrological shocks (including floods and droughts), as well as address food insecurity and low agricultural productivity.

5.3.2 Development Agencies and Non-Governmental Organizations

African Conservation Tillage Network (ACT): The core mandate of ACT is the mainstreaming of conservation agriculture through stakeholder engagement. ACT is implementing a number of CSA and conservation agriculture projects not only in Kenya, but across Africa. In Kenya some of the main projects being implemented include the following:

- **Agro-Ecology-Based Aggradation-Conservation Agriculture (ABACO) Project:** The project is targeting the establishment of site-specific innovations that rely on site-specific agro-ecology and aggradation measures to restore soil productivity in order to improve food security in semi-arid Africa. This project is targeting local research and extension institutions designing or promoting conservation agriculture in semi-arid regions of Africa, including Kenya. ABACO principles are rehabilitation of degraded soils, increased water productivity, intensifying agro-ecological functions, innovation support systems and institutionalizing of enabling policies and market conditions.



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- **Upscaling Conservation Agriculture for Increased Resilience to Climate Change and Improved Food Security in Eastern and Southern Africa (CA4CCFS –ESA):** This project is conducted in collaboration with NORAD with the aim of strengthening resilience to climate change, thereby contributing to increased food security among rural communities of Eastern and Southern Africa.

International Fund for Agricultural Development (IFAD): IFAD has implemented a number of CSA-related programmes in Kenya since the beginning of 2015. These include:

- **Kenya Cereals Enhancement Programme (KCEP):** KCEP has been implemented by the MALF with funding from the EU and supervision by IFAD. The programme will run for seven years (2015-2021) covering eight counties, with the objective of contributing to national food security by increasing the production of targeted cereal staples (maize, sorghum, millet and pulses), and thereby increasing the incomes of smallholder farmers in the production areas.
- **Kenya Climate Resilient Agricultural Livelihoods Programme (KCALP):** The programme will run from 2015 until 2022 with the aim of increasing the resilience of smallholder agricultural livelihoods in the ASALs. The programme will be run in partnership with the IGAD Climate Prediction and Applications Centre (ICPAC), the EU and FAO.

IGAD Climate Prediction and Applications Centre (ICPAC): The Greater Horn of Africa, like many parts of the tropics, is prone to extreme climate events such as droughts and floods. In an effort to minimize the negative impacts of extreme climate events, the World Meteorological Organization (WMO) and the United Nations Development Programme (UNDP) established the regional Drought Monitoring Centre (DMC) in Nairobi and a sub-centre in Harare in 1989, covering 24 countries in the eastern and southern African sub-region. In 2003, DMC Nairobi became a specialized institution of the Intergovernmental Authority on Development (IGAD) and was renamed the IGAD Climate Prediction and Applications Centre (ICPAC). The participating countries of ICPAC are Burundi, Djibouti, Eritrea, Ethiopia, Kenya, Rwanda, Somalia, Sudan, Uganda and the United Republic of Tanzania. The Centre is responsible for climate monitoring, prediction, early warning and

applications for the reduction of climate-related risks in the Greater Horn of Africa. ICPAC's main objective is to contribute to climate monitoring and prediction services for early warning and mitigation of the adverse impacts of extreme climate events on various socioeconomic sectors in the region, such as agricultural production and food security, water resources, energy and health. The early-warning products enable users to put mechanisms in place for coping with climate- and weather-related risks in the Greater Horn of Africa.

“ICPAC’s main objective is to contribute to climate monitoring and prediction services for early warning and mitigation of the adverse impacts of extreme climate events on various socioeconomic sectors in the region, such as agricultural production and food security, water resources, energy and health.”

The Centre also promotes capacity-building for both climate scientists and users. ICPAC provides regular regional climate advisories, including 10-day, monthly and seasonal climate bulletins as well as timely early-warning information on evolving climate extremes and associated impacts.¹⁶ At present, some key projects being implemented by IGAD ICPAC and its partner institutions include the following:

- UNDP-IGAD is aimed at strengthening the capacity of IGAD in building resilience in the Horn of Africa, which involves development of an integrated early-warning system that links livestock, rangelands, food security and DRR into one;
- Planning for Resilience in East Africa through Policy, Adaptation, Research and Economic Development (PREPARED), which is aimed at mainstreaming climate-resilient development planning and programme implementation into the East African Community (EAC) and its Partner States’ development agenda.

World Vision Kenya (WVK): WVK is implementing a project on Adapting to Climate Change in Arid and Semi-Arid Lands (KACCAL) in Kenya. This project supports poor and vulnerable communities in the Mwingi District of the Arid and Semi-Arid Lands (ASALs) of Kenya to enhance their adaptive capacity to drought (and

16 Drought Monitoring and Early Warning: ‘concepts, progress and future challenges’ (WMO – No. 1006)



floods). This is being achieved through enhanced access to and management of water for irrigation; promotion of indigenous crops that are more resilient to anticipated climate change (and improved access to markets for these crops); promotion of livestock varieties that are more suited to the climate; and development and promotion of alternative livelihood opportunities (such as beekeeping activities). The project is also strengthening climate risk management planning and the capacity of district-level planners to mainstream climate change into district-level sectoral development plans. The project was initiated jointly by the United Nations Development Program (UNDP) and the World Bank. The UNDP component focuses primarily on enhancing the adaptive capacity of key stakeholders in the district of Mwingi, complementing the support given by the World Bank in four other districts of Garissa, Turkana, Marsabit and Malindi. The partners involved are GEF, World Vision Kenya and the Ministry of Agriculture, Livestock and Fisheries.

Care Kenya: Care Kenya is implementing the Climate Change Vulnerability and Adaptive Capacity project in Garissa County within the framework of the Kenya Adaptation Learning Programme (ALP). The Adaptation Learning Programme for Africa is working to increase the capacity of vulnerable households in Garissa County to adapt to climate change and variability. As part of its community-based adaptation process, ALP conducted participatory research and analysis on climate change vulnerability and adaptive capacity with six communities

in Garissa County in 2011. Based on this analysis, the project explores the impacts of climate change on livelihoods in pastoral and agropastoral households, using the villages of Shant'abaq and Kone to illustrate the realities of climate change in vulnerable communities. It also aims to highlight the existing adaptive capacity within these communities and the issues that constrain people's ability to put this capacity into action. The programme is also engaging with county-level government stakeholders and civil society organizations active in the area. CARE Kenya has moreover conducted studies on the measurement of GHG emissions with the aim of proving that agricultural GHG emissions can be reduced while still improving agricultural productivity, food security, incomes and livelihoods. Similar work has been done by CCAFS, FAO, ICRAF and Vi Agroforestry, among others.

“Adaptive capacity to drought (and floods) is being achieved through enhanced access to and management of water for irrigation; promotion of indigenous crops that are more resilient to anticipated climate change; promotion of livestock varieties that are more suited to the climate; and development and promotion of alternative livelihood opportunities.”

Food and Agriculture Organization of the United Nations (FAO): FAO Kenya has been implementing a number of food security and resilience related projects across the country. In addition, along with providing general support to the upscaling of conservation agriculture and conservation agriculture with trees through the Kenya Conservation Agriculture with Trees Task Force, FAO has been implementing a number of CSA or CSA-related projects in recent years, which include the following:

- **Climate-Smart Natural Resources Management Project:** This project is being implemented in partnership with the Ministry of Agriculture, Livestock and Fisheries and with funding from the United States Department of Agriculture (USDA). The main objective of the project is to build the capacity of the Ministry in climate change adaptation and mitigation technologies through the development of training materials and dissemination of information. The major outcome has been the development of a comprehensive climate-smart agriculture manual with illustrations of a set of agricultural technologies targeting smallholder farmers as well as ward-level agricultural extension agents in supporting climate-smart practices in the counties. The manual focuses on key CSA practices such as conservation agriculture, integrated soil fertility management (ISFM), water harvesting, greenhouse farming, herd management, biogas production and beekeeping. It is well illustrated, with easy step-by-step instructions that focus on what to do, how to do it and why. Other countries in eastern Africa could use the manual as an example of what can be done in their own countries to support knowledge on key CSA practices.
- **The Mitigation of Climate Change in Agriculture (MICCA¹⁷) project:** Launched in 2010, this project aims to make agriculture more climate-smart by supporting developing countries in their efforts to mitigate climate change in agriculture. The programme focuses on the gradual transformation of agricultural productivity through implementation of climate-smart agricultural policies and practices. The objective is to develop a selection of CSA practices for smallholder farmers based on participation and consultation at multiple levels. The pilot site in Kenya is being implemented within the framework of the East Africa Dairy Development Project (EADD), a regional dairy development programme led by Heifer International

aimed at providing quantifiable evidence that climate-smart agricultural practices can mitigate climate change, improve farmers' lives and improve the capacity of local communities to adapt to climate change. The assessment conducted with the EX-ACT tool demonstrates the mitigation potential of the EADD-MICCA project based on identified CSA practices. It was found that adopting better feeding and breeding practices, developing agroforestry and improving the quality of pasturelands can lead to the storage of 663 689 MT CO₂e in a period of 20 years, which is equivalent to 4 MT CO₂e/ha/yr. Training and demonstrations to facilitate upscaling and adoption of identified activities were also organized. A volunteer farmer-trainer approach for scaling-up CSA was used in the project.

“The major outcome has been the development of a comprehensive climate-smart agriculture manual with illustrations of a set of agricultural technologies.”

- **Supporting Developing Countries to Integrate the Agricultural Sectors into National Adaptation Plans (NAPs):** This is part of an FAO-UNDP project to support eight developing countries to integrate agriculture into National Adaptation Plans. The project is an extension of FAO's and UNDP's work being conducted through the NAP Global Support Programme and will allow FAO to bring in its extensive work-based experience through the Framework Programme for Climate Change Adaptation (FAO-Adapt) to assist countries with their respective agriculture sectors in the NAP processes. The project is funded through the International Climate Initiative (ICI). This project builds directly onto the country's first National Adaptation Planning Meeting for the Agricultural Sector held in September 2013, which discussed food production challenges and opportunities presented by climate change. The project adds value to the Knowledge and Capacity-Building Working Group, and intends to help Kenya move forward in operationalizing the NCCRS, which aims to integrate climate change strategies into its vision of transforming into an emerging economy.

17 <http://www.fao.org/climatechange/micca/en/>

18 <http://www.viagroforestry.org>

Box 2: FAO MICCA Project in Kenya

Each of MICCA's pilot projects is a collaborative effort carried out in partnership with national and international partners within the framework of larger agricultural development projects. In Kenya, the MICCA pilot project team worked with smallholder dairy producers in the Rift Valley. The pilot project was undertaken within the framework of the East Africa Dairy Development Project (EADD) being implemented in Kenya, Rwanda and Uganda. In this pilot project, the MICCA Programme, in close collaboration with ICRAF and smallholder dairy producers, used a life-cycle analysis and other approaches to propose and test technical alternatives for reducing the climate change 'footprint' of the dairy industry. As part of its work to support farmers in raising climate-smart cattle and to improve the overall greenhouse gas balance of the farming systems, the project looked at ways of enhancing fodder production, improving manure and livestock management systems to produce fertilizer and biogas, and lessening the GHG emissions from the whole farm systems.

Dissemination of CSA practices and knowledge in the pilot site applied an innovative farmer-led extension approach that relied on volunteer farmer trainers. Farmer trainers hosted demonstration plots used to train other farmers on CSA practices. The main CSA practices demonstrated included:

- improved fodder production (Napier grass, Rhodes grass, Brachiaria grass, Columbus grass, forage sorghums, desmodium, dolichos lab and lucerne (alfalfa);
- agroforestry and fodder trees (*Calliandra*, *Leucaena trichandra*, tree lucerne, *Sesbania sesban*, *Grevillea* and *Croton*);
- tree nursery establishment and management for both fodder shrubs and agroforestry trees;
- better manure management through composting and biogas generation; and
- feed conservation by baling hay and making silage.

During the implementation period of three years, 23 volunteer farmer trainers directly reached about 1 500 farmers belonging to 32 farmer groups. These farmer groups were formed as the main training units while volunteer farmer trainers for each group were selected through the Kapcheno Dairy. In addition, with the technical support of the MICCA pilot project, 32 group tree nurseries were established with 90 000 seedlings and two biogas digesters were constructed.

Source: FAO Mitigation of Climate Change in Agriculture Project
<http://www.fao.org/climatechange/micca/87066/en/>



Vi Agroforestry (Vi-skogen): Vi Agroforestry¹⁸ is a Swedish development cooperation organization fighting poverty and improving the environment through tree planting, with a focus on the Lake Victoria Basin in East Africa. The foundation of Vi Agroforestry's work is sustainable agriculture and agroforestry – growing trees alongside crops and livestock. In Kenya, Vi Agroforestry is implementing the Agriculture Carbon Project (KACP) funded by the World Bank. The project has developed a method to estimate the climate benefits of sustainable agriculture land management practices (SALM). This is done by measuring sustainable agriculture potential for carbon storage, especially in the soils. The method was developed to be suitable for smallholder farmers who farm on degraded soils. In 2011, the method of sustainable agriculture land management was approved by one of the most well-known standards in the voluntary carbon market, the Verified Carbon Standard. The project was the first carbon project in Africa for land and agriculture.

5.3.3 Research and Academic Institutions

Kenya Agriculture and Livestock Research Organisation (KALRO formerly KARI): KALRO has been undertaking numerous research projects that address CSA in one way or another, but very few of them specifically address the topic of CSA in totality. KALRO has conducted research and demonstrated drip irrigation, integrated soil fertility management, drought-resistant and short-season varieties, improved livestock, multipurpose legumes and water harvesting, among others. KALRO has also partnered with international research organizations such as the CGIAR institutes, with which it has undertaken CSA pilot projects such as the climate-smart agriculture villages being piloted in Makeni, Kenya. Other projects include FACASI and SIMLESA, in which it is partnering with organizations such as CIMMYT. Other projects it has been involved in include Drought Tolerant Maize for Africa (DTMA); Developing promising strategies using 'climate change analogue locations' in eastern and southern Africa (CALESA) Project; and the Western Kenya Rain-fed Rice Project – Adaptability of New Rice for Africa (NERICA).

“KALRO has conducted research and demonstrated drip irrigation, integrated soil fertility management, drought-resistant and short-season varieties, improved livestock, multipurpose legumes and water harvesting, among others.”



International Maize and Wheat Improvement Centre (CIMMYT): CIMMYT has been implementing the Sustainable Intensification of Maize-Legume Cropping Systems for Food Security in Eastern and Southern Africa (SIMLESA) project. CIMMYT is also undertaking, or is involved in, a number of other projects with a CSA component, which include the Conservation Agriculture and Smallholder Farmers in Eastern and Southern Africa (CASFESA) funded by EU-IFAD; the Farm Mechanization and Conservation Agriculture for Sustainable Intensification (FACASI) project; and the Adoption Pathways Programme.

World Agroforestry Centre (ICRAF): ICRAF is one of the 15 centres of the CGIAR Consortium and has its headquarters in Nairobi, Kenya. ICRAF is promoting conservation agriculture with trees in Kenya and other eastern African countries. ICRAF stresses the importance of growing trees and shrubs on farms and in rural areas, combined with crops and livestock to create profitable, productive, healthy and sustainable landscapes. Over three billion people worldwide use fuelwood and other solids for cooking, boiling water, light and heat. Planting the right trees provides easy access to fuel and reduces pressure on forests. In Kenya, along with training in agroforestry, ICRAF is supporting research on agroforestry-related issues, including those relating to climate change adaptation and mitigation such as REDD+.

CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS): CCAFS seeks to overcome the threats to agriculture and food security in a changing climate, exploring new ways of helping vulnerable rural communities adjust to global changes in climate. Climate-smart agriculture is one of

the flagship programmes of CCAFS and the focus here is on how to transition to climate-smart agriculture at a large scale. CCAFS has been supporting a number of CSA initiatives in Kenya. These include the establishment and piloting of climate-smart villages in Western Kenya. As part of these climate-smart villages, CCAFS has also piloted the measurement of greenhouse gas emissions and carbon sequestration from different practices, supported adoption of drought-tolerant crop and livestock varieties, and supported access to climate information and decision-support tools for farmers.

5.3.4 Private Sector

East African Farmers Federation (EAFF): EAFF is implementing the Strengthening the Capacity of Farmer Organizations in Climate-Smart Agriculture Approaches project. The project is being undertaken in four countries in Eastern Africa, including Kenya and Uganda, through EAFF member organizations in these countries. The membership of these organizations are different forms of farmer groups including co-operative societies, district farmer associations, women organizations, commodity associations or community-based organizations. Through the relevant structures, EAFF intends to reach over 7 000 individual small-scale farmers directly through the project activities. These activities include capacity building on appropriate CSA practices for different agro-ecologies as well as development of guidelines on implementation of different CSA practices.

Ndume Agricultural Machinery Manufacturers: While not directly involved in the promotion of climate-smart agriculture in Kenya, Ndume has supported the import and local manufacture of various types of machinery for conservation agriculture. These include direct seeders (no-till planters) and rippers. A number of other companies are involved in the import and/or manufacture of equipment for CSA-related practices such as conservation agriculture, greenhouse agriculture and irrigation.

5.4 Key Policies and Institutions Relevant to CSA in Kenya

Kenya was among the first non-least developed countries (LDCs) in Africa to develop government plans for responses to climate change across key economic sectors. Climate change has acquired the status of a key national

policy challenge in the country and the Government of Kenya has in recent years developed a number of policies and strategies related to agricultural development and climate change adaptation and mitigation. Some of these policies and strategies include the Strategy for Revitalizing Agriculture (SRA, 2004-2015); Kenya Vision 2030; Agricultural Sector Development Strategy (ASDS, 2010-2020) as well as the National Climate Change Response Strategy (2010) and National Climate Change Action Plan (2013). The ASDS 2015-2020 is a revised strategy for revitalizing agriculture that incorporates Kenya's Vision 2030 objectives. Most recently the Government of Kenya has launched the National Climate-Smart Agriculture Programme to be jointly implemented by the Ministry of Environment and Natural Resources and the Ministry of Agriculture, Livestock and Fisheries. The Programme outlines six strategic priorities as sources of Kenya's agricultural development and growth in a changing climate.

Agricultural Sector Development Strategy (ASDS, 2010-2020): The ASDS sets out a detailed plan to “position the agricultural sector as a key driver for delivering the 10 percent annual economic growth rate envisaged under the economic pillar of Vision 2030”. The strategy outlines agricultural policy goals and provides guidance to the public and private sectors' efforts in overcoming the outstanding challenges facing Kenya's agricultural sector¹⁹. The strategy has included climate adaptation as a priority for the country.

Agricultural Sector Medium-Term Investment Plan (MTIP, 2010-15): This is the medium-term framework for investments in growth and food security through increased agricultural productivity and trade and is fully aligned with the ASDS and CAADP. The aim, just like that of the ASDS, is to achieve enhanced productivity in key subsectors through targeted investments. The MTIP has six pillars:

- Increasing productivity, commercialization and competitiveness
- Promoting private sector participation
- Promoting sustainable land and natural resource management
- Reforming delivery of agricultural services
- Increasing market access and trade
- Ensuring effective coordination and implementation

19 Kenya's Agricultural Sector Reforms 2013, Global Agricultural Information Network (GAIN) report

The MTIP considers major climate-related issues including early-warning systems and climate change adaptation measures while differentiating investments according to high rainfall, semi-arid and dry areas.

The Constitution of Kenya (2010): The Constitution promotes sustainable approaches to natural resource management and establishes the right to food security and to live in a clean and healthy environment, while emphasizing sustainable and productive management of land resources (e.g. maintenance of tree cover in 10 percent of the country's land area). It introduces two levels of government with specific functions for each level, thus providing guidance on climate change response and CSA implementation.

Kenya Vision 2030 Blueprint: This represents the country's development blueprint for 2008-2030, identifying agriculture as a key sector to boost economic growth rates. It aims to transform smallholder agriculture from low-productivity subsistence activities to an innovative, competitive agricultural sector. Operationalized in a series of five-year Medium-Term Plans (MTP), the current MTP (2013 to 2017) being the second one, puts emphasis on devolution socio-economic development, equity and national unity. As part of Vision 2030, the Government of Kenya recognizes that emissions are likely to increase as development progresses and that there is need for mitigation actions to support the country to transition to a low-carbon economy that supports Kenya's contribution to global GHG mitigation actions.

National Climate Change Response Strategy (NCCRS) (2010): The strategy calls for accelerated investment in weather information systems, research on drought-tolerant crop varieties, soil and water conservation, water harvesting and strengthening integrated pest-management systems, among others. Kenya has already established itself as a leader in agricultural mitigation by hosting a variety of innovative land-based carbon projects, as well as biogas development programmes. The strategy considers climate change as a crosscutting issue that will be mainstreamed into the planning process, both at national and county level and in all sectors of the economy. The NCCRS recommends that climate change legislation be enacted to support the mainstreaming of climate change at national level. The Kenyan Climate Change Bill passed in 2012 has resulted in the establishment of the National Climate Change Authority as the entity that would coordinate activities across sectors and guide the implementation of the NCCRS.

National Climate Change Action Plan (NCCAP) (2013-2017): This was developed through a consultative process that engaged stakeholders across government, the private sector and civil society. Agriculture is a key part of the NCCRS, reflecting the National economy's reliance on agriculture as well as the vulnerability of the sector.

CAADP Compact: The Comprehensive Africa Agriculture Development Programme has been endorsed by the African Heads of State and Government as a framework for restoration of agriculture growth, food security and rural development in Africa. CAADP incorporates CSA through the sustainable intensification and resilience of production systems and the reduction of greenhouse gas emissions caused by agriculture. Kenya's CAADP Compact commits the government to implementing the common vision of the sector, as described in the Agricultural Sector Development Strategy (ASDS), to address the agricultural development agenda in the country.

“Kenya has already established itself as a leader in agricultural mitigation by hosting a variety of innovative land-based carbon projects, as well as biogas development programmes.”

Nationally Appropriate Mitigation Actions (NAMAs): Under the Low Emission Capacity Building (LECB) Programme, financed by the EU, Germany and AusAID, Kenya is receiving support to formulate Nationally Appropriate Mitigation Actions (NAMAs), as well as establishing the underlying data collection systems (i.e. national GHG inventory systems and monitoring, reporting and verification systems). Kenya has identified conservation agriculture and agroforestry as two areas in the agriculture sector for development into NAMAs. These are currently under development.

National Irrigation Policy (2014): The focus is on expansion of the land under irrigation and includes issues around water harvesting and storage, use of waste water, exploitation of groundwater and promotion of sustainable models for commercial irrigated farming.

National Climate-Smart Agriculture Programme (2015-2030): The vision for the CSA Programme is a “climate-resilient and low carbon growth sustainable agriculture that ensures food security and contributes to national development goals in line with Kenya's Vision

2030". The programme identifies four key objectives and six key result areas. The objectives are to:

- contribute to increasing productivity and commercialization of agriculture-related value chains with gender considerations;
- enhance efficiency and resilience of the social, environmental and economic aspects of agriculture and food systems to climate change impacts;
- contribute to low carbon development through/by lowering national emission intensity in agriculture and food systems; and
- strengthen institutional coordination for effective implementation of the climate-smart agriculture programme at national and county levels.

Key result areas are improved productivity and incomes; building resilience and mitigation co-benefits; value chain integration, research for development innovations; improving and sustaining agricultural advisory services; and improved institutional coordination. Some activities planned within the programme include the promotion of improved crop and livestock varieties; irrigation development; food storage infrastructure; integrating CSA into farmer field schools and the education

curriculum; implementation of REDD+; vulnerability mapping; development of early-warning systems; value-chain enhancement; and CSA awareness raising. The programme also proposes the establishment of a national CSA Steering Committee chaired by the Permanent Secretary in charge of climate change in the Ministry of Agriculture, Livestock and Fisheries.

Draft National Forest Policy (2015): The overall goal of this policy is the sustainable development, management, utilization and conservation of forest resources and equitable sharing of accrued benefits for present and future generations of the people of Kenya. The policy includes an objective on “enhanced management of forest resources for conservation of soil, water biodiversity and environmental stability”.

East African Community Climate Change Policy (EACCCP): As part of the East African Community, Kenya is subject to the East African Community Climate Change Policy (EACCCP). This policy emphasizes the need for an integrated, harmonized and multi-sectoral framework for responding to climate change among EACs five member states, which also include Burundi,



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Rwanda, Tanzania and Uganda. The policy is aimed at:

- strengthening meteorological services and improving early-warning systems;
- increasing preparedness for disaster risk management;
- scaling-up of efficient use of water and energy resources;
- irrigation;
- crop and livestock production;
- protection of wildlife and key vulnerable ecosystems such as wetlands, coastal, marine and forestry ecosystems;
- improving land use, soil protection, tourism, infrastructure and human settlement; and
- intensifying the control of diseases, vectors and pests.

Mitigation measures prioritized in this policy include afforestation, reforestation, promotion of energy efficiency, efficient crop and livestock production systems, efficient transport systems and waste management, while capturing opportunities in emission reduction in the region. The blueprint emphasizes that such actions should not compromise the region's social and economic development. In order to implement this policy, each partner state shall develop a national policy, strategies and institutional arrangements to operationalize the provisions made in this policy.

International climate change policy regime: Kenya is a signatory to a number of multilateral agreements related to climate change, land degradation and sustainable

development as a whole. This includes the United Nations Framework Convention on Climate Change (UNFCCC), the Convention on Biological Diversity (CBD) and the United Nations Convention to Combat Desertification (UNCCD). In June 2015, Kenya submitted its Intended Nationally Determined Contribution (INDC) to the UNFCCC. Kenya's INDC represents the country's targets to contribute to global GHG mitigation efforts and represents a 30 percent emissions reduction target from the business-as-usual scenario by 2030. The INDC includes plans to increase forest cover to 10 percent of the national land area, improve sustainability of agriculture and reduce reliance on wood fuel. The INDC is also conditional to international finance and technological support. The INDC integrates components from Kenya's Climate-Smart Agriculture programme.

“Mitigation measures prioritized in the East African Community Climate Change Policy include afforestation, reforestation, promotion of energy efficiency, efficient crop and livestock production systems, efficient transport systems and waste management, while capturing opportunities in emission reduction in the region.”



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Table 2: Summary of the key CSA-related policies in Kenya

Policy	Year	Intention or goal
Constitution of Kenya	2010	In line with CSA principles, the Constitution promotes sustainable approaches to natural resource management, establishes the right to food security and to live in a clean and healthy environment, while emphasizing sustainable and productive management of land resources (e.g. maintenance of tree cover in 10 percent of the country's land area).
Kenya's Economic Blueprint – Vision 2030	2008-2030	Represents the country's development blueprint for 2008-2030, identifying agriculture as a key sector to boost economic growth. It aims to transform smallholder agriculture from low-productivity subsistence activities to an innovative, competitive agricultural sector. Operationalized in a series of five-year Medium-Term Plans (MTP), the current MTP (2013 to 2017) places emphasis on devolution, socio-economic development, equity and national unity.
Agricultural Sector Development Strategy (ASDS 2010 – 2020)	2010	Provides a framework for transforming agriculture into a modern and commercially viable sector. The current plan puts emphasis on addressing challenges of food and nutrition security, overdependence on rain-fed agriculture, youth unemployment, poverty reduction and high cost of inputs, among others. The strategy mentions climate change adaptation as a priority for the country.
Agricultural Sector Medium-Term Investment Plan	2010-2015	The aim, like that of the ASDS, is to achieve enhanced productivity in key subsectors through targeted investments. The MTIP considers major climate-related issues including early-warning systems and climate change adaptation measures while differentiating investments according to high rainfall, semi-arid and dry areas.
National Climate Change Response Strategy (NCCRS)	2010	Adaptation measures suggested for agriculture in NCCRS include changes in land use, restoration of degraded ecosystems, provision of downscaled weather information and farm inputs, water harvesting for irrigation, protection of natural resource base (soil and water conservation techniques), research and dissemination of superior (drought-tolerant, salt-tolerant, pest- and disease-resistant) crops.
National Climate Change Action Plan (NCCAP)	2013-2017	Within this framework, Kenya planned for a low-carbon Nationally Appropriate Mitigation Actions (NAMAs) pathway for energy, transport, industry, agriculture, forestry and waste management. Selected practices for mitigation in the NCCAP included restoration of forest on degraded lands, REDD+, agroforestry, increase of tree cover to 10 percent of the total land area and conservation tillage.
Sessional Paper №3 of 2009 on National Land Policy	2009	Encourages sustainable intensification of land use in high-potential, densely populated areas, through the application of efficient methods, improvement of the condition and productivity of degraded lands, and through application of cost-effective irrigation methods.
Farm Forestry Rules	2009	Require farmers to establish and maintain farm forestry (i.e. woodlots) on at least 10 percent of every agricultural land holding. Likewise, species of trees or varieties planted must not have adverse effects on water sources, crops, livestock, soil fertility and the neighbourhood and must not be of an invasive nature. Moreover, agriculture authorities at the district (now county) level are required to identify land at risk of degradation and establish measures necessary for ensuring its conservation, including the planting of trees.
Draft National Irrigation Policy	2014	The objectives of the policy are to expand land under irrigation; increase agricultural water-harvesting and storage capacities; promote water-harvesting, use of waste water and exploitation of groundwater for irrigation; build capacity for generation and utilization of irrigation research, innovation and technology; and promote and adopt an integrated approach to sustainable commercial irrigation farming.
National Agricultural Research System Policy	2012	The policy aims to establish an integrated national agricultural research system that guides and supports the development of an innovative, commercially oriented and modern agricultural sector; design a novel funding mechanism for agricultural research that ensures adequacy, predictability and sustainability of research; and formulate a comprehensive framework for partnership building and consultation, and collaboration with stakeholders.
CAADP Compact		Kenya's CAADP Compact commits the government to implementing the common vision of the sector, as described in the Agricultural Sector Development Strategy (ASDS), to address the agricultural development agenda in the country.
National Climate-Smart Agriculture Programme	2015	The vision for the CSA Programme is a "climate-resilient and low carbon growth sustainable agriculture that ensures food security and contributes to national development goals in line with Kenya's Vision 2030".
Draft National Forest Policy	2015	The overall goal is sustainable development, management, utilization and conservation of forest resources and equitable sharing of accrued benefits for present and future generations of the people of Kenya.

Source: Kenya National Climate-Smart Agriculture Programme, 2015

Box 3: Farmer field schools (FFS) in climate-smart agriculture

A farmer field school in the context of climate-smart agriculture is a farmer-centered ecological agriculture initiative that empowers farmers to take the lead role in building their resilience/adaptation to climate change, sustainably increasing their productivity and meaningfully contributing to mitigation of climate change. FFS appreciates farmers' wealth of knowledge and experiences in coping with extreme climatic variabilities. FFS seeks to integrate indigenous and new, ecologically sound innovations to increase adaptation and mitigation.

5.5 Gender Issues for CSA in Kenya

As in many other developing countries, the majority of the poorest groups are composed of women, the disabled and those living with HIV/AIDS. In many cases CSA programmes have targeted these groups and aimed to mainstream gender into their activities. As a result, CSA activities implemented have had an overall positive impact on social equity and gender equality among the target group/s as well as broader communities in general. Many of the activities have had a direct positive impact on gender equality in the form of enhanced food resources and incomes, especially for women who constitute approximately 75 percent of the rural agricultural labour force in the country.

One of the main impacts of CSA practices on gender equity and women's empowerment is linked to changes in field labour requirements. Farm forestry for example, has had a positive impact on increases in the forest cover and greening of the farmlands. This has reduced the felling of forests and now women can fetch firewood closer to their homes. Another example is that the use of herbicides and mulching in conservation agriculture are in many cases done by men, thus freeing up time for women. Reduction in weeding due to some CSA practices such as integrated pest management also means less time in the fields for women.

Overall, more research into the gendered impacts of CSA practices in the country is needed. In addition, the role of youth in conservation agriculture and other climate-smart practices (not to mention agriculture in general) has been mentioned as a means to promote the practice while at the same time supporting youth livelihoods.



In a study conducted as part of the FAO MICCA Project in Kenya, it was noted that new technologies aimed at improving farm productivity may require additional finances through credit facilities for their effective implementation. While access to credit between men and women in this case did not differ significantly, it was found that male-headed households more often bought farm inputs with available agricultural finance while female-headed households more often bought livestock for keeping as a household asset; the indications being that male-headed households were already more asset secure and could thus afford to make investments into improving farm productivity.

Another finding from the project was that most households have secure land tenure, which could serve as security for investment into longer-term improved practices such as planting agroforestry and fodder trees and other climate-smart practices. However, men are the custodians of land title deeds with limited user-rights extended to women and youth, thereby making it difficult for them to make decisions on issues such as tree planting, which were used for farm boundary marking rather than sustainable land improvements. The study found that women-headed households often prefer to plant trees on farm boundaries rather than within the farm. This was attributed to the smaller farm sizes of women-headed households when compared with male-headed households.

Box 4: Women's Success Story from the FAO MICCA Project in Kaptumo, Kenya

A group of women in the Kamotony area were worried that they would be unable to provide for their children in the face of hard economic times. They formed a group but did not quite know what they could gainfully do together. According to them, they would dejectedly ask themselves, “*Sasa sisi tutafanya nini kutoka hali hii?*” (What can we do to emancipate ourselves from this situation?).

When they interacted with the MICCA project staff and were trained in various climate-smart agricultural practices, it became clear what they would do — they would establish a group tree nursery.

The income they generated from selling indigenous tree seedlings, tea leaves, ornamental trees and garden flowers from the tree nursery gave them a financial stepping-stone for investing in dairy production. They have increased milk production after applying the knowledge gained through training on improved fodder production and dairy cattle management. This has allowed them to access credit facilities, which has enabled them to make further investments in their farm enterprises.

Unlike in the past, they are now able to pay their children's school fees without difficulty. Some even use the proceeds from milk sales to make monthly contributions to the National Health Insurance Fund for their family members. In addition, the application of composted manure onto their kitchen gardens and passion fruit has contributed to improved household nutrition.

The women mentioned that the adoption of CSA practices has generally reduced their stress levels and enhanced cohesion in their homes. The success of this group has made it easier for them to adopt some practices such as agroforestry, which ordinarily would be difficult for cultural reasons. Apart from being a source of firewood and herbs, the planting of trees has freed up time they used to spend collecting firewood, which they now use productively in other activities.

Looking forward, this women's group will use the income derived from milk sales not only to build social capital as a dairy management group, but also to increase their financial capital through regular table banking.

Source: FAO Mitigation of Climate Change in Agriculture Project
<http://www.fao.org/3/a-i4396e.pdf>



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5.6 Constraints to CSA Adoption in Kenya

In Kenya the adoption of CSA practices is hampered by a general lack of awareness, understanding and confidence on the part of farmers and technical/extension workers as to the principles and viability of some CSA practices compared with conventional practices, as well as a lack of government policy thrust to drive the countrywide promotion and adoption of CSA. Other constraints are described below.

At times there is a lack of quality agricultural inputs, particularly in rural communities where quality agrochemicals, farm implements and equipment, seeds, tree seedlings and other necessary inputs for the adoption of certain climate-smart agriculture practices are either not readily available or are unaffordable. In many cases, inputs and implements of low quality are used, resulting in sub-optimal results which ultimately do not favour the promotion of climate-smart practices.

Small farm sizes, lack of available labour and limited access to seed and planting materials were noted as challenges hampering some climate-smart practices, in particular farm fodder production. These have a direct influence on the extent of adoption of specific fodder crops and the area put under fodder crop production by farmers. These factors need to be considered when

promoting climate-smart agriculture practices involving fodder production. Small plot sizes moreover have an influence on practices such as agroforestry, as a farmer with a small plot of land may not be able to plant many trees within the farm but may rather prefer to plant trees on the farm boundaries so as to reduce tree-crop competition for resources. Research into appropriate tree species for small farm sizes would be useful.

“Small farm sizes, lack of available labour and limited access to seed and planting materials were noted as challenges hampering some climate-smart practices, in particular farm fodder production.”

A lack of general and technical knowledge on climate-smart practices is another challenge among farmers. For example, in agroforestry some farmers have cited challenges of poor seed germination as well as seedling damage by pests and diseases. With proper training on nursery management, these challenges can be overcome. Knowledge and adoption of practices such as biogas is also low and households require technical capacity building and financial support to implement such practices successfully.



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The prevalence of the open grazing system presents a challenge for the adoption of a number of CSA practices including biogas, intercropping and composting. The main issue is that the open grazing system makes manure management a time- and labour-intensive undertaking. While benefiting from carbon credit is not the main goal of climate-smart agriculture, the lack of financial incentives for undertaking climate-smart practices does not bring any benefits to those trying to promote the three principles. There is a need for clear mechanisms for farmers to benefit financially from practices such as agroforestry.

While Kenya has a good agricultural extension network, it is often hampered by a lack of financial capacity. The extension system itself needs to build capacity in climate-smart agriculture to enable extension workers to provide the required support to farmers.

As with other countries in the sub-region, many of the projects related to CSA in Kenya are being implemented in a fragmented manner, with few linkages with one another. This type of implementation arrangement is unsustainable in the long run and does not have the intended large-scale impact on adoption of practices and the national contribution to the three CSA pillars. The relatively short to medium-length duration of these projects also does not promote long-term sustainability and wide-scale adoption.

Many appropriate policy frameworks exist for wide-scale implementation of climate-smart agriculture; however, one of the main challenges is the availability of sufficient funding. Taking the Kenya INDC as an example, the funds required to implement the programme are estimated at as high as US\$40 billion (while Ethiopia's are estimated at \$150 billion).

While CSA is now a commonly used term among climate change and agricultural development practitioners across the world, there is a lack of integration of climate-smart agriculture into tertiary education curriculums across Kenya. In addition, the level of awareness and knowledge about climate-smart agriculture among the broad public, including media practitioners, is low.

Institutional coordination on climate-smart agriculture is still lacking, despite the presence of a number of CSA-related policies, programmes and plans.

5.7 Opportunities for CSA Promotion in Kenya

There are a number of opportunities for the promotion of CSA technologies and practices in Kenya. As with the challenges, the main pull factor for adoption of climate-smart practices relates to issues of direct socio-economic benefit for the farmers, including improved food security, improved incomes, alternative energy sources (in the case of biogas) as well as improved availability of fuelwood and construction material (in the case of agroforestry).

The opportunity to reduce costs and increase profits related to farm produce is also an important factor, with, for example, manure management practices providing for reductions in the purchase of organic fertilizer, multiple use of manure, including for biogas, of which the slurry can be used for fruit and vegetable gardens as well as fish ponds.

“The main pull factor for adoption of climate-smart practices relates to issues of direct socio-economic benefit for the farmers, including improved food security, improved incomes, alternative energy sources as well as improved availability of fuelwood and construction material.”

Devolution of national government functions provides an opportunity for the integration of CSA into county-level plans, programmes and policies.

Collective farmer actions, for example integrated savings and lendings and shared community resources, provide opportunities for joint resource mobilization and implementation of CSA practices such as community seed production and community forestry.

There is a strong base of human capital in the agricultural sector, including extension workers, development workers and private sector stakeholders. Kenya's extension service has been estimated to have over 5 400 staff members across the country, thus providing a base from which CSA extension services can be provided to smallholder farmers in different parts of the country. This is complemented by a number of well-equipped training and demonstration centres that can be used to train and demonstrate CSA practices and principles.

Kenya has a well-developed and distributed research infrastructure covering all agro-ecological zones in the country. This is complemented by the presence of a large number of international research organizations such as ICRAF and CIMMYT, who have regional offices and are conducting research in many parts of the country. This provides an opportunity for large-scale research on CSA practices in different parts of the country.

Kenya's establishment of a Climate Change Unit (CCU) responsible for the coordination and implementation of climate change activities presents an opportunity to mainstream climate change adaptation and mitigation across all sectors, including agriculture.

Kenya's policy-making environment and receptive policy-makers are conducive to the formulation and implementation of climate change policies and strategies in the country, as well as other policies and strategies related to CSA, such as the National Climate-Smart Agriculture Programme. Local knowledge and coping strategies at grassroots level can be tapped and utilized to support adoption of improved practices.

There is huge unexploited irrigation potential through water harvesting and irrigation among smallholder farmers and in the construction of large dams in drought-prone areas.

“Kenya has a wide range of communication technologies that can be used to pass on the message of climate change to a wider audience.”

Carbon markets bring opportunities for carbon trading, especially for smallholder farmers who would like to invest in forestry-related activities.

There is huge potential to engage Kenya's youth in agriculture, particularly in the production of high-value crops and commercial farming. The youth are also open to new technologies and are likely to adopt innovative climate-smart practices quicker than the elderly.

Kenya has a wide range of communication technologies that can be used to pass on the message of climate change to a wider audience. Examples are the 'Shamba Shape Up' TV programme (aired by Citizen TV every Sunday at 2 p.m.) and the 'Seeds of Gold' newspaper pullout in national print media every Saturday, which provide advice on improving agricultural production.

Many international organizations, development partners, research organizations and donors are becoming involved in CSA and are indicating their willingness to support Kenya's climate change initiatives.



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COUNTRY STUDY 3: UGANDA

6

6.1 Overview of the Agriculture Sector in Uganda

Uganda has a total land area of 241 551 km² of which about 30 percent is highly degraded. The country has 14 agro-ecological zones (AEZs) with different farming systems determined by soil types, climate, landforms as well as socio-economic and cultural factors. Farming systems cover a wide range of activities, including the production of traditional cash crops (coffee, sugar cane, cotton and tea) and food crops (banana, cassava, maize, sorghum, finger-millet, rice, potatoes and beans) and keeping livestock (cattle, goats, pigs and poultry). Agriculture supports the livelihoods of 73 percent of households in the country and contributes 20.9 percent of the national GDP and 80 percent of foreign currency earnings, yet approximately 95 percent of the farmers are smallholders with landholdings averaging two hectares. Fisheries also play a major role in the food system and economy of the country.

Over the years poor agricultural land management and increased occurrence of extreme weather events have escalated land degradation. Consequently, the sector is

characterized by low agricultural productivity, limited use of external inputs (such as improved seeds, agro-chemicals and fertilizer), poor land management practices using rudimentary production tools which contribute to low agricultural productivity and land degradation, and high post-harvest losses currently estimated at 30 percent.

“Over the years poor agricultural land management and increased occurrence of extreme weather events have escalated land degradation.”

Population growth rates are relatively high at 3.2 percent per annum, which accelerates land fragmentation, soil nutrient depletion and unsustainable production practices. Large human populations tend to degrade highland ecosystems, while animals degrade marginal lands such as the cattle corridors semi-arid ecosystem, which stretches from Rakai in southern Uganda to Karamoja in the north east of the country, largely caused by overgrazing. The

rapid human population growth has led to increased demand for food, energy and other social services. This has led to the expansion of land under agriculture (shifting cultivation), resulting in loss of vegetation. No deliberate efforts have been made by the people to increase production through improved agricultural practices. Typically, farm operations are by conventional tillage, which involves land clearing followed by ploughing (normally twice before planting), often using ox-drawn ploughs or hand hoes. Widespread clearing of forests, continuous cultivation, burning of crop residue and overgrazing have exposed land to agents of degradation, thus raising serious concerns about conventional tillage. Land degradation is also evident in the drylands of the cattle corridor of Uganda, where land management is threatened by overgrazing by local and mobile pastoralist herds, deforestation by excessive use of fuelwood resources and poor and inappropriate agricultural practices on marginal land.

Forests also play a major role in the economy of Uganda; however the impacts of climate change and climate change-induced activities will directly and indirectly reduce the contribution of the sector to Uganda's development. Reduction in forest products such as

timber, poles and fuel (direct) and services such as habitat, agricultural productivity and watershed protection, will lead to a reduction in the contribution of forests to the development of Uganda.

Uganda has been described as one of the most vulnerable countries to climate change. Unreliable rainfall, frequent drought, precarious water supply, seasonal fires and endemic poverty are all major climate-related issues. Already it has been observed that during the period 1900 to 2000, the frequency of years with significantly below normal rainfall increased from once every 20 years to as often as once every five years, with severe impacts on agricultural production. In addition to changes in rainfall patterns, consistent warming trends have been observed across the country and climate projections indicate that this trend is likely to continue. As with other eastern African countries, agriculture in Uganda is the major source of greenhouse gas emissions, currently contributing 57 percent of national emissions. Figure 6 shows the major sources of GHG emissions within the agriculture sector of Uganda. The largest proportion of emissions result from enteric fermentation, followed by manure left on pasture, both of which are related to livestock production.

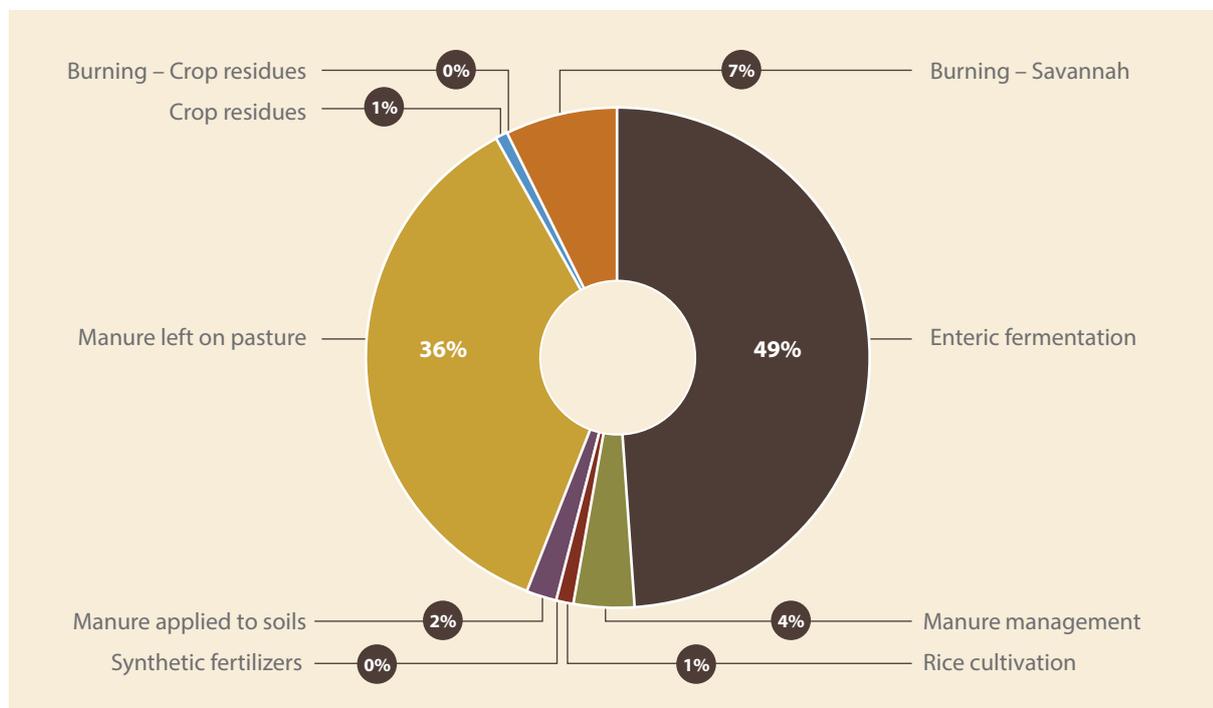


Figure 6: GHG emissions in Ugandan agriculture in 2012 (FAOSTAT, 2015)

6.2 CSA Technologies and Practices: Adoption and Implementation

Over the past few years, with the support of local and international partners, Uganda has been aiming to integrate climate change into its national development agenda. A number of technologies and practices have been promoted and used by different stakeholders across the country in order to support climate change adaptation, mitigation and food security. These technologies include conservation agriculture, agroforestry, soil and water conservation (through terracing, strip and contour cultivation, ridge and tie ridging practices), water harvesting for crops and livestock, intercropping, livestock management, improved fodder production, biogas and watershed management.

- **Conservation agriculture:** The vast majority of farmers in Uganda establish crops by digging with hand hoes or ploughing with oxen or tractors. Burning of crop residues and clearing of new land for agricultural expansion are also common. As a result soil erosion, loss of top soil, soil crusting and water logging are common among Ugandan farmers. In order to address these problems, various conservation agriculture principles are being promoted in Uganda, including minimum soil disturbance through the use of planting basins and animal and mechanized ripping (e.g. the Ndume tractor ripper of Kenya and Magoye animal-drawn ripper of Uganda); crop rotation including the integration of legumes; mulching and crop residue retention; and herbicide use. In total, the country is targeting having 250 000 hectares under conservation agriculture by the year 2016 and about one million farmers practising conservation agriculture by 2025.
- **Agroforestry:** In Uganda this is commonly conducted on hilly terrain primarily as a means to reduce erosion. The practice involves integrating trees and/or shrubs together with crops and/or livestock on the same piece of land. In many cases farmers plant trees which provide multiple benefits such as fuelwood, shade, fodder, fruit and timber along with soil conservation benefits. Alley planting of trees in between crop rows is a form of agroforestry. Some of the commonly used trees for this purpose in Uganda include *Calliandra*, *Gliricida* and *Sesbania* species which are grown with maize or finger millet. Agroforestry is often promoted along with practices such as apiculture, which can provide additional incomes as well as

promote sustainability and productivity of agro-ecosystems.

- **Water harvesting for crops and livestock:** Rainwater harvesting is practised in many parts of Uganda as a means of supplying water for domestic use, livestock and crop production. The harvesting mechanisms include large dams, small check dams, ponds lined with PVC and diversion channels to direct ground runoff where it is needed. Innovative methods such as roof and underground rainwater harvesting have also been promoted, for example the Rubangano Roof Rainwater harvesting system. To complement the water-harvesting initiatives, micro-irrigation technologies such as low-cost drip irrigation have also been promoted.
- **Soil and water conservation practices:** These are widely practised across the country and include a variety of conservation activities such as planting of grasses and shrubs, terracing (for example Fanya Juu terraces), riparian buffers as well as infield rainwater harvesting.
- **Integrated soil fertility management (ISFM):** This involves practices such as compost production, integrated nutrient management, crop residue management and the planting of nitrogen-fixing legumes and trees in and around crop fields (for example lab-lab around maize fields).



Livelihood diversification: As with other countries in Eastern Africa, livelihood diversification is promoted as a key practice for increasing resilience and reducing vulnerability to climate change. Livelihood diversification activities include integrated aquaculture, apiculture, fruit production and use of alternative poultry such as guinea fowl and ducks.

Biogas and biomass fuel production: Biogas is promoted as a means of managing manure from which a large amount of GHG emissions emanate, as well as for domestic energy production. Biogas projects in Uganda are being implemented by a number of research and development organizations such as SNV and Heifer International. To make the most out of biogas systems, there may be a need to combine them with sustainable intensification of livestock as well as animal confinement to ensure efficient collection of manure. At the same time, biogas slurry can be used as an organic fertilizer to manage soil fertility. Most biogas systems are small-scale and used for domestic lighting and cooking by households connected to the biogas digester.

“To make the most out of biogas systems, there may be a need to combine them with sustainable intensification of livestock as well as animal confinement to ensure efficient collection of manure.”

6.3 CSA Stakeholders, Programmes and Projects in Uganda

6.3.1 Government Programmes

The Ministry of Agriculture, Animal Industry and Fisheries (MAAIF): The Ministry has undertaken a number of CSA-related projects in various districts in collaboration with other ministries such as the Ministry of Water and Environment (MWE) and other national and international development partners. Some projects being implemented include the following:

- **Enabling Environment for Sustainable Land Management (SLM) to Overcome Land Degradation in the Uganda Cattle Corridor:** This project is funded by the Global Environment Facility through UNDP. The objective is to provide land users and managers with the enabling policy, institutional and capacity environment for effective adoption of SLM within the complexity of the cattle corridor production system. The project integrates some CSA practices in six districts of Uganda – Nakasongola, Nakaseke, Lyantonde, Sembabule, Kamuli and Kaliro. Some activities involve the promotion and creation of an enabling environment for sustainable charcoal production.
- **Enhancing Adaptation to Climate-Smart Agriculture Practices in the Farming Systems of Uganda:** This project, which is funded by COMESA and UNDP, aims to enhance CSA adoption in five districts of Uganda –



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Namutumba, Bugiri, Budaka, Busia and Buyende. The project's main objectives are to increase productivity through the sustainable management of soil and water resources and build capacity of farmers and extension officers at local government level in an effort to develop a climate change resilient society and generally increase the number of farmers using climate-smart agriculture practices. The project is implemented by the Ministry of Agriculture, Animal Industry and Fisheries in collaboration with the National Agricultural Research Organization (NARO), Ministry of Water and Environment, Ministry of Trade, Industry and Cooperatives and the local government staff in the participating districts. Activities include supporting farmers in the planting of 500 000 agroforestry trees, establishing climate-smart gardens at a minimum of 30 schools and training teachers and students to manage these gardens, as well as developing a monitoring and evaluation system for CSA.

- **Agricultural Technology and Agribusiness Advisory Service SLM Initiative:** This World Bank-funded project supports the National Agricultural Research Organization (NARO) and National Agricultural Advisory Services (NAADS) in two districts of Nakasongola and Lira. Along with aiming to improve agricultural productivity, the project also looks at enhancing the sustainability and resilience of agricultural production systems to land degradation and climate risks, as well as expanding the land area under improved land and water management practices.
- **The National Climate-Smart Agriculture Task Force (NCSATF):** The task force is supported by UNDP and FAO Uganda and is chaired by the Ministry of Agriculture, Animal Industries and Fisheries. The NCSATF is a consortium of partners who are either practising or funding CSA activities in the country. The technologies promoted include conservation agriculture, agroforestry, integrated watershed management, natural resources management, sustainable land management and rangeland management.
- **Uganda Strategic Sustainable Investment Framework on Sustainable Land Management (U-SIF SLM) Project:** The project aims to promote cooperation among key sectors to improve natural resource-based livelihoods and other ecosystem services. The U-SIF

SLM is a multi-sector national initiative spearheaded by the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) – the focal ministry for the UNCCD and CAADP. The SIF is aimed at providing an integrated cross-sectoral approach to investing in solutions to crosscutting SLM challenges. It is also aimed at scaling-up and mainstreaming SLM into the centre of national development agendas. The development objective is to strengthen sector cooperation in order to halt, reverse and prevent land degradation/desertification and to mitigate the effects of climate change and variability. The U-SIF SLM has a 10-year (2010-2020) horizon organized into two phases: Phase I (2010-2015) and Phase II (2015-2020). The ultimate goal is to increase food security through increased production, water and environmental management, restoration of ecosystems in the dry areas and reduction of deforestation.

Ministry of Water and Environment

- **Strengthening Climate Information and Early Warning Systems for Climate Resilient Development and Adaptation to Climate Change in Uganda:** The project aims to ensure the establishment of information infrastructure on weather, climate and disaster management. The project is implemented by the Uganda National Meteorology Authority and the Department of Water Resources Management in the Ministry of Water and Environment, in partnership with the Ministry of Agriculture, Animal Industry and Fisheries, Office of the Prime Minister and other relevant partners at national and district level.
- **Strengthening Sustainable Environment and Natural Resource Management, Climate Change Adaptation and Mitigation in Uganda Project:** This project is aimed at enhancing sustainable conservation and utilization of natural resources, climate change adaptation and mitigation, and strengthening the capacities of institutions to undertake sustainable environment and natural resources actions. The project is implemented by the World Wide Fund for Nature (WWF) in collaboration with the Ministry of Water and Environment, Ministry of Agriculture, Animal Industry and Fisheries, UNDP Small Grants Scheme and the International Union for Conservation of Nature (IUCN). Activities have included the establishment of tree seedling nurseries, installation of biogas digesters and capacity building in the sustainable production and utilization of charcoal.

6.3.2 Development Agencies and Non-Governmental Organizations

United Nations Development Programme (UNDP): UNDP is supporting a number of CSA-related programmes and projects in Uganda in partnership with MAAIF and MWE. These include:

- **The Green Charcoal Project – Addressing Barriers to Adoption of Improved Charcoal Production Technologies and Sustainable Land Management Practices through an Integrated Approach:** The main goal of the Green Charcoal Project is to develop and promote improved charcoal production technologies and sustainable land management practices through an integrated approach. The project is implemented by the Ministry of Energy and Mineral Development (MEMD) in collaboration with the Ministry of Water and Environment, National Forestry Authority, Nyabyeya Forestry College and the four districts of Kiboga, Kiryandongo, Mubende and Nakaseke.
- **The Low Emission Capacity Building (LECB) Project for Uganda:** This project focuses on strengthening Uganda’s technical and institutional capacity in the development of greenhouse gas (GHG) inventory systems and nationally appropriate mitigation actions (NAMAs) with built-in measuring, reporting and verification (MRV) systems. Within this project, agricultural NAMAs are also being developed related to upland rice and livestock, while an energy NAMA related to efficient cook stoves is also being proposed. The project is funded by the German Government, the European Union and UNDP and is implemented in partnership with the Ministry of Water and Environment’s Climate Change Unit.

Food and Agriculture Organization of the United Nations (FAO): FAO is implementing a number of CSA-related programmes in Uganda. A key component of this work is the support to the National CSA Task Force to conduct CSA awareness-raising and promotion activities across the country. This has included support in the development of awareness-raising material, conducting awareness-raising events, giving demonstrations, development of a conservation agriculture field manual, and conducting various studies and assessments related to climate-smart agriculture. As with Ethiopia and Kenya, this work is conducted with funding from COMESA through the project “FAO Technical Support to the COMESA-EAC-SADC Programme on Climate Change Adaptation and Mitigation in Eastern and

Southern Africa”. Recently FAO has been supporting the development of Uganda’s climate-smart agriculture programme as well as the climate-smarting of Uganda’s national agricultural investment plans. FAO has also supported a study on the mainstreaming of climate change into the second national development plan. Other key projects include:

- **Agricultural Adaptation to Climate Change in the Central Cattle Corridor Project by FAO Uganda:** The project has two main funding partners – the European Union and the Government of Belgium. This FAO project is implemented within the framework of the Global Climate Change Alliance (GCCA) and aims to strengthen the resilience of the rural population and the agricultural production systems in the central part of the cattle corridor, and to build the capacities of communities, commercial farmers and the Government of Uganda to cope with climate change. The GCCA in Uganda is ensuring ownership and alignment by supporting the implementation of the National Adaptation Programme of Action (NAPA), particularly its components of water for production, drought adaptation, tree planting and climate-compatible development planning. To enhance Uganda’s climate change knowledge and capacities, the GCCA is concentrating on strengthening the institutional capacity of the Climate Change Unit of the Ministry of Water and Environment, increasing climate change awareness and knowledge in selected departments and districts, and ensuring that good adaptation practices are integrated into policies and plans. The partners in the project are the Ministry of Water and Environment, the joint Water and Environment Sector Working Group and the Ministry of Agriculture, Animal Industry and Fisheries.

“To enhance Uganda’s climate change knowledge and capacities, the GCCA is concentrating on strengthening the institutional capacity of the Climate Change Unit of the Ministry of Water and Environment, increasing climate change awareness and knowledge in selected departments and districts, and ensuring that good adaptation practices are integrated into policies and plans.”



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- **Supporting Developing Countries to Integrate the Agricultural Sector into National Adaptation Plans (NAPs):** This is part of an FAO-UNDP project to support eight developing countries to integrate agriculture into their National Adaptation Plans. The project is an extension of FAO's and UNDP's work being conducted through the NAP Global Support Programme and will allow FAO to bring in its extensive experience based on work through the Framework Programme for Climate Change Adaptation (FAO-Adapt) to assist countries with their respective agriculture sectors in the NAP processes. The project is funded through the International Climate Initiative (ICI). The project is aligned with the priorities of the Climate Change Unit, which include building the technical capacity of the Unit, the development of a climate change policy and the development of mainstreaming guidelines for harmonizing national action on climate change adaptation and mitigation.
- **Trans-boundary Agro-Ecosystem Management Programme (TAMP):** The TAMP project is aimed at combating land degradation through the use of

CSA-related practices and ensuring sustainable land productivity. The project is implemented using funding channelled through FAO and has adopted the Farmer Field School (FFS) approach. The farmers are greatly motivated as, for decades, they have witnessed their soils being washed into the Kagera River and now they see a real possibility of reducing this loss. The FFS approach has enabled them to implement a number of CSA practices within the framework of integrated watershed management. A few examples of practices being promoted and conducted within TAMP are shown in Annexure 4. These include the Katongelo Watershed Management Project (Kyebe); the Kiruhura Watershed Management Project (Sanga); and the Rubangano Watershed Management Project (Mwizi).

Climate and Development Knowledge Network (CDKN): CDKN is supporting a project on the economic assessment of climate change in Uganda commissioned by Uganda's Climate Change Unit. The project aims to make regional-scale historical and future climate change projections of annual, seasonal and monthly rainfall and near-surface temperatures under two scenarios from the IPCC's Fifth Assessment Report.

Vi Agroforestry (Vi-skogen): In Uganda, Vi Agroforestry has supported tree planting, undertaken agroforestry and climate change-related training, supported agroforestry awareness campaigns in schools and promoted more efficient energy sources.

Uganda Faiths Network on Environmental Action (UFNEA): This organization aims to use a faith-based approach in strengthening local adaptive capacity in sustainable land management. Since the launch of UFNEA in October 2013, the network has implemented several CSA-related activities, which include promotion of tree

planting, environmental awareness campaigns, energy-saving initiatives (e.g. improved cook stoves) and water harvesting training, among others. UFNEA has also been promoting and conducting training on Farming God's Way (FGW) and Islamic Farming (IF) to small-scale farmers in a number of communities in Uganda with the aim of increasing agricultural productivity and improving peoples' livelihoods. IF and FGW have similar technological and management aspects and both promote conservation agriculture practices based on religion. See Box 5 below for more details on UFNEA and their work.

Box 5: Faith-Based Climate-Smart Agriculture Activities by UFNEA Uganda

The Uganda Faiths Network on Environmental Action (UFNEA) is a voluntary, not-for-profit network of faith groups and faith-based organizations in Uganda that are committed to protecting the environment and promoting sustainable development and agriculture, according to their own beliefs, teachings and practices. UFNEA draws its inspiration from the Alliance of Religions and Conservation (ARC), a UK-based charity that works with 11 major faiths worldwide to help them develop environmental programmes based on their beliefs, practices and teachings.

In 2010, ARC began working with Christian, Muslim and Hindu groups in sub-Saharan Africa on sustainable land and water management. As a result, in 2012, 27 faith groups from 11 countries launched long-term plans on the environment – actions that each faith group pledged to take over the next seven years. These faith groups included a number of Ugandan faith-based organizations, which in 2013 formed a faith network in Uganda to enable development of closer partnerships with the Ugandan government and other stakeholders to harness efforts in sustainable land and water management. UFNEA's mission is "to inspire faith groups in Uganda into strengthening awareness and action on the environment and sustainable agriculture". UFNEA's partners include MAAIF, ARC, the Jane Goodall Institute and the Kenya Organization for Environmental Education.

Selected UFNEA activities include:

- Tree growing by each of the founding members and their various constituencies, i.e. churches, mosques, target areas and organizations.
- Environmental sermons in places of worship, particularly on Fridays and Sundays, to encourage the faithful to engage in environmental activities in their homes and indeed their places of influence.
- Environmental awareness workshops at village level, in schools and tertiary institutions.
- Energy conservation initiatives such as fireless cookers, improved stoves and briquette making to conserve energy by reducing the amount of charcoal and firewood used at household level.
- Water conservation initiatives, e.g. bio-sand filter, water-harvesting techniques, etc.
- The faith-based Education for Sustainable Development tool kit launch at a workshop. The kit has been reviewed by the National Curriculum Development Centre and a teachers' workshop was held in October 2014.
- Conservation agriculture, Farming God's Way and Islamic Farming: In efforts to carry out agricultural extension, UFNEA has been promoting and conducting training in Farming God's Way (FGW), Islamic Farming (IF) and conservation agriculture to small-scale farmers in a number of communities in Uganda with the aim of increasing agricultural productivity and improving peoples' livelihoods. The principles remain the same across the three techniques: no ploughing (minimal disturbance of the soil or no tillage); mulching, to minimize water loss; no burning of crop residues; and practising crop rotations.

The Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA): ASARECA is implementing a number of climate-smart agriculture-related projects in the Eastern Africa sub-region, which include:

- **Sustainable Agricultural Water Productivity Enhancement for Improved Food and Nutrition Security in Eastern and Central Africa Project.** This project is implemented by institutions in seven of the 11 ASARECA member countries. The project goal is to increase efficient use of water to improve food and nutrition security. Through the project, ASARECA seeks to use climate-smart agriculture initiatives to diversify water management benefits in the sub-region. ASARECA is also building on this project with a new initiative that seeks to strengthen the capacity of agricultural research for development and training institutions in Eastern and Central Africa to empower communities to adapt to climate change. Unlike most ASARECA projects, which are limited to 11 member countries, this 14-month initiative will stretch beyond the ASARECA sub-region to the COMESA region. It was conceived in a pan-African partnership between ASARECA and COMESA and is informed by the rapid change in climatic conditions leading to risks such as crop failure, livestock deaths, loss of income, food insecurity, malnutrition and conflicts, which have a direct and immediate impact on the livelihoods of the populations.
- **ASARECA Sorghum Project:** The goal of this project is to enhance productivity and competitiveness of the sorghum-legume system in the semi-arid areas of Eastern and Central Africa (ECA), with a focus on promoting sustainable sorghum-legume system

technologies and innovations by smallholder farmers in the semi-arid areas of Eritrea, Sudan, Kenya, Tanzania and Uganda. Sorghum, being a perennial crop, is a good example of a conservation agriculture crop.

Forum for Agricultural Research in Africa (FARA): FARA is implementing the Climate-Smart Agriculture Project. The project is funded through a grant from the Norwegian Agency for Development Cooperation (NORAD) to implement a two-year project aimed at promoting adoption of CSA strategies that enhance agricultural productivity for improved food security and poverty reduction. More importantly, the project will provide a formidable platform for strengthening capacities and emphasizing the need for increased awareness of CSA in African Research for Development (AR4D) policies, processes and strategies at national and regional levels. The project essentially deals with research and analytical work efforts to enhance the scientific and political economy understanding of local circumstances and driving factors for enhanced and sustained adoption of CSA. At the conclusion of the project, it is envisaged that the increased capacity among the National Agriculture Research Stations (NARS) will contribute to the realization of the CAADP objectives as well as the scaling-up of successful CSA initiatives to other parts of the region.

“The FARA Climate-Smart Agriculture Project will provide a formidable platform for strengthening capacities and emphasizing the need for increased awareness of CSA in African Research for Development (AR4D) policies.”



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The European Union (EU) Delegation in Uganda:

The EU Delegation in Uganda is supporting many programmes which have CSA components. In future, all EU programmes will ensure that climate change is mainstreamed into development and food security projects in the country. These include:

- The Global Climate Change Alliance Project being implemented through FAO;
- Peace Recovery Development Programme (PRDP) in Karamoja (in partnership with other development partners);
- Karamoja Improved Livelihoods Programme (KAILP); and
- Northern Uganda Agriculture Livelihoods Recovery Programme (ALREP).

The Cooperative League of the United States of America (CLUSA) Uganda:

CLUSA Uganda is implementing a three-year programme in 13 districts of Uganda – Alebtong, Masindi, Pader, Apac, Dokolo, Kole, Lira, Otuke, Oyam, Kaberamaido, Kiryandongo, Amolator and Agago. The programme aims to increase food security by increasing agricultural productivity of maize and beans (including soybeans) through the introduction of conservation farming (CF) cropping practices into smallholder farming systems. The project, which is funded by the United States Department of Agriculture (USDA), intends to reach 60 000 direct beneficiaries. CLUSA is also collaborating with the Ministry of Agriculture and has been involved in other CSA-related projects such as the Sustainable Intensification of Maize-Legume Cropping Systems for Food Security in Eastern and Southern Africa (SIMLESA).

Participatory Ecological Land-Use Management (PELUM) Uganda:

PELUM is part of a 10-country association of CSOs in Eastern and Southern Africa²⁰ whose vision is to empower communities to utilize their natural resources sustainably. PELUM Uganda is a network of organizations promoting ecological land-use management through capacity building, research and advocacy for improved community livelihoods; as well as several interventions to address the knowledge gap in smallholder farmers' adaptation to climate change and build the capacity of member organizations with regard to climate change. A first sensitization workshop for member organizations on climate change was held in 2009. Since then PELUM Uganda has supported three member organizations – Volunteer Efforts for Development Concerns (VEDCO), Uganda Environmental Education Foundation (UEEF) and Caritas Nebbi – to pilot small grants projects in Nakasongola, Mukono and Nebbi districts on community-based adaptation to climate change.

A study on enhancing small-scale farmers' livelihoods and food security through climate change adaptation was conducted in 2010/11. In 2012, a publication on building community resilience to climate change through sustainable agriculture was developed. A video documentary on building community resilience to climate change impacts was produced in 2013. Public dialogues on climate change have been ongoing since 2011, with numerous engagements in consultation processes towards the development of climate change policy. In 2013/14, the development of Community-Managed Climate-Smart Sustainable Agriculture (CSSA) models was addressed.



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A teacher at Sekulo Primary School in Uganda's Budaka District instructs pupils on digging of planting basins



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Ndume tractor ripper manufactured in Gilgil, Nakuru County, Kenya

20 www.pelum.org

Since then, the CSSA model has been piloted by three other member organizations – International Institute for Rural Reconstruction (IIRR), Ecological Christian Organisation (ECO) and War on Want NI – in Teso, Karamoja and Gulu districts respectively.

6.3.3 Research and academic institutions

National Agricultural Research Organization (NARO): NARO's piloting of conservation agriculture supported by FAO began in 2001 in 16 micro catchments in the Mbale and Palisa districts. NARO introduced cover crops for increased soil fertility and later addressed herbicide issues. NARO-AEATRI has been involved in developing prototypes, and testing and manufacturing new equipment such as hand hoes, animal-drawn implements and processing equipment. However, poor links with the market and high production costs posed serious problems in stepping up to large-scale production. Other challenges encountered at the time included weed management, difficulties encountered in changing farmer mindsets to avoid crop residue burning, low turnout for training sessions, a lack of appropriate farm implements, use of poor-quality inputs such as herbicides, crop pests and diseases and land tenure disputes.

“NARO-AEATRI has been involved in developing prototypes, and testing and manufacturing new equipment such as hand hoes, animal-drawn implements and processing equipment.”

NARO has also implemented the Agriculture Technology and Agribusiness Advisory Services (ATAAS) project funded through GEF. The technology promoted by the project was that of plant basins adopted from South Africa. These basins were meant to collect rain water and conserve it. Thus, there would be residual water and also nutrient retention in the soil. The basin was big enough to allow three seeds per basin of maize and six of beans. This was found to increase production by 30 percent and this as an incentive for more farmers to engage in conservation agriculture. The basin had the added advantage of breaking hardpan created in soils.

Training was also conducted in rip lines technology. The advantage of rip lines is the precision of nutrient application. This allows crops to maximize fertilizer usage. Farmers were also trained in crop rotations and associations. Overall, the project found that conservation

agriculture does well in areas that are not heavily degraded. In such areas, the basins and rippers come in handy. For the rippers, farmers depend on each other's oxen. The oxen owners rip the rows at a fee and they use the money to buy feeds for the oxen. NARO is also working on a number of other national and regional CSA programmes and projects, including the SIMLESA project.

CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS): CCAFS is implementing the Policy Action for Climate Change Adaptation (PACCA) programme in Tanzania and Uganda, with various collaborations. These include:

- IITA, CIAT, ILRI, Bioversity, ICRAF, CCAFS East Africa;
- public bodies (MAIF, MWE, climate change agencies);
- private bodies (media, NGOs, civil society, private sector); and
- local government, farmer associations and producers.

PACCA's overall objective is to use interdisciplinary science-based recommendations to influence policy implementation that encourages adoption of climate-smart agricultural practices across multiple scales through creation of a learning alliance and engagement with national policy decision-makers.

Makerere University: Makerere University established a Centre for Climate Change Research and Innovation (MUCCCRI) in the Agriculture Department to carry out research and innovation and also to mainstream the teaching of climate change into the University curriculum. The centre recently reviewed a short climate change course for parliamentarians. The centre works closely with FAO, NARO, MAAIF, MWE, FANRPAN and other development partners. It is anchored in four pillars: Climate Change Science; Climate Change Mitigation; Climate Change Adaptation; and Policy and Outreach.

6.3.4 Private Sector

Balton Uganda: Balton Uganda is a member of the Balton group of companies. The agrochemical division is involved in supporting CSA initiatives by promoting water-harvesting techniques, irrigation and greenhouse farming. Benefits of these three initiatives include increased crop production on a small area, higher yields per unit area and less water usage per unit area. Balton Uganda provides additional support through herbicide sales and promotions for use in conservation agriculture, promotion of water troughs for livestock in the ASALs and crop production techniques by means of aquaponics and hydroponics. Another initiative is the promotion



of a dam-liner material used in man-made dams for water harvesting and storage. The dam liner is made of high-density polythene and comes in various sizes. The advantage is that the material can be re-used and the dams can be of any size.

Uganda National Farmers Federation (UNFFE): UNFFE has been conducting a number of CSA-related programmes. These include:

- **Promotion of climate-smart agriculture among farmers to increase their resilience to the impacts of climate change.** This project was piloted in Nakasongola and Sironko districts. The project is funded by Agriterria with an overall objective of raising awareness among grassroots farmers of the adverse consequences of climate change and the possible mitigation and adaptation technologies available, or which can be developed and adapted, with strong emphasis on adaptation.
- **Scaling out climate-smart agriculture in Eastern Africa.** The project is funded by NORAD through the East Africa Farmers Federation (EAFF). The goal is to contribute to strengthening the capacity of farmer organizations in Eastern Africa by addressing food insecurity. The project is implemented in the districts of Mukono and Buikwe.
- **Agroforestry project.** This project, funded by the Swedish Cooperative Centre, is implemented in four districts around the Lake Victoria basin. The project has four components – climate change; lobby and advocacy; HIV and AIDS; and institutional development. The main objective is to build capacity of UNFFE and four of its members in the four components, for them to be able to serve their members better by conducting training on HIV/

AIDS and establishing demonstration farms at the local level, demonstrating the different agroforestry and climate-smart approaches so that other farmers in the vicinity can learn from the demonstrations. This project is being implemented in Mayuge, Bugiri, Iganga and Mukono districts.

- **Regional farmers' dialogues on climate change for evidence-based engagement with policy-makers on climate change and food security.** Funded by the Royal Norwegian Embassy, the overall objective of this project is to raise awareness among farmers about climate change and its impacts and to build an evidence-based advocacy agenda on climate change and food security.
- **Enhancing the capacity of UNFFE to effectively influence the policy environment for Climate Change Adaptation.** Funded by USAID Uganda, the objectives of this project are to:
 - Build farmers' resilience to climate change by raising awareness of the adverse consequences of climate change and the different adaptation technologies available; and building the capacity of farmers' organizations and grassroots farmers to respond accordingly;
 - Increase farmers' awareness of existing policies, legislation and programmes for supporting agricultural value chains and climate change adaptation; and
 - Strengthen the capacity and effectiveness of farmers in policy advocacy and engagement relating to policies affecting agricultural and/or climate change adaptation.

Rural Enterprise Development Services (REDS): REDS Uganda implemented the Conservation Agriculture Regional Programme (CARP) from 2010 to 2014. Funded by the Royal Norwegian Government in collaboration with COMESA, REDS works closely with MAAIF in order to promote conservation agriculture in Uganda. CARP is a regional project being implemented in Uganda, Malawi, Kenya and Tanzania. The project goal is to support climate change adaptation priorities, including conservation agriculture, in the COMESA-EAC-SADC region. The project had a target of 35 000 conservation agriculture adopters in 10 districts and 60 000 personnel trained on conservation agriculture by 2015. By November 2014, results of REDS work showed that 28 000 farmers had adopted and are practising conservation agriculture and 58 000 farmers had been trained in conservation agriculture in the 10 target districts. The main focus is on training farmers and lead farmers to enhance the adoption of conservation agriculture.



6.4 Key Policies and Institutions Relevant to CSA in Uganda

FAO recently assisted the country to conduct a study aimed at supporting the mainstreaming of climate change into the Second National Development Plan for the country, which will run from 2015-2020. FAO has also assisted Uganda to conduct workshops aimed at supporting the mainstreaming of climate-smart agriculture into the country's Agriculture Sector Strategic Framework (ASSP, 2015-2020) based on the Agriculture Sector Development Strategy and Investment Programme (DSIP, 2010-2015). Overall there is still a significant need for Uganda to raise the level of awareness among stakeholders and build the capacity of various sectors to mainstream climate change into national and sector development plans. Most recently the Government of Uganda launched the National Climate-Smart Agriculture Programme to be jointly implemented by the Ministry of Agriculture, Animal Industry and Fisheries and the Ministry of Water and Environment. The Programme outlines six strategic priorities as sources of Uganda's agricultural development and growth in a changing climate.

Uganda CAADP Compact: In the CAADP Compact, Uganda committed itself to three principles – firstly, agriculture-led growth as a main strategy; secondly, the pursuit of a six percent average annual growth rate for the agricultural sector; and thirdly, to increase the share of the national budget allocated to the agricultural sector to reach the eventual target of 10 percent. Therefore, at least for the foreseeable future, agriculture will continue to be one of the most important sectors in Uganda's economy.

Uganda National Climate Change Policy (2012): Uganda developed a draft National Climate Change Policy in 2012. The draft policy recognizes the need for both adaptation and mitigation actions and paved the way for the establishment of a Climate Change Unit within the Ministry of Water and Environment. The main objective of the National Climate Change Policy is to ensure that all stakeholders address climate change impacts and their causes through appropriate measures, while promoting sustainable development. The policy also aims to create the enabling framework for addressing climate change in the country. The focus of the policy is on adaptation, mitigation and research, as well as cross-cutting areas of capacity building, education and

training. The policy addresses sector-specific adaptation and mitigation priorities in agriculture and livestock, water, fisheries and aquaculture; as well as forestry, land use and land-use change, including Reducing Emissions from Deforestation and Forest Degradation (REDD+).

Uganda National Climate-Smart Agriculture Programme (2015-2025): The vision for the CSA Programme is a “climate-resilient and low-carbon agricultural and food system contributing to increased food security, wealth creation and sustainable economic growth in line with the National Vision 2040”. The programme identifies five key programme objectives and six key result areas. The objectives are to:

- Increase agricultural productivity through climate-smart agricultural practices and approaches that consider gender;
- Increase the resilience of agricultural landscapes and communities to the impacts of climate change;
- Increase the contribution of the agricultural sector to low carbon development pathways through transformation of agricultural practices;
- Strengthen the enabling environment for efficient and effective scaling-up of climate-smart agriculture; and
- Increase partnerships and resource mobilization initiatives to support implementation of climate-smart agriculture.

The vision for the CSA Programme is a “climate-resilient and low-carbon agricultural and food system contributing to increased food security, wealth creation and sustainable economic growth in line with the National Vision 2040”.

The key result areas are improved productivity and incomes; building resilience and mitigation co-benefits; value chain integration, research for development innovations; improving and sustaining agricultural advisory services; and improved institutional coordination. The programme also highlights the importance of sustainable land management, farm forestry, REDD+, promotion of improved crop and livestock varieties; irrigation development; value chain enhancement; and raising awareness of CSA, among others. The programme suggests an institutional structure for CSA that places the National CSA Task Force at the helm of CSA coordination in the country.

Agriculture Sector Development Strategy and Investment Plan (DSIP, 2010-2015): In its Agriculture Sector Development Strategy and Investment Plan, the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) emphasized the renewed recognition of the fundamental importance of agriculture in Uganda’s economy and the central role it plays in development, economic growth and poverty reduction. The DSIP has four main pillars:

- Enhancing production and productivity;
- Market access and value chain development;
- Improving the enabling environment; and
- Institutional strengthening in the sector.

In June 2015, FAO’s specialized agricultural investment division (TCI) undertook a screening of the DSIP for climate-smartness in order to use the exercise and the information to mainstream CSA into the upcoming Agriculture Sector Strategic Framework (ASSP, 2015-2020). Overall it was found that the DSIP is most responsive to increased slow-onset climate change and thus greater effort could be made to ensure the inclusion of more activities and/or budget for activities aimed at responding to extreme events as well as contributing to climate change mitigation. Mitigation potential in the DSIP is mostly related to increased efficiency in production, and more emphasis could be placed on activities related to carbon sequestration (such as agroforestry) and reducing emissions (for example sustainable energy sources such as biogas and improved cook stoves).



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The report reiterated the need to engage the private sector and research institutions on issues of more effective equipment (e.g. rippers, direct seeders) and machinery (two-wheel tractors) as a means to support both mitigation and adaptation. In terms of the specific DSIP programmes, activities planned under the production and productivity component of the DSIP showed significant potential for CSA benefits in terms of adaptation to both slow onset climate change events, extreme weather events and climate change mitigation. Market access and value chain development offered most in contributing to resilience to extreme weather events, mostly through investments in storage infrastructure to safeguard yields.

The programme on the enabling environment offered opportunities for resilience to extreme events, mostly through the development of early-warning systems, appropriate climate information systems, vulnerability and capacity assessments and integration of climate change into district development plans (this could be an area of focus going forward to draw from national to district level). The enabling environment programme also had potential to contribute to mitigation through improved agricultural statistics related to GHG emissions data, development of a livestock policy that integrates climate change issues and issues around value chain development and improved agricultural profitability.

Box 6: Evaluating climate-smartness of National Agricultural Investment Plans

FAO has been supporting countries in Eastern and Southern Africa in screening and climate-smarting of CAADP National Agricultural Investment Plans (NAIPs) using tools developed in partnership with the World Bank. The tools help to identify opportunities for, and systematically incorporate CSA investments into NAIPs based on three main criteria – adaptation to slow-onset climate change events (e.g. increases in ambient temperature), adaptation/resilience to extreme weather events (e.g. floods and droughts); and climate change mitigation. The screening categories and terms as well as examples of activities in each category are shown below.

Screening measures		Example of CSA-responsive actions
Slow on-set	Physical resilience	Development and promotion of drought-tolerant and/or heat-tolerant crop varieties/animal breeds; enhanced water control and storage capacity.
	Economic resilience	Increased economic welfare and individual savings; crop insurance schemes; village warehouse receipts facilities, etc. Diversification of production system, improved storage, off-farm earnings, diversity of employment opportunities, health and social services, markets.
	Human-social resilience	Increased individual knowledge of climate change impacts; strengthened local resource management capacities, etc. Extension and access to technical know-how, farmer organizations, networks, education and training, information management.
Extreme events		Flood early-warning systems; national disaster response preparedness; crop gene bank and robust seed system, etc.
Mitigation	Carbon sequestration	Increased above-ground and below-ground woody biomass; increased soil organic matter content. Forestry, agroforestry.
	GHG emission reduction	Reduction in point-source emissions, e.g. use of renewable fuels, re-use/recycling of materials, reduction in wildfires/crop residue burning, etc. Biogas, improved stoves.
	GHG emission efficiency	Increased crop/animal productivity per unit of emission output through improved timing of input usage, more complete animal nutrition, etc.

While the exercise was initially conducted on the NAIPs of 12 countries in Eastern and Southern Africa through desk review, a participatory process is now being used through workshops with technical officers representing key areas of the NAIPs. In Eastern Africa, the exercise has recently been conducted in Uganda. Other countries in Eastern Africa are targeted for similar support.

The Uganda Forestry Policy (2001): The National Forestry Policy was formulated in response to the deterioration in the condition of the country's forests. The overall goal of this policy is to achieve "an integrated forest sector that achieves sustainable increases in the economic, social and environmental benefits from forests and trees by all the people of Uganda, especially the poor and vulnerable". The policy recognizes the need to protect watersheds and forests given their importance for ameliorating the impacts of droughts. It also acknowledges the importance of forests in climate change mitigation.

Disaster Preparedness and Management Policy (DPM, 2010): The goal of the DPM is to establish institutions and mechanisms that will reduce the vulnerability of people, livestock, plants and wildlife to disasters in Uganda. Climate change is mentioned as one of the issues that need to be addressed and the policy proposes that government develop climate change adaptation and mitigation measures.



National Development Plan (2015-2020): The goal of the National Development Plan is to facilitate achievement of Uganda's Vision 2040, which in itself has the goal of transforming Uganda from a predominantly peasant and low-income society to a competitive upper middle income status country over a 30-year period. The Second National Development Plan (2015 to 2020) prioritizes agriculture among other key sectors of Uganda's economy. A concerted effort has been made to ensure that the Second National Development Plan takes climate change into consideration. Recently, FAO assisted the country in conducting a study aimed at supporting the mainstreaming of climate change into the Second National Development Plan.

National Adaptation Programmes of Action (NAPA, 2007): Uganda's NAPA notes that the country's livelihoods and food security are particularly vulnerable to the effects of climate change, owing to the high proportion of the country's population that depends on rain-fed agriculture for their livelihoods. Uganda's NAPA identifies nine Priority Adaptation Areas, which include activities on community tree growing; ecosystem-based adaptation; land degradation management; strengthening meteorological services; community water and sanitation projects; water for production projects; drought-adaptation projects; vectors, pests and disease control; indigenous knowledge (IK); and natural resources management. Although NAPA piloting has been initiated by the Ministry of Water and Environment, large-scale implementation has not commenced.

Nationally Appropriate Mitigation Actions (NAMA): Uganda's NAMA proposal included NAMAs related to agriculture, forestry, REDD+, renewable energy, waste management and transport. In forestry, the focus was largely on sustainable charcoal production and sustainable forest management, with the aim of reducing emissions from deforestation as well as providing sustainable charcoal-related livelihoods. In agriculture, two NAMAs have been proposed through work done in the Low Emissions Capacity Building (LECB) Project for Uganda. These include NAMAs on:

1. The promotion of upland rice: The purpose of the NAMA is to promote the cultivation of high-yielding upland rice, combined with a reduction in total acreage under paddy rice.
2. Livestock mitigation: This NAMA seeks to develop methods to reduce GHG emissions from livestock production in Uganda.



Table 3: Summary of the key CSA-related policies in Uganda

Policy	Year	Intention or goal
Uganda CAADP Compact	2010	Agriculture-led growth as a main strategy; pursuit of a six-percent average annual growth rate for the agricultural sector; and increase in the share of the national budget allocated to the agricultural sector to reach the eventual target of 10 percent.
Disaster Preparedness and Management Policy	2010	The goal of the Disaster Preparedness and Management Policy (DPM) is to establish institutions and mechanisms that will reduce the vulnerability of people, livestock, plants and wildlife to disasters in Uganda.
National Development Plan	2016 – 2020	The goal of the National Development Plan is to facilitate achievement of Uganda's Vision 2040, which in itself has the goal of transforming Uganda from a predominantly peasant and low-income society to a competitive upper middle income status country over a 30-year period.
National Forestry Policy	2001	The overall goal of this policy is to achieve “an integrated forest sector that achieves sustainable increases in the economic, social and environmental benefits from forests and trees by all the people of Uganda, especially the poor and vulnerable”.
Draft National Climate Change Policy	2012	The policy aims to ensure that all stakeholders address climate change impacts and their causes through appropriate measures while promoting sustainable development.
Agriculture Sector Development Strategy and Investment Plan	2010 – 2015	The plan emphasizes the renewed recognition of the fundamental importance of agriculture in Uganda's economy and the central role it plays in development, economic growth and poverty reduction.
Uganda Climate-Smart Agriculture Programme	2015 – 2025	The vision for this programme is climate-resilient and low-carbon agricultural and food systems contributing to increased food security, wealth creation and sustainable economic growth in line with the National Vision 2040.

Uganda is a signatory to a number of multilateral agreements related to climate change, land degradation and sustainable development as a whole. This includes the United Nations Framework Convention on Climate Change (UNFCCC), the Convention on Biological Diversity (CBD) and the United Nations Convention to Combat Desertification (UNCCD). The country submitted its Intended Nationally Determined Contribution (INDC) to the UNFCCC ahead of COP21 in Paris in November 2015. Uganda's INDC represents the country's targets to contribute to global GHG mitigation efforts and aims for a 22 percent emissions reduction target from the business-as-usual scenario by 2030. The INDC includes plans to increase forest cover to 10 percent of the national land area, improve the sustainability of agriculture and reduce reliance on wood fuel. The INDC is also conditional to international finance and technological support. The INDC integrates components from Uganda's Climate-Smart Agriculture programme.

As part of the East African Community, Uganda is subject to the East African Community Climate Change Policy (EACCCP). This policy emphasizes the need for an integrated, harmonized and multi-sectoral framework for responding to climate change among EAC's five member states, which also include Burundi, Kenya, Rwanda and Tanzania. The policy aims to:

- strengthen meteorological services and improve early-warning systems;
- increase preparedness for disaster risk management;
- scale up efficient use of water and energy resources, irrigation, crop and livestock production, protection of wildlife and key vulnerable ecosystems such as wetlands, coastal, marine and forestry ecosystems;
- improve land use, soil protection, tourism, infrastructure and human settlement; and
- intensify control of diseases, vectors and pests.

Mitigation measures prioritized in this policy include afforestation, reforestation, promotion of energy efficiency, efficient crop and livestock production systems, efficient transport systems and waste management, while capturing opportunities in emission reductions in the region. However, the blueprint emphasizes that such actions should not compromise the region's social and economic development. For full implementation of this policy, each partner state needs to develop a national policy, strategies and institutional arrangements to operationalize the provisions made in this policy.

6.5 Gender Issues for CSA in Uganda

Across the various programmes there is evidence of gender inclusion in decision-making and access to resources for CSA interventions in Uganda. Most programmes have shown slight but insignificant differences between men and women in the form of land and credit access, production, harvesting and market levels, and during farmer training sessions. The common use of one language, Luganda, is a contributing factor to social inclusion in CSA programmes. A number of studies have been conducted on integrating gender into climate change adaptation, including studies done by FAO and CCAFS in Rakai District, one of Uganda's most vulnerable districts to climate change. Here it was found that men are more likely to use mulching as a method for soil and water conservation compared with women, as mulching material has to be obtained off-farm, which is easier for men to do. Men are also more likely to use inorganic fertilizers as a method to enhance soil fertility compared with women, because these fertilizers are also obtained off-farm.

When it came to crop management techniques such as intercropping, men and women engaged in this activity equally. It was also found that women face more constraints regarding access to agricultural information, including information on weather, climate and climate-smart practices and technologies, mostly because of lower mobility than men as a result of cultural restrictions. Women also have to balance domestic and agricultural duties.

Other information showed that external factors such as insecure land tenure may also affect adoption of CSA practices. For example, women may not have the power to influence decisions regarding the land they till owing to insecure land tenure or land tenure customs that restrict women's decision-making. There are cases of organizations working with women's groups to promote climate-smart practices. These include the Gomba Women's Environment Project in Uganda and the Uganda Muslim Women's Association, whose members are trained in conservation agriculture and the demonstration of conservation agriculture practices.

In general, more research needs to be done on the impacts of various CSA practices on gender equity and social inclusion, particularly with regard to the effects on agricultural labour and time.

6.6 Constraints to CSA Adoption in Uganda

While Uganda has a large number of programmes and projects focusing on climate change adaptation, particularly in the ASALs and drought-affected parts of the country, there are still a number of challenges to the adoption of CSA by smallholder farmers in the country.

- Fragmented land holdings and small land sizes pose a challenge for some CSA practices that are often more suitable for farmers with larger pieces of land, for example agroforestry and fodder production.
- The prevalence of the open grazing system presents a challenge for the adoption of a number of CSA practices including biogas, intercropping and composting. The open grazing system makes manure management a very time- and labour-intensive undertaking.
- There is limited knowledge of the CSA concept and some of the key practices among farmers, policy-makers, the media and the general public. This poses a challenge for awareness-raising, advocacy, policy-making and adoption of the practices.
- At times, quality agricultural inputs are unavailable and/or unaffordable, particularly in rural communities with a need for quality agrochemicals, farm implements and equipment, seeds and tree seedlings for implementation of some climate-smart agriculture practices.

- Many of the projects related to CSA in Uganda are being implemented in a fragmented manner. This fragmented approach, with limited coordination and linkages, is unsustainable in the long run and is likely not to have a large-scale impact on adoption of practices and national contribution to the three CSA pillars. The relatively short to medium duration of these projects also does not promote long-term sustainability and wide-scale adoption.

“The prevalence of the open grazing system presents a challenge for the adoption of a number of CSA practices including biogas, intercropping and composting.”

- There is limited investment by government in CSA initiatives, partly on account of competing priorities and a lack of available funds. The Medium Term Expenditure Framework (MTEF) for the DSIP indicated a 23.5 percent budget difference between the requirements for full implementation and the maximum allowable expenditure for its implementation determined by the Government of Uganda. There may actually be a bigger deficit based



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on what was eventually utilized within the sanctioned budget allocation. Programmes such as the Uganda INDC will require significant financing, which will need to be availed by the international community and through international climate-financing instruments.

- Smallholder farmers in Uganda rely primarily on government extension officers for agricultural support and advice. However, Uganda's National Agricultural Advisory Service (NAADS) is not currently geared towards CSA promotion and support, with the result that the farmers cannot be adequately supported to undertake new and improved climate-smart practices. The national agricultural extension system is currently being restructured and it has been suggested that the new extension set-up should include a focus on capacity development of extension officers in CSA.

6.7 Opportunities for CSA Adoption in Uganda

There are a number of opportunities for the upscaling of CSA in Uganda, which include the following:

- Religious approaches in the form of Farming God's Way and Islamic Farming present an opportunity to scale up CSA to the millions of farmers who have firm religious values.
- The likelihood for improved food security, improved incomes, reduced costs, alternative energy sources (in the case of biogas), as well as improved availability of fuelwood and construction material (in the case of agroforestry) presents an opportunity to advocate and campaign for the adoption of climate-smart agriculture across the country.
- The existence of a strong agricultural research sector in Uganda through the National Agricultural Research Organization as well as other national and international agricultural research organizations presents an opportunity for extensive research on climate-smart agriculture, especially with regard to practices suitable for the different agro-ecological regions of the country.
- The agricultural extension service in Uganda is undergoing major reform within the framework of the National Agricultural Advisory Services (NAADS). This presents an opportunity to integrate CSA into their operations. Assessments and capacity building in order to integrate CSA into the extension service from training to deployment and from national to district level could be supported by government partners.
- There is currently a huge focus in Uganda on issues around resilience, climate change adaptation and climate-smart agriculture by Government and

stakeholders across the country. The Government of Uganda has also shown great willingness to collaborate with the various stakeholders towards a coordinated approach to CSA in the country through platforms such as the National Climate-Smart Agriculture Task Force. This presents an opportunity for all stakeholders to work together to improve the scale up and sustained adoption of key climate-smart agricultural practices.

- Uganda is in the process of finalizing key national plans and programmes, including the Second National Development Plan and the Agriculture Sector Support Programme, both of which will run up to 2020. Already partners such as FAO have conducted activities aimed at supporting the mainstreaming of climate change and climate-smart agriculture into these programmes. There is a need to ensure that the final programmes adequately incorporate climate-smart agriculture and that sufficient budgets are allocated for climate-smart components of these programmes.
- Uganda has a large number of organizations involved in CSA promotion that, if well-coordinated, can be an information resource to share evidence and best practices for upscaling CSA across the country.
- These organizations can be utilized as a resource to share their experiences and lessons as well as a resource to spread awareness and knowledge on climate-smart agriculture in a harmonized manner to all parts of the country.





SUB-REGIONAL OVERVIEW

7

Overall the study showed that while a number of CSA programmes and projects have been implemented across the three countries, adoption of CSA practices still remains low for various reasons, including limited knowledge of and capacity in CSA, lack of coordination among CSA stakeholders, lack of finance for CSA investments both at farmer and at national level, and underdeveloped input and output markets for CSA.

7.1 Summary of Sub-regional Findings

The main climate-smart agricultural practices in the sub-region included conservation agriculture, agroforestry, soil and water conservation, rainwater harvesting and climate information, among other key CSA practices in the sub-region which are shown in Table 4.

The study identified that all three countries have climate-smart agriculture-related policies, strategies and programmes, for example the Climate Resilient Green Economy Strategy in Ethiopia and the Climate Change Policy and Action Plan in Kenya, while Uganda and

Kenya are both developing climate-smart agricultural programmes which have been shared for stakeholder review.

“The main climate-smart agricultural practices in the sub-region included conservation agriculture, agroforestry, soil and water conservation, rainwater harvesting and climate information.”

There is a need to ensure budget allocation as well as implementation of these policies, programmes and strategies. The key national CSA-related programmes, policies and strategies are shown in Table 5. In addition, all countries are signatories to a number of multilateral agreements related to climate change, land degradation and sustainable development as a whole. These include the United Nations Framework Convention on Climate Change (UNFCCC), the Convention on Biological

Table 4: Summary of the key CSA-related policies in Eastern Africa

CSA Practice	Components	How it is climate smart
Conservation agriculture	<ul style="list-style-type: none"> • Reduced tillage • Crop residue management – mulching, intercropping • Crop rotation/intercropping with cereals and legumes 	<ul style="list-style-type: none"> • Carbon sequestration • Reduce existing emissions • Resilience to dry and hot spells
Integrated soil fertility management	<ul style="list-style-type: none"> • Compost and manure management including green manuring • Efficient fertilizer application techniques (time, method, amount) 	<ul style="list-style-type: none"> • Reduced emission of nitrous oxide and CH₄ • Improved soil productivity
Small-scale irrigation	<ul style="list-style-type: none"> • Year-round cropping • Efficient water utilization 	<ul style="list-style-type: none"> • Creating carbon sinks • Improved yields and food security
Agroforestry	<ul style="list-style-type: none"> • Tree-based conservation agriculture • Practised both traditionally and as improved practice, e.g. farmer-managed natural regeneration 	<ul style="list-style-type: none"> • Carbon sequestration • Resilience and improved productivity of agriculture
Crop diversification	<ul style="list-style-type: none"> • Popularization of new crops and crop varieties • Pest resistance, high yielding, tolerant to drought, short season 	<ul style="list-style-type: none"> • Food security • Resilience • Improved incomes
Improved livestock feed and feeding practices	<ul style="list-style-type: none"> • Reduced open grazing/zero grazing • Forage development and rangeland management • Feed improvement • Livestock breed improvement and diversification 	<ul style="list-style-type: none"> • Improved livestock productivity • GHG reduction • CH₄ reduction
Other	<ul style="list-style-type: none"> • <i>In situ</i> water conservation/harvesting • Early-warning systems and weather/climate information • Alternative energy – biofuels, efficient stoves • Crop and livestock insurance • Livelihood diversification (apiculture, aquaculture) • Post-harvest technologies (agroprocessing, storage) 	<ul style="list-style-type: none"> • Resilience of agriculture • Improved incomes • Reduced emissions • Reduced deforestation • Reduced climate risk • Reduced losses

Table 5: CSA-Related Programmes, Policies and Strategies in Eastern Africa

Country	Programme, Policy or Strategy
Ethiopia	<ul style="list-style-type: none"> • Environmental Policy of Ethiopia, 1997 • Environmental Impact Assessment Proclamation, 2002 • National Adaptation Program of Action (NAPA), 2007 • CAADP Compact, 2009 • Growth and Transformation Plan (GTP), 2010 • Agriculture Sector Policy and Investment Framework, 2010 • Agriculture Sector Programme on Adaptation to Climate Change (APACC), 2011 • Ethiopian Programme of Adaptation to Climate Change (EPACC), 2011 • Climate Resilient Green Economy (CRGE) Strategy, 2011
Kenya	<ul style="list-style-type: none"> • Agriculture Sector Development Strategy (ASDS), 2010-2020 • Kenya's Economic Blueprint – Vision 2030 • National Climate Change Response Strategy (NCCRS), 2010 • Climate Change Implementation Framework (NCCIF), 2012 • National Climate Change Action Plan (NCCAP), 2013 • Climate-Smart Agriculture Programme, 2015 • Draft National Forest Policy, 2015
Uganda	<ul style="list-style-type: none"> • National Development Plan (2010 – 2014) and Second National Development Plan (2016 – 2020) • National Agriculture Policy, 2011 • National Climate Change Policy, 2013 • Agriculture Sector Development Strategy (ASDS), 2010-2015 • Disaster Preparedness and Management Policy, 2010 • Draft National Climate Change Policy, 2012 • Agriculture Sector Development Strategy and Investment Plan (DSIP), 2010-2015 (to be followed by the upcoming Agriculture Sector Strategic Plan [ASSP], 2016-2020). • Climate-Smart Agriculture Programme, 2015

Diversity (CBD) and the United Nations Convention to Combat Desertification (UNCCD). As of September 2015, both Ethiopia and Kenya have submitted their Intended Nationally Determined Contributions to the UNFCCC and Uganda submitted theirs ahead of the 21st Conference of the Parties to the UNFCCC (UNFCCC COP21) held in Paris, France at the end of 2015. Both Kenya and Uganda, as member states of the East African Community, are also subject to the East African Community Climate Change Policy (EACCCP).

Key stakeholders involved in promoting CSA can be grouped according to four broad categories – government; development agencies (including international and local organizations, NGOs and CBOs); research and academic institutions; and the private sector. In Eastern Africa some of the key stakeholders include regional economic communities (RECs) such as IGAD, EAC and COMESA; multilateral development agencies such as FAO and UNDP; government ministries and departments, particularly ministries related to agriculture, forestry, water and environment; national research organizations (i.e. EIAR, NARO and KALRI), international research institutes such as ICRAF, CIMMYT, ILRI and CCAFS;

and local, regional and international NGOs such as World Vision, Vi Agroforestry, ASARECA, AGRA, CARE International and the Africa Conservation Tillage Network (ACT). At continental level the African Union and NEPAD, through programmes such as the Africa Climate-Smart Agriculture Alliance and the Gender Climate Change Agriculture Support Programme (GCCASP), are playing a key role in promotion of CSA among sub-Saharan African countries.

Across the three countries the role of suppliers and buyers of CSA value chain products has to be carefully examined. Financial service providers such as banks and microfinance institutes are also key stakeholders who play a role in financing climate-smart investments by smallholder and commercial farmers as well as supporting entrepreneurs involved in various aspects of the CSA value chain, such as equipment manufacture and import. The media were noted as another key stakeholder in spreading awareness on climate-smart agriculture in the three countries. Capacity building for media practitioners on climate-smart agriculture has been identified as a key CSA promotional activity for the sub-region.



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Table 6: CSA Promotion Methods in the Sub-Region

	Components
Training of Trainers	The goal of the TOTs is to equip trainees with the necessary knowledge and skills to prepare them for the role of trainer. The approach is based on the premise that before a person can train others they need to be trained themselves, as well as on the multiplier effect or catalytic role of each person trained training another or others, thus leading to quick dispersion of a technology or principle from person to person. The approach is used for a number of CSA activities including conservation agriculture, agroforestry and integrated pest management.
Demonstrations	Demonstrations are used to show and compare a technology, under field conditions, as opposed to the usual farmer practice. Demonstrations have been used for the promotion of conservation agriculture in the sub-region as well as for demonstration of other practices such as integrated pest management.
Watershed management approach	In Ethiopia, some climate-smart agricultural practices are being promoted in the context of a broader watershed management approach. This is particularly the case for the SLM Programme that is being implemented in the country. The watershed management approach is an approach to managing natural resources (land, fisheries, forests and water) that involves tackling technical, institutional, economic and social issues in an integrated manner that includes all stakeholders in a participatory manner. The approach is in line with FAO principles on CSA promotion, which state that climate-smart agriculture requires actions beyond the farm level and go on to call for adoption of an ecosystem approach, working at landscape level and ensuring intersectoral coordination.
Farmer field schools	FAO and their partners promote the farmer field schools approach which is non-formal, participatory and interactive. This group-based learning process involves enhancing farmers' abilities to investigate, analyse, innovate and learn improved farming practices. The approach has been in use since 1989 and has more recently been used in conservation agriculture training.
Religious methods	Farming God's Way and Islamic Farming are two examples of religious methods of promoting climate-smart agriculture. The approaches have been used in the promotion of conservation agriculture principles in countries such as Uganda and Kenya. Farming God's Way takes a Christian perspective to more sustainable farming systems while Islamic Farming takes a Muslim perspective.
Agricultural shows	The theme for the Uganda National Agricultural Show was "Climate-Smart Agriculture for Sustainable Food Security and Wealth Creation". The Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), through the Uganda Climate-Smart Agriculture Task Force, took a lead in organizing the show under this theme and also engaged a wide range of stakeholders including the Uganda National Farmers Federation and private sector partners. Given that all countries in the sub-region hold national (and in some cases sub-national) agricultural shows, this method of CSA promotion has the potential to generate a broad knowledge and awareness of CSA.
Schools outreach programmes	Reaching out to schools – and hence their staff, students and parents – is another commonly used method of promoting CSA. For example, the Kenya Forestry Services (KFS) is encouraging tree planting in schools across the country through agroforestry. In Uganda, the Climate-Smart Agriculture Task Force has held CSA awareness-raising events for teachers and school children.
Volunteer farmer trainer approach	This farmer-to-farmer extension approach involves training farmers who, in turn, train and share the knowledge and skills they acquired with other farmers. These farmer trainers are usually not paid for their services, but receive free training and inputs from institutions implementing the projects. The approach was used in the FAO MICCA Project. The approach is more participatory and responds to challenges of linear extension models used in most countries.
Land-care approach	The land-care approach focuses on empowering local people to willingly take action on local problems, and integrates those actions into addressing broader issues. The approach has been used in the promotion of agroforestry in Eastern Africa. The approach focuses on community-based and -led sustainable natural resource management and integrated sustainable natural resource management; simultaneously improving people's livelihoods as well as the natural resource base upon which they depend.
Other methods	Community-based natural resource management has been used as an approach for creating awareness of some CSA practices such as agroforestry, promotion of biogas and improved livestock management.

Financiers of CSA projects included the World Bank, COMESA, GiZ, the Norwegian Agency for Development Cooperation (NORAD) and the Netherlands Development Agency. Regional and national farmers' organizations, particularly the East African Farmers' Federation and its national counterparts are also playing a vital role in CSA promotion. The private sector played a key role in direct CSA promotion in Uganda and Ethiopia (for example Makobu Enterprises and REDS Uganda), while in Kenya the private sector played a role in the import, manufacture and sales of CSA equipment (e.g. Ndume Limited). Private sector involvement, especially in CSA value chain development and improving availability of CSA inputs and equipment, was identified as an area that could be enhanced and could support improved adoption of CSA practices.

Based on the country studies it was found that different approaches are used for promoting climate-smart agriculture in the three countries. However, there are some common tried and tested approaches which include farmer field schools (FFS), integrated watershed management, training of trainers (TOTs) and demonstrations. In some cases, faith-based approaches were used successfully, for example the Farming God's Way approach in Uganda. Table 6 indicates some of the commonly utilized CSA promotion methods in the sub-region.

7.2 Challenges to CSA Adoption and Promotion in Eastern Africa

While a number of CSA programmes and projects have been implemented across the three countries, adoption still remains low, partly on account of the following challenges:

- Climate-smart agriculture, as opposed to conventional farming practices, is not adequately incorporated into national agricultural extension training and manuals, and indeed the extension system as a whole. Thus while all three countries included in the study have functioning national agricultural extension systems, these are not geared towards CSA promotion, and hence the majority of smallholder farmers in the sub-region cannot easily adopt many of the practices.
- All three countries have a large population of agropastoralists who primarily practise free grazing. This results in a number of challenges for CSA promotion and adoption, such as competition between crops and livestock for mulch, unsustainability of intercropping and green manure practices owing to the preference of livestock to feed on the green manures (usually straight from the field, thus damaging crops), and extensive labour requirements associated with the collection of cattle manure for compost and/or biogas production. In all three countries, the livestock subsector, where much of the agricultural GHG emissions emanate and subsequently where there is greatest potential for reduction of agricultural GHG emissions, has unfortunately not received the focus and attention the sector warrants, especially from a GHG mitigation perspective.
- There is a general lack of quality agricultural inputs, particularly in rural communities where quality agrochemicals, farm implements and equipment, seeds, tree seedlings and other necessary inputs for some CSA practices are either not readily available or are unaffordable. In many cases low-quality inputs and implements are used, resulting in sub-optimal results which ultimately do not favour the promotion of climate-smart practices.

“There is a general lack of quality agricultural inputs, particularly in rural communities where quality agrochemicals, farm implements and equipment, seeds, tree seedlings and other necessary inputs for some CSA practices are either not readily available or are unaffordable.”

- Awareness and knowledge on climate-smart agriculture among farmers, policy-makers, the media and the general public is limited and there are cases where concepts have been misunderstood. This, coupled with a lack of integration of CSA into the agricultural extension system, means that adoption of some key CSA practices are likely to be low, especially among rural smallholder farming households.
- There are numerous climate-smart agriculture projects and programmes across the Eastern Africa sub-region, ranging from policy work to research to on-the-ground promotion and implementation of CSA practices and technologies. However, in many cases these programmes and projects are being implemented in a fragmented manner, which poses a threat to the sustainability and impact of these initiatives. There is a need to harmonize the approach to the promotion of CSA as well as to strengthen the CSA coordination mechanism.
- Many of the projects have used a top-down approach to sharing new technologies and practices that may have been successful elsewhere, but that are not necessarily

acceptable in the local context and disregard farmers' local knowledge and preferences. Development, testing and sharing of climate-smart technologies should be done in partnership with the farmers themselves so as to enhance adoption and sustainability.

- There is a need for more research on CSA in the sub-region, particularly with the aim of testing context and location-specific practices for the various agro-ecologies, soil types, rainfall patterns, farming systems, temperatures as well as moisture ranges. Action research and field-based research are particularly desirable. That research which is already available is often kept largely in the intellectual and scientific domains and does not always reach those who need it the most, the smallholder farmers.
- In some cases the CSA projects being promoted over-emphasize the mitigation aspect of CSA through agroforestry and promise funds for carbon sequestration, which at times turn out to be very little, thus leading to disillusionment among the farmers. In the context of the Eastern Africa sub-region, the focus needs to be on improving productivity and

incomes, building resilience and adapting to climate change, which are more beneficial and tangible to the farmers. Incorporating mitigation aspects into more productive and resilient practices will then support the reduction of greenhouse gas emissions. Farmers can be trained to realize that becoming more efficient and reducing waste, while reducing environmental impacts, also improves profitability.

- Many of the CSA projects are funded for a short period only (two to five years), while long-term (10 to 20 years) financial support is necessary to allow farmers to grasp concepts fully as well as to realize the benefits of the practices.
- There is inadequate budgetary allocation to ensure fiscal support for the implementation of the various CSA-related policies present in the sub-region. In many cases policies are not supported with financial allocations or financial plans. This may be on account of limited funds available and competing priorities. International partners are encouraged to support the climate change adaptation and mitigation plans of countries in the sub-region.



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- There is still limited and inadequate investment in CSA technologies such as water harvesting and irrigation in most of the sub-region. While there are a number of efforts related to supporting water harvesting on both a small and large scale, these efforts need to be stepped up, particularly since much of Eastern Africa is composed of arid and semi-arid lands, which are prone to water shortages and droughts and where most of the rainfall is lost through runoff. There is still overdependence on rain-fed agriculture on the part of smallholder farmers, rendering them vulnerable to weather variability and climate change. Practices such as agroforestry require adequate water, especially in the early stages from seedling propagation to planting.
- Gender disparities in access to productive resources and decision-making over land are also a challenge. Men and women often have differing priorities and CSA promotion programmes and projects need to take these into consideration.
- Although the global carbon market is an opportunity that, if well exploited, can yield benefits for smallholder farmers, participating in the carbon markets poses huge challenges to smallholder farmers. The primary challenge facing farmers wishing to benefit from carbon offsets is the cost of measurement and verification of the change in carbon emissions as well as the relatively small amounts of money involved when considering the amount of land and effort involved.
- One of the biggest challenges is that food-insecure farmers find it costly to invest in better land and agricultural management systems, which often have slow returns on investments (three to five years). Many climate-smart agricultural practices require establishment and maintenance costs and can take considerable time before farmers benefit from them. Limited access to markets and capital compounds the issues related to investments in improved agricultural practices and limits the ability of farmers to invest in practices that will raise their income in the long run and improve the sustainability and resilience of their production systems.

“Gender disparities in access to productive resources and decision-making over land are also a challenge. Men and women often have differing priorities and CSA promotion programmes and projects need to take these into consideration.”

7.3 Opportunities for CSA Promotion in Eastern Africa

There are a number of opportunities for the promotion, adoption and upscaling of CSA in the three study countries and across the sub-region. These include the following:

- There are a number of institutions, organizations, regional economic communities and government departments involved in climate-smart agriculture in the sub-region. There is a need to ensure that these institutions, organizations and departments coordinate their efforts and conduct their work in a manner that adds value across the programmes and projects rather than duplicating or being in conflict with one another.
- Local knowledge and coping strategies at the grassroots level that are being used by farmers can be built upon and strengthened. Many indigenous practices exist which can be documented and shared, or used as a basis on which to promote improved practices.
- The fact that climate change is already being experienced in the form of increased weather variability and increased incidence and severity of extreme weather events in Eastern Africa has increased the sense of urgency in tackling climate change among policy-makers, development practitioners and farmers themselves. This presents an environment conducive to the promotion of CSA from grassroots level to national, regional and international level. However, the extent to which government goodwill is translated into action on the ground is debatable, since many of the relevant policies, legislation documents and strategies are still in draft form or do not have clear implementation or financing strategies.
- Many of the countries in the sub-region still have vast agricultural potential complemented by huge irrigation potential. This potential needs to be fully exploited, particularly through investment in rainwater harvesting (small and large dams) and irrigation.
- There is a wide range of research projects undertaken and technologies developed by agricultural research institutes in the sub-region, such as EIAR (Ethiopia), NARO (Uganda) and KARO (Kenya), which can help communities build resilience to droughts, floods, diseases and pests. These technologies and research results are, however, not widely applied by farmers and in many cases farmers are not aware of the range of technologies and options available to them. There is immense opportunity to share these research results and translate them into action on the ground.
- Carbon trading presents an opportunity, particularly in forested areas of the sub-region. However, carbon

trade regulations could be modified to include the tree crops many farmers are planting (coffee, tea, mangoes, etc.), while local governments and development agents should make an effort to encourage groups of farmers to establish joint woodlots or community forests even in the absence of carbon funds, as these can provide other community benefits such as fuelwood, forage and flood and erosion control.

- There are opportunities for the promotion of green technology, which could result in increased jobs and off-farm employment, particularly for the youth. These could include the production of conservation tillage equipment through training of local youths as artisans, which in turn would help solve some of the other constraints to the implementation of CSA, such as the lack of access to CSA equipment.
- Opportunities exist in the expansion of production under intensive systems such as irrigation, greenhouse systems and deep litter or cage systems with a view to increasing productivity per unit and obviating the need for opening up of large tracts for production under rain-fed conditions.
- Other opportunities include:
 - Expansion of biogas technology among livestock farmers to reduce demand on fuelwood and the production of methane.
 - Promotion of beekeeping, which would in turn increase demand for forage tree cover for the production of nectar.
 - There are opportunities to revisit past research programmes and findings/technologies and review them in light of climate changes that have occurred. A recent example is the continued research on coffee that has developed new varieties adapted to low-rainfall areas and is leading to an increase in coffee production. Similar examples exist in maize, pulses, sorghum, poultry and other farm enterprises.
 - Information and communication technology can be used to promote CSA, for example the use of text messages to share information on innovative practices or to give weather advisory services to smallholder farmers.
 - Government policies and regulatory frameworks are increasingly recognizing the role of CSA as a pathway to combating climate change.
 - Increased investments in agriculture modernization and commercialization offer opportunity for investments in climate-smart agriculture and sustainable land management.

- Emerging regional markets made possible by regional integration could provide expanded input and output markets for CSA products.
- The large natural resources base and existence of several agro-ecological zones present an unlimited opportunity for expansion and diversification of agricultural development activities.
- Partnerships and strategic alliances can be formed with national, regional and international research institutions, non-governmental organizations, agro-industries, commercial farmers and development agencies.

7.4 Recommendations

Based on the report findings, the following recommendations are made:

- Countries are at different levels of promotion and implementation of climate-smart agriculture. At the same time, while there are similarities in the contexts of the three target countries for this study, there are also many significant differences in terms of soils, climate, culture and finances, among other factors. Countries need to be supported based on their current status and needs as there is no blanket approach that can be used to support CSA across the sub-region.
- A number of projects and programmes have been conducted focusing on the promotion of CSA. There is now a need to focus more on the results of all this work with regard to adoption by farmers and long-term impact at grassroots level regarding the three CSA pillars among those who have been sensitized, trained and supported to adopt CSA practices. This can be supported by the development of, and capacity building in improved monitoring and evaluation systems for CSA adoption, as well as support to countries to conduct CSA baseline studies, develop CSA databases and integrate CSA data collection into national agricultural surveys or censuses.
- CSA needs to be mainstreamed within national and regional CAADP Compacts and National Agricultural Investment Plans (NAIPs). This can be done through the development of CSA investment frameworks, the integration of CSA into new NAIPs and the screening of current NAIPs for CSA opportunities. The exercise has already commenced in Eastern Africa, with Uganda having been supported on this; however, as per the desire of the regional economic communities (EAC in particular), the wish is for all countries to receive the same support and rise to the same levels.

- More action research on key CSA practices such as conservation agriculture, agroforestry, manure management and integrated soil fertility management (ISFM) is needed, particularly with the aim of testing context and agro-ecological-specific practices. Research already available must be shared and scaled-up.
- Value chain development for CSA inputs and outputs such as seeds, chemicals and equipment as well as for processing, use and sales of CSA products is needed across the sub-region. Specific CSA value chain studies for key CSA practices and key CSA commodities is required and would assist in identifying constraints and enabling factors for improvement of the CSA value chain. Identifying CSA opportunities in selected agricultural value chains could be another option whereby the value chain for selected commodities is analysed through a CSA lens to identify opportunities for adaptation and mitigation.
- Despite a great deal of information on CSA being shared across the sub-region, this is an aspect that needs to continue through awareness-raising, advocacy and sensitization on CSA for policy-makers, government departments, the private sector, the media and the farmers themselves.
- CSA stakeholders need to continue to work together and ensure coordination of CSA activities at national and sub-regional level. This will help reduce duplication and support effectiveness and sustainability of CSA programmes. The national climate-smart agriculture task forces in the sub-region have an important role to play in this regard and require support in their activities to coordinate CSA at national level. National governments need to ensure that such structures are institutionalized within government structures (as is being done by Uganda) and that they are supported politically and financially to carry out their mandates. The Eastern Africa sub-regional CSA platform must also be supported so as to promote coordination and knowledge sharing between the countries.
- There is a need to develop standardized tools and guidelines across the sub-region on different CSA



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practices and technologies and support capacity building on their use in the different countries. This process is currently ongoing for sub-Saharan Africa with the development of the CSA Practical Guide through the Africa CSA Alliance. However, even within Eastern Africa and within the countries in the sub-region standardized tools, guides and manuals on CSA promotion need to be developed.

- Given the ambitious targets set by the countries in the sub-region related to GHG mitigation through the INDCS as well as national policies, programmes and strategies, there is a need for availing of financial support for climate-smart agriculture. International climate-funding instruments can play a key role in this regard and should be leveraged on the basis that investments in CSA provide triple wins that benefit all parties involved. The available sources of funding include GEF funds as well as UNFCCC funds that are managed by the GEF, i.e. Special Climate Change Fund and Least Developed Countries Fund. Other multilateral donors and international development agencies will also have a role to play.
- Stakeholders should improve monitoring systems to track the multiple benefits of climate-smart agriculture including benefits to adaptation, mitigation and food security. To this end, there is a need to have sub-regional and national level tools and standards for the monitoring and tracking of the adoption of various CSA practices in Eastern Africa, as well as the results of the adoption in terms of improved food production, reduced greenhouse gas emissions and overall resilience of people and ecosystems.
- There is a need to build the capacity of extension workers and support extension departments in Eastern Africa to integrate CSA into their extension package. This could be done through the development of CSA extension manuals and training syllabi or through the updating of current extension manuals so that they include CSA components. This work must be

done in partnership with the relevant government ministries and departments to ensure ownership, and hence uptake.

- Agricultural research institutions should invest in CSA demonstration sites across the country to show location-specific good practices in CSA that can be easily adopted by farmers. This can be complemented by the establishment of community-based resource centres where communities can access information on various CSA technologies and practices.
- Universities and tertiary-level education institutions need to be supported to develop CSA curriculum and training courses so as to enhance the knowledge of graduates in this area. This can be initiated by first conducting an assessment of knowledge, status and uptake of CSA in the tertiary education curriculum at national and sub-regional level.
- Lastly, one of the key issues relates to financing – while the governments of the host countries must make every effort to ensure sufficient budgetary allocation for the development of climate-smart agriculture, attention also needs to be given to identifying investments outside of government through bi- and multilateral development financing sources that target the same, or related, activities.

Overall many strides are being made in the Eastern Africa sub-region in terms of CSA promotion and the countries involved in the study should be commended for the efforts being undertaken. However, a lot still needs to be done and support from all stakeholders as well as international, regional and national partners is called upon to transform the agricultural systems in the target countries into climate-smart agricultural systems that contribute to national food security by sustainably increasing productivity and incomes; building resilience and adapting to climate change; and developing opportunities for reducing greenhouse gas emissions compared with expected trends.

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ANNEXURE 1: SUMMARY OF HUDUMAKWA MKULIMA (HKM) 25 PROJECT IN KENYA

The Hudumakwa Mkulima 25 project seeks to scale up the adoption of conservation agriculture by one million farm households in Kenya by 2025. The project drivers are built on the fundamentals of mechanization of smallholder farming; adoption of climate-smart agriculture by clusters of farmers; and engagement of the for-profit agribusiness innovations of the private sector to enhance access to services along the value chain. Consequently, in its two five-year phases, the project will contribute to eliminating hunger, halving poverty, inducing resilience to climate change, and attracting and creating decent rural employment, particularly for youths and women.

This project has been prepared as part of a pan-African initiative led by the African Conservation Tillage Network (ACT) with the support of the Government of Kenya (Ministry of Agriculture, Livestock and Fisheries) and other partners to realize the CAADP goal of a six-percent annual growth rate in agriculture with a view to realizing food security on the African continent. Conservation agriculture is based on three principles: minimum disturbance to the soil (no-till or minimum tillage); permanent soil cover; and crop rotations/associations. Conservation agriculture is now practised on over 150 million hectares worldwide and is expanding at the rate of seven million hectares annually. Unfortunately, there

are about one million hectares in Africa and less than 40 000 in Kenya held up primarily by poor access to services and negative mind-sets. The main constraints to upscaling and adoption of conservation agriculture upon which HKM is built are:

- Inadequate policies and strategies for implementation of conservation agriculture;
- Inadequate and inefficient research on conservation agriculture;
- Inadequate information and knowledge on conservation agriculture;
- General lack of awareness and understanding of the potential of conservation agriculture in generating employment, agribusiness, food security and environmental conservation;
- Traditional barriers and/or negative mind-sets, with farmers stuck in traditional ways of farming; and
- Inadequate access to conservation agriculture inputs, equipment and services.

To address the above challenges, the project proposes the development of an infrastructure of services and human resources that will facilitate the emergence of entrepreneurs to provide sustainable conservation agriculture services to farmers and other stakeholders along the relevant value chains. This, in turn, should lead to transforming conservation agriculture into an agribusiness as it relates to farmer practices and users of conservation agriculture, as well as to service providers as suppliers of services. The conceptual approach is to move away from the provision of subsidized inputs to farmers in favour of developing commercial linkages with service providers.

The infrastructure of services and human resources includes support for research and development, development of standard curricula for the training of farmers and key stakeholders along the value chain, establishing strategic linkages with key support services that include financial, insurance and manufacturing institutions, and the engagement of young people through schools to inculcate conservation agriculture thinking and practices for posterity.

For more information, please visit: www.act-africa.org



ANNEXURE 2: SELECTED CASE STUDIES OF INTEGRATED WATERSHED MANAGEMENT IN UGANDA

1. Katongelo Watershed Management – Kyebe

The site is very steep and stony and appears to be extremely difficult to manage. Despite this, the farmers have recognized the importance of ensuring sustainable management of their resources and improving productivity of the four major crops – coffee, bananas, cassava and sweet potatoes. Other crops include beans and groundnuts. The project provides only coffee seedlings. Farmers obtain other planting materials from previous crops or from other farmers. They work in groups and meet regularly to identify problems (which vary from farm to farm) and help one another to ensure that a given task is performed.

2. Sanga-Kiruhura Watershed Management

Sanga-Kiruhura is an area where the management of natural resources is clearly at an advanced level. The reasons are not clear, but the farmers are definitely motivated. The area is a good example of where the principles of CSA are very well integrated to ensure minimum soil loss and improved productivity. Nearly all the banana plantations are very well mulched and there are various combinations of intercropping, including banana/coffee; maize/cabbages; *Calliandra* trees with cabbages.

Many farmers grow crops and keep cattle. Farmers have well-organized paddocks and well-established pastures, among others of Rhodes grass and lablabⁱ. In the case of Sanga, farmers produce lablab as forage but in addition, lablab provides live mulch and improves soil organic matter. On steep hills, many farmers have planted trees (largely pines). Because of the effective integration of the key principles of CSA, soil erosion is largely under control and the land appears to be very productive, as evidenced by the large bunches of banana. The widespread practice of mulching is an indication that farmers are well aware of the benefits. There are attempts to heal gullies – situations where land with gullies is being reclaimed by planting perennial crops like sugar cane and building cross ridges to check the speed of water.

3. Rubangano Watershed Management – Mwizi

The terrain of the area is extremely hilly, but the land appears to be generally fertile. Like the other areas, the farmer field school approach has considerably improved the farmers' understanding of the problems associated with farming in this area. The farmers appear to be very motivated and well organized. They organize regular meetings to discuss progress and identify new problems. The main crops grown are bananas and coffee. Other crops include sweet potatoes, maize, beans and cabbages. Because farming is largely on the steep hill slopes, farmers have welcomed the concept of CSA. The main practice includes planting grass strips, terracing, and making trenches in combination with grass strips. Elephant grass from the strips are cut and carried to be used to feed animals (goats), whose droppings are collected and used in the preparation of manure. The trenches are about 60 cm wide and 60 cm deep across the slope. The soils are typically put on the upper side of the trench (referred to as *Fanya Juu*). These are reinforced by planting grass bands on the side where soils are heaped. *Fanya Juu* prevent the soil from being washed down the slope when it rains and also increase infiltration. Mulching of banana is a universal practice. Other CSA-related practices include planting trees and preparing manure. Manure is prepared in large trenches, called *Orusaniya*, or large plates which feed at least four stools of bananas.



ⁱ Lablab, sometimes called dolicos beans, is a species of beans in the family Fabaceae and is cultivated in many countries in the tropics for food or forage.

ANNEXURE 3: FAITH-BASED CSA-RELATED ACTIVITIES BY UFNEA UGANDA

The Uganda Faiths Network on Environmental Action (UFNEA) is a voluntary, not-for-profit network of faith groups and faith-based organizations in Uganda that are committed to protecting the environment and promoting sustainable development and agriculture, according to their own beliefs, teachings and practices. The network is focusing on advocacy, practical approaches, partnership development and capacity building. UFNEA draws its inspiration from the Alliance of Religions and Conservation (ARC), a UK-based charity that works with 11 major faiths worldwide to help them develop environmental programmes based on their beliefs, practices and teachings.

In 2010 ARC began working with Christian, Muslim and Hindu groups in sub-Saharan Africa on sustainable land and water management. As a result, in 2012, 27 faith groups from 11 countries launched long-term plans on the environment – action that each faith group pledged to take over the next seven years. These groups included a number of Ugandan faith-based organizations. Therefore, a faith network in Uganda will enable faith groups to develop closer partnerships with the Ugandan government and other stakeholders to harness efforts in sustainable land and water management. The network is registered by the registrar of companies under number 174057 and was launched on 30 October 2013.

UFNEA's mission is "to inspire faith groups in Uganda into strengthening awareness and action on the environment and sustainable agriculture". UFNEA's partners include MAAIF, Alliance of Religions and Conservation (ARC), the Jane Goodall Institute and the Kenya Organization for Environmental Education.

"UFNEA is a voluntary, not-for-profit network of faith groups and faith-based organizations in Uganda that are committed to protecting the environment and promoting sustainable development and agriculture, according to their own beliefs, teachings and practices."

Selected UFNEA achievements

Since the launch of UFNEA in October 2013, the network has implemented several activities, including the following:

- Tree growing by each of the founding members and their various constituencies such as churches, mosques, target areas and organizations.
- Environmental sermons in places of worship, particularly on Fridays and Sundays, to encourage the faithful to engage in environmental activities in their homes and their places of influence.
- Awareness workshops at village level, in schools and tertiary institutions.
- Energy-conservation initiatives such as fireless cookers, improved stoves and briquette making to conserve energy by reducing the amount of charcoal and firewood used at household level.
- Water conservation initiatives, such as the bio-sand filter and water-harvesting techniques.
- The faith-based Education for Sustainable Development tool kit launched at a workshop. The tool kit was reviewed by the National Curriculum Development Centre and a teachers' workshop was held in October 2014.
- Conservation agriculture, Farming God's Way and Islamic Farming: UFNEA, in its effort to carry out agricultural extension, has been promoting and conducting training in Farming God's Way (FGW), Islamic Farming (IF) and conservation agriculture (CA) to small-scale farmers in a number of communities in Uganda with the aim of increasing agricultural productivity and improving peoples' livelihoods. The principles remain the same across all three techniques. These are:
 - No ploughing (minimal disturbance of the soil or no tillage) – the practice of ploughing destroys soil structure, including the micro-organisms that live in the soil, leading to erosion and rapid water loss.
 - Mulching to minimize water loss.
 - Not burning the crop residues.
 - Practising crop rotations.

Table 7: Training in Farming God's Way (FGW), Islamic Farming (IF) and conservation agriculture (CA)

Name of course	Group(s) trained	Number of participants	Training dates	Training provider
Conservation agriculture	UFNEA	22	March 2014	MAAIF
School demonstration plots	Namusera UMEA	Schools	April to September 2014	Hear Uganda
	Buziga Islamic			
	Kabasanda prison			
	Kabasanda Technical Institute			
	Kikoto Masaka Secondary School			A Rocha Uganda
	Buiyta, Mukono			
	Wakatayi Luweero			
	Nama UMEA – planted maize and beans			
	Kisowera Church of Uganda Secondary School planted vegetables			
Farming God's Way	Gomba Women Environment Project (GWEP)	41	August 2013	A Rocha Uganda
	Uganda Muslim Women Association (UMWA)	73	August 2013	A Rocha Uganda
	Mukono – Nalya Kampungu village, Bivva Muntuyo Women's group (BMW)	21	August 2014	A Rocha Uganda
	Mukono – Nsumba Village, Kyagwe	23	August 2014	A Rocha Uganda
	Buikwe – Lugasa group	28	August 2014	A Rocha Uganda
Islamic Farming	Muslim leaders and farmers were trained in Islamic Farming. They came from Mukono, Luweero, Wakiso and Butambala.	40	August 2014	Alliance of Religions and Conservation and A Rocha Uganda
Churches	Lugasa Full Gospel – Nakifuma C.O.U	≥100	2014	A Rocha Uganda
	St. Stephen Kisowera, C.O.U – Kamuli, C.O.U			
	Namirembe Diocese – All Saints Cathedral Nakasero and Iganga			

Selected photographs of Farming God's Way by the Gomba Women Environment Project (GWEP) and Uganda Muslim Women Association (UMWA)



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Members of the Gomba Women Environment Project (GWEP) clear the land for a demonstration garden



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Holing out for the maize garden



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Holing out for the bush bean garden



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Mulching the garden



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Gardens in Gomba under Farming God's Way



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Gardens in Gomba under Farming God's Way

Selected photographs of Farming God's Way by the Gomba Women Environment Project (GWEP) and Uganda Muslim Women Association (UMWA)



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Islamic Farming training at Arch Apartments in Ntinda, Kampala in 2014



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Farming God's Way training in Mukono



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A Farming God's Way garden in Mpoma



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Farming God's Way on maize and beans in Kakiri, Wakiso District



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Farming God's Way on sweet potato in Kakiri, Wakiso District

ANNEXURE 4: CONSERVATION AGRICULTURE TRAINING CONDUCTED BY MAKOBU ENTERPRISES IN ETHIOPIA (2012 – 2014)

Date of training	Name of zonal administration	No of districts (woredas) covered	Venue	No of participants	Training cost ²¹
Feb. 28, 2012	South Western Shoa Zone	11	BachoWoliso Farmers Coop. Unions Assembly Hall, TulluBollo	87	36 769.09
May 15, 2012	East Wollega	8	Desalegn Hotel	53	28 995.58
July 20, 2012	South Western Shoa Zone	5	BachoWoliso Farmers Coop. Unions Assembly Hall, TulluBollo	33	6 122.50
Nov. 30, 2012	West Hararghe	14	AsebeTeferi, Chiro	63	26 406.37
March 4, 2013	East Wellega	7	East Wellega Zone Bureau of Agriculture Hall, Nekempte	53	30 584.02
April 29, 2013	East Wellega	7	East Wellega Zone Bureau of Agriculture Hall, Nekempte	68	40 209.28
Nov. 7, 2013	West Shoa Zone	18	Ambo	85	31 114.76
Nov. 21, 2013	East Showa	2	Debrezeit	65	14 037.23
Nov. 26, 2013	Arsi Zone	9	Asella	64	15 970.91
Dec. 6, 2013	East Showa Zone (Alema Farm)	1	Bishoftu	39	10 858.26
Dec. 17, 2013	West Shewa Zone (Bako)	1	Bako	71	17 208.83
January, 2014	North Showa Zone	14	Fitche	54	15 155.17
March 6, 2014	Finfine Zuria Special Zone	6	Holeta	62	14 154.71
May 23, 2014	Oromia Zone	3	Kemise	61	20 714.79
May 28, 2014	Arsi Zone (Shirika)	1	Gobessa	66	15 555.14
June 27, 2014	Bale Zone	10	Robe	67	25 690.06
Total		117		991	349 546.70

21 All training was conducted at Makobu Enterprises' expense in conjunction with zonal administrations and Makobu's area distributors. All costs in Ethiopian Birr (ETB).



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