KENYA CLIMATE SMART AGRICULTURE STRATEGY

2017 - 2026

REPUBLIC OF KENYA

MINISTRY OF AGRICULTURE, LIVESTOCK AND FISHERIES

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LIVESTOCK AND FISHERIES

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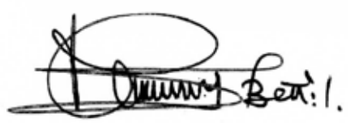
FOREWORD

Kenya envisions being a middle- income country with citizens enjoying high quality of life and a sustained annual economic growth rate of at least 10% by the year 2030 according to the National Development Blue Print “The Kenya Vision 2030”. The agriculture sector has been identified as one of the key sectors to contribute to the projected annual national economic growth. The sector is envisaged to ensure food security, provision of raw materials for agro-industries, creation of employment opportunities, generation of income and foreign exchange earnings.

The sector is however the most vulnerable to impacts of climate change and extreme weather events. Enhanced temperatures and change in precipitation regimes have led to reduced suitability of agro-based enterprises; reduced productivity of crops, livestock and fisheries due to temperature and water stresses; and rising production costs. The increase in frequency and intensity of extreme weather events such as droughts, floods and strong winds have led to loss of investments, incomes and livelihoods, destruction of agro-based infrastructure as well as increased frequency of weather related disasters. Due to these challenges, the government recognizes the need to develop interventions that make agriculture more resilient to climate change and extreme weather events while minimizing its contribution to greenhouse gas emissions.

Climate smart agriculture (CSA) is an approach that helps to guide actions needed to transform and reorient agricultural systems to effectively support development and ensure food security in a changing climate. CSA aims to achieve three main objectives: sustainably increasing agricultural productivity and incomes; adapting and building resilience to climate change; and reducing and/or removing greenhouse gas emissions, where possible. These objectives form part of Kenya’s obligation as a signatory to the United Nations Framework Convention on Climate Change (UNFCCC). Climate smart agriculture is the pathway that leads to attainment of the national interests of food security, productivity and incomes, while at the same time reducing or sequestering greenhouse gas emissions.

CSA provides the means to help stakeholders at local, national and international levels to identify agricultural strategies suitable to their conditions. This Climate Smart Agriculture Strategy has been developed to guide investments and implementation of activities in the context of the current agriculture sector governance structure. I am optimistic that this Strategy will contribute to the achievement of Vision 2030. I take this opportunity to request all the relevant stakeholders to play their respective roles in ensuring the successful implementation of this Strategy for the well-being of all citizens.



Willy Bett, E.G.H
Cabinet Secretary,
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PREFACE

Climate change has evolved from being simply an environmental problem to a major development challenge impacting all economic sectors. There is evidence from historical records that Kenya has experienced increased temperature over the last 50 years. The frequency of intense extreme weather events like droughts and floods has also increased. Future climatic predictions indicate a possible temperature increase of 1^0C by 2020 and 2.3^0C by 2050.

The changes in climate and weather patterns will expose the rain-fed farming systems, especially the arid and semi-arid lands, to more climate related vulnerabilities. This will predispose farming communities to food insecurity and poverty through loss of the productive assets and the weakening of coping strategies and resilience. On the other hand, the agriculture sector contributes to the climate change problem through emissions arising from inefficiencies in crop, livestock, fisheries and forestry production systems. These inefficiencies lead to greater levels of enteric fermentation in livestock, poor manure and agro-based waste management systems, improper land preparation systems, inefficient input and resource use in crop management systems as well as inefficiencies that raise emissions from agro-based machinery.

The agriculture sector is a major contributor the economy of Kenya in terms of food security, employment creation, supply of agrobased industry raw materials and foreign exchange earnings. About 98% of Kenya’s agricultural systems are rain-fed and highly susceptible to climate change and variability. This susceptibility is likey to jeopardize attainment of the sector contribution to the national economy.

Innovative and transformative measures are therefore urgently required to assist stakeholders in the sector across the agricultural value chains to cope with effects of current and projected change in climate patterns. Climate smart agriculture (CSA) has been identified as a viable approach to provide solutions towards increased agriculture sector productivity while addressing impacts of changing climate. For the government to fully and effectively implement climate smart agriculture, sound and enabling strategies that provide set goals and actions that promote investment must be in place.

The development of the climate smart agriculture is our collective effort and commitment to address agriculture sector development under changing climatic conditions. The development of this strategy has been highly consultative and participatory and involved stakeholders at county and national levels. We urge all stakeholders to play their respective roles in ensuring this strategy is successfully implemented to ensure continued sector growth while shielding it from the negative impacts of climate change.

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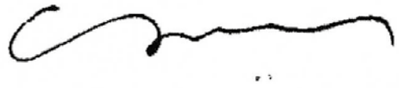

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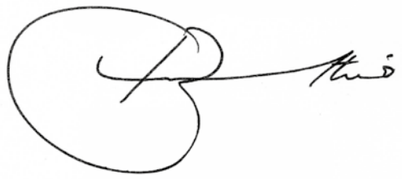

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ACKNOWLEDGEMENTS

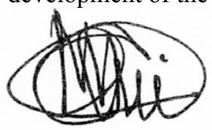
The development of this strategy was highly consultative and participatory and involved stakeholders at national and county levels with support from various people and organizations.

I give special thanks to Mr. Willy Bett, the Cabinet Secretary, Ministry of Agriculture, Livestock and Fisheries, Prof. Judi Wakhungu, the Cabinet Secretary, Ministry of Environment and Natural Resources and Mr. Eugene Wamalwa, the Cabinet Secretary Ministry of Water and Irrigation for the support and goodwill extended during the development of this strategy. I also wish to thank the following Principal Secretaries for giving guidance and leadership; Dr. Richard Lesiyampe, State Department for Agriculture, Ministry of Agriculture, Livestock and Fisheries, Dr. Andrew Tuimur, State Department for Livestock, Ministry of Agriculture, Livestock and Fisheries; Mr. Charles Sunkuli, State Department for Environment, Ministry of Environment, and Natural Resources; and Ms.-Zeinab Hussein, State Department for Irrigation, Ministry of Water and Irrigation.

I also appreciate the contributions by all the Government Ministries and Departments for clearly identifying their stake and giving valuable inputs that enriched the strategy. I recognize the support and invaluable contribution of the County Governments through the County Executive Committee members in charge of Departments of Agriculture, Livestock, Fisheries, Irrigation and Environment. In particular the contribution of the following County Executive Committee members of the Intergovernmental Thematic Working Group on Policy and Legislation, Dr. David Okeyo Odiwour, Saphia Sheikh Omar, Caroline Lentupuru Tenges, Jenaro Guantai and Laurian Killikho.

I sincerely thank the World Bank through the Kenya Adaptation to Climate Change in Arid and Semi-arid Lands (KACCAL) project for funding the development process of this strategy. I acknowledge and appreciate the support of the Food and Agriculture Organization of the United Nations (FAO) and the United Nations Development Programme (UNDP) Kenya representations through the Integrating Agriculture in National Adaptation Plans project, for supporting the production of this strategy for wider dissemination. The farmer organizations, farmer's representatives and other special interest groups are also appreciated for their contribution and participation during the various consultative fora and during the national validation workshop.

Finally, I acknowledge and appreciate the efforts and commitment demonstrated by the inter-ministerial technical taskforce comprising of the following members; Dr. Michael Obora, Robin Mbae, Dr. Samuel Guto, Vincent Githinji, Lucy Ng'ang'a, David Ombalo, Rose Akombo, Timothy Ogwang', Michael Okumu, Benjamin Kibor, Davies Makilla, Janet Oyuke, Joseph Mahongah, Lucy Kamande, Veronica Ndetu, Mary Githinji, Phanuel Webi, Vincent Ogwang' and Zipora Otieno of the FAO Kenya Office. These members ensured the final document was of high quality and that the development of the strategy was finalized on time.



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EXECUTIVE SUMMARY

Climate change is real and has become an impediment to sustainable development globally. Climate change will have a range of positive and negative impacts in agriculture depending on the regions of the world. The negative impacts are expected to be more adverse in developing countries, particularly those in sub-Saharan Africa such as Kenya which has experienced increasing temperatures from 1960's coupled with increased frequency and intensity of extreme weather events such as El Niño and La Niña. Effects of the negative impacts will include declining agricultural productivity and loss of crops, livestock, fish and investments in agriculture due to changing temperatures and precipitation regimes and increased frequency and intensity of extreme weather events. Further, fisheries and aquaculture are affected through acidification of the water bodies, changes in water temperatures and circulation patterns which alter the physico-chemical properties of the fish habitats and ultimately the productivity.

Agriculture is not only impacted upon by climate change but also contributes to the problem. The country's agriculture is predominantly rain-fed and therefore vulnerable to climate change particularly changes in temperature regimes and precipitation patterns, and extreme weather events. This leads to, among others, unsustainable land and agricultural water management. Kenya's greenhouse gas (GHG) emissions were estimated to be 73 million tons of carbon dioxide equivalent ($MtCO_2e$) in 2010 and are expected to rise to 143 $MtCO_2e$ in 2030 unless appropriate mitigation actions are taken. Agriculture is the largest source of GHG emissions; it was responsible for one-third of Kenya's total emissions in 2010. Agricultural emissions are likely to increase from 20 $MtCO_2e$ in 2010 to 27 $MtCO_2e$ by 2030, largely driven by livestock methane emissions and land use change, which account for 90% of agriculture emissions and 30% of overall national emissions.

Weak polices, legislations, enforcement, and overlap of mandates among institutions involved in regulation coupled with poor coordination and collaboration among institutions and stakeholders in climate smart agriculture (CSA) have contributed to the country's inability to effectively address vulnerability and GHG emissions. Further, cross cutting issues such as inadequate financing of CSA activities; limited capacity of Women, Youth, and Vulnerable Groups (WY&VG) to participate in CSA activities; unsustainable natural resource management (NRM) and utilization; limited human resource capacity to undertake CSA; limited CSA research technology development and innovations; and inadequate data and information on CSA have also led to poor implementation of CSA activities.

The country requires transformation of its agricultural systems to make them more productive and resilient while minimizing GHG emissions under a changing climate. CSA provides an excellent opportunity for the transformation by uniting agriculture, development and climate change under a common agenda through integrating the three dimensions of sustainable development (economic, social and environmental) by jointly addressing food security and climate challenges. CSA therefore sustainably increases agricultural production and incomes, builds resilience of agricultural systems to climate change and minimizes GHGs emissions. However existing national strategies and interventions such as the National Climate Change Action Plan (2013-2017) and the Agriculture Sector Development Strategy (2010-2020) have not adequately mainstreamed adaptation, building resilience and mitigation of GHG's into the agricultural sector. Consequently, the sector needs a sound and enabling CSA strategy that will simultaneously guarantee productivity and food security while addressing climate change adaptation and mitigation.

The broad objective of the Kenya CSA Strategy (KCSAS) is to adapt to climate change, build resilience of agricultural systems while minimizing emissions for enhanced food and nutritional security and improved livelihoods. The specific objectives of the KCSAS are to (i) enhance adaptive capacity and resilience of farmers, pastoralists and fisher-folk to the adverse impacts of climate change; (ii) develop mechanisms that minimize greenhouse gas emissions from agricultural production systems; (iii) create an enabling regulatory and institutional framework; and (iv) address cross-cutting issues that adversely impact CSA.

Four broad strategic areas have been identified for KCSAS: (i) Adaptation and building resilience by addressing vulnerability due to changes in rainfall and temperature, extreme weather events and unsustainable land/water management and utilization; (ii) Mitigation of GHG's emissions from key and minor sources in the agriculture sector; (iii) Establishment of an enabling policy, legal and institutional framework for effective implementation of CSA; and (iv) Minimizing effects of underlying cross-cutting issues such as human resource capacity and finance which would potentially constrain realization of CSA objectives.

The coordination framework and implementation mechanism for KCSAS will be harmonized with the inter-governmental coordination structure under development and near completion. This will ensure clarity in flow of information, policy direction and funds. The implementation of this strategy will be mainly by the County Governments.

The KCSAS is a tool to implement Kenya's NDC contribution for the agriculture sector and will require domestic and international support. The implementation of KCSA strategy will require a total of KSh. 500 billion (US$ 5.0 billion) for adaptation and mitigation actions for agriculture sector up to 2026. This will contribute to building resilience and adaptive capacity in the sector as well as reducing sectoral emissions to 30 $MtCO_2e$ relative to the business as usual trajectory projection of 37 $MtCO_2e$ in 2026. Investment resources to implement the KCSAS will be mobilized from diverse sources and appropriate mechanisms established for access, disbursement and utilization. The strategy provides a detailed implementation framework with clear stakeholder roles and responsibilities. The implementation framework also forms a basis for the establishment of a monitoring and evaluation (M&E) framework.

ACRONYMS/ABBREVIATIONS

ABS	American Breeders' Society
AFA	Agriculture and Food Authority
AFD	French Agency for Development
AfDB	Africa Development Bank
AgGDP	Agriculture Gross Domestic Product
ARR	Annual Review Report
ASALs	Arid and Semi-Arid Lands
ASDS	Agricultural Sector Development Strategy
BMUs	Beach Management Units
BUR	Biannual Update Reports
AusAID	Australia Agency for International Development
CBOs	Community Based Organizations
CCAFS	Climate Change, Agriculture and Food Security Programme of CGIAR
CCC	Climate Change Council
CIAT	International Center for Tropical Agriculture
CIDP	County Integrated Development Plans
CIFOR	Center for International Forestry Research
COG	Council of Governors
CSA	Climate Smart Agriculture
CSO	Civil Society Organizations
DANIDA	Danish International Development Agency
DfID	United Kingdom's Department for International Development
DRSRS	Department of Resource Survey and Remote Sensing
DVS	Directorate of Veterinary Services
EAC	East African Community
EACCCP	East African Community Climate Change Policy
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
ENSO	El Nino Southern Oscillation
EWS	Early Warning Systems
FAO	Food and Agriculture Organization of the United Nations
FBO	Faith Based Organizations
GCF	Green Climate Fund
GDP	Gross Domestic Product
GESIP	Green Economy Strategy and Implementation Plan
GHG	Green House Gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit/ German International Development Agency
GoK	Government of Kenya
ICIPE	International Centre of Insect Physiology and Ecology
ICPALD	Inter-Governmental Authority Centre on Pastoral Areas and Livestock Development
ICRAF	International Centre for Research in Agroforestry
IFAD	International Fund for Agriculture Development

IGF	Inter-Governmental Forum
IGR	Inter-Governmental Relations Summit
IGSC	Inter-Governmental Steering Committee
ILRI	International Livestock Research Institute
INDC	Intended Nationally Determined Contribution
IPCC	Intergovernmental Panel on Climate Change
IPPC	International Plant Protection Convention
IRA	Insurance Regulatory Authority
IRRI	International Rice Research Institute
ISFM	Integrated Soil Fertility Management
ITK	Indigenous Technical Knowledge
ITWG	Inter-Governmental Technical Working Group
JAS	Joint Agricultural Secretariat
JATESC	Joint Agriculture Technical Steering Committee
JICA	Japan International Cooperation Agency
KACCAL	Kenya Adaptation to Climate Change in Arid and Semi-Arid Lands
KAGRC	Kenya Animal Genetic Resource Centre
KALRO	Kenya Agricultural and Livestock Research Organization
KCIC	Kenya Climate Innovation Centre
KCSAS	Kenya Climate Smart Agriculture Strategy
KEFRI	Kenya Forest Research Institute
KENAFF	Kenya National Farmers Federation
KENAS	Kenya Accreditation Service
KEPHIS	Kenya Plant Health Inspectorate Service
KEPSA	Kenya Private Sector Alliance
KEVEVAPI	Kenya Veterinary Vaccines Production Institute
KFS	Kenya Forest Service
KfW	Kreditnastalt fur wiederaufbau/German government owned bank
KICD	Kenya Institute of Curriculum Development
KIPI	Kenya Intellectual Property Institute
KIRDI	Kenya Industrial Research and Development Institute
KMD	Kenya Meteorological Department
KMFRI	Kenya Marine and Fisheries Research Institute
KNBS	Kenya National Bureau of Statistics
KRRF	Kenya Rice Researchers Forum
KSS	Kenya Soil Survey
LULUCF	Land Use, Land Use Change and Forestry
M&E	Monitoring and Evaluation
MALF	Ministry of Agriculture, Livestock and Fisheries
MDAs	Ministries, Departments and Agencies
MENR	Ministry of Environment, Natural Resources
MIAD	Mwea Irrigation Agricultural Development Center
MICT	Ministry of Information Communication Technology
MITC	Ministry of Industrialization, Trade and Cooperatives
MITI	Ministry of Industrialization and Enterprise Development
MLPP	Ministry of Lands and Physical Planning
MDP	Ministry of Devolution and Planning
MoE	Ministry of Education
ME&P	Ministry of Energy and Petroleum
MPSYGA	Ministry of Public Service, Youth & Gender Affairs

MRV	Measurement, Reporting and Verification
MTI	Ministry of Transport and Infrastructure
MTP	Medium Term Plan
MWI	Ministry of Water and Irrigation
NACOSTI	National Commission for Science, Technology and Innovation
NAMA	Nationally Appropriate Mitigation Actions
NAP	National Adaptation Plan
NBA	National Biosafety Authority
NCCAP	National Climate Change Action Plan 2013 – 2017
NCCC	National Climatic Change Council
NCCRC	National Climate Change Resource Center
NCCRS	National Climate Change Response Strategy
NCIC	National Cohesion and Integration Commission
NDC	Nationally Determined Contributions
NDMA	National Drought Management Authority
NDOC	National Disaster Operation Center
NEMA	National Environment Management Authority
NGO	Non-Governmental Organization
NIB	National Irrigation Board
NIMES	National Integrated Monitoring and Evaluation System
NLC	National Land Commission
NRM	Natural Resource Management
OECD	Organization for Economic Cooperation and Development
PESTLE	Political, Economic, Social, Technology, Legal and Environmental Analysis
PPP	Public Private Partnership
R&D	Research and Development
RCMRD	Regional Centre for Mapping Resource for Development
RDAs	Regional Development Authorities
REDD+	Reducing Emissions from Deforestation and Forest Degradation plus the efforts in conservation, sustainable management of forests and enhancement of forest carbon stocks
RVF	Rift Valley Fever
SDGs	Sustainable Development Goals
SIDA	Swedish International Development Cooperation Agency
SLM	Sustainable Land Management
UNCED	United Nations Conference on Environment and Development
UNCSD	United Nations Conference on Sustainable Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
WCED	World Commission on Environment and Development
WMO	World Meteorological Organization
WRA	Water Resources Authority
WRUA	Water Resource Users Associations
WY&VG	Women, Youth and Vulnerable Groups

GLOSSARY/DEFINITION OF TERMS

Adaptation: Adjustment in agro-ecosystems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

Agro-ecosystem: The organisms and environment of an agricultural area considered as an ecosystem.

Arid and Semi-Arid Lands: Areas characterized by inadequate precipitation, which constrains their two major interlinked services of primary production and nutrient cycling.

Biodiversity: The total diversity of all organisms and ecosystems at various spatial scales (from genes to entire biomass).

Capacity building: In the context of climate smart agriculture, it is the process of developing relevant technical skills and institutional capability to enable effective addressing of the causes and effects of climate change for the agriculture sector.

Carbon market: A trading system through which countries or other entities may buy or sell units of greenhouse gas emissions in an effort to meet their national limits on emissions under various protocols or other agreements. The term comes from the fact that carbon dioxide is the predominant greenhouse gas, and other gases are measured in units called “carbon-dioxide equivalents.”

Carbon sequestration: The process of removing carbon from the atmosphere and depositing it in a reservoir, such as the soil or trees.

Climate change: Climate change refers to a change in the state of the climate that can be identified (e.g. by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcing, or to persistent anthropogenic changes in the composition of the atmosphere or in land use.

Climate-proofing: Ensuring that climate risks are reduced to acceptable levels through long-lasting and environmentally sound, economically viable and socially acceptable changes implemented at one or more of the stages in the project cycle.

Climate smart agriculture: Agriculture that sustainably increases productivity, resilience (adaptation), reduces/removes greenhouse gases (mitigation), and enhances the achievement of national food security and development goals.

Co-benefits: Multiple benefits in different fields resulting from one policy, strategy, or action plan.

Conservation Agriculture: An approach to managing agro-ecosystems for improved and sustained productivity, increased profits and food security while preserving and enhancing the resource base and the environment. It is characterized by three linked principles namely, continuous minimum mechanical soil disturbance; permanent organic soil cover; and diversification of crop species grown in sequences and/or associations.

Crop diversification: Species diversification through varied crop associations and/or rotations (involving annual and/or perennial crops including trees).

Cross breeding: Cross breeding refers to the process of breeding an animal or plant with purebred parents of two different breeds, often with the intention to create offspring or seedlings that share the traits of both parent lineages, or producing an animal or plant with hybrid vigor.

Deforestation: The conversion of forest to another land use or the long-term reduction of tree canopy cover below the 10% threshold.

Disaster risk management: The systematic process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster.

Disaster risk reduction: The concept and practice of reducing disaster risks through systematic

efforts to analyze and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment and improved preparedness for adverse events.

Disaster: A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources.

Drought: The phenomenon that exists when precipitation is significantly below normal recorded levels, causing serious hydrological imbalances that often adversely affect land resources and production systems.

Dry spell: Short period of water stress during critical crop growth stages and which can occur with high frequency but with minor impacts compared with droughts.

Ecosystem resilience: The capacity of an ecosystem to absorb external pressure or perturbations through change and re-organization, but still retain the same basic structure and ways of functioning.

Ecosystem services: Ecological processes or functions that have monetary or non-monetary value to individuals or society at large e.g. Productivity or biodiversity maintenance; provisioning services such as food, fibre, or fish; regulating services such as climate regulation or carbon sequestration; and cultural services such as tourism or spiritual and aesthetic appreciation.

Ecosystem: The interactive system formed from all living organisms and their abiotic (physical and chemical) environment within a given area.

Enteric fermentation: Enteric fermentation is a natural part of the digestive process for many ruminant animals where anaerobic microbes, called methanogens, decompose and ferment food present in the digestive tract producing compounds that are then absorbed by the host animal. A resulting by-product of this process is methane.

Enteric methane: Methane gas emitted as a natural by-product of microbial fermentation of carbohydrates and, to a lesser extent, amino acids in the rumen and the hindgut of farm animals.

Erosion: The process of removal and transport of soil and rock by weathering, mass wasting, and the action of streams, glaciers, waves, winds and underground water.

Exposure: The nature and degree to which a system is exposed to significant climatic variations.

Food and nutrition security: This exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.

Greenhouse gases: The atmospheric gases responsible for causing global warming and climate change. The major GHGs are carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Less prevalent but very powerful greenhouse gases are hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and Sulphur hexafluoride (SF_6).

Index-based insurance: An insurance product in which the insured in a specified geographical region, receive indemnity payments based on independently observable outcomes/parameters such as temperature, rainfall, vegetation quantity, crop yields among others which are used to determine premiums and payouts.

Integrated landscape management: An umbrella term for natural resource management (NRM) systems that recognize the value of various ecosystem services to multiple stakeholders, and how this leads them to pursue different land use objectives or livelihood strategies.

Integrated pest management: An ecosystem approach to crop production and protection that combines different management strategies and practices to grow healthy crops and minimize the use of pesticides.

Intergovernmental Panel on Climate Change: Established in 1988 by the World Meteorological Organization and the UN Environment Programme, the IPCC surveys world-wide scientific and

technical literature and publishes assessment reports that are widely recognized as the most credible existing sources of information on climate change. The IPCC also works on methodologies and responds to specific requests from the UNFCCC's subsidiary bodies.

In-vitro conservation of genetic resources: Conservation by cryopreservation of genetic material so that living organisms can, if necessary, be regenerated in the future.

In-vivo conservation of genetic resources: Conservation of genetic material through maintenance of living populations, which encompasses both in-situ conservation in their typical production environment and ex-situ in-vivo conservation, in non-typical surroundings, such as a research farm.

Mitigation: In the context of climate change, human intervention to reduce the sources or enhance the sinks of greenhouse gases e.g. using fossil fuels more efficiently or electricity generation, switching to solar energy or wind power from fossil fuels for industrial processes and expanding forests and other "sinks" to remove greater amounts of carbon dioxide from the atmosphere.

Nationally Appropriate Mitigation Actions: A set of government prioritized actions aimed at reducing or limiting greenhouse gas emissions.

Payment for Ecosystem Services: An economic instrument designed to provide positive incentives to users of agricultural land and those involved in coastal or marine management. These incentives are expected to result in continued or improved provision of ecosystem services, which in turn, will benefit society as a whole.

Public-Private Partnerships: Public-Private Partnerships are an association between government and private sector through which private financing is utilized to perform a public function, at a profit to the private sector.

Protocol: An international agreement linked to an existing convention, but as a separate and additional agreement that must be signed and ratified by the Parties to the convention concerned. Protocols typically strengthen a convention by adding new, more detailed commitments.

Reducing Emissions from Deforestation and Forest Degradation plus: Reducing Emissions from Deforestation and Forest Degradation plus the role of conservation, sustainable management of forests and enhancement of forest carbon stocks.

Reforestation: The re-establishment of forest formations after a temporary condition with less than 10% of canopy cover due to human-induced or natural perturbations.

Resilience: The ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner.

Sensitivity (to climate variability or change): Sensitivity is the degree to which a system is affected, either adversely or beneficially, by climate variability or change. The effect may be direct (e.g. a change in crop yield in response to a change in the mean, range or variability of temperature) or indirect (e.g. damages caused by an increase in the frequency of coastal flooding due to sea-level rise).

Sustainable development: Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Technology transfer: A broad set of processes covering the flows of know-how, experience and equipment for mitigating and adapting to climate change among different stakeholders.

Vulnerability: The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity.

Watershed: A topographically delineated area that is drained by a stream system, i.e. the total land area that drains to some point on a stream or river. The watershed is a hydrologic unit that has been described and used as a physical-biological unit and a socio-economic-political unit for planning and managing of natural resources.

CHAPTER ONE: INTRODUCTION

1.1 BACKGROUND INFORMATION

1.1.1 The Agriculture Sector

Kenya's agriculture is key to meeting the challenges of feeding a growing population, creating wealth, reducing poverty and managing the degradation of natural resources. The agricultural sector continues to be a key economic and social driver of development. Overall, the sector directly contributes about 25% of Kenya's GDP and about 27% indirectly through linkages to agro-based industries and the service sector. The sector accounts for over 65% of exports, provides about 75% of total employment and supports over 80% of the rural population. The agricultural sector has four major sub-sectors, namely, crops, livestock, fisheries and forestry.

The crops sub-sector is key to agricultural development and industrialization for the nation. Overall, the crops sub-sector contributes 77.6% to the Agricultural Gross Domestic Product (AgGDP). The sub-sector comprises industrial, food and horticultural crops. The main industrial crops in Kenya include tea, coffee, sugarcane, cotton, sunflower, pyrethrum, barley, tobacco, sisal, coconut and bixa, all of which contribute about 55% of agricultural exports. According to the Economic Survey Report of Kenya (KNBS, 2014), industrial crops contributed 17.9% of the AgGDP in 2012.

The main food crops include cereals, pulses, roots and tubers, fruits and vegetables, all of which contribute about 32% of the AgGDP and 0.5% of exports earning. Most cereal crops recorded significant decline in production in the recent past. In the same period, performance of the crops sub-sector was boosted by a higher output of paddy rice and wheat. Over the same period, production of beans decreased while production of Irish potatoes improved significantly.

Horticulture is a critical sector in the country that has recorded a remarkable export-driven growth in the past decade. It is now the largest sub-sector contributing about 33% of the AgGDP and 38% of export earnings. The volume of fresh horticultural exports stood at 213.8 thousand tonnes in 2013.

Livestock plays an important economic and socio-cultural role among many Kenyan communities. The major livestock resources include cattle, camel, poultry, sheep, goats, bees, emerging livestock and their products. The national census of 2009 showed that Kenya's animal resource base comprised of 17.5 million cattle, 27.7 million goats, 17 million sheep, 3 million camels, 31.8 million domestic birds, and 1.8 million donkeys (GoK, 2010a). About 60% of Kenya's livestock herd is found in the arid and semi-arid lands (ASALs) which constitute over 80% of the country.

The livestock sub-sector contributes about 19.6% of the AgGDP and about 4.9% of Kenya's Gross Domestic Product (GDP). The sub-sector employs 50% of the agricultural labor force and is the main source of livelihood to over 10 million Kenyans living in the ASALs. The sub-sector has the potential to provide adequate supplies of all animal products to meet domestic food and nutrition needs and generate surplus for export.

The fisheries sub-sector provides food, employment and incomes to a large population and earns the country KSh. 5 billion annually from the foreign exchange. These earnings are likely to increase if the under-exploited areas such as Aquaculture and the Exclusive Economic Zone (EEZ) are tapped.

The sub-sector directly employs at least 300,000 people working as fishers and fish farmers. It also provides livelihoods for over 4 million Kenyans involved mainly in fish processing, fish trade and input support. Kenya's fishing communities rely on fish as a rich source of protein. The country's per capita consumption stood at 4.5 kg/person/year in 2014. Overall, the sub-sector contributes about 2% of AgGDP and 0.5% of national GDP. Kenya's fisheries sub-sector is mainly composed of freshwater (lakes, rivers and dams) and marine (Indian Ocean) sources with the rest coming from aquaculture. Lake Victoria is the most important source of fish in Kenya and the biggest source of freshwater fish in the country. The lake is also important in conservation terms because of its great biodiversity of endemic fish species. The other lakes that are important sources of fish are Turkana, Naivasha, Baringo and Jipe.

The main fish species of commercial importance from inland fisheries include Nile Perch, Tilapia, *Rastrineobola argentea* (dagaa/omena), while marine species comprise of Tuna, Snappers and Crustaceans. The national fish production in 2014 was about 187,000 MT valued at about KSh.32 billion (ex-vessel). Inland capture fisheries contributed about 124,000 MT (68%) of fish valued at Ksh. 12 billion while marine capture fisheries contributed about 9,000 MT (27%) valued at Ksh. 18 billion in 2014.

Forestry and agriculture are closely linked, since agriculture is the major driver of deforestation leading to forest loss. The forestry sub-sector contributes about 0.2% of AgGDP. Forest resources provide important ecosystem services that include food, water and medicine; regulation of floods, drought and land degradation; supporting soil formation and nutrient cycling; and cultural services such as recreational, spiritual, religious and other non-material benefits.

1.1.2 Climate Change

Climate change refers to a change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. It refers to any change in climate over time, whether due to natural variability or as a result of human activity.

Scientists started providing anecdotal evidence of anthropogenic climate change from the late 19th century but stronger evidence of human influence on global climate only emerged in the late 1950's when Keeling and others at the Scripps Institute of Oceanography began to measure the concentration of carbon dioxide in ice-cores. The results of these studies showed that global carbon dioxide concentrations were rising and linked the rise in concentration to an increase in global temperatures. Carbon dioxide had been known then to have a greenhouse or warming effect, which is the inherent ability to trap and retain infrared radiation.

The 1960s and 1970s saw heightened concerns over the global environmental change. These became prominent in the 1980s with the release of the Brundtland Report (also commonly known as 'Our Common Future') (Brundtland, 1987). The report alluded to various environmental concerns including climate change and associated the change with increasing atmospheric concentrations of greenhouse gases (GHGs). Climate change was considered one of the undesirable consequences of man's unsustainable development practices. Concerned with this, two UN bodies; the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) jointly

established the Intergovernmental Panel on Climate Change (IPCC) in 1989 to provide broad and balanced information about climate change. The IPCC does this by reviewing and assessing the most recent scientific, technical and socioeconomic information produced worldwide and relevant to the understanding of climate change and translating this information into IPCC Assessment Reports.

As a follow-up to the work of Brundtland Commission, which is formally known as the World Commission on Environment and Development (WCED), the United Nations Conference on Environment and Development (UNCED), informally known as the Earth Summit was convened in Rio de Janeiro, Brazil in June 1992. The Summit sought to take stock of past development paths and lay foundations for a new future economic development trajectory, one that would marry economic needs with environmental concerns. From the Summit, the United Nations Framework Convention on Climate Change (UNFCCC) emerged along with the Conventions on Biodiversity, Desertification, Agenda 21 and other major international environmental governance instruments and initiatives. A total of 192 Member States signed and ratified the UNFCCC, and committed to arrest the growing negative effects on climate by reducing emissions of GHGs which have a massive global warming impact.

The UNFCCC and its subsidiary bodies, now states with certainty that the earth is warming, largely spurred by human activities, and this will have many serious and potentially damaging effects in the coming decades. This is captured in the Fourth Assessment Report of the IPCC, the scientific advisory arm of the UNFCCC, which states that '*warming of the climate system is **unequivocal**, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level.*'

1.2 CLIMATE CHANGE AND AGRICULTURE

1.2.1 Global issues on Climate Change and Agriculture

There is wide scientific consensus that global climate is changing in part as a result of human activities (IPCC, 2001) and that the social and economic costs of slowing it down and responding to its impacts will be large (OECD, 2001). Current data demonstrates that the climate is changing globally at an unprecedented rate and that unparalleled levels of human induced greenhouse gas (GHG) emissions, especially carbon dioxide, are causing an increase in global temperatures that creates changes in the earth's weather. Atmospheric concentrations of carbon dioxide have increased from a pre-industrial value of 278 parts per million (ppm) to 379 ppm in 2005. It is now generally accepted that this climate change is the result of increasing concentrations of carbon dioxide, methane, nitrous oxide and other GHGs in the atmosphere (IPCC, 2001).

Studies have shown that there has been a steady rise in average global temperature. The earth has warmed by 0.74°C during the last 100 years. For example, the 1990s were about 0.6°C warmer than the late 1890s. The 1990s were the warmest decade since the beginning of instrumental record-keeping in 1860, and the warmest in the past thousand years on the basis of tree rings and other proxy measurements. Moreover, there has been an increase in the number of heat waves and a reduction in the frequency and duration of frosts in many parts of the world.

Climate change will have a range of positive and negative impacts on agriculture. It is generally agreed that agricultural impacts will be more adverse in tropical areas than in temperate areas. Developed countries will largely be beneficiaries: cereal productivity is projected to be higher in Canada, northern Europe and parts of the former Soviet Union compared with what it would have

been in the absence of climate change. By contrast, a number of today's poorest developing countries are likely to be negatively affected (IPCC, 2001). In these countries, the next 50 to100 years will see widespread declines in the extent and potential productivity of cropland (Fischer *et al.*, 2007) particularly in sub-Saharan Africa and southern Europe (Parry *et al.*, 1999).

It is now clear that climate change has become an impediment to sustainable development globally and urgent action is required. The UNFCCC recognizes these consequences and in Article 2 has called on the world's governments to take action aimed at reducing and stabilizing concentrations of GHGs '*in the atmosphere at a level that would avoid dangerous anthropogenic interference with the climate system*.' There is an opportunity based on the Paris Agreement 2015, for all nations of the world to address the impacts of climate change and maintain a balance between increasing agricultural productivity and environmental sustainability.

In the year 2015, the United Nations adopted the 2030 agenda for sustainable development. This has seventeen Sustainable Development Goals (SDGs). The SDGs cover issues addressed in the Kenya Vision 2030 (GoK, 2007). The goals relevant to agricultural development include; ending poverty, hunger, ensuring healthy lives, achieving gender equality, ensuring availability and sustainable management of water, access to clean energy, ensuring sustainable economic growth, fostering industrialization and innovation, reduction of inequalities, promoting responsible consumption and production, interventions on climate change, conservation of marine ecosystems, protection and restoration of terrestrial ecosystems, promote partnership for goals.

1.2.2 Regional issues on Climate Change and Agriculture

African economies are highly dependent on agriculture. Arable land and permanent pasture occupy one-third of the land area in Africa. Agriculture constitutes approximately 30% of GDP. It is estimated that 75% of the African population resides in rural areas, and almost all of the rural labor force is engaged in the production of crops, livestock, fisheries, and forestry.

Climate change is real, and is already affecting African agriculture. Between 1886 and 2012, global average temperatures have risen by 0.85°C and this is reflected across all regions of sub-Saharan Africa; and further increases of about 1.5°C by 2050 are almost certain. In 2013, Africa experienced an overall hot year, the second warmest on record after 2010. Changes in current rainfall patterns are less clear. However, a decline in precipitation has been observed in West Africa since the end of the 1960s, ranging from 20 to 40% between 1931 to 1960 and 1968 to 1990 (IPCC, 2007; Sissoko *et al.,* 2010). In a recent study, Fabusoro *et al.* (2014) found that in the sub-humid parts of Nigeria, the mean monthly rainfall has been increasing by 65 mm/month/decade from 1982 to 2010. These changes have contributed to prolonged and intensified droughts in eastern Africa; unprecedented floods in western Africa; depletion of rain forests in equatorial Africa; and an increase in ocean acidity around Africa's southern coast.

The IPCC Fourth Assessment Report indicates that annual rainfall is likely to decrease in much of Mediterranean Africa and the Northern Sahara, with a greater likelihood of decreasing rainfall towards the Mediterranean coast. On the other hand, rainfall in southern Africa is likely to decrease in much of the winter rainfall region and western margins. There is likely to be an increase in annual mean rainfall in East Africa, but it is unclear how rainfall in the Sahel, Guinean Coast and the Southern Sahara will evolve.

These observed and anticipated changes in weather patterns and climate extremes threaten agricultural production and food security which in turn undermines Africa's ability to grow and develop. Regional initiatives to respond to climate change include; the development of the East African Community Climate Change Policy (EACCCP), Masterplan and Strategy, which also informs Kenya's National Climate Change Framework Policy. The EAC regional Climate Change Master Plan (2011-2031) serves as the blue print to guide regional climate change response measures, in the long term.

1.2.3 National issues on Climate Change and Agriculture

Kenya's economic indicators over the years show that growth in the agriculture sector is synonymous to Kenya's economic growth. Historically, development worldwide has been closely related to greenhouse gas emissions due to unsustainable exploitation of natural resources, which contributes to climate change. Having been reclassified in 2014 from a low-income economy to lower-middle-income economy, there are clear indications that Kenya is developing, and therefore likely to increase its emissions. To realize Kenya's development vision as stated in the Kenya Vision 2030, "the low carbon climate resilient development pathway" was set out in the National Climate Change Response Strategy (NCCRS). This is meant to enhance development, make investments resilient to climate change and extreme weather events while reducing greenhouse gas emissions, where possible.

In Kenya, data from the Kenya Meteorological Department (KMD) indicates changes in temperature and rainfall over the last 50 years. From the early 1960s, Kenya has generally experienced increasing temperatures over vast areas. Over inland areas, the trends in both minimum (night-time/early morning) and maximum (daytime) temperatures depicts a ***general warming*** through time that has had negative impacts on the scenic snow-cap of Mt Kenya that rises above the surrounding savanna and can be seen from hundreds of kilometers away. Only 11 of the 18 glaciers that covered Mt Kenya's summit a century ago remain, leaving less than one third of the previous ice cover. The ice on Mt Kenya has also become thinner. While this trend dates to the late 1800s, emerging evidence suggests that it has accelerated since the 1970s due to climate change.

These changes in weather patterns and climate extremes are likely to jeopardize agricultural production and food security and hence Kenya's ability to grow and develop. For example, a temperatures rise of 2°C would lead to large areas of Kenya currently suited to growing tea becoming unsuitable. This would have an enormous impact on the tea industry which directly and indirectly employs three million Kenyans or about 8% of the population.

In general, annual highest rainfall events indicate that the 24 hour intense rainfall amounts observed in the recent years are relatively lower than those in the early 1960s; essentially, these values have ***been reducing (negative trend)*** with time. These trends are also depicted in the time series of the 'Long Rains' season which contributes a significant amount of rainfall to annual totals over most parts of the country. However, the changes (reductions) are not very significant. Most of the standard seasons also depict the same type of patterns in the highest daily rainfall values observed. Thus far, there is an indication of relatively more intense rainfall occurring more frequently. This causes floods particularly in lakeshore and coastal counties leading to loss of life and crops, displacement of households, and destruction of homes.

Changing rainfall patterns have effects on sustainability of water resources. For example, Lake Victoria which is the world's second largest freshwater lake and the largest lake in Africa is fed by waters from Kagera, Mara and Sondu catchments which accounts for 20% of the lake's water, while the remaining 80% is from direct rainfall (Awange *et al.,* 2008). The Basin provides livelihoods for about a third of the combined population of the three countries that share the lake's waters. In the 105-year history of accurate measurements on Lake Victoria, water levels have fluctuated widely since 1970 due to rainfall variability. This threatens the fisheries sub-sector on which the local population relies for household food security and income generation.

Climate change is also a factor towards increased intensity of El Niño and La Nina events, resulting in more severe and frequent floods and droughts. These events have become more intense since 1900 than at any time in the last 130,000 years. These droughts decimate livestock populations and crop harvests, while excessive rainfall results in increased incidences of diseases such as Rift Valley Fever (RVF). RVF outbreaks in the past have worsened food insecurity among pastoralists already suffering from severe drought and floods (USAID, 2007).

These changing temperature and rainfall patterns have profound impacts on Kenya's socio-economic sectors, most of which are climate-sensitive. These sectors include Agriculture, Livestock, Water, Health, Forestry, Energy and Fisheries. These impacts and others portend an increasingly worsening and worrying situation in the future if national efforts are not enhanced to make agriculture climate smart.

Past and current efforts by government have focused on policies and strategies to address climate change challenges. The following are key policies and strategies the government has developed and is implementing: Vision 2030, National Climate Change Response Strategy (NCCRS), 2010; National Climate Change Action Plan (NCCAP) 2013-2017; Agriculture Sector Development Strategy (ASDS) 2010-2020, the Agriculture (Farm Forestry Rules, 2009).

1.2.4 Climate Smart Agriculture

Globally, it is projected that food production will need to increase by a minimum of 50-70% by 2050 as the population is expected to increase from 7.4 billion in 2016 to 9.6 billion by 2050. At the same time, it is forecasted that there will be a 5% decrease in global food production by 2050 and that without adaptation, crop yields will decline by around 1.5% per decade (Lobell and Gourdji, 2012) or by approximately 5.6% by 2050 in an optimistic assessment. While increased agricultural productivity is key to meeting global food production deficit, agriculture also contributes to emission of greenhouse gases. It is currently estimated to contribute about 30% of the global greenhouse gas emissions responsible for climate change and hence has critical role in emissions reduction.

The term "climate-smart agriculture" (CSA) was adopted in late 2010 at the 1st Global Conference on Agriculture, Food Security and Climate Change at the Hague to describe tensions between maximizing global agricultural productivity, increasing the resilience of agricultural systems in the face of climate change, and concerns to minimize greenhouse gas (GHG) emissions from agriculture. CSA was defined as an agriculture that *"sustainably increases productivity, enhances resilience, reduces/ removes greenhouse gas emissions, and enhances the achievement of national food security and development goals"* (FAO, 2010). This definition set a global agenda for investments in agricultural innovations that unite agriculture, development and climate change communities under a common agenda through integrating the three dimensions of sustainable development (economic, social and environmental) by jointly addressing food security and climate challenges.

During the Hague conference, it was recognized that food security and climate change have emerged as possibly the two most significant global challenges over the coming decades, and therefore described CSA as an approach to developing the technical, policy and investment conditions to achieve sustainable agricultural development for food security under climate change. It contributes to the achievement of national food security and development goals with three objectives; (i) sustainably increase agricultural productivity and incomes; (ii) adapt and build resilience to climate change; and (iii) minimize greenhouse gas emissions where possible.

1. 3 MISSION VISION AND GUIDING PRINCIPLES

Vision

A climate resilient and low-carbon growth sustainable agriculture that ensures food security and contributes to national development goals.

Mission

To facilitate agriculture that sustainably increases productivity, enhances resilience and minimizes greenhouse gas emissions.

Overall objective

The overall objective of this strategy is to build resilience and minimize emissions from agricultural farming systems for enhanced food and nutritional security and improved livelihoods.

Specific Objectives

i. To enhance adaptive capacity and resilience of farmers, pastoralists and fisher-folk to the adverse impacts of climate change.

ii. To develop mechanisms that minimize greenhouse gas emissions from agricultural production systems.

iii. To improve coordination and collaboration among institutions and stakeholders in climate smart agriculture.

iv. To address cross-cutting issues that adversely impact or enhance CSA.

Guiding Principles

This Strategy is in accordance with the fundamental and operational principles across agricultural, environmental and financial boundaries and innovative institutional arrangements. The implementation of this Strategy will be guided by the following principles:

i. **Multi-dimensional, considering short, medium and long term:** This strategy will, at every stage, take into account global to local implications, as well as short, medium and long term time scales.

ii. **Country and context specific:** This considers the socio-economic, political, cultural and environmental circumstances; the institutional and technological context; political will, resource availability and mobility; social and political awareness, and overall capacity. The strategy appreciates that there is not a single "perfect" approach, and the approach taken is informed by principles of good practice and adapted based on specific circumstances and context.

iii. **Intergovernmental and participatory**: The strategy recognizes distinctiveness and inter-dependence of the two levels of government in line with Kenya's Constitution and the Intergovernmental Relations Act, 2013. It has adopted a cross-sectoral approach which takes advantage of potential synergies.

iv. **Sustainable agriculture:** This Strategy will endeavor to nurture healthy ecosystems and support sustainable management of land, water and natural resources while ensuring increased productivity for national food security. This will entail improving efficiency in the use of resources; direct action to conserve, protect and enhance natural resources; and enhance resilience of people, communities and ecosystems, especially to climate change and market volatility. This is in line with the United Nations Sustainable Development Goals, as adopted on 25th September 2015.

v. **Good Governance:** This Strategy will promote good governance that comprises Accountability (sound fiscal choices, made in a transparent manner, that give priority to productive social sectors such as agriculture); Transparency (decision-making, particularly in budget, regulatory and procurement processes that is critical to the effectiveness of resource use and the reduction of corruption and waste); The rule of law (a fair, predictable and stable legal framework to enable actors assess economic opportunities and act on them without fear of arbitrary interference and expropriation); and Participation (a consultation process that enables all stakeholders to participate in the formulation of development strategies and in the design and implementation of programmes and projects). This principle will guide the Strategy in institutionalizing an overall enabling environment for implementation of CSA and mainstreaming climate change issues in agriculture.

vi. **Environmental Management**:

a) The Polluter Pays Principle,

b) The User Pays Principle,

c) The Precautionary Principle,

d) The Principle of Effectiveness and Efficiency,

e) The Principle of Responsibility,

f) The Principle of total value,

g) The Principle of Participation, and

h) The Principle of Proportionality which is based on the concept of balance. To maintain balance between economic development on the one hand and environmental protection on the other. It cannot be disputed that no development is possible without some adverse effects on ecology. Therefore, it is essential to adjust the interest of the people as well as the necessity to maintain the environment. Moreover, comparative hardships have to be balanced and benefits to a larger section of the people have to be maintained. This principle will guide the Strategy in institutionalizing measures that will ensure balance between increasing food supply and maintenance of environmental integrity.

1.4 JUSTIFICATON

Kenya's agricultural sector is highly vulnerable to extreme weather events and climate variability and change. Climate change has led to declining crop production due to variation in rainfall onset dates, amounts, distribution and cessation. It has also caused loss of livelihood arising from loss of livestock, particularly in ASAL areas due to depletion of natural vegetation and pasture. The recurrent droughts and rising temperatures attributed to climate change continues to exert more pressure on fisheries resources due to reduction of water supply, and increased evaporation of water in lakes and rivers. The country therefore requires transformation of its agricultural systems to make them more productive, resilient and competitive in generating incomes under a changing climate. CSA provides an excellent opportunity for this transformation. CSA is an approach that sustainably increases agricultural production and incomes, builds resilience of agricultural systems to climate change and minimizes GHG emissions.

However existing national strategies and interventions have not adequately mainstreamed climate change adaptation and mitigation in the agricultural sector. There is inconsistency between agriculture, food security and climate change leading to inefficiencies in implementation of climate change adaptation and mitigation interventions. In 2015, Kenya submitted its Intended Nationally Determined Contribution (INDC) to the UNFCCC which has outlined CSA as a strategy to implement adaptation and mitigation actions in the National Climate Change Action Plan (GoK, 2012). Therefore the sector needs a sound and enabling Strategy that simultaneously addresses climate change adaptation and mitigation, rural development, food security and environmental management.

1.5. METHODOLOGY

The development of the Climate Smart Agriculture Strategy was initiated by the Ministry of Agriculture, Livestock and Fisheries (MALF) and coordinated by the Climate Change Unit. Committee meetings were held to prepare the strategy development roadmap with detailed terms of reference (ToR), work plan, resource requirements and a concept note. The Principal Secretaries, State Department for Agriculture, State Department for Livestock Production, State Department for Fisheries and the Blue Economy, State Department for Environment and State Department for Irrigation constituted a multidisciplinary team of experts to spearhead the development of the strategy. The task team comprised experts with specialization in the following areas: Environment, Crops, Livestock, Fisheries, Meteorology, Forestry, Irrigation, Policy Formulation and Climate Change.

The task team convened an induction workshop where key thematic areas, important resource documents and key stakeholders were identified and draft strategy outline developed. The team undertook literature review that informed the situational analysis and was used to determine the strategic issues and strategy direction. The initial and subsequent CSA drafts were developed in workshops and desktop working sessions. The process also engaged the Inter-Governmental Technical Working Group (ITWG) on Policy, Legislation and Standards under the Secretariat of the Council of Governors. The draft document was then subjected to further interrogation by senior technical staff of the Ministry of Agriculture, Livestock and Fisheries and Ministry of Environment, Natural Resources and Regional Development Authorities. The draft was then subjected to wider stakeholder consultations that brought together all the 47 counties in six clustered regional workshops in Garissa, Mombasa, Meru, Naivasha, Kitale, and Kisumu.

The back to back workshops were held to capture input from stakeholders in the counties. The views from regional/county consultations were collated and incorporated. The draft strategy was then presented to Cabinet Secretary and Principal Secretaries for discussion and then presented to a multi-stakeholder National Validation Workshop. The inputs from these two meetings were then incorporated into a final strategy for climate smart agriculture and launched for implementation.

Flooded bananas from Alon Tana River

Construction of a water harvesting pan for agricultural use

CHAPTER TWO: SITUATION ANALYSIS

2.1 CURRENT SITUATION

2.1.1 Impact of Climate Change on the Agriculture Sector

Kenya's total area is comprised of 97.8% land and 2.2% water surface. Out of this, only 16% of the land falls within medium to high rainfall areas where 75% of the population live and the rest is arid or semi-arid characterized by water deficit for sustainable agricultural production.

The high rainfall zones receive more than 1,000 mm per annum, occupy less than 20% of the productive agricultural land and carry approximately 50% of the country's population. Most of the food and cash crops as well as livestock products are produced in these zones under semi-intensive and intensive systems. The medium rainfall zones receive between 750 and 1000 mm of rainfall annually and occupy between 30 and 35% of the 20% of the productive agricultural land area and carry approximately 30% of the population. Farmers in these zones keep cattle and small stock, and grow a wide range of crops. The ASALs receive 200 to 750 mm of rainfall annually and occupy about 84% of Kenya's total land area. ASALs are predominantly used as rangelands and game parks and carry 80% of the country's livestock and 65% of the wildlife.

The impacts of climate change in Kenya's agriculture sector are manifested in extreme weather events that causes flooding, drought, landslides, strong winds; seasonal weather variations; increased temperatures and gradual change in precipitation patterns. These impacts causes acute and chronic threats to agro-based livelihoods and leads to encroachment into fragile ecosystems. Climate change leads to land degradation and decrease in agricultural productivity; increased incidences of pests and diseases affecting crops, livestock, fish and trees; as well as the destruction of physical and social infrastructure. This leads to reduced yields and loss of income in the agriculture sector; food shortage and malnutrition; reduced quality of produce and earnings as well as increased postharvest losses. In addition, due to the high risks in agro-based enterprises, there is low agro-based investments and low technology uptake for production and value addition. Though physical and social infrastructure is needed to adapt to climate change, build resilience and exploit opportunities that arise due to climate change, Kenya currently has inadequate and, in some cases inappropriate infrastructure such as for irrigation.

Agricultural production relies heavily on finite resources that include land, water, forest and pastures. People living in a specific area usually consist of different groups with divergent interests and therefore compete for various natural resources leading to resource conflicts. Increased biodiversity loss due to climate change disrupts ecosystem structure and functionality. Reduced biodiversity interferes with provision of ecosystem services such as medicinal plants, aesthetics, food, and forest products which eventually escalates conflicts. These conflicts may result in loss of human life, livestock and crops hence disrupting agriculture, livestock and fisheries activities and affecting livelihoods and economic development. Besides, agriculture expansion is in conflict with forest conservation as it has been identified as a core driver of deforestation and forest degradation.

Crops sub-sector

The major climate change-related challenges in the crops sub-sector include changes in enterprise suitability for specific areas, leading to decrease in profitability; unpredictable timing of farming operations due to seasonal weather variability and reliability, leading to lower production efficiency; losses due to yield reductions, total crop failures, enhanced postharvest losses and increased production costs arising from extreme weather events or reduced land productivity.

Drought and floods lead to decline in crop production, total crop failure, degradation of the environment and an increase in destitution. For instance, due to droughts, the country's famine cycles have reduced from 20 years (1964-1984), to 12 years (1984-1996), to two years (2004-2006) and to yearly (2007/2008/2009). This necessitated distribution of approximately 530,000 metric tons (MT) of assorted foodstuffs worth Ksh. 20 billion between 2004 and 2009 to feed a population of between 3.5 and 4.5 million people annually.

Livestock sub-sector

Climate change is having substantial effects on ecosystems and the natural resources upon which the livestock sub-sector depends. Climate change has led to declining livestock production due to direct and indirect impacts to both livestock and their production systems. In grazing systems, the direct impacts include increased frequency of extreme weather events; increased frequency and magnitude of droughts and floods; productivity losses due to physiological stress occasioned by temperature increase; and change in water availability. The indirect impacts stem from agro-ecological changes and ecosystem shifts that lead to alteration in fodder quality and quantity; change in host-pathogen interaction resulting in increased incidences of emerging diseases; and disease epidemics. In non-grazing systems, the direct impacts include change in water availability and increased frequency of extreme weather events while the indirect impacts include increased resource prices (e.g. feed, water and energy), disease epidemics and increased cost of animal housing (e.g. cooling systems).

Fisheries sub-sector

Fish are cold blooded organisms and depend on the environment in which they live in hence more prone to climate change threats. The major climate change-related challenges in the fisheries sub-sector emanate from changes in temperature regimes and precipitation patterns; extreme weather events and water quality.

Climate change affects fisheries and aquaculture through acidification of the water bodies, changes in sea temperatures and circulation patterns, the frequency and severity of extreme events, and sea-level rise and associated ecological changes. These changes have the potential of altering the physico-chemical properties of the fish habitats. Consequently, fish feeding, migration and breeding behavior will be directly affected while indirectly the changes will affect growth, mortality and reproduction (Brander, 2010). The distribution patterns of many fish species will probably change as warmer-water species and colder-water species are both expected to move pole wards (Beare *et al*., 2004). The changes manifest in the fish through increased metabolism that culminates in smaller body size and a smaller brood, sex determination that favors the prevalence of females over males, expansion and/or contraction of suitable habitats (e.g. coral reefs, sea grass beds and mangroves) and shifts in the distribution of fish stocks due to alteration or reduction of feeding grounds, reduction in breeding grounds, changes in migratory circuits that connect life stages, thereby affecting successful completion of the life cycle and successful recruitment. Coastal areas with coral reefs are particularly vulnerable to changes in temperature and acidity, with serious food security concerns for countries that rely on these resources for food and coastal protection. This is because coral reefs provide both shelter and feeding grounds for the juveniles of many fish species.

On the other hand, the flooding and sea-level rise may create new opportunities and environments as polar ice melts (Easterling *et al*., 2007), resulting in new areas for mangroves and aquaculture opportunities. In addition, new fisheries may become available as fish populations shift geographic distributions. In aquaculture production systems, increased water temperatures, variability in water

availability, eutrophication, stratification, and toxicity of pollutants will lower the habitat quality and availability of dissolved oxygen thereby lowering productivity and the nutritional value of aquatic products.

Forestry sub-sector

Forests are also casualties to climate change. Kenya's forest cover is estimated to be 7%, which include both indigenous and plantation forests (FAO, 2015) and this is far below the internationally accepted minimum level of 10%. Deforestation and forest degradation have caused significant reduction in forest cover, destruction of habitat, loss of biodiversity, and increasing GHG emissions. This is already evident in many places including upper parts of lower eastern conservancy such as Machakos and Kitui, and Taita Taveta in coast conservancy as well as all ASALs of Kenya. Changing climatic conditions have also affected the regeneration rate, and biodiversity composition, especially of natural forests.

This decrease has resulted from unplanned excision of land for settlement and unsustainable harvesting of trees without replanting. The destruction of forestland has contributed to increased rates of flooding as the concentration time is reduced on bare ground leading to landslides and siltation of rivers. Currently, efforts in forestry development in the country focuses on increasing forest/tree cover through natural forest conservation, plantation forestry, dryland forestry, commercial forestry, farm forestry, school greening programs and urban forestry to achieve the desired minimum 10% tree cover. Government is also conserving and rehabilitating degraded water catchment areas. The adoption of agro-forestry has improved over the years with government promoting farm forestry and conservation of natural environment. Initiatives aimed at introducing commercial tree species in ASALs to control desertification and improve livelihoods are on-going. Hence there is need for an integrated landscape approach to conservation and restoration. The ASDS 2010-2020 (GoK, 2010b) stipulates promotion of tree planting, wildlife conservation, agricultural productivity enhancement and upscaling micro-enterprises which provide synergies that improve overall environmental and production needs.

2.1.2 Greenhouse Gas Emissions in the Agriculture Sector

Kenya's GHG emissions are expected to rise, consistent with a growing population and expanding economy, with emissions increasing from 73 million tons of carbon dioxide equivalent ($MtCO_2e$) in 2010 to 143 $MtCO_2e$ in 2030 (Figure 1). The livestock, agriculture and forestry sectors are the largest emitters in Kenya accounting for approximately 67% of emissions in 2010. The largest absolute growth in emissions is expected in energy and transport, with energy emissions increasing from 10 $MtCO_2e$ in 2010 to 33 $MtCO_2e$ in 2030 and transport emissions increasing by about three times in the same period (NCCAP 2013-2017).

The UNFCCC has laid the foundation for the system of reporting on information on GHG emissions by sources and removals by sinks, as well as on the actions that countries are taking to mitigate and adapt to climate change e.g. Nationally Determined Contributions (NDCs), Biennial Update Reports (BURs) and National Communication. This is key in determining the progress in the implementation of agreements at both international and national levels. Hence the need for development of a Measurement, Reporting and Verification (MRV) system.

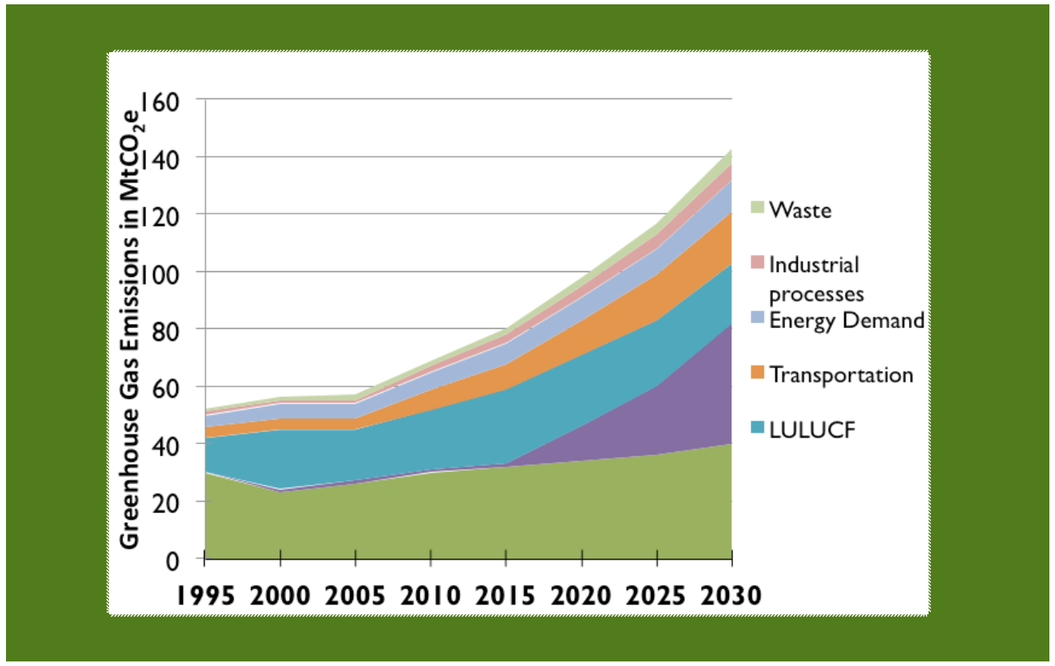

Figure 1**:** Kenya's GHG emissions between 1995 and 2010 and projections up to 2030

Crops sub-sector

The crops sub-sector contributes about 10% of all emissions from the agriculture sector and the major greenhouse gases emitted are CO_2, CH_4 and N_2O. These gases emanate from activities such as deforestation, land use change, conventional tillage, flooding of paddy rice fields, and burning of crop residues. Other sources include direct emissions from farm machinery due to inadequate maintenance and unfavorable working conditions such as wet soils.

Livestock sub-sector

The livestock sub-sector contributes about 90% of the emissions from the agriculture sector mainly from enteric fermentation. Livestock farming systems are largely extensive and clearing of forests and grassland to open up land for grazing thereby emit greenhouse gases. The quality of ruminant feeds available to farmers is of low quality and low digestibility. These, combined with poor animal health and husbandry, contribute largely to high emissions. To sustain extensive production systems, livestock farmers and pastoralists burn grassland to enhance growth of lush pastures. The pastoral communities take pride in overstocking for social security without regard to pasture management aspects, a practice that leads to overgrazing and land degradation. Other sources of emissions include land preparation and fertilizer use during pasture establishment, processing of inputs, poor manure management, processing of produce and transportation.

Fisheries sub-sector

The likely contributor of GHG emissions within the fisheries value chain is at fishing and fish farming stages. In aquaculture production system, the construction of fish ponds, manufacturing of feeds and fish feed waste contribute to the emissions. In capture fisheries, use of fossil fuel; inefficient and poorly maintained engines; long fishing hours and shifting fishing grounds; transportation; and fish storage and processing lead to GHG emissions.

Forestry sub-sector

According to the NCCAP 2013-2017, forestry and other land use related emissions accounted for 19.6 $MtCO_2e$ in 2010, or about 32% of national emissions. Deforestation, forest and grassland fires, land clearing for agricultural production are the major sources of greenhouse gas emissions. However, farmers do not relate land use, land use change and forestry (LULUCF) to carbon emissions. Currently, managing farmers' high expectations from carbon market is critical as emphasis should be on benefits that come from the farm in terms of increased productivity and incomes rather than the carbon trade.

2.1.3 Policy, Legal and Institutional Framework

There are various institutions and stakeholders that are core in climate change and climate smart agriculture issues. In developing this strategy, policies, legislations and strategies related to climate smart agriculture which are spread across different Government Ministries and State Agencies have been reviewed and reference made to the Constitution of Kenya to ensure coherence, alignment and identification of gaps.

2.1.3.1 Policies and strategies in relation to agriculture and climate change

a) Kenya Vision 2030

To achieve the objectives of Kenya Vision 2030, agriculture is expected to be innovative, commercially oriented and modern. The Vision also states that the country aims to be a nation that has a clean, secure and sustainable environment. It provides for an increase of 4% in forest cover and to lessen by half all environment-related diseases. The Vision has provided for flagship projects in water catchment management, land cover and land use mapping and specific programs in agricultural development, and investment in renewable sources of energy. The implementation of Vision 2030 will lead to the achievement of Sustainable Development Goals (SDG) through programs envisaged in social, economic and political pillars.

b) Agriculture Sector Development Strategy (ASDS) 2010-2020

The ASDS is the blue-print of the agricultural sector to implement Vision 2030. It sets out a detailed plan to "position the agricultural sector as a key driver for delivering the 10% annual economic growth rate envisaged under the economic pillar of Vision 2030". It envisions "a food-secure and prosperous nation" and aims to increase productivity; commercialization and competitiveness of agricultural commodities and enterprises; and develop and manage key factors of production. The Strategy advocates for sustainable land management and scaling up of appropriate technologies suitable for drought-prone areas. It further proposes programs for mitigation and adaptation to climate change.

c) National Policy for the Sustainable Development of Northern Kenya and other Arid Lands

The Sessional Paper No. 8 of 2012 on National Policy for the Sustainable Development Northern Kenya and other Arid Lands recognizes that pastoralists have successfully managed climate variability for centuries. However, the policy notes that skills and indigenous knowledge will become more valuable as the impact of global climate change becomes more pressing. The policy also states that climate change will exacerbate the challenges already facing the arid and semi-arid regions of the country. A key objective of this policy is to strengthen the climate resilience of communities living in the ASALs and ensure sustainable livelihoods. The policy proposes a variety of measures to reduce the effects of drought and climate change on vulnerable communities in the ASALs.

d) National Livestock Policy

The Sessional Paper No. 2 of 2008 (Revised 2015) on the National Livestock Policy identifies high frequency and increased severity of droughts as one of the effects of the climate change phenomenon. The policy identifies measures to enable the livestock sub-sector enhance its contribution to food and nutritional security, provide raw materials for agro-based industries and contribute to improved livelihoods in the country. It emphasizes the improvement of the livestock management systems for sustainable development of the livestock industry. Due to frequent droughts that affect livelihoods that are dependent on livestock, the policy proposes to establish a livestock insurance scheme that will be operated in a public-private-partnership model.

e) National Oceans and Fisheries Policy (2008)

The National Oceans and Fisheries Policy (2008) proposes ecosystem-based sustainable exploitation of fishery resources conservation and management. For purposes of aquaculture, the policy proposes to use adaptive and environmentally sustainable technologies and best international practices. It further requires the enforcement of fish handling standards that minimize post-harvest losses. With regard to capture fisheries, it proposes sustainable management and responsible use of natural resources for increased production and productivity.

f) Water Master Plan Towards 2030

The plan recognizes that the country has not fully developed her irrigation potential estimated at 1.342 million hectares. This is based on surface and underground water including water harvesting and storage. It identifies that approximately 12% of the potential has been equipped with irrigation infrastructure, presenting an opportunity to increase productivity to meet the rising demand for food and other agro-products. However, it proposes formulation of irrigation development programmes and financing to build infrastructure and a well-equipped human resource capacity for sustainable operations and management. It also proposes the establishment of an institutional arrangement for efficient management and coordination to facilitate enhanced participation of stakeholders so as to embrace business-oriented irrigated agriculture.

g) National Land Policy (2007)

The policy focuses on sustainable and equitable use of land. It requires actions to address environmental problems such as land degradation, soil erosion and pollution. The policy stipulates the principles of conservation and management of land based natural resources; protection and management of fragile and critical ecosystems including wetlands and arid lands. The policy further calls for extensive overhaul to current policies and institutions in an attempt to address chronic land tenure insecurity and equity. The overall objective of the policy is to secure rights over land and provide for sustainable growth, investment and reduction of poverty in line with the Government's overall development objectives. This policy was developed through extensive stakeholder consultations and most policy recommendations are reflected in the Constitution of Kenya, 2010.

h) National Climate Change Response Strategy (2010)

The strategy proposes adaptation and mitigation strategies to cushion climate sensitive sectors like agriculture (GoK, 2010c). It focuses on ensuring that adaptation and mitigation measures are integrated in all government planning and development objectives; has prioritized the most vulnerable sectors of the economy for quick and immediate action; and has provided explicit measures for addressing climate change in Kenya and defined criteria to track effectiveness of such measures. It has given recommendations on priority interventions on climate smart agriculture.

i) National Climate Change Action Plan 2013-2017

The NCCAP identifies priority adaptation and mitigation actions for transforming to a low carbon climate resilient development pathway. The priority adaptation actions for agriculture includes coordination and mainstreaming of climate change into agricultural extension; establishment and maintenance of climate change related information for agriculture; and upscaling specific adaptation and mitigation actions. These actions include promotion and bulking of drought tolerant traditional high value crops, water harvesting for crop production, index-based weather crop insurance, conservation agriculture, agroforestry, and integrated soil fertility management.

j) Kenya National Adaptation Plan (NAP) 2015-2030

Its main objective is to consolidate the country's vision on adaptation. This is supported by macro-level adaptation actions that relate with the economic sectors and county-level vulnerabilities in order to enhance long term resilience and adaptive capacity.

k) Green Economy Strategy and Implementation Plan (GESIP)

The GESIP underpins Kenya's commitment to undertake a transition to a green economy in line with the outcome of the United Nations Conference on Sustainable Development (UNCSD) held in 2012 (Rio+20 Summit). The GESIP outlines an avenue for functional interaction between economic development and the Sustainable Development Goals (SDGs). The plan proposes resilience building efforts that focuses on ensuring that the economy and livelihoods are less vulnerable to risks and challenges of climate change.

2.1.3.2 Institutional Framework

Various institutions address climate smart agriculture at different levels. These include National and County Governments, Private Sector, Development Partners, Regional and Global Institutions as well as other stakeholders. These different institutions and stakeholders undertake policy formulation, regulatory functions, research and technology development, advisory and service provision, implementation, capacity building and financing climate smart agriculture related activities.

Institutions involved in formulation of policies related to CSA include the following ministries, departments and state agencies: Ministry of Environment and Natural Resources (MENR); Ministry of Agriculture, Livestock and Fisheries (MALF); Ministry of Water and Irrigation (MWI); Ministry of Lands and Physical Planning (MLPP); The National Treasury (TNT); Ministry of Devolution and Planning (MDP); and Ministry of Energy and Petroleum (ME&P) and County Governments.

Regulatory institutions in matters related to climate smart agriculture include: National Environment Management Authority (NEMA); Water Resources Authority (WRA); Water Services Regulatory Authority (WaSReA); National Land Commission (NLC); National Biosafety Authority (NBA); Agriculture and Food Authority (AFA); Directorate of Veterinary Services (DVS); Kenya Plant Health Inspectorate Service (KEPHIS); Kenya Forest Service (KFS); and Fisheries Department in charge of Monitoring, Control and Surveillance; and Fish Quality Assurance.

Research organizations that have a role in climate smart agriculture include: Kenya Agriculture and Livestock Research Organization (KALRO); Kenya Forestry Research Institute (KEFRI); Kenya Marine Fisheries Research Institute (KMFRI); International Livestock Research Institute (ILRI); World Agroforestry Centre (ICRAF); Centre for International Forestry Research (CIFOR); International Centre for Insect Physiology and Ecology (ICIPE); and Universities.

Institutions and stakeholders involved in advisory and provision of support services include: Kenya Meteorological Department (KMD); Department of Resource Surveys and Remote Sensing (DRSRS); Kenya Forestry Service (KFS); National Irrigation Board (NIB); Regional Development Authorities (RDAs); Regional Centre for Mapping Resources for Development (RCMRD); Inter-Governmental Authority Centre on Pastoral Areas and Livestock Development (ICPALD) and NGOs.

Training institutions dealing with climate smart agriculture include the universities and middle level colleges such as Kenya Water Institute, Bukura Agricultural College, Kenya School of Agriculture, Dairy Training Institute, Kenya Forestry College, Public and Private Agricultural Training Centres, Kenya Institute of Organic Farming; Kenya Meat Training Institute and the Animal Husbandry and Industry Training Institutes.

Organizations involved in financing of climate smart agriculture programmes and projects include: The National and County Governments; United Nations Development Programme (UNDP); United States Agency for International Development (USAID); Japanese International Cooperation Agency (JICA); Swedish International Development Agency (SIDA); Danish International Development Agency (DANIDA); International Fund for Agricultural Development (IFAD); African Development Bank (AfDB); UK Department for International Development (DfID); German International Development Agency (GIZ); German Government owned bank (KfW) and Australia Agency for International Development (AusAID).

2.1.3.3 Legal Framework for CSA

Laws and regulations are integral to effective strategy implementation and operationalization. The existing legal frameworks that govern issues which are directly and/or indirectly linked to climate change and consequently to climate smart agriculture include the following:

The Constitution of Kenya 2010

The Constitution of Kenya 2010 provides for sustainable natural resource management in the bill of rights especially land, environment and natural resources. Further, it requires "the state to ensure sustainable exploitation, utilization, management and conservation of the environment and to ensure equitable sharing of accruing benefits". It states that land in Kenya shall be held, used and managed in a manner that is equitable, efficient, productive and sustainable. The Constitution grants "every person the right to a clean and healthy environment" which includes the right to have the environment protected through legislative and other measures, thereby obliging the state to involve the public in the management, protection and conservation of the environment. It also entitles "every person to adequate, clean and safe water". The Constitution bestows upon every citizen the duty to cooperate with state organs and other persons to protect and conserve the environment and to ensure ecologically sustainable development and use of natural resources.

The Constitution, in its Fourth Schedule, stipulates the division and sharing of functions between the National and County Governments. The National Government is mandated to carry out policy formulation, disaster management, and protection of the environment and natural resources with a view to establishing a durable and sustainable system of development and disaster management. The functions of County Governments include implementation of specific National Government policies on natural resources and environmental conservation which include CSA related functions such as soil and water conservation; forestry and agroforestry; crop and animal husbandry; fisheries; disaster management; water and sanitation services; and storm water management.

The Climate Change Act of 2016

This Act of parliament provides for a regulatory frame work for enhanced response to climate change to provide for mechanisms and measures to achieve low carbon climate development and for connected purposes. The Act is intended to be applied for the development, management, implementation and regulation mechanisms to promote sustainable development.

Environmental Management and Coordination Act (EMCA), Cap 387

This Act provides a framework for environmental and social development and harmonizes the various sector specific legislation impacting on environment and the management of natural resources**.** Under the EMCA 1999 (revised 2013), there are a number of activities that are relevant to CSA which require Environmental Impact Assessment (EIA). These include; changes in land use that entail major changes in the use of land and large scale resettlement schemes. Also included are forestry related activities such as clearance of forest areas, reforestation/afforestation with alien species, and introduction of alien species and excisions of gazetted forest for whatever purposes.

In agriculture, these activities include large scale agriculture, introduction of new pesticides, large scale pest control programs, widespread introduction of new crops and animals, widespread introduction of fertilizers, irrigated agriculture exceeding 50 hectares, major developments in biotechnology including the introduction and testing of genetically modified organisms.

For processing and manufacturing industries, these include fertilizer manufacture or processing, large scale tanning and dressing of hides and skins, large scale abattoirs (more than 15 animals per day) and meat processing plants, large scale brewing and malting, bulk grain processing and storage, large scale fish processing plants, pulp and paper mills and large scale food processing plants.

Agriculture (Farm Forestry) Rules 2009

The key elements of the farm forestry rules relevant to climate smart agriculture are its objectives and purpose which is to maintain a compulsory farm tree cover of at least 10% of any agricultural land holding. The 10% tree cover would enhance conservation of water, soil and biodiversity; protection of riverbanks, shorelines, riparian and wetland areas; sustainable production of wood, charcoal and non-wood products; provision of fruits and fodder; and carbon sequestration and other environmental services.

Agriculture and Food Authority (AFA) Act No. 13 of 2013 (revised 2015)

This Act provides for consolidation of the laws on the regulations and promotion of agriculture generally, to provide for the establishment of the Agriculture and Food Authority. It also makes provision for the respective laws of National and County Governments in agriculture, excluding livestock and fisheries and related matters in furtherance of the relevant provisions of the 4th schedule of the Constitution and for connected purposes. The Act provides for formulation of policy guidelines on development, preservation and utilization of agricultural land; noxious and invasive weeds; and responsibilities of county governments.

Forest Conservation and Management Act No. 34 of 2016

The Act provides for establishment, development and sustainable management, including conservation and rational utilization of forest resources for socio-economic development of the country. It has provisions for enforcement of related regulations and creation and management of forests.

The Water Act No. 43 of 2016

The Act provides for the regulation, management, development and use of water resources, and water and sewerage services. It has provisions for formulation of five-year integrated water services strategy with plans, programs for protection, conservation, control and management of water resources; establishment of water sector institutions which include Water Resources Authority (in place of Water Resources Management Authority) to regulate water rights and works; the National Water Harvesting and Storage Authority (in place of National Water Conservation and Pipeline Corporation); the Water Services Regulatory Authority (in place of Water Services Regulatory Board); Water Works Development Agencies (in place of Water Services Boards); the Water Sector Trust Fund (in place of Water Services Trust Fund) to enhance water services; the Water Services Regulatory Authority to control water service providers, and the Water Tribunal (in place of Water Appeals Board) for dispute resolution. The act also addresses use of water resources to satisfy human and livestock needs, and to protect ecosystems to secure ecologically sustainable development, including the responsibilities of county governments and public private partnerships.

Land Act of 2012

This Act revises, consolidates and rationalizes land laws so as to provide for the sustainable administration and management of land and land-based resources. It provides for the legal regime that will govern, among others, the administration and management of public and private land, contracts over land, leases, charges, easements and related rights. The Act applies to all public land, community

land and private land as defined in the Constitution of Kenya 2010. The Land Act outlines the following guiding values and principles that are relevant to sustainable land management: sustainable and productive management of land resources; conservation and protection of ecologically sensitive areas; democracy, inclusiveness and participation of the people in land management. The Act binds these values and principles on all state organs, state officers and all persons whenever any of them enacts, applies or interprets any provisions of the Act or makes or implements public policy decisions.

Land Registration Act of 2012

This Act provides for revision, consolidation and rationalization of the registration of titles to land to give effect to the principles and objects of devolved government in land registration. The Act provides that no part of the land comprised in a land register shall be transferred unless the proprietor has first sub-divided the land and duly registered each sub-division. It sets provisions that protect selling of land. The Act however fails to give provisions for minimum and maximum land holding acreages in respect of private land as required in Article 60 (1) of the Constitution which has implication on the implementation of sustainable land management practices in farm holdings.

National Land Commission Act of 2012

The purpose of the Act is to make provision to the functions and powers of the National Land Commission (NLC). The following objects and purposes of this act are relevant to CSA: management and administration of land should be in accordance with the principles of land policy as set out in the constitution and the national land policy; there should be linkage between the commission, county governments and other institutions dealing with land and land related resources. In the Act, the functions of the NLC relevant to CSA include: recommending a national land policy to the national government; conducting research related to land and the use of natural resources, and make recommendations to appropriate authorities; monitoring and oversight responsibilities over land use planning throughout the country.

Other legislations

Other legislations that have bearing on climate change and climate smart agriculture include the Acts establishing Regional Development Authorities which provide for resource mobilization for investment in multipurpose water storage facilities; the Standards Act for regulating quality standards; the Biosafety Act which establishes the National Biosafety Authority and provides for the regulation of genetically modified organisms; and the Energy Act which provides for the development and use of renewable energy. There are also sanitary and phytosanitary legislations under DVS, Fisheries and KEPHIS that have a bearing on CSA.

There is therefore need for collaboration to enable harmonization of implementation of the above laws to harness synergy in addressing matters related to CSA.

2.1.3.4 Gaps in policies, legislations, strategies and institutional framework

Most of the existing policies, strategies and legislations are not aligned to the Constitution and do not provide for coordination of CSA related issues, for a coherent and effective response to the local, national and global challenges and opportunities on climate change as it affects agriculture. Further, the various CSA instruments provide limited innovative interventions on adaptation and mitigation. There are inadequate mechanisms for linkages and coordination between CSA agencies and stakeholders which results in overlaps and inefficiency in implementation of programs.

2.1.4 Cross-Cutting Issues

(i) Climate Smart Agriculture Finance

This is an important enabling aspect to support climate change mitigation and adaptation activities in crops, livestock, fisheries, forestry and water sub-sectors. The current sources of financing climate change activities are from Government, private and multilateral institutions such as World Bank and African Development Bank; bilateral financial partners such as United Kingdom's Department for International Development (DfID), French Agency for Development (AFD), Danish International Development Agency (DANIDA), German International Development Agency (GIZ), Japan International Cooperation Agency (JICA), Swedish International Development Cooperation Agency (SIDA), International Fund for Agricultural Development (IFAD), the Food and Agriculture Organization of the United Nations (FAO). However, there is no strategy that guides the financing of climate change adaptation and mitigation activities by the different players in the agriculture sector.

(ii) Equity and Inclusivity of Women Youth and Vulnerable Groups

The Bill of Rights in Chapter 4 of the Constitution of Kenya proscribes discrimination against all persons directly or indirectly on any ground, including race, sex, pregnancy, marital status, health status, ethnic or social origin, colour, age, disability, religion, conscience, belief, culture, dress, language or birth. In the Agriculture Sector Development Strategy (2010-2020), social inclusion and equity of Women, Youth and Vulnerable Groups (WY&VG) in the agriculture sector activities is emphasized including safeguarding of their interests and rights for sustainable sector growth in the light of climate change. Nevertheless, discrimination against WY&VG in the light of climate change issues persists to date and would be largely responsible for low adaptive capacity and reduced resilience of farming systems leading to problems of food and livelihood insecurity.

(iii) Human Resource Development

Adequate human resource, both in terms of number and requisite skills, is required for effective implementation of CSA. However, the numbers and skills available is not adequate to meet the needs of CSA. This is due to many factors, including low employment of relevant professionals and limited capacity of institutions to train on emerging issues such as adaptation and building resilience in response to climate change impacts. The recent conversion of middle-level agricultural institutions into institutions of higher learning has led to lack of adequate hands-on CSA technical agricultural workforce.

(iv) Research and Development

Although there are a number of national and international institutions engaged in CSA research, the research activities are fragmented due to lack of coordination and some areas in the sector are not catered for e.g. emerging crops and livestock. In addition, the research agenda on CSA is largely set by development partners through provision of targeted funding and not demand driven. There is also low public expenditure on research and limited participation by the private sector coupled with poor management of agricultural research information.

(v) Data and information on Climate Smart Agriculture

Strategic decision making and implementation of CSA initiatives require accurate, current, reliable data and information. This includes collection, storage, access, collation, synthesis and dissemination of climate smart agriculture data and information. Currently, there is no comprehensive climate smart agriculture data and information management system. Creating an inventory for data is important as main ingredient in provision and development of national communications. In addition, data system and management is a tool for feeding to domestic frameworks for measurement, reporting and verification (MRV), for the agricultural sector.

2.2: ANALYSIS OF STRENGTHS, WEAKNESSES, OPPORTUNITIES AND THREATS (SWOT)

2.2.1 Introduction

The SWOT analytical framework provides a scan of areas of strengths within the agriculture sector and climate change which actors can take best advantage of and focus to consolidate gains, weaknesses that require addressing as well as potential opportunities and threats posed within the operating environment. In order to determine the strategic issues that will inform the strategic focus for the CSA, the SWOT analyses the impact of climate change on agriculture; greenhouse gas emissions; policy legal and institutional framework; and the cross-cutting issues such as finance, equity and inclusivity, natural resource management, human resource development and, research and development.

I. Impact of Climate Change on Agriculture			
STRENGTH	**ISSUE TO ADDRESS**	**WHAT TO DO WITH STRENGTH**	**THREATS**
Existence of knowledge on adaptation options within line ministries, departments and research institutions	Capacity building for resilience	Disseminate knowledge on climate change adaptation options	• Dynamic climate beyond our control • Limited human and physical resources
Existence of diverse production systems	Adaptive capacity of production systems	Promote diversification of enterprises and alternative livelihoods	• Changing weather patterns • Slow pace of changing to new types of agricultural enterprises and production systems
Availability of arable land	Utilization of land resource	Sustainable management and utilization of land	• Decline in soil health and water quality due to climate change and extreme weather events
Existence of a diverse and rich natural resource base	Sustainable natural resource management and utilization	Enhance capacity in land use planning and sustainable resource management	• Natural disaster such as drought and floods • Political interference
Availability of adaptive species to climate change phenomena	Promotion of the desired species that have adaptive capacity	Propagation and promotion of the species to build on resilience	• Diminishing access and availability of adaptive genetic species
WEAKNESS	**ISSUE TO ADDRESS**	**WHAT TO DO WITH WEAKNESS**	**THREATS**
Low adaptive capacity of local communities	Diminishing agricultural productivity	Promote measures that strengthen adaptive capacity	• Limited resources • Cultural mindset that limits adoption
Over-reliance on rain-fed production	Vulnerability to changing precipitation patterns	Promote measures to reduce vulnerability of farmers, pastoralists and fisher folk	• Dynamic climate changes which is beyond our control
Low adoption/uptake of technologies	Inefficient production systems	Enhance adoption/uptake of technology	• Limited resources • Cultural mindset that limit adoption
Susceptibility to extreme weather events	Capacity for resilience	Promotion of interventions that enhance resilience capacity and risk mitigation	• Limited resources • Cultural mindset that limit adoption
Competition for natural resources	Sustainable natural resource base	Rationalize use of natural resources to ensure appropriate and sustainable utilization	• Conflicts on natural resource use e.g. pastoralists and farmers • Political interference

OPPORTUNITY	**ISSUE TO ADDRESS**	**WHAT TO DO WITH OPPORTUNITY**	**THREATS**
Existence of diverse Agro Ecological Zones and Species diversity	Base for diversified agricultural production and agro-ecological zone specific enterprises	• Promote Land use zoning • Enterprise diversification	• Politics • Cultural mindset • Shift in crop/livestock/ fishery suitability zones due to changing temperature and precipitation patterns
Bimodal rainfall pattern	Optimize utilization of multiple cropping	Rainfall forecasting/ prediction	• Dynamic climate which is beyond our control • Inadequate Infrastructure
Existence of Stakeholders' platforms and institutions relevant to CSA	Low adoption of resilience building	Support the platforms for CSA stakeholders to collaborate and participate in developing and implementing policies and strategies that promote CSA	• Resources • Cultural mindset
Devolved system of governance	Management of natural resources	Involve stakeholders in management of natural resources	• Conflicts on natural resource use e.g. pastoralists and farmers • Political interference
II. Greenhouse Gas Emissions			
STRENGTH	**ISSUE TO ADDRESS**	**WHAT TO DO WITH STRENGTH**	**THREATS**
Existence of technologies that reduce emissions in agriculture sector	Dissemination and adoption of emissions reduction technologies	Develop mechanisms for dissemination/awareness and adoption of technologies	• Limited resources • Weak Inter and intra governmental relations • High cost of technologies/ trade-off of adopting new technology • Cultural mindset that limits adoption
Existence of expertise on mitigation in the agriculture sector	Consolidate knowledge and expertise on mitigation	Establish a CSA consultative forum	• Challenges with coordination and sustainability
WEAKNESS	**ISSUE TO ADDRESS**	**WHAT TO DO WITH WEAKNESS**	**THREATS**
Unsustainable agricultural land management practices	Consolidate knowledge and expertise on mitigation	Mainstreaming of sustainable agricultural land management in development and conservation planning	• Limited resources • Low adoption of sustainable land management practices • Land fragmentation • Land tenure
Inefficient crop and livestock production systems	Emissions due to inefficient crop and livestock production systems (especially paddy rice production and enteric fermentation)	Support intensification and efficiency in production systems.	• Low Farmer resource base • Land tenure • Cultural mindset
Poor management of fertilizers/ manures and agricultural wastes	Emissions from manure, agricultural waste and inefficient fertilizer use	Promote recommended livestock manure and agricultural waste management and efficient use of fertilizer	• Extensive production systems • Cost of technologies

Fossil fuel use in the agriculture sector	Emission from fossil fuels	Support efficient innovations in machinery and equipment, and promote Green sources of energy.	• Cost of technologies and innovations
Inadequate data on emissions from agriculture sector	Inadequate emission data for the sector	Establishment of a data management system	• Poor data sharing policies • Cost of data assembly and management
Inadequate MRV mechanism	Inventory of GHG emissions and action to address mitigation	Develop structure to collect GHG emission information and data	• Indolent of consultancy • Reliance on external knowledge and skill
OPPORTUNITY	**ISSUE TO ADDRESS**	**WHAT TO DO WITH OPPORTUNITY**	**THREATS**
Kenya's submission of Intended Nationally Determined Contribution to UNFCCC to carry out mitigation actions	Agriculture specific mitigation interventions	• Development of NAMAs • Development of programs/ projects on mitigation	• Limited human and Financial resources
Expertise in climate friendly practices among rural development agencies, farmers' organizations, NGOs, private agricultural businesses	Institutional challenges to rapidly scale up climate-friendly practices	• Tap diverse expertise • Impart CSA skills to expand knowledge pool	• Lack of institutional platforms
III Policy Legal and Institutional Framework			
STRENGTH	**ISSUE TO ADDRESS**	**WHAT TO DO WITH STRENGTH**	**THREATS**
Existence of climate change related policies and legislations	Policy guidance and regulation	Enhance coordination and implementation instruments	• Inadequate structures in Intergovernmental relations for implementation of CSA related policies and legislations
Existence of climate change institutions	Structured coordination and implementation	Improve coordination and strengthen institutional capacities	• Weak inter- and intra-governmental linkages and among other organizations
WEAKNESS	**ISSUE TO ADDRESS**	**WHAT TO DO WITH WEAKNESS**	**THREATS**
Weak legal enforcement mechanism	Implementation of policies and laws	Strengthen capacity of lead agencies	• Inadequate human, financial and operational resources
Limited alignment of existing CSA related policies and laws to the Constitution of Kenya 2010	Aligning of policies and laws	Review and align existing CSA related policies and laws to the Constitution of Kenya 2010	• Delays due to conflicting interests amongst actors
Inadequate focus of CSA in existing policies and strategies	Leverage of CSA on the policies and strategies	Lobby for review of existing CSA related policies and strategies	• Conflicting interests amongst stakeholders

Overlap of mandates among State agencies	Efficiency and effectiveness in planning and implementation	Improve coordination among State Agencies	• Limited cooperation among relevant institutions
OPPORTUNITY	**ISSUE TO ADDRESS**	**WHAT TO DO WITH OPPORTUNITY**	**THREATS**
Existence of global and regional institutions addressing CSA related issues	Capacity development, networking and advocacy	Strengthen linkages and collaboration	• Divergent interests among actors
Existence and dynamism of conventions, protocols and standards	Global guidelines on implementation of CSA related action plans	Adaptation and review of conventions, protocols and standards	• Political and economic considerations • Bureaucratic processes and procedures
IV Cross-cutting:			
(a) Finance			
STRENGTH	**ISSUE TO ADDRESS**	**WHAT TO DO WITH STRENGTH**	**THREATS**
The existence of financial support for CSA	Climate smart agriculture financing	Enhance efficient financial systems to manage CSA funds	• Budget cut and reallocation • Changes in Government policies and regulations on financial management • Changes in government funding and expenditure priorities • Poor governance
WEAKNESS	**ISSUE TO ADDRESS**	**WHAT TO DO WITH WEAKNESS**	**THREATS**
Limited access to CSA funds	Funds for CSA implementation	Enhance capacity to access CSA funds	• Limited funds
Low financing priorities for CSA programs and projects	Sustainable CSA funding	• Awareness creation/ lobbying. • Establishment of a fund for the implementation of activities for CSA.	• Budget ceilings for programmes and projects.
OPPORTUNITY	**ISSUE TO ADDRESS**	**WHAT TO DO WITH OPPORTUNITY**	**THREATS**
Existing private and International donor funds to support CSA programmes and projects	Funding for CSA activities.	• Strengthen institutional capacity and strategic partnerships with external partners to mobilize resources • Build capacity of stakeholders to access various funding sources • Promote PPPs	• Complex modalities of accessing external CSA funds • Donor withdrawal • Demand for immediate benefits by the private sector • Dynamic international legal instruments and standards
(b) Equity and Inclusivity			
STRENGTH	**ISSUE TO ADDRESS**	**WHAT TO DO WITH STRENGTH**	**THREATS**
Existence of a National Framework to address inequity and exclusion for Women Youth and Vulnerable Groups	Capacity of Women Youth and Vulnerable Groups to adapt to climate change impacts.	• Increase resilience of Women Youth and Vulnerable Groups in farming systems to improve food security and livelihood	• Political dynamism • Gender disparity/ bias • Cultural beliefs and practice • Misrepresentation and misunderstanding of gender issues

WEAKNESS	ISSUE TO ADDRESS	WHAT TO DO WITH WEAKNESS	THREATS
Limited capacity of WY&VG to adapt to climate change impacts in agriculture	• Build capacity to promote equity and inclusivity of WY&VG	Reduce vulnerability of WYVG due to insecure livelihoods, decline in nutrition and health status	• Limited training facilities and both financial and human resources
OPPORTUNITY	**ISSUE TO ADDRESS**	**WHAT TO DO WITH OPPORTUNITY**	**THREATS**
Advocacy by the civil society and international organizations on WY&VG equity and inclusivity	The participation of WY&VG in CSA activities	Create awareness to mainstream CSA issues among the WY&VG.	• Political and cultural interference • Misrepresentation and misunderstanding of gender issues
(c) Human Resource Development			
STRENGTH	**ISSUE TO ADDRESS**	**WHAT TO DO WITH STRENGTH**	**THREATS**
Availability of skilled human resource	Human capacity for CSA	Build capacity for CSA	• High turn-over of staff, • Poor succession planning
WEAKNESS	**ISSUE TO ADDRESS**	**WHAT TO DO WITH WEAKNESS**	**THREATS**
Limited capacity of institutions to train on emerging CSA issues	Capacity building on emerging issues on CSA	• Mainstream of CSA issues in curriculum development for training institutions • Provide quality training standards for CSA	• Inadequate financial resources • Inadequate training facilities on CSA
OPPORTUNITY	**ISSUE TO ADDRESS**	**WHAT TO DO WITH OPPORTUNITY**	**THREATS**
Existence of CSA online information sources and information sharing platforms	CSA information	• Enhance internet access • Create awareness on the online existence of the CSA information	• Cost of access to web-based information • Computer access and literacy • Limited ICT infrastructure
(d) Research and Development			
STRENGTH	**ISSUE TO ADDRESS**	**WHAT TO DO WITH STRENGTH**	**THREATS**
Existing research institutions to undertake CSA research	CSA research for technology development and innovations	Promote participatory CSA research, technology development and innovations	• High cost of research • Changing donor priorities
WEAKNESS	**ISSUE TO ADDRESS**	**WHAT TO DO WITH WEAKNESS**	**THREATS**
Limited research on CSA	CSA research technology development and innovations	• Enhance CSA research agenda • Coordinate inter-institutional CSA research development and dissemination	• Different statutes governing mandates and operations of the research institutions • Limited funding for research
OPPORTUNITY	**ISSUE TO ADDRESS**	**WHAT TO DO WITH OPPORTUNITY**	**THREATS**
The existing indigenous CSA knowledge	Innovative traditional and cultural knowledge on CSA	Integrate indigenous knowledge with scientific knowledge	• Limited inventory of indigenous knowledge • Attitude of researchers • Dynamics of technology • Lack of legal framework for Indigenous knowledge

2.3 POLITICAL, ECONOMIC, SOCIAL, TECHNOLOGY, LEGAL AND ENVIRONMENTAL (PESTLE) ANALYSIS

2.3.1 Introduction

This is a framework or tool that has been used to analyze the various external (Political, Environment, Social, Technology, Legal and Economic) factors that might impact on the components of the CSA strategy. The results of the analysis are used to assess the strengths, weaknesses, opportunities and threats that the external factors pose on CSA and use it to inform the strategic interventions. The strategies are aimed to achieve the objectives of the CSA strategy; adapting and building resilience to climate change, mitigation of greenhouse gas emissions for enhanced, income, food and nutritional security.

1. POLITICAL FACTORS

Impact of Climate Change on Agriculture

1.1 Increased awareness and support to address climate change in general

1.2 Inadequate appreciation by the political leaders of the linkages between climate change and development

1.3 Low interest by political leaders on long term investments and delayed returns/benefits from CSA

1.4 Increased political role in the counties in implementation of policies, strategies and programmes e.g. distribution of resources for CSA related projects.

GHG Emissions

1.5 Kenya is a signatory to the United Nations Framework Convention on Climate Change (UNFCCC) and other related multilateral climate change agreements.

1.6 Kenya has submitted the Intended Nationally Determined Contribution (INDC) and other documents providing measures and actions on mitigation.

1.7 Both national and county governments are yet to appreciate climate change mitigation.

1.8 Lack of standardization, quality assurance and quality control mechanisms for green products and services

Policy legal and Regulatory

1.9 Political goodwill that encourages policy, legal and institutional reforms.

1.10 Increased political role in formulation and implementation of policies, legislations and strategies from National and County Governments (up to the Ward level).

1.11 Possibility of conflict of laws due to different legislating bodies (Parliament and County Assemblies).

1.12 Political interests in the management of natural resources.

1.13 Weak regulatory enforcement.

Cross-cutting Issues

1.14 Operational treaties, conventions and protocols that are nationally binding on climate smart financing

1.15 Bureaucratic procedures in accessing international climate financing

1.16 Ratification and accessions of international laws depends on the political leadership.

1.17 Political goodwill that addresses issues of Women, Youth and Vulnerable Groups

2. ECONOMIC FACTORS

Impact of Climate Change on Agriculture

2.1 More funds for development in the county under devolved system of governance.

2.2 More funds assigned to developing countries under the Paris Agreement.

2.3 Growing private sector interest in investing in CSA technologies e.g. starch from cassava, re-afforestation by Total Kenya and Safaricom.

2.4 Inadequate knowledge by actors of the climate change-agriculture nexus, and the subsequent impact on agricultural GDP and economic development.

2.5 The economic effects of extreme weather events on agricultural enterprises and agro-based infrastructure.

2.6 Inadequate mechanisms for risk management in the agricultural sector e.g. early warning systems and agricultural insurance.

GHG Emissions

2.7 Limited access to capital constrains up-scaling of mitigation actions in agriculture.

2.8 There is inadequate investment directed towards promoting eco-labeling of agricultural products.

2.9 High cost of technologies for emission reduction and development of MRV system.

Policy Legal and Regulatory

2.10 Provision of contingency funding and disaster risk management interventions (insurance, food and feed reserves).

2.11 Programmes targeted to recovery from impacts of climate change (irrigation, cash transfer, etc.).

2.12 Provision of climate change fund in the Climate Change Act, 2016

Cross-cutting Issues

2.13 Low public expenditure on CSA.

2.14 High cost of research.

3. SOCIAL FACTORS

Impact of Climate Change on Agriculture

3.1 Gradual adoption of agricultural practices that safeguard against climate change e.g. irrigation and intensification.

3.2 Existence of indigenous knowledge for climate change adaptation.

3.3 Conflicts in natural resource use due to competition for declining resources.

3.4 Demographic challenges e.g. high population growth puts pressure on existing natural resources.

3.5 Unresolved historical issues on natural resources e.g. land and water.

3.6 Cultural norms and beliefs towards resource ownership and access.

GHG Emissions

3.7 Lack of safeguard and incentive mechanisms in promoting reduction of emissions from agriculture sector.

3.8 Cultural mind-sets limit mitigation options.

3.9 Slow adoption of agricultural practices that minimize emission of GHGs.

Policy Legal and Regulatory

3.10 Existence of conflict resolution structures and emphasis on alternative dispute adjudication mechanisms in the country which can be used for CSA related issues.

Cross-cutting Issues

3.11 Conflicts in natural resource use due to competition for declining resources.

3.12 Demographic challenges e.g. high population growth puts pressure on existing natural resources.

3.13 Unresolved historical issues on natural resources e.g. land and water

3.14 Cultural norms and beliefs towards resource ownership and access.

3.15 Limited special skills on CSA.

4. TECHNOLOGY FACTORS

Impact of Climate Change on Agriculture

4.1 Use of inappropriate technologies and practices leading to low productivity and greater susceptibility to climate change.

4.2 Increased use of ICT based weather forecasting and early warning and information generation and sharing.

GHG Emissions

4.3 Lack of integrated landscape approach in implementation of mitigation actions.

4.4 Limited research on mitigation in agriculture sector.

4.5 Inadequate private sector engagement in the agriculture sector.

4.6 Use of inefficient farm equipment and machinery that leads to high emissions.

4.7 Low capacity of extension service providers to disseminate mitigation interventions.

4.8 Lack of quality control of CSA advisory services.

4.9 Limited technology and knowledge in addressing MRV.

Policy Legal and Regulatory

4.10 Inadequate integration of CSA related issues in technology development and dissemination.

4.11 Lack of legal framework for indigenous knowledge.

Cross-cutting Issues

4.12 High rate of technological changes in CSA.

4.13 Inadequate research-extension-farmer linkage.

4.14 Inadequate CSA knowledge management system to collect, store, process and disseminate developed knowledge.

4.15 Fragmented research.

5. LEGAL FACTORS

Impact of Climate Change on Agriculture

5.1 Adequate legal instruments available at the local and international levels to address climate change challenges e.g. the Constitution of Kenya, the Climate Change Act 2016, the Climate Change Framework Policy and the Paris Agreement, 2015.

5.2 Poor enforcement of laws and policies relating to CSA.

5.3 Bill of Rights in the Kenya Constitution 2010 which supports inclusivity and equity and Chapter 5 of the constitution that supports sustainable natural resource management.

GHG Emissions

5.4 Lack of a consolidated legal framework in agricultural sector that guides mitigation efforts on overlapping and linked mandates.

5.5 Lack of clear land tenure rights, tree tenure/user rights and carbon rights jeopardize implementation of mitigation actions.

5.6 Lack of guidelines on carbon trading in the agriculture sector.

5.7 Absence of structures and mechanism for monitoring emissions.

Policy Legal and Regulatory

5.8 There is no legislation on age limit of imported farm machinery.

5.9 Lack of legislation to regulate pollution from machinery and motor vehicles working in the sector.

5.10 Lack of legislations on land use/enterprise zoning.

Cross-cutting Issues

5.11 Bill of Rights in the Kenya Constitution 2010 which supports inclusivity and equity and Chapter 5 of the constitution that supports sustainable natural resource management.

6. ENVIRONMENTAL FACTORS

Impact of Climate Change on Agriculture

6.1 There is a shift in the seasonal rainfall patterns, distribution and reliability.

6.2 There is a general rise in the average temperatures and changes in temperature ranges leading to loss of agricultural land due to the rise of sea level.

6.3 Shift in agro-ecological zones for agriculture production due to changes in temperature and rainfall regimes.

6.4 There is abundant and unexploited solar and wind energy.

6.5 There is increased encroachment of water catchments leading to land degradation.

6.6 Un-sustainable use of natural resources.

GHG Emissions

6.7 Rapid land use change and desertification.

6.8 Overfishing, overstocking, deforestation and wetland degradation.

6.9 Inappropriate agricultural waste management.

Policy Legal and Regulatory

6.10 Existence of policies and legislations for the protection and conservation of the environment.

Cross-cutting Issues

6.11 Conversion of forest land for agriculture and human settlement.

2.4 STRATEGIC ISSUES

The key strategic issues outlined below emanated from the analysis of the Strengths, Weaknesses, Opportunities and Threats (SWOT) and the Political, Economic, Social, Technological, Legal and Environmental (PESTLE) in the context of climate smart agriculture. This revolved around the thematic areas of impact of climate change on the agriculture sector; green house gas emissions in the sector**;** institutional, legal and regulatory framework for CSA; and the role of cross-cutting issues in CSA. The strategic issues under each of the above areas are examined with respect to how they impact on productivity, growth and development of the crops, livestock, fisheries and forestry subsectors.

2.4.1: Impacts of Climate Change on the Agriculture Sector

Strategic Issue 1: Vulnerabilities due to changes in temperature regimes and precipitation patterns

Crops sub-sector

The changes in temperature regimes and precipitation patterns have led to the shifting of agro-ecological zones thereby changing the geographical suitability of crop enterprises as well as shifting the cropping seasons (such as planting dates and harvesting dates). This has resulted in reduced production per unit area, increased post-harvest losses and production costs for crops. The changes have also contributed to an increase in the incidences of pests and diseases in crops, as well as emergence of new ones.

Crop simulation models show that, in general, temperature rise caused by climate change is the main driver of crop yield decreases (Luedeling, 2011). All simulated crops respond negatively to higher temperatures. Among crops that will find future climatic conditions intolerable are soy bean (with very low yield potential and very high yield reduction under rising temperatures), cotton (its production risk stems from its transitional place between two seasons), and to lesser extents maize and dry beans. However, some crops are expected to experience more favorable growing conditions as a result of climate change, such as banana, cassava, sorghum, sweet potato, pearl millet, groundnut, and finger millet. There is also evidence that mango, banana, sugarcane and pineapple show increasing suitability for all future climate scenarios (Luedeling, 2011). However, many suitability scenarios enhanced by higher temperatures also seem constrained by water shortage.

Livestock sub-sector

Over time, heat stress increases livestock vulnerability to diseases, reduces fertility and milk production. Temperature and precipitation contributes to increase in prevalence of parasites and diseases that affect livestock. Diminished precipitation levels and enhanced temperatures have also led to decrease in forage across most of Kenya. This was manifest in 2009 when livestock mortality rates reached 80% in southern Kenya due to drought and enhanced temperatures (Ericksen *et al.,* 2012).

Fisheries sub-sector

Global warming has led to loss of cold-water fish farming areas. There is strong evidence partly linking El Nino Southern Oscillation (ENSO) events with systematic changes in plankton abundance and aquatic/marine plant as well as animal composition over recent decades in many regions worldwide. The ENSO events with phases of warm water reduce plankton production, and cause fish

stocks to decline. In addition, changes in ocean circulation are predicted to lead to loss of certain fish populations or establishment of new ones. Temperature changes will likely result in changes of up-welling patterns, which might affect fish spawning period and success of larvae, thereby altering the entire life cycle and size of fish populations.

Forestry sub-sector

The distribution of most of Kenya's forests is determined by rainfall. With rainfall as one of the most affected climatic elements, the survival of Kenya's forest resources is likely to be severely affected. For example, the ASALs are subject to recurring droughts, which when coupled with overexploitation of resources, result in high vulnerability to land degradation and desertification. This not only increases levels of GHG emissions, but simultaneously threatens livelihoods. The vulnerability of Kenya's forest resource is further exacerbated by the depletion of forest and other land cover through rapid increase in population and demand for human settlements; both agricultural and grazing land; construction materials; food; fuel wood; essential oils; and herbal medicines.

Climate change adds to the stresses on Kenya's forest cover by altering the growth of trees, causing dieback in forests and animal species to migrate, which will in turn impact on forest products supply. The reduction in forest cover will have disastrous effects on downstream agriculture and hydropower generation, with big rivers such as Ewaso-Nyiro being reduced to small streams and hundreds of other small rivers completely dry up especially during serious drought periods. This has serious implications for the livelihoods of those living downstream and the rest of the country, which depend on products from these ecosystems.

Changes in temperature usually leads to changes in vegetation while some species may become extinct. For example, some tree species such as *Melia volkensii, Terminalia spinosa, Delonix elata,* and *Hyphaene coriacea* in the North Eastern region, and *Psychotria* species in the Taita Hills of coast region may either dwindle in abundance or become extinct.

Strategic Issue 2: Vulnerabilities due to extreme weather events

Crops

Climate change has led to more frequent and intense extreme weather events such as drought, floods, strong winds, hailstorms, and frosts. Droughts lead to loss of investments in crop production due to reduced yields or total crop failure as a result of water stress, inhibiting plant nutrient abstraction from the soil and the vital physiological processes of the plant. Floods lead to anaerobic soil conditions, hindering the ability of the roots to aerobically respire and abstract nutrients from the soil. This results in plant stresses that reduces yields or causes total crop failure. Strong winds lead to breakage, logging or physical injury of the crop, accelerated evapotranspiration that lead to crop stress and yield reduction. Hailstorms cause physical crop damage, reducing the photosynthetic leaf area and predisposing the plant to disease infections. In some cases, depending on the degree and stage of the crop, hailstorm damage may trigger rapid translocation of photosynthates from the vegetative parts of the plant to the reproductive (yield determining) parts. This may in turn enhance the achievement of better yields.

Frosts are more prevalent in the upper highlands, affecting mainly tea and horticultural crops, thereby reducing the yields and quality of the produce. Frosts lead to crystallization of water within plant tissues, causing death of the resultant tissues, and if widespread, death of the plants may occur. Depending on the magnitude and spread, this affects both the quantity and quality of the produce.

Drought, floods and strong winds also lead to the destruction of infrastructure such as the silting of dams, clogging and breaking of irrigation and drainage infrastructure; destruction of farm buildings and roads; drying, storage and marketing facilities, as well as agro-based industries. Wet conditions during harvest of cereals lead to enhanced postharvest losses due to rotting and aflatoxin contamination. Strong winds, landslides and dust storms also contribute to the reduction of soil fertility through erosion and translocation of the fertile top soils.

Livestock

Extreme weather events, especially droughts and floods lead to reduced pasture and forage availability, degradation of the environment and an increase in destitution. Strong winds and dust storms also contribute to the reduction of forage availability as they erode top soil, thus making grass regeneration difficult even when it rains. Recurring droughts have caused heavy losses to livestock, forcing an estimated 30% of livestock owners out of pastoralism in the past 20 years. Estimated livestock mortality as a result of drought is about 10–15% above normal in the affected areas, which is equivalent to 5% of Kenya's livestock population (World Bank, 2011). Between 2008 and 2011, drought caused losses in livestock that amounted to about KSh. 700 billion. Extended periods of drought erode livelihood opportunities and community resilience and leads to undesirable coping strategies that damage the environment and impair household nutritional status, further undermining long-term food security.

Fisheries

Extreme weather events such as heavy tropical storms and drought incidences that are projected with the changing climate will affect fisheries and aquaculture through acidification of the water bodies, changes in sea temperatures, circulation patterns and associated ecological changes. These changes have the potential of altering the physico-chemical properties of the fish habitats. Consequently, fish feeding, migration and breeding behavior will be directly affected while indirectly the changes will affect growth, mortality and reproduction (Brander, 2010). The distribution patterns of many fish species will probably change as warm-water species and cold-water species are both expected to move pole wards (Beare *et al*., 2004). The changes manifest in the fish through increased metabolism that culminates in smaller body size and a smaller brood, sex determination that favors the prevalence of females over males, expansion and/or contraction of suitable habitats (e.g. coral reefs, sea grass beds, and mangroves).

The changes also leads to shifts in the distribution of fish stocks due to alteration or reduction of feeding grounds, reduction in breeding grounds, and changes in migratory circuits that connect life stages, thereby affecting successful completion of the life cycle and successful recruitment, a factor that will translate into reduced earnings for the fisher folk. Coastal areas with coral reefs are particularly vulnerable to changes in temperature and acidity, with serious food security concerns for countries that rely on these resources for food and coastal protection. This is because coral reefs provide both shelter and feeding grounds for the juveniles of many fish species. According to the IPPC estimates, the sea level will rise by between 17 and 59 cm by the end of this century, which is well below estimates by other scientists who predict a rise of up to 1 m even if GHG emissions were kept at a low level.

Forestry

The projected rise in temperatures and long periods of drought will lead to more frequent and intense forest fires. These have in the recent past affected Kenya's major forests including the Mau and Mt. Kenya Forests. Kenya has over the past 20 years lost more than 5,700 hectares of forest cover per year due to forest fires causing phenomenal economic damage that is yet to be quantified. The rise in temperature could extend the ecosystems range of pests and pathogens. This is likely to affect many

aspects of forests such as tree-growth, survival, yield and quality of wood and non-wood products. The impact of pests may result in the curtailment of plantation programmes, abandonment of certain tree species, or the necessity to harvest large areas dominated by infested trees as witnessed in the late 1990s when the country had to clear huge tracts of cypress plantations because of cypress aphid attack. There are already fears of a widespread attack on *Pinus patula* (Mexican weeping pine) plantations in South Africa and these could easily spread northwards to Kenya.

Strategic Issue 3: Vulnerabilities due to unsustainable use of natural resources

Kenya's economy is highly dependent on the natural resource base as it is critical for survival. Majority of Kenyans depends on agriculture, livestock, fishing and forestry as their main source of livelihood. All the four sub-sectors rely greatly on the natural resources to thrive.

Crops

Unsustainable land and agricultural water management affect both land and water through accelerated erosion, soil mining, salinization, seawater intrusion and groundwater depletion. These impacts have been exacerbated by climate change and have led to decline in soil health and water quality by altering the chemical, physical and biological properties through erosion, leaching, sedimentation and accelerated breakdown of organic matter. This eventually determines crop nutrient and water use efficiency, affecting the costs of production and hence productivity.

Soil chemical properties such as pH, organic matter content, cation exchange capacity and cation ratios determine soil fertility. Various crops respond differently to soil pH ranges, nutrient levels and ratios, impacting on their growth and performance. The physical properties of soil determine the workability for mechanization, soil erodibility, and water holding properties, water infiltration, plant root penetration and water abstraction. Soil biological properties determine the diversity of the soil fauna, microfauna, flora and microflora which could be beneficial or detrimental to crop production and productivity.

Due to pressure from agriculture, both soil and water resources are being degraded through erosion, salinization, seawater intrusion; and groundwater depletion. In addition, the current model of intensive agriculture is associated with a high carbon and greenhouse gas footprint, while at the same time many agricultural systems are highly vulnerable to the predicted impacts of climate change.

Nachtergaele *et al*. (2010) broadened the definition of land degradation beyond simply soil erosion or loss of soil fertility, extending it to the deterioration of a balanced ecosystem and the loss of the services that ecosystem provides. Land degradation thus needs to be considered in an integrated way, taking into account all ecosystem goods and services; biophysical as well as socio-economic.

The current 1600 million hectares of cultivated land represent the better and more productive part of global land resources. However, parts of this land are degrading through farming practices that result in water and wind erosion, nutrient mining, topsoil compaction, salinization and soil pollution. As a result, the productivity of the land resource base has declined. Land degradation also leads to off-site problems, such as sedimentation of reservoirs, reduced watershed system functioning and carbon dioxide emissions.

Ecosystems in which cultivation, forest management or grazing are dominant activities are at present often negatively affected by human-induced causes, most importantly by land use and land use changes that affect the biophysical characteristics of the land (e.g. pollution, salinization, nutrient depletion). Where management practices are poorly adapted to local ecological conditions, degradation can occur. Even a number of causes that are seemingly natural can have wholly or partly indirect human causes (bush invasion, forest fires, floods, landslides and droughts).

About 14% of the 1.3 million hectares of Kenya's irrigation potential has been exploited. High variability in rainfall complicates irrigation scheduling because most systems abstract water directly from river flows. Less than 10% of irrigator's abstract water from dams and 5% from ground water, domestic water supply systems and waste water. Water storage potential has been under-developed and there are major challenges in achieving equitable water allocation and deliveries. As much as 30 to 60% of abstracted irrigation water is lost to seepage, evaporation, tail water loss and weed transpiration due inefficient irrigation systems and application technologies. Water saving technologies such as lining of canals, sprinklers, drip kits and low cost greenhouses have not yet been widely adopted by farmers.

Land use planning is important in improving the sustainable use and management of natural resources. Planning for sustainable land management require integrated information and knowledge as well as empowerment of all stakeholders involved in participatory approaches to land use planning. At the moment the capacities of the stakeholders are limited hence few mechanisms are in place for effective land use planning for sustainable utilization of natural resources. There is therefore need for integrated information and knowledge on the extent of these natural resources and their distribution across the country.

Degradation of natural resources is a serious threat to biodiversity conservation and sustainable use of resources. This threatens both the economic and physical well-being of the communities dependent on natural resources. Climate change exercabates human activities such as deforestation and degradation and disrupts ecosystem structure and functionality. There is therefore need to promote sustainable use and management of natural resources.

Livestock

In this sub-sector, soil health and water quality affect growth of pasture and fodder through diminished capacity of soils to avail water and nutrients to the plants; increased risk of soil erosion by water and wind; and increased soil surface temperatures and greater rates of mineralization of soil organic matter. Other challenges emanate from colonization of grazing systems by invasive species such as *Prosopis juliflora* (Mathenge).

According to NEMA's State of Environment Report of 2006/07, major floods periodically afflict the Lake Victoria basin, Lower Tana basin and the Coastal region, occurring at least six times in the past 50 years. In these areas, higher turbidity, siltation, and sedimentation occur. Floods carry fertilizer and pesticide residues into water bodies resulting in eutrophication, which has detrimental impacts on water quality and livestock production. According to the NEMA report, serious droughts have occurred at least 12 times in the past 50 years. Major rivers including the Tana, Athi, Sondu Miriu, Ewaso-Nyiro and Mara have experienced severe reduced volumes during droughts and many seasonal ones have completely dried up. The parts of the country most affected are Eastern, North Eastern and parts of Rift Valley regions.

Fisheries

Kenya's aquatic ecosystem and species are prone to diverse anthropogenic threats. Pollution, uncontrolled water abstraction, deforestation, siltation, and unregulated physical developments have serious and significant impacts on the breeding areas of coastal and inland waters. The proliferation of alien aquatic flora and fauna invasive species (e.g. water hyacinth) threatens sustainability of the indigenous species.

Forestry

Forests and related forestry activities contribute to improved agricultural productivity through conserving soil and water, and enhancing soil fertility. The destruction of forestland, coupled with climate change, has contributed to increased rates of flooding as the concentration time is reduced on bare ground leading to landslides and siltation of rivers. In the low lying coastal areas where mangroves occur, a small increase in sea level will leave mangroves submerged unless they can retreat further inland, which is improbable due to human encroachment. Research undertaken by the Kenya Marine and Fisheries Research Institute (KMFRI) as well as other organizations and individuals indicates evidence of mangrove loss due to climate change and other factors in several areas along the Kenyan coast such as Gazi Bay, Mwache Creek, Ngomeni, Tana River Delta and Dodori Creek.

2.4.2 Greenhouse Gas Emissions in the Agriculture Sector

Strategic Issue 4: Emissions from key sources in agricultural production systems

Crops sub-sector

The main source of emissions is from the paddy rice production system. Emissions from paddy rice depend on rice varieties, water management, soil organic matter management, temperature, soil properties, as well as rice straw management. The poor management of rice straw in flooded paddy rice production systems contribute to methane emissions. Application of rice straw to paddy fields significantly increases the methane emission rate compared to application of the rice straw compost or chemical fertilizer. The burning of rice residues such as straw and husks also contributes to greenhouse gas emission. However, the plants themselves are a major source of methanogenic feedstock compared to external inputs including the rice straw. Emissions from paddy rice production can be addressed by adoption of best practices/technologies and innovations.

Livestock sub-sector

The emissions are mainly from enteric fermentation due to low-quality and low-digestibility of ruminant feeds. Poor animal health and husbandry and limited intensification of livestock management systems that lead to low productivity also contributes to emissions. Another key source of emissions arises from manure management. Aspects of manure management relate to housing, manure collection, storage system and utilization. There is very low adoption of recommended measures to address the management of emissions arising from manure in livestock production systems.

Strategic Issue 5: Emissions from other sources in agricultural production systems

Crops-

Poor agricultural practices such as inappropriate tillage, burning of agricultural residues, clearing of trees in farmlands and inappropriate use of fertilizers contribute to greenhouse gas emissions. In addition, emissions arise from agricultural machinery, post-harvest practices, and agro-processing and residue management.

Livestock

Land degradation is a key issue in pastoral and agro-pastoral areas where communities keep livestock as the main source of livelihood. Overstocking is a common practice which in effect leads to overgrazing. The practice of overgrazing and burning of pasture in rangelands lead to both reduced carbon sinks and enhanced emissions in rangelands.

Fisheries

In capture fisheries, a number of activities contribute to GHG emissions either directly or in-directly. These include the use of fossil fuel and inefficient engines; long fishing hours, transportation, and storage and processing of fish. In addition, upstream land degradation leads to siltation of water bodies and displacement of fish habitat. Fishing on depleted fish stocks requires more fuel per kilogram of landed fish than fishing on abundant fish stocks, because low fish abundance forces fishers to search longer and use of heavier gear to catch the fish.

Further, in aquaculture, the establishment of fish ponds leads to land degradation. This is due to land clearing, excavation/soil disturbance and inadequate restoration. The exposure of the soils and reduction of vegetation cover further contributes to carbon emissions.

Forestry

Clearing of trees to open up land for agricultural activities leads to land degradation if sustainable measures are not put in place. Trees are carbon sinks and their elimination leads to reduction of greenhouse gas absorption from the atmosphere. Promotion of agroforestry in croplands have huge potential for forest carbon stock enhancement because of the high additionality. However, there is lack of effective incentive mechanisms to motivate reductions of emissions from deforestation and forest degradation, forest conservation, sustainable management of forests and enhancement of carbon stocks (REDD+) in the farming systems.

Strategic Issue 6: Lack of accountable quantification of GHGs emissions

The agriculture sector lacks adequate mechanisms for measuring, reporting and verifying its greenhouse gas emissions. This is critical for tracking the progress in achieving its commitment to international agreements and obligations.

2.4.3 Policy Legal and Institutional Framework

Strategic Issue 7: Weak policies, legislations, enforcement, and overlap of mandates among institutions involved in regulation

There exists several policies and legislations that guide CSA related issues. However they have the following challenges; inadequate content on climate smart agriculture; poor enforcement of CSA related laws and; overlap of mandates among institutions implementing CSA issues.

Strategic Issue 8: Poor coordination and collaboration among institutions and stakeholders in climate smart agriculture

There is a large number of diverse institutions with CSA related functions. These functions include policy setting, regulatory, research, advisory and provision of support services, capacity building and financing. The challenges faced by the various institutions while implementing and coordinating CSA activities are inadequate coordination among stakeholders; uncoordinated planning, implementation, monitoring and evaluation of programmes and projects; lack of harmonization between National and Development Partners' priorities; and inadequate linkages between National and County Governments in CSA related issues. There is therefore need to establish coordination and collaboration mechanisms. This will ensure effective implementation of programmes for improved agricultural production and productivity; build resilience; and mitigate GHG emissions.

2.4.4 Cross-cutting Issues

Strategic Issue 9: Inadequate financing of CSA activities

Climate change financing to the agriculture sector from the exchequer has not been forthcoming in the amounts needed in the past and financing gaps are projected in the future. This has been due to other pressing government priorities. In addition, the financing from the private sector has been

inadequate due to lack of structured partnership arrangements. Other development partners have provided finance for CSA activities through NGOs, CSOs and programmes and projects but this has been poorly coordinated, leading to duplication of efforts.

There are several sources of international climate finance such as Green Climate Fund (GCF), Adaptation Fund, and Global Environmental Fund, but the process of accessing these sources to support climate smart agriculture is complicated.

The Climate Change Act, 2016 provides for the establishment of a Climate Change Fund. This avails an opportunity to enhance financing for CSA activities from both domestic and international sources.

Strategic Issue 10: Limited capacity of Women, Youth and Vulnerable Groups (WY&VG) **to participate in CSA activities**

These groups have limited education and limited access to land and other natural resources. In addition, women spend most of their time addressing domestic responsibilities and livelihood challenges leaving less time to attend to capacity building initiatives for acquisition of extra skills on climate smart agriculture. Both women and youth lack awareness and capacity to undertake CSA activities that are attractive to them.

In the face of climate change, the ability of WY&VG to obtain productive resources is reduced. Climate variability and change has serious implication on food security: food availability, accessibility, utilization and systems stability. In the context of climate change, food sources become more erratic and scarce, making WY&VG to experience food insecurity and loss of income. The related increases in food prices make food more inaccessible to WY&VG resulting to deterioration in their nutrition and health status. Besides, in the rural areas, WY&VG are highly dependent on climate-sensitive biomass such as wood, agricultural crops, wastes and forest resources for their energy and livelihoods.

Strategic issue 11: Limited human resource capacity to undertake CSA

Climate smart agriculture is an emerging issue in agriculture that has received limited attention. There is limited capacity in personnel with specialized training to handle such emerging issues as adaptation and mitigation of climate change. Consequently, there is inadequate CSA services provided by extension service providers. In addition, CSA has received very limited attention in training institutions. There has been some effort towards mainstreaming CSA in formal training institutions at certificate, diploma, graduate and postgraduate levels but it has not been possible to enforce quality standards in the training. Furthermore, some private institutions offer CSA training but are not accredited due to lack of a clear accreditation scheme.

Thus climate change impacts in agriculture is a serious challenge requiring active participation of all members of the society to manage. However, there is no effective social mobilization frame work under functional communication structure that can help to rally all segments of the society to take appropriate action towards mitigation and adaptation.

Strategic Issue 12: Limited CSA research technology development and innovations

There is limited research on CSA due to inadequacy of operational resources, infrastructure and skilled research personnel for the development of demand driven CSA technologies and innovations. Rare and

emerging crops, trees, livestock and fish issues are being neglected. Lack of coordination also leads to duplication of efforts and limited synergy in research efforts. Though a number of institutions are engaged in CSA research, there is no framework that facilitates inter-institutional knowledge storage, integration, packaging and dissemination. Most of the CSA information generated is in formats that most end users are not able to isolate and apply in their specific regions for better production.

In local communities, there exists innovative traditional and cultural practices that ensure adaptive and resilient farming systems. However, research on mitigation and adaptation has not adequately taken into account the indigenous technical knowledge that would contribute towards better adaptation and mitigation towards climate change in the agriculture sector.

There is need to enhance capacity of institutions to undertake mitigation and adaptation research which entails availing adequate infrastructure for research; providing adequate skilled research personnel, adopting indigenous knowledge and culture, enhancing capacity to carry out MRV, and increasing operational resources for CSA research. Additionally, there is need to improve coordination of research, innovation, knowledge generation and dissemination.

Strategic Issue 13: Inadequate data and information on CSA

In the agricultural sector, there is inadequate CSA related data and information for estimating GHG emissions and monitoring activities on climate change adaptation and mitigation. Further, the existing CSA data and information is scattered across various actors hence is incompatible and difficult to integrate. Besides, there is no climate smart agriculture resource centre or a platform to share data and information on climate smart agriculture.

There is therefore need to establish and maintain a data and information management system, build capacities on data collection and information management, and promote data generation and dissemination during planning, implementation, monitoring and evaluation at both national and county levels. This will help in developing reliable country inventory system on GHG emission as well as enhance MRV.

High value beef cattle

CHAPTER THREE: GOALS, OBJECTIVES AND STRATEGIES

3.1 ADAPTATION AND BUILDING RESILIENCE

Strategic Issue 1: Vulnerabilities due to changes in temperature regimes and precipitation patterns

Strategic goal: Enhanced adaptive capacity and resilience of farmers, pastoralists and fisher-folk to the adverse impacts of climate change.

Strategic objective: Institute measures to reduce the vulnerabilities of farmers, pastoralists and fisher-folk to changing temperature regimes and precipitation patterns.

Strategies

(i) Provision of accurate, timely and reliable climate/weather information to inform decisions of actors on crops, livestock and fisheries value chains

This involves improvement, modernization and maintenance of weather infrastructure; integration of scientific and indigenous technical knowledge and technical skills enhancement in weather data analysis, packaging, dissemination and use of early warning weather information.

(ii) Promote crop varieties, livestock and fish breeds and tree species that are adapted to varied weather conditions and tolerant to associated emerging pests and diseases

This involves breeding and promoting the use of crop and forage varieties, livestock breeds, fish and tree species that are adapted to flooding, drought, strong winds, hailstorms, heat waves and frost as well as tolerant to emerging pests and diseases.

(iii) Technology development, dissemination and adoption along crops, livestock, fisheries and forestry value chains

This entails research that includes crops and forage varieties, livestock breeds and fish species that are able to withstand weather variations; facilitating the adoption of crop varieties, livestock breeds and fish and tree species; providing efficient extension and advisory services, and improving the capacity of actors to use new or existing technologies.

(iv) Diversification of enterprises and alternative livelihoods

This includes incorporation of integrated farming and pastoral production systems based on agro-ecological zones and priorities, non-agricultural enterprises and putting in place contingency plans.

(v) Enhance productivity and profitability of agricultural enterprises

This entails promotion of use of improved technologies; post-harvest approaches such as improved storage and distribution of agricultural products and market access.

Strategic Issue 2: Vulnerabilities due to extreme weather events

Strategic goal: Reduced vulnerabilities of farmers, pastoralists and fisher-folk to extreme weather events.

Strategic objective: Institute measures to reduce the vulnerabilities of farmers, pastoralists and fisher folk to extreme weather events

Strategies

(i) Develop and implement strategies for early warning and response, and ensure preparedness for extreme weather events

This involves developing effective early warning systems, producing and disseminating

of downscaled weather information on extreme weather events, and the preparation of contingency plans to end drought emergencies.

(ii) Develop and use index-based agricultural insurance

This involves the identification and development of diverse agricultural insurance products, capacity enhancement among actors to support insurance product availability, and the sensitization of product users along the value chains to take up agricultural insurance as a means of risk transfer.

Strategic Issue 3: Vulnerabilities due to unsustainable natural resource management

Strategic goal: Enhanced resilience of agriculture systems to climate change impacts through sustainable natural resource management

Strategic objective: Mainstream sustainable natural resource management into production systems to enhance resilience of the farmers, pastoralists and fisher-folk

Strategies

(i) Establish baselines and undertake inventory of the existing natural resources

This entails reviewing and collating information on existing natural resources and their distribution; undertaking inventory and mapping of natural resources; and developing and maintenance of database for natural resources at National and County levels.

(ii) Promote Sustainable Management and Utilization of Natural Resources

This involves the development of a framework for sustainable natural resource management; the development and implementation of programmes and projects on sustainable management and utilization of natural resources. This includes integrated soil health management to include soil nutrient management, soil and water conservation, and conservation agriculture; restoration of degraded soils and conservation of soil biodiversity; protection of riparian reserves, fish landing stations, wildlife corridors and stock routes. In addition, challenges of invasive species in cropping systems, grazing systems and fisheries (e.g. water hyacinth, *Prosopis juliflora* and Striga weed) and the establishment and implementation of mechanisms for resolving natural resource use conflicts will be undertaken.

(iii) Promote water harvesting and storage, irrigation infrastructure development and efficient water use

This entails incorporation of components that enhance resilience (irrigation of crops, aquaculture, livestock watering and agroforestry) in designs and development of water harvesting and storage structures; development of appropriate irrigation infrastructure and technologies (including use of clean energy) as per the prevailing farming and pastoral systems; and promotion of effective and efficient agricultural water use, including waste water management.

(iv) Promote and support conservation and propagation of germplasm of species with adaptive capacity

This involves the establishment of *in-situ* and *ex-situ* genetic resources conservation areas/ centres, the identification of species of livestock, crop and fish origin that are adaptive and tolerant to adverse weather conditions, breeding, multiplication and field trials and demonstrations.

(v) Strengthen research, technology development and dissemination for sustainable natural resource management

This involves participatory and collaborative research towards development of suitable sustainable natural resource management technologies and innovations as well as technology packaging and transfer to end users e.g. farmer's field schools, exhibitions, demonstrations, exchange visits, ICT, and electronic and print media.

(vi) Establish and implement mechanisms for resolving natural resource use conflicts

This will entail the development of mechanisms for identification of potential natural resource conflict hotspots; the profiling of the natural resource conflict hotspots; and the development of mechanisms for conflict resolution.

3.2 MITIGATION OF GREENHOUSE GAS EMISSIONS

Strategic Issue 4: Emissions from key sources in agricultural production systems

Strategic Goal: Minimize emissions from key sources in agricultural production system

Strategic Objective: Develop mechanisms that minimize greenhouse gas emissions from key sources in agricultural production systems

Strategies

(i) Reduce the rate of emissions from livestock (manure and enteric fermentation).

This will involve formulation and support of programs that promote development and use of low emissions technologies to manage livestock feed and manure. In addition, the formulation of improved feeds and feed additives to reduce enteric fermentation will be undertaken. The development of breeding schemes and improvement of herd health to enhance efficiency in production; and the support for innovations in livestock management systems that enhance productivity will also be promoted.

(ii) Reduce the rate of emissions from rice production systems

This will involve promotion and development of programmes for improving efficiency in irrigated rice production systems; promotion of production of rainfed rice; and develop and transfer appropriate technologies for efficient rice production.

Strategic Issue 5: Emissions from other sources in agricultural production systems

Strategic Goal: Minimize emissions from other sources in agricultural production systems

Strategic Objective: Mainstream efficient agricultural production systems to enhance productivity and minimize emissions as a co-benefit.

Strategies

(i) Mainstream Sustainable Natural Resource Management to reduce emissions as a co-benefit

The activities for sustainable natural resource management will be implemented as adaptation interventions while providing mitigation co-benefits. This will involve promotion of agroforestry/farm forestry and adoption of practices that encourage inclusion of trees in the farming systems e.g. conservation agriculture with trees for reduction of emissions from deforestation and forest degradation, forest conservation, sustainable management of forests and enhancement of carbon stocks, including rangelands. In addition livestock and agriculture/agroforestry/rangelands, Nationally Appropriate Mitigation Actions (NAMAs) will be developed and implemented to mainstream sustainable land management. The use of fire in rangeland and cropland management will be minimized to limit emissions.

(ii) Promotion of energy-efficient technologies and innovations

This will entail the reduction of the rate of emissions associated with processing and transportation of agricultural inputs and products; reduction of the rate of emissions associated with distances covered and residence-time used for capture fisheries; and the promotion of alternative techniques/innovations, along agricultural value chains that either use fuel efficiently or green energy.

Strategic Issue 6: Lack of accountable quantification of GHGs emissions

Strategic Goal: Adequate Measurement, Reporting and Verification (MRV) System in the agriculture sector

Strategic Objectives: Enhanced capacity to measure, report and verify emissions from the agriculture sector

Strategies

(i) Development of Measurement, Reporting and Verification Systems

The MRV systems help in improving the transparency in reporting of actions and mitigation measures in the agriculture sector. This will involve setting standards and install MRV infrastructure and development of an inventory system data bank on sector emissions. Development of structures on data collection and recording including an inventory will be necessary for continuous reporting on GHG emissions status for the country, particularly on the interventions carried out on mitigation.

(ii) Capacity building of agricultural sector stakeholders on Measuring, Reporting and Verification processes

Without an accurate assessment of agricultural sector carbon emissions, it will be difficult to plan effective policies and strategies that address sector emissions, hence inability to monitor progress on the target and sectoral contribution in regard to Nationally Determined Contributions (NDCs). Capacity building on measurement of GHGs emissions in agricultural sector; management of inventory system and data collection, reporting and verification are critical.

3.3 ENABLING POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

Strategic issue 7: Inadequate policy, weak regulatory frameworks and overlap of mandates among institutions involved in CSA

Strategic Goal: An enabling policy, regulatory and institutional frameworks

Strategic Objective: To improve policy, regulations and harmonize institutional mandates for climate smart agriculture

Strategies

(i) Develop and review CSA policies and regulatory frameworks

This will involve formulation and review of policies and regulations for CSA activities (including county specific policies and legislations), establishing oversight and accountability systems. Capacities for enforcement at national and county levels will be enhanced. In addition, incentive mechanisms for promotion of CSA best practices according to the provisions of the Climate Change Act, 2016 will be developed.

(ii) Strengthen collaboration between State Agencies on enforcing CSA activities

This will entail review of CSA regulations to provide for harmonization of institutional mandates and responsibilities. Further, collaboration and partnerships among stakeholders will be enhanced to undertake joint planning, implementation and M&E by State Agencies and other actors to enhance effective enforcement of CSA related guidelines and standards.

Strategic Issue 8: Inadequate capacities and weak coordination among institutions and stakeholders in climate smart agriculture

Strategic Goal: Improved coordination of implementation of CSA activities

Strategic Objective: To improve capacities and coordination among institutions and stakeholders in climate smart agriculture**.**

Strategies

(i) Strengthen coordination of CSA implementation

The coordination framework and implementation mechanism for KCSAS will be harmonized with the inter-governmental coordination structure.

(ii) Strengthen institutions involved in CSA

This will entail enhancing capacity building and provide support to CSA institutions at national and county levels.

3.4 ADDRESSING CROSS-CUTTING ISSUES THAT ADVERSELY IMPACT CSA

Strategic Issue 9: Inadequate financing of CSA activities

Strategic Goal: Adequate and sustainable financial sources for CSA activities.

Strategic Objective: To increase funding for CSA activities

Strategies

(i) Establish mechanisms for accessing Climate Finance for Climate Smart Agriculture (CSA) activities

This involves enhancing access to Climate Change Fund provided for in the Climate Change Act, 2016 and ensure that climate activities are mainstreamed in the MTP.

(ii) Promote strategic partnerships

This entail promoting structured partnership arrangements with private sector , NGOs, CSOs and other development partners to provide finance for CSA activities, programmes and projects.

Strategic issue 10: Limited capacity of WY&VG to participate in CSA activities

Strategic Goal: WY&VG empowerment for improved participation in CSA activities

Strategic Objective: Improve participation in CSA by WY&VG.

Strategies

(i) Increase the capacity of WY&VG to participate in CSA activities.

This will entail creation of awareness, capacity building and promotion of CSA-related income generating activities targeting WY&VG.

(ii) Promote equity and inclusivity of WY&VG participation in CSA activities.

This will entail development of inclusive and responsive agricultural value chains and establishment of Social Protection and Safety net programmes to cushion WY&VG to impacts of climate change.

Strategic issue 11: Limited human resource capacity to undertake CSA

Strategic Goal: Adequate and effective human resource capacity for CSA activities

Strategic Objective: To enhance adequacy and quality of human resource for CSA

Strategies

(i) Increase the pool of technical personnel with expertise in CSA

This will involve auditing of CSA human resource capacity at both national and county levels; recruiting qualified personnel; and establishing working partnerships and collaboration with institutions that have expertise in CSA.

(ii) Improve CSA knowledge and skills among technical personnel

This will entail carrying out training needs assessment, organizing and conducting trainings; mainstreaming CSA into training curricula of educational institutions and awareness creation.

Strategic issue 12: Limited CSA research, technology development and innovations

Strategic Goal: Enhanced CSA research, technology development, innovations and knowledge management.

Strategic Objective: To improve capacity to undertake CSA research, technology development, innovations and knowledge management.

Strategies

(i) Enhance capacity of institutions to undertake CSA research

This entails availing adequate infrastructure for research on mitigation, indigenous and cultural knowledge, technology development and innovation; providing adequate skilled research personnel for CSA research, MRV, and increasing operational resources for CSA research.

(ii) Improve coordination of CSA research, innovation and knowledge generation.

This entails promoting public private partnerships in CSA research and technologies / innovations development; establishing mechanisms for prioritization of CSA research needs; establishment and maintenance of CSA information and knowledge generation systems; promoting integration of scientific and indigenous CSA knowledge and technology; and putting in place mechanisms for identifying, incubating and commercialization of innovations.

Strategic Issue 13: Inadequate data and information on CSA

Strategic Goal: Functional and accessible data and information management system on CSA.

Strategic Objective: Avail adequate and updated data and information on CSA.

Strategies

(i) Establish and maintain a data and information management system

This involves the development of CSA communication strategy and use of information management system that links the CSA information management system to the National Climate Change Resource Centre and other CSA related information management systems.

(ii) Build capacities on data collection and information management

This entails the identification of capacity gaps and training in data collection and information management, including those required for MRV.

(iii) Promote data management and information generation and dissemination

This involves data collection, analysis and information generation as well as information packaging and dissemination during planning, implementation, monitoring and evaluation at both national and county levels.

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Oil Palm in Western Kenya

CHAPTER FOUR: STRATEGY IMPLEMENTATION, MONITORING AND EVALUATION

4.1 INTRODUCTION

The realization of the objectives of this CSA strategy will depend on the roles and responsibilities undertaken by the ministries, departments and agencies (MDAs) responsible for; agriculture environment, energy, transport and infrastructure, finance, industrialization and enterprise development, land, water and irrigation, regulatory and support institutions at both levels of governments. The MDAs will also need to be coordinated to avoid overlaps and to create synergy in pursuit of effective strategy implementation. Further, the devolution of agricultural functions will necessitate regular consultation and coordination between national and county governments.

4.2 COORDINATION OF THE STRATEGY IMPLEMENTATION

The National Government through the Agriculture Sector MDAs will be responsible for policies, strategies and regulatory services including CSA. The County Agriculture Sector MDAs will spearhead the implementation of the identified strategies in the counties. The coordination framework and implementation mechanism for KCSAS will be harmonized with the inter-governmental coordination structure for the agriculture sector that is currently under development and is expected to be finalized soon. The proposed agriculture sector coordination structure (Figure 2) proposes the establishment of Sector Working Agriculture Groups (SWAGs).

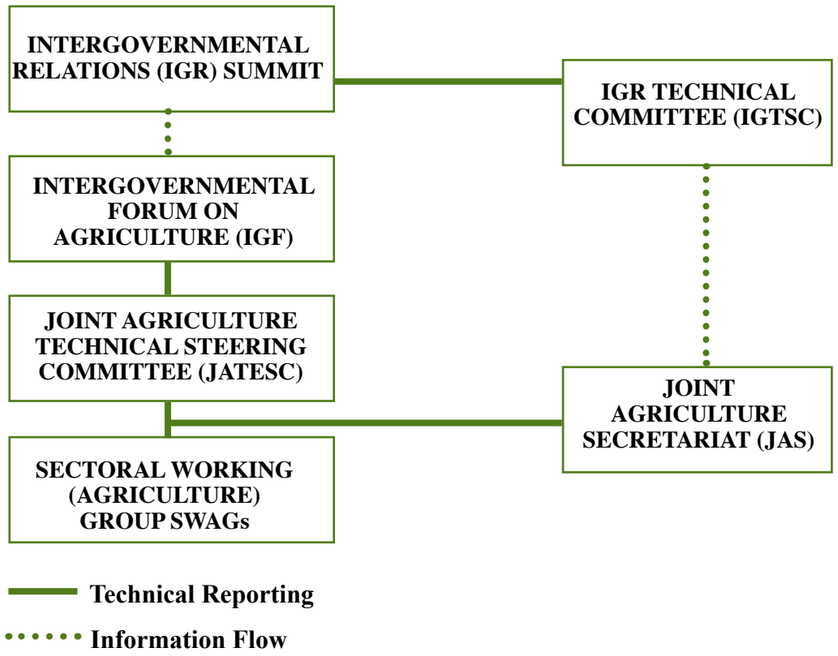

Figure 2: Proposed Inter-governmental Coordination structure for the Agricultural Sector

The three sub-sectors in agriculture will be expected to form separate SWAGs namely; Agriculture (crops), Livestock & Veterinary; Fisheries & Blue Economy. Each SWAG will be made up of Seven Executives comprising of three persons from each arm of government and appointed by the Cabinet Secretary, MALF and Chair of Council of Governors (COG), respectively. Subject matter

specialists from the Joint Agricultural Secretariat (JAS) will form the secretariat of the SWAGs. Other experts from the sector are proposed to be part of the SWAGs depending on the subject matter under consideration. The SWAGs will be expected to meet at least once quarterly or according to need and will be co-chaired by the two levels of government.

The Steering Committee will be authorized to disband existing or establish more Sectoral Working Groups according to identified needs. Consequently, the proposed entry point for CSA will be through the establishment of a SWAG whose composition will be determined by the sector demands and needs. The SWAG for CSA will be expected to facilitate coordination, harmonization and liaison between national and county governments through:

a) Monitoring and evaluating the implementation of CSA initiatives

b) Compiling annual intergovernmental sub-sector CSA reports,

c) Facilitating capacity building of national and county bodies on CSA related issues

d) Preparing and follow-up upon events and functions between the national and county governments, including meetings of the Inter-Governmental Forum (IGF) for agriculture, Inter-Governmental Steering Committee (IGSC) and ad hoc multi-stakeholder consultation bodies on CSA related issues

e) Establishing a forum for joint planning on CSA programmes

4.2.1 The County Governments

The County Governments will be responsible for implementation of this strategy. Each county will thus develop CSA policies, strategies and plans to guide implementation or integrate County specific strategies into their County Integrated Development Plans (CIDPs) and other plans.

4.2.2 Ministry responsible for energy

The ministry responsible for energy at the two levels of government should explore and promote affordable and reliable clean energy for use in agriculture during energy generation.

This is because the production, storage and value addition of crops; livestock; fisheries; and forestry require energy supply. Current energy sources include hydroelectric, geothermal and wind power; petroleum products; solar; wood fuel and biogas. They are used in land preparation, processing and transportation of crops; livestock; fisheries; and forestry commodities. Some of these energy sources particularly wood fuel and petroleum products contribute to greenhouse gas emissions.

4.2.3 Ministry responsible for transport and infrastructure

The national and county governments need to prioritize rehabilitation and maintenance of trunk and rural access roads, respectively. Product marketing and trade require developed and well maintained infrastructure networks. There is need for legislation and enforcement on minimum emissions from vehicles, plant and machinery. This will ensure reduced greenhouse gas emissions.

4.2.4 Ministry responsible for industrialization and enterprise development

The national and county governments through the ministries responsible for industrialization and enterprise development will need to develop and support implementation of policies and strategies that will encourage investment in processing and value addition of agricultural produce. To enhance productivity and income, producers need to be organized into viable groups that can sustainably satisfy the needs of various commodity industries and consumers.

4.2.5 Ministry responsible for land

Activities on land heavily impact water sources and the agricultural environment. In Kenya, land is classified as private, communal or public. All categories of classification support agricultural

production and are threatened by different aspects of citizen behavior that require the interventions of both levels of governments by implementing land consolidation, setting minimum land size for agricultural use and protection of government land. Land should be set aside for research in agriculture, water towers and gazetted forests.

4.2.6 Ministry responsible for environment and natural resources

This ministry will be responsible for policies and strategies for conservation of forests, water catchments, water towers, wetlands, riparian areas and rehabilitation of degraded areas. These areas provide important habitats for fish and other biodiversity while maintaining ecosystem goods like water resource. The ministry also formulates programmes for promotion of dryland forestry to create resilience in the ASALs. The forest and water catchments need to be protected by reforestation and afforestation activities in gazetted forests, farmlands and communal lands. The overall goal is to have a 10% forest cover in the country.

Wetland and forest sequestration of carbon from the atmosphere regulates climate and optimizes crops, livestock and fisheries production. These are strategic for improvement of agricultural production, reduction of poverty and environmental degradation.

4.2.7 Ministry responsible for water and irrigation

The ministry is responsible for formulation of policies, strategies and programmes for sustainable development and management of water resources. Water catchment areas are the main sources of rivers in the country. The rivers provide water for irrigated crops, livestock and fisheries. Investment in infrastructure for water harvesting and storage alongside irrigation systems need to be prioritized to build resilience and support CSA.

4.2.8 Ministry responsible for finance

The ministry is responsible for fiscal and economic policies and strategies. It should provide adequate financial incentives to CSA actors at different stages of various Agricultural Value Chains. Funding for agriculture (crops, livestock and fisheries) should not be less than 10% of the national budget as per the Maputo Declaration of 2003. Cascaded to the counties, a similar, if not higher, allocation should go to the three sub-sectors. In order to lower prices of agricultural inputs and raise product competitiveness, it is necessary for the National Treasury to institute targeted tax reliefs and subsidies that will promote CSA.

4.2.9 Regulatory agencies and support institutions

Regulatory agencies and support institutions are critical in ensuring enforcement of laws and regulations. They will play an important role in setting standards; codes and guidelines; and ensure compliance by stakeholders to CSA statutes and practices.

4.2.10 The private sector

The private sector includes producers, farmers, processors, marketers and all other actors in the crops, livestock, fisheries and forestry value chains. Majority of these actors contribute to greenhouse gas emissions which impact on climate change. Climate change has negatively affected productivity and sustainability of the value chains. The actors will collaborate with the national and county governments in implementation of mitigation and adaptation measures. They will also participate in the development and review of CSA policies and strategies; legislations and investment ventures.

4.3 RESOURCE MOBILIZATION

The implementation of KCSAS strategy will require a total of KSh. 500 billion (US$ 5.0 billion) during the ten (10) year period (2017 to 2026). A summary of the financial requirements for the key thematic areas in CSA is presented in Table 1.

Table 1: Summary of the financial requirements for implementation of KCSAS

Thematic area	Financial Years			
	2017/20	2020/24	2024/27	Total (KSh. in Billions)
1. Adaptation and Building Resilience	60.00	150.00	90.00	**300.00**
2. Green House Gas Mitigation	25.00	42.50	32.50	**100.00**
3. Policy, Legal and Institutional	10.00	6.40	3.60	**20.00**
4. Cross-Cutting Issues	18.50	36.00	25.50	**80.00**
Total	**113.50**	**234.90**	**151.60**	**500.00**

To implement the KCSAS, the bulk of the funding will be provided to the relevant Ministries, Departments and Agencies (MDAs) by the national and county governments through the Exchequer. This will be guided by the national and county prioritized CSA programs and projects including sectoral policies and strategies. In addition, efforts will be made to mobilize technical and financial support from development partners and civil society to realize the objectives of this strategy. A CSA fund basket shall be established and proper mechanisms set up for oversight and governance. Both levels of government will explore possibilities of benefiting from the climate change fund provided for in climate change Act 2016 for inclusion of budgetary provisions for CSA at both national and county levels. Further, the government at both levels will explore possibilities and accessing existing climate–related dedicated funding for use in CSA activities/joint sourcing of funding from potential donors by National/County Committees.

Direct financing and investments by the private sector through public private partnerships (PPPs) is critical to the successful implementation of this strategy initiative. To this end, the national and county governments will create conducive environments to facilitate participation of the private sector. This will include strengthening financial institutions, providing loan facilities to support farmers' investments, savings and risk management for CSA activities; ensuring availability of credit to farmers at concessionary interest rates and appropriate insurance schemes to protect farmers from impacts associated with climate change.

4.4 IMPLEMENTATION, MONITORING AND EVALUATION

Monitoring and evaluation (M&E) is a tool for assessing the success of result based management. It provides decision makers, sponsors and other stakeholders with better means of learning from past experience, improving service delivery, planning, allocating of resources and demonstrating results as part of accountability to key stakeholders.

For successful implementation of this strategy, an M&E framework will be developed as an integral component to ensure the strategy objectives are achieved in a cost effective, coordinated and harmonized approach at both the national and county levels. The ministry responsible for crops, livestock and fisheries in collaboration with the county governments, relevant implementing Ministries, Departments and Agencies (MDAs), private sector and other stakeholders will develop an M&E framework within six months of the strategy launch. For purposes of this strategy, the ministry shall also undertake a comprehensive baseline survey that will be used to gauge achievement of CSA related agricultural activities.

The M&E framework is expected to be consistent with the National Integrated Monitoring and Evaluation Systems (NIMES) and have clear terms of reference for relevant stakeholders in data collection and reporting at all levels. There will be an Annual Review Report (ARR) on implementation of the strategy that will be presented to the Climate Change Council (CCC) by the Cabinet Secretary responsible for Crops, Livestock and Fisheries for dissemination to the public and relevant stakeholders. The strategy will be reviewed periodically to address the sector challenges and emerging issues.

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ANNEX 1: IMPLEMENTATION FRAMEWORK

Strategies	Activities	Measure of achievement	Responsibilities and Institutions			Priority TimelineST <3 yrs; MT 3-6 yrs LT > 6)	Indicative Budget (Billions in KSh)
			National Government	County Government	Other Stakeholders		
Thematic Area 1. Adaptation and Building Resilience							
Strategic Issue 1: Vulnerabilities due to changes in temperature regimes and precipitation patterns							
Strategic goal: Enhanced adaptive capacity and resilience of farmers, pastoralists and fisher-folk to the adverse impacts of climate change.							
Strategic objective: Institute measures to reduce the vulnerabilities of farmers, pastoralists and fisher-folk to changing temperature regimes and precipitation patterns							
(i) Provision of accurate, timely and reliable climate/weather information to inform decisions of actors on crops, livestock and fisheries value chains	(a) Improve network of weather stations countrywide	• Number of weather stations	• Policy guidance, • Capacity building, • Weather forecasting Infrastructure • Funding • National data aggregation (KMD, MALF, WRA,RDAs)	• Support review, integration and maintenance of the existing EWS • Dissemination of downscaled weather information (Departments responsible for: Environment and Natural, Resources, Agriculture, Livestock, Irrigation, Fisheries)	• Support improvement of weather stations networks (WMO, Development Partners, International Research Institutions, Private Sector)	ST/LT	6.0
	(b) Modernization and maintenance of meteorological infrastructure	• Number of modern infrastructure for weather data capturing, processing and dissemination	• Support modernization and maintenance of meteorological infrastructure	• Provide site for installation and • Support maintenance of the new meteorological infrastructure	• Support maintenance of EWS infrastructure: (WMO, Development Partners, International Research Institutions, Private Sector)		3.0
	(c) Integration of scientific and indigenous technical knowledge in weather forecasting	• Number and type of advisories generated from integrated forecasts	• Provision of downscaled scientific forecast • Guidelines and standards on ITK based forecasts • Capacity building KMD	• Mobilization of ITK practitioners • Facilitating fora for integrated forecasts – Capacity building (Departments responsible for: Environment and Natural Resources, Agriculture, Livestock, Irrigation, Fisheries)	• Capacity building • Collaborate with weather-related agencies (ITK practitioners, Development Partners, NGOs, CBOs, Private Sector)	ST/LT	1.2
	(d) Enhance human capacity in weather data collection, analysis and packaging	• Number of stakeholders capacity built (Staff, traditional weather forecasters, communities)	• Policy guidance • Capacity building (KMD, MALF, WRA and RDAs)	• Capacity building • Collaborate with weather related agencies Collect weather data (Departments responsible for Environment and Natural Resources, Agriculture, Livestock, Irrigation, Fisheries)	• Capacity building • Collaborate with weather-related agencies (Development Partners, NGOs, CBOs, Private Sector)	ST/LT	1.2
	(e) Provide early warning information on seasonal weather patterns	• No. of information packages disseminated	• Capacity building Downscale and package weather information (KMD, MALF,WRA and RDAs)	• Disseminate downscaled information • M&E (Departments responsible for Environment and Natural Resources, Agriculture, Livestock, Irrigation, Fisheries)	• Support networks for providing weather information • Use weather information for decision making (Development Partners, NGOs, CBOs, Private Sector, farmers fisher folk and pastoralists)		0.2
(ii) Promote crop varieties, livestock and fish breeds and tree species that are adapted to varied weather conditions and tolerant to associated emerging pests and diseases.	(a) Breeding of crop varieties, livestock and fish breeds, and tree species, that are adapted to weather variations and tolerant to pests and diseases	• Number and type of bred and adapted crop varieties, livestock and fish breeds and tree species	• Policy guidance • Breeding • Research Infrastructure and support • Funding (KALRO, KEMFRI, KEFRI, MALF, MENR)	• Prioritize research needs • Participate in research (Departments responsible for agriculture, livestock, fisheries, forestry)	• Prioritize research needs • Support research / funding • Participate in research (Private sector, NGOs, CBOs and FBOs)	ST/LT	4.8
	(b) Facilitate the adoption of crop varieties, livestock breeds and fish and tree, species, that are adapted to weather variations and tolerant to pests and diseases	• No of breeds / varieties / species adopted	• Capacity building • Support extension programmes	• Farmer extension services • Develop outreach and distribution networks (Departments responsible for agriculture, livestock, fisheries, forestry)	• Development of outreach and distribution networks • Extension service provision • Farmer sensitization • Funding (Private sector, NGOs, CBOs and FBOs)	ST/LT	3.0

Strategies	Activities	Measure of achievement	Responsibilities and Institutions			Priority TimelineST <3 yrs; MT 3-6 yrs LT > 6)	Indicative Budget (Billions in KSh)
			National Government	County Government	Other Stakeholders		
(iii) Technology development, dissemination and adoption along crops, livestock, fisheries and forestry value chains	(a) Conduct participatory research on improved technologies and practices informed by needs of users and agro-ecological zones along prioritized value chains	• Number of research publications • Number and type of new technologies developed	• Policy guidance • Facilitate research agenda setting • Provide research Infrastructure • Funding • Conducting Research (MALF, KALRO, KEMFRI, KEFRI, Academic Institutions)	• Participate in Research agenda setting • Provision of research infrastructure • Conducting research	• Undertaking of joint research activities • Funding (Regional and International Research Institutions; Private Sector)	LT	6.0
	(b) Conduct on-farm research into low-cost appropriate technologies and practices and deliver them as packages	• Number of research publications • Number of technology packages delivered	• Policy guidance • Facilitate research agenda setting • Provide research Infrastructure • Funding • Conducting Research • Technology packaging (MALF, KALRO, KEMFRI, KEFRI, Academic Institutions)	• Participate in Research agenda setting; • Provide research infrastructure; • Participate in conducting research • Support technology packaging	• Undertaking of joint research supporting Dissemination activities • Funding (Regional and International Research Institutions, Private sector)	LT	4.8
	(c) Build the capacity of extension service providers, producers and other stakeholders in the use of existing/ new /improved CSA technologies and practices	• Number and type of capacity building programmes developed • Number of stakeholders trained, equipped and facilitated • Number of private sector actors distributing CSA technologies	• Identify capacity needs • Development of capacity building programmes • Carry out capacity building (MALF, KALRO, KEMFRI, KEFRI Academic Institutions)	• Promote stakeholder involvement in outreach and distribution of CSA technologies • Availing staff for capacity building • Conduct trainings • Provide extension services (County Departments that offer extension services)	• Farmer sensitization • Develop outreach and distribution networks • Lobby government to facilitate CSA outreach and distribution of CSA technologies (NGOs FBOs CBOs, Private Sector and Development Partners)	LT	7.2

(iv) Diversification of enterprises and alternative livelihoods	(a) Promote integrated farming systems comprising crops, livestock, aquaculture and farm forestry	• Number of farmers practicing integrated farming	• Promotion of appropriate integrated farming systems • Building of capacity of stakeholders on integrated farming systems (MALF)	• Identification of appropriate integrated farming systems • Conduct trainings • Farmer extension services (County Departments that offer extension services)	• Promote and invest in integrated farming system technologies • Provision of extension services (Private Sector, INGOs, NGOs and Development Partners)	LT	6.0
	(b) Promote non-agricultural enterprises as alternative livelihoods	• Number of entrepreneurs • Number of non-agricultural initiatives/enterprises	• Promotion of non-agricultural livelihood options • Building of capacity on alternative livelihoods (MALF, Social services)	• Flag non-agricultural business opportunities • Train on non-agricultural enterprises • Avail seed money to support non-agricultural investments • (County Departments responsible for entrepreneurship, trade and extension services)	• Startup of non-agricultural business • Provision of capital and advisory services • Capacity building on non-agricultural business (Producers, NGOs, FBOs)	ST	1.8
(v) Enhance productivity and profitability of agricultural enterprises	(a) Promote use of improved technologies and practices in crops, livestock, fisheries and forestry	• Number of farmers using improved technologies and practices	• Policy guidance • Technology development and packaging • Capacity building • Irrigation/agricultural Infrastructure • Funding (KALRO, MALF, MWI)	• Rules and regulations for implementation • Technology dissemination • Capacity building (County Assembly, Departments of Agriculture, Irrigation, Livestock, Fisheries and Forestry)	• Extension service provision • Farmer sensitization • Funding (Private sector, NGOs, CBOs and FBOs)	ST/LT	4.8
	(b) Promote post-harvest management, improved storage, distribution and market access	• Number of post-harvest technologies promoted and adopted • Number of market information packages developed • Number of existing markets rehabilitated • Number of new markets constructed • Volume of marketed produce	• Post-harvest technology development and packaging • Support development of agricultural markets • Infrastructure • International, Regional and National Market information and linkages • (MALF, KALRO, AFA, MITI, Universities)	• Dissemination of postharvest technologies • Development of agricultural market infrastructure • Rehabilitation of existing markets • Market information and linkages (Departments responsible for agriculture, livestock, fisheries, forestry, irrigation, trade and infrastructure)	• Provision of information on international, regional and national markets • Linkages with markets • Funding (Private sector, NGOs, CBOs and FBOs)	LT	4.8

Strategies	Activities	Measure of achievement	Responsibilities and Institutions			Priority TimelineST <3 yrs; MT 3-6 yrs LT > 6)	Indicative Budget (Billions in KSh)
			National Government	County Government	Other Stakeholders		
Strategic Issue 2: Vulnerabilities due to extreme weather events							
Strategic goal: Reduced vulnerabilities of farmers, pastoralists and fisher-folk to extreme weather events.							
Strategic objective: Institute measures to reduce the vulnerabilities of farmers, pastoralists and fisher folk to extreme weather events							
(i) Develop and implement mechanisms and systems that provide early warnings; ensure preparedness and response to extreme weather events	(a) Develop effective early warning systems	• No. of working mechanisms for triggering early warnings	• Link with regional and international agencies on information on early warning • Packaging of early warning information (WMO, KMD, MALF)	• Collaborate with national institutions on early warning (Departments responsible for meteorology, Agriculture, Fisheries, Livestock, Environment, Irrigation)	• Partner with government on EWS (WMO, NGOs, Development partners, CBO)	ST/LT	3.0
	(b) Produce and disseminate downscaled weather information on extreme weather events	• Number and type of products on weather information	• Provide timely and appropriately packaged downscaled weather information (KMD, NDMA, MALF	• Support dissemination of timely and appropriately packaged downscaled weather information (Departments responsible for meteorology, Agriculture, Fisheries, Livestock, Environment, Irrigation)	• Support production, dissemination of timely and appropriately packaged weather information (Media, Regional Institutions, NGOs, CBOs, FBOs, Development partners, Private sector)	ST/LT	1.8
	(c) Preparation of contingency plans	• Number of contingency plans developed • Number of communities with contingency plans	• Provide information to inform development of community contingency planning(KMD, MALF, NDMA, NDOC)	• Support communities to develop contingency plans • Dissemination of downscaled weather information • County data aggregation	• Support development and implementation of community contingency plans (NGOs, CBOs, FBOs, Development partners, Private sector)	ST/LT	1.2
(ii) Develop and use index-based agricultural insurance	(a) Identification and development of suitable agricultural insurance products	• Number and type of insurance products developed	• Identify, coordinate and support insurance actors to develop products (MALF, IRA)	• Identify county agricultural insurance needs	• Development of agricultural insurance products (Insurance Companies, Reinsurance Companies)	MT	0.3
	(b) Build capacity of extension, stockists and other stakeholders on agricultural insurance.	• Number by type of stakeholders trained	• Identify training needs and carry out training (MALF, IRA)	• Identify county agricultural insurance training needs, and target trainees	• Stakeholder sensitization (Insurance companies, development partners)	LT	1.2
	(c) Promote the use of agricultural insurance as a means of risk transfer by farmers, pastoralists, and fisher-folk	• Number and type of insurance products in use	• Provide an enabling environment for agriculture insurance industry (MALF, IRA)	• Sensitization and awareness creation • Promoting uptake to insurance products • Provision of extension services	• (Insurance companies, Agro-stockists, NGOs and development partners)	ST/LT	48
Strategic Issue 3: Vulnerabilities due to unsustainable natural resource management							
Strategic goal: Enhanced resilience of agriculture systems to climate change impacts through sustainable natural resource management							
Strategic objective: Mainstream sustainable natural resource management into production systems to enhance resilience of the farmers, pastoralists and fisher-folk							
(i) Establish baselines and undertake inventory for the natural resources (agricultural land, water, pastures, fisheries and forestry).	(a) Review and collate information on existing natural resources and their distribution	• Baseline reports	• Undertake baseline survey (MALF, MENR, KALRO, KEFRI, NACOSTI and KMFRI)	• Provide personnel to participate in the survey. (Departments of Environment, Science & Technology, Agriculture, Livestock, Fisheries)	• Technical support towards natural resources survey. (Development partners and International Research Institutions)	ST	0.1
	(b) Undertake Inventory and mapping of natural resources	• Number of reports • Resource maps	• Funding • Do mapping (MALF, MENR, KALRO, KEFRI, NACOSTI and KMFRI, DRSRS)	• Participate in mapping exercise • Prioritize natural resource in the counties that require mapping. (Departments of Environment, Science & Technology, Agriculture, Livestock, Fisheries)	• Technical support (Development partners and International Research Institutions)	ST	3.0
	(c) Develop and maintain database for natural resources at national and county levels	• Updated database at national and county levels	• Establish a database for natural resources. • Link and manage the national level and county levels database (MALF, MENR, KALRO, KEFRI, NACOSTI and KMFRI, DRSRS)	• Establish a database for natural resources • Manage county level database. (Departments of Environment, Science & Technology, Agriculture, Livestock, Fisheries)	• Technical support (Development partners and International Research Institutions)	MT	3.0

Strategies	Activities	Measure of achievement	Responsibilities and Institutions			Priority TimelineST <3 yrs; MT 3-6 yrs LT > 6)	Indicative Budget (Billions in KSh)
			National Government	County Government	Other Stakeholders		
(ii) Promote Sustainable Natural Resource Management	(a) Develop a framework for sustainable natural resource management	• Framework for natural resource management	• Resources • Review and develop regulations and guidelines for sustainable natural resources relevant to CSA (MALF, NEMA, MENR, KALRO, KEFRI, NACOSTI and KMFRI)	• Resources • Enforce regulations and guidelines on sustainable natural resource management. • Develop and review county specific-regulations and guidelines for natural resources (Departments responsible for Environment, Science & Technology, Agriculture, Livestock, Fisheries)			1.2
	(b) Integrated soil fertility management (ISFM)	• No and types of soil nutrient technologies promoted and adopted	• Develop regulatory frameworks and guidelines • Capacity building • Soil analysis (MALF, KALRO, Parliament)	• Rules and regulations for implementation • Farmer extension services • Soil sampling and analysis • Soil data collection (Departments responsible for Agriculture, Livestock, Irrigation)	• Capacity building • Soil sampling and analysis Support soil fertility programmes (NGOs, Research Institutions, Development partners)	ST/LT	25.2
	(c) Restoration of degraded soils and conservation of soil biodiversity	• No. and area of degraded sites	• Profiling of degraded areas and degradation hotspots • Support restoration of degraded areas (MALF, KALRO-KSS, RCMRD)	• Build capacity of communities • Restoration of degraded areas and soil biodiversity (Departments responsible for Agriculture, Livestock, Environment and Natural Resources, Irrigation)	• Build capacity of communities • Restoration of degraded areas and soil biodiversity (NGOs, Research Institutions, Development partners)	ST/LT	10.8
	(d) Develop and implement programmes and projects on sustainable management and use of natural resources including alternative livelihoods (e.g. protection of riparian reserves, fish landing stations, wildlife corridors, stock routes and off-farm activities)	• Number and types of programmes / projects	• Resources • Formulate programmes and projects • Coordinate implementation of programmes and projects (MALF, NEMA, MENR, KALRO, KEFRI, NACOSTI and KMFRI, MDP)				6.0

Strategies	Activities	Measure of achievement	Responsibilities and Institutions			Priority TimelineST <3 yrs; MT 3-6 yrs LT > 6)	Indicative Budget (Billions in KSh)
			National Government	County Government	Other Stakeholders		
(iii) Promote water harvesting and storage, irrigation infrastructure development and efficient water use.	(a) Incorporation of components that enhance resilience (irrigation of crops, aquaculture, livestock watering and agroforestry) in designs and development of water harvesting and storage structures	• No. of designs climate-proofed and developed	• Guidelines on climate proofing and development of water harvesting and storage structures • Capacity building • Funding • Implementation of major water harvesting and storage structures (MWI, MALF, NIB, KALRO)	Capacity building • Mobilize resources for infrastructure development • Implementation of small water harvesting and storage structures (Departments responsible for Agriculture, Livestock, Environment and Natural Resources, Fisheries, Water and Irrigation)	• Financial and Technical support • Capacity building • Implementation of water harvesting and storage structures (NGOs, Development partners)	ST/LT	1.2
	(b) Development of appropriate irrigation infrastructure and technologies (including use of clean energy) as per the prevailing farming and pastoral systems	• Number of appropriate irrigation infrastructure and technologies developed	• Mobilize resources for infrastructure development • Facilitate preparation of project design and tender documents for national projects • Execute, supervise and commission construction works for national projects. (MWI, MALF, NIB, ME&P, KALRO)	• Mobilize resources for infrastructure development • Facilitate preparation of project design and tender documents • Execute, supervise and commission construction works. (Departments responsible for Agriculture, Livestock, Environment and Natural Resources, Fisheries, Water and Irrigation)	• Financial and Technical support (Development Partners, NGOs and Private Sector)	LT	118.8
	(c) Promote effective and efficient agricultural water use, including waste water management.	• No. of effective and efficient water use practices • No. of adopters of effective and efficient water use practices	• Provide guidelines for agricultural water use and waste water management for agricultural use • Capacity building (MWI, MALF, NIB, MoE, KALRO)	• Capacity building • Provision of extension • Support small scale irrigation initiatives • Wastewater management • (Departments responsible for Agriculture, Livestock, Environment and Natural Resources, Fisheries, Water and Irrigation)	• Capacity building • Provision of extension • Support small scale irrigation initiatives • On-farm waste water management (NGOs, Private sector, CBOs, FBOs)	ST/LT	3.0

(iv) Promote and support conservation and propagation of germplasm of species with adaptive capacity.	(a) Establishment of *in-situ* and *ex-situ* genetic resources conservation areas/ centres	• No. of set areas (Farms and sites) for conservation of genetic resources	• Set conservation farms(Areas) • Develop guidelines (MALF, MENR)	• Set conservation farms(Areas) • Review county guidelines (Departments responsible for Environment, Agriculture, Livestock, Fisheries)	• Set private farms or zones for conservation (CBOs, WRUAs, FBOs, CSOs, NGOs)	ST/LT	4.8
	(b) Identification of species of livestock, crop and fish origin that are adaptive and tolerant to adverse weather conditions	• Number of species and types identified	• Research • Data • Policy and promotions (KALRO, MALF)	• Collaborative research • Data and information on indigenous knowledge • Guidelines and integration to CIDP (Departments responsible for Environment, Agriculture, Livestock, Fisheries)	• Collaborative research • Private trials and innovations (Private Research Organizations)		0.3
	(c) Breeding, Multiplication and field trials and demonstrations	• Number of Breeds, Quantities, trials and demonstrations	• Research • Support for Development (KALRO, MALF)	• Farm trials • Collaboration (Departments responsible for Environment, Agriculture, Livestock, Fisheries)	• Private research and trials (Farmers, Private research Organizations)		3.0

Strategies	Activities	Measure of achievement	Responsibilities and Institutions			Priority TimelineST <3 yrs; MT 3-6 yrs LT > 6)	Indicative Budget (Billions in KSh)
			National Government	County Government	Other Stakeholders		
(v) Strengthen research, technology development and dissemination for sustainable Land Management and agriculture water management	(a) Undertake participatory and collaborative research on suitable SLM and agricultural water management technologies and innovations	• No. of research programmes on SLM and agricultural water management undertaken • No. of technologies and innovations	• Undertake research • Capacity building (MWI, MALF, NIB, ME&P, KALRO)	• Prioritize research needs • Participate in research • Mobilize stakeholders to participate in research (Departments responsible for Agriculture, Livestock, Environment and Natural Resources, Fisheries, Water and Irrigation)	• Support research • Participate in research • Capacity building on participatory approaches (NGOs, Private sector, CBOs, FBOs, Universities, International and Regional Research Institutions)	ST/LT	3.0
	(b) Technology development, packaging and transfer	• Number of technologies developed, packaged and disseminated	• Policy guidance • Capacity building • Funding (MWI, MALF, NIB, MoE, KALRO)	• Awareness creation • Technology packaging and dissemination • Farmer extension services (Departments responsible for Agriculture, Livestock, Environment and Natural Resources, Fisheries, Water and Irrigation)	• Awareness creation • Technology packaging and dissemination • Farmer extension services (Media, NGOs, Private sector, CBOs, FBOs, Universities, International and regional research institutions)	ST/LT	1.8
(vi) Establish and implement mechanisms for resolving natural resource use conflicts	(a) Develop mechanisms for identification of potential natural resource conflict hotspots	• Existence of a framework for identification NRM conflict hotspots	• Development of framework for identification NRM conflict hotspots (MALF, NEMA, MDP, COG, NDMA, NCIC)	• Identification of hotspots (Departments responsible for Environment, Agriculture, Livestock, Fisheries)	• Identification of hotspots (Council of elders, Natural resource user associations, CBOs, WRUAs, FBOs, CSOs, NGOs)	ST/LT	0.3
	(b) Profile natural resource conflict hotspots	• Existence of updated NRM hotspots database	• Coordination profiling of national NRM hotspots database • Support counties in development of county-specific NRM hotspots maps (MALF, DRSRS, NEMA, MDP, COG, NDMA, NCIC)	• Development of county-specific NRM hotspots maps (Departments responsible for Environment, Agriculture, Livestock, Fisheries)	• Participate in the development of county-specific NRM hotspots maps		1.2
	(c) Develop mechanism for conflict resolution	• No. of conflict resolution mechanisms established • No of conflicts resolved	• Review and develop guidelines for conflict resolution (MALF, NEMA, MDP, Judiciary, COG)	• Implement guidelines on conflict resolution. • Develop and review county specific guidelines for natural resources dispute resolution • Dispute resolution (Departments responsible for Environment, Agriculture, Livestock, Fisheries)	• Dispute resolution (Council of elders, Natural resource user associations, CBOs, WRUAs, FBOs, CSOs, NGOs)	ST/LT	3.0

Strategies	Activities	Measure of achievement	Responsibilities and Institutions			Priority TimelineST <3 yrs; MT 3-6 yrs LT > 6)	Indicative Budget (Billions in KSh)
			National Government	County Government	Other Stakeholders		
Sub-Total for Adaptation and Building Resilience							**300**
Thematic Area 2. Mitigation of Greenhouse Gas Emissions							
Strategic Issue 4: Emissions from key sources in agricultural production systems							
Strategic Goal 4: Minimize emissions from key sources in agricultural production systems							
Strategic Objective 4: Develop mechanisms that minimize greenhouse gas emissions from key sources in agricultural production systems							
(i) Reduce the rate of emissions from livestock (enteric fermentation and manure)	(a)Formulate and support programs that promote development and use of low emissions technologies to manage livestock feed from farm residues and manure	• No of technologies developed and adopted • No of programs formulated and supported	• Formulate programs • build capacity • Research in technologies to manage livestock feed from farm residues and manure • Develop guidelines for feed formulation from farm residues and manure management. (MALF, KALRO)	• Formulate county specific programs • Implement the developed programs • Build capacity (Departments responsible for Agriculture, Livestock, Fisheries)	• Capacity building • Formulation and implementation of programmes • Technical assistance (NGOs, ILRI, Private sector, CBOs, FBOs)	**ST/LT**	4.6
	(b)Formulate and support programs that promote development and use of low emissions technologies for rangeland, manure and livestock waste management	• No of technologies developed and adopted • No of programs formulated and supported	• Research in technologies for rangeland, manure and livestock waste management • Formulate programs • build capacity • Develop guidelines for rangeland, manure and livestock waste management. (MALF, KALRO)	• Formulate county specific programs • Implement the developed programs • Build capacity (Departments responsible for Agriculture, Livestock, Fisheries)	• Capacity building • Formulation and implementation of programmes • Technical assistance (NGOs, ILRI, other regional and international research institutions, Private sector, CBOs, FBOs)	ST/LT	5.9
	(c) Formulate improved feeds and feed additives to reduce enteric fermentation	• No of improved feeds types and feed additives formulated	• Research on feed formulations and feed additives • Develop policy, guidelines and standards for feeds • Capacity building (MALF, KALRO)	• Implement policy, guidelines and standards • Capacity building • Provide extension services • Facilitate involvement of private sector in improved feed business (Departments responsible for Agriculture, Livestock, Fisheries)	• Technical assistance • Formulate feeds and feed additives • Offer advisory services • Research (NGOs, ILRI, other regional and international research institutions, Private sector, CBOs, FBOs)	ST/LT	11.8
	(d)Develop breeding schemes and improve herd health to enhance efficiency in production	• No of breeding schemes developed, • Increased herd efficiency in production	• Policy direction and guidance • Undertake breeding to improve herd health and enhance efficiency in production (MALF, KALRO, KAGRC, KEVEVAPI)	• Implement breeding schemes • Provide extension services (Departments responsible for Agriculture, Livestock, Fisheries)	• Implement breeding schemes • Provide extension services • Service provision • Technical assistance (NGOs, ILRI, other regional and international research institutions, Private sector, CBOs, FBOs)	ST/LT	9.8
	(e)Support development and use of innovations in livestock management systems that enhance productivity.	• No of innovations supported	• Identify and support incubation and dissemination of innovations (MALF, KALRO, KAGRC, KIRDI, KIPI)	• Identify and support incubation and dissemination of innovations • Support commercialization of innovations (Departments responsible for Agriculture, Livestock, Fisheries, Industry, Information)	• Financing R&D, • Technology transfer • Publicity (ABS, KCIC, private sector, ILRI, other regional and international research institutions, media)	ST/LT	7.9

Strategies	Activities	Measure of achievement	Responsibilities and Institutions			Priority TimelineST <3 yrs; MT 3-6 yrs LT > 6)	Indicative Budget (Billions in KSh)
			National Government	County Government	Other Stakeholders		
(ii) Reduce the rate of emissions from rice production systems	(a) Promote and develop programmes for improving efficiency in irrigated rice production systems	• Acreage under efficient irrigated rice production	• Develop programmes on irrigated rice production • Develop guidelines for efficient water and fertilizer use and waste infrastructure in irrigated rice production systems • Capacity building (MALF, MWI, NIB, KALRO Mwea and Kibos, MIAD, RDAs)	• Implement programmes, • Capacity building • Participate in development of guidelines • Adopt and use guidelines • Provision of extension services (Departments responsible for Agriculture, Livestock, Fisheries Irrigation)	• Funding • Capacity building • Research • Provision of extension services (Development partners, private sector, KRRF, IRRI, other regional and international research institutions)	ST/LT	3.4
	(b) Promote production of rainfed rice	• Acreage under rainfed rice production	• Formulate programmes and projects on rainfed rice production (MALF, KALRO Mwea and Kibos, NIB, RDAs)	• Participate in formulation of programs and projects on rainfed rice production • Promote and implement rainfed rice production programs and projects (Departments responsible for Agriculture, Livestock, Fisheries Irrigation)	• Funding • Capacity building • Research • Provision of extension services (Development partners, private sector, KRRF, IRRI, other regional and international research institutions)	ST/LT	2.5
	(c) Develop and transfer appropriate technologies for efficient rice production	• No of appropriate technologies developed	• Conduct research • Funding for research (MALF, KALRO Mwea and Kibos, NIB, RDAs)	• Collaborative research • Disseminate and implement findings (Departments responsible for Agriculture, Livestock, Fisheries Irrigation)	• Technical assistance • Collaborative research • Disseminate findings (Development partners, private sector, KRRF, IRRI, other regional and international research institutions)	ST/LT	3.9

Strategic issue 5: Emissions from other sources in agricultural production systems

Strategic goal: Minimize emissions from other sources in agricultural production systems

Strategic objective: Mainstream efficient agricultural production systems to enhance productivity and minimize emissions as a co-benefit.

(i) Mainstream Sustainable Natural Resource Management to reduce emissions as a co-benefit	(a) Promotion of agroforestry for reduction of emissions from deforestation and forest degradation plus, forest conservation, sustainable management of forests and enhancement of carbon stocks, including range management.	• Increase in on-farm tree cover • Enhanced level of additionality	• Develop a national agroforestry baseline • Development of Agriculture (Farm Forestry) Rules, 2009 implementation guidelines • Development of programmes and projects on agroforestry in agricultural production systems • Development of information packages on agroforestry • M&E (MALF, DRSRS, MENR, KFS, KEFRI, ICRAF, KALRO)	• Data collection and reporting • Implement guidelines • M&E • Develop and implement agroforestry programs and projects • Capacity building on data management • Incorporate baseline findings in their development plans • Provision and incorporation of technical information in extension system (Departments responsible for Agriculture, Livestock, Fisheries Irrigation)	• Data collection and reporting • Develop and implement agroforestry projects • Capacity building • Develop information packages (Development partners, Private sector, NGOs, CBOs)	ST/LT	7.4
	(b) Develop and implement agricultural sector Nationally Appropriate Mitigation Actions (NAMAs)	• No. of NAMAS developed	• Develop NAMA proposals • Resource mobilization • Capacity building on NAMAs at all levels • Measuring, Reporting, and Verification (MRV) (MALF, MENR, KALRO, KEFRI, KFS)	• Collect and collate relevant data for NAMA development and implementation • Implement NAMAs at the county level (Departments responsible for Environment, Agriculture, Livestock, Fisheries, Forestry and Irrigation)	• Technical assistance • Funding (Development partners, private sector, other regional and international research institutions, Financial Organizations, NGOs)	ST-LT	7.0
	(c) Minimize use of fires in rangelands and croplands management	• Acreage subjected to burning	• Policy direction • Capacity building (MALF, MENR, KALRO)	• Develop and enforce regulations • Sensitization and awareness • Capacity building • Monitoring and surveillance (Departments responsible for Environment, Agriculture, Livestock, Fisheries, Forestry and Irrigation, emergency response)	• Funding • Equipment • Capacity building (NGOs, CBOs, FBOs, Development Partners, private sector)	ST-LT	3.9

Strategies	Activities	Measure of achievement	Responsibilities and Institutions			Priority TimelineST <3 yrs; MT 3-6 yrs LT > 6)	Indicative Budget (Billions in KSh)
			National Government	County Government	Other Stakeholders		
(ii) Promotion of energy-efficient technologies and innovations	(a) Reduce rate of emissions associated with processing and transportation of agricultural inputs and products	• Percentage reduction in rate of emissions	• Policy guidance • Establish emission baseline • Develop, review and enforce regulations • Capacity building • Resource mobilization • Monitoring, Reporting and Verification (MALF, MENR, KALRO, AFA, KIRDI, ME&P, MTI, NEMA, MITC, KMFRI)	• Develop and enforce regulations • sensitization and awareness • Capacity building, • Monitoring and surveillance (Departments responsible for Environment, Agriculture, Livestock, Fisheries, Forestry and emergency response)	• Funding • Capacity building • Provision of advisory services (Development partners, private sector, other regional and international research institutions)		2.5
	(b) Reduce rate of emissions associated with distances covered and residence-time used for capture fisheries	• Percentage reduction in rate of emissions	• Policy guidance • Establish emission baseline • Develop, review and enforce regulations • Carry out restocking • Enhance fish abundance • Capacity building • Resource mobilization (MALF, NEMA, KMFRI)	• Develop and enforce regulations • Sensitization and awareness • Capacity building, • Carry out restocking to enhance fish abundance • Conduct monitoring, control and surveillance (MCS) for stocks recovery to reduce time spent fishing (Departments responsible for Fisheries, Environment, emergency response)	• Funding • Capacity building • Provision of advisory services • Carry out restocking to enhance fish abundance (BMUs, Development partners, private sector, other regional and international research institutions)		1.2
	(c) Promote alternative techniques/ innovations along agricultural value chains that either use fuel efficiently or green energy.	• No of alternative energy sources developed	• Policy guidance • Develop, review and enforce regulations • Capacity building • Resource mobilization (MALF, MENR, KALRO, AFA, KIRDI, ME&P, MTI, NEMA, MITI, KMFRI)	• Develop and enforce regulations • Sensitization and awareness • Capacity building, • Monitoring and surveillance (Departments responsible for Environment, Agriculture, Livestock, Fisheries, Forestry)	• Funding • Capacity building • Provision of advisory services (Development partners, private sector, other regional and international research institutions)		2.0

Strategic Issue 6: Lack of Accountable quantification of GHGs emissions							
Strategic Goal: Adequate Measurement, Reporting and Verification System in Agriculture sector							
Strategic Objectives: Enhanced capacity to measure, report and verify emissions from agriculture sector							
(i) Development of MRV Systems	(a) Designing, setting standards and establishment of MRV infrastructure	• Standards set, MRV infrastructure established and operational	• Establishment of the MRV infrastructure (MALF, KALRO, KEFRI, KEMFRI, KFS)		• Establish MRV infrastructure, participatory standard setting (Development partners, ILRI, ICRAF, CFOR, CCAFS, CIAT, NGOs)		5.9
	(b) Development of an inventory system (Data bank on sector emissions)	• Inventory system developed	• Establishment of the sector inventory system (MALF, KALRO, KEFRI, KEMFRI, KFS)	• Provision of data and information	• Provision of data and information (Development partners, ILRI, ICRAF, CFOR, CCAFS, CIAT, NGOs)	LT	3.9
	(c) Develop an M&E system	• M&E system developed for sector emissions	• Establishment of a reporting mechanism • Establishment of an evaluation/verification system (Departments in charge of Agriculture, Livestock and Fisheries)	• Provision of Reports • Participation in evaluation processes (Departments in charge of Agriculture, Livestock and Fisheries)	• Provision of reports • Participation/ assist in evaluation processes (Development partners, ILRI, ICRAF, CFOR, CCAFS, CIAT, NGOs)		1.7
(ii) Capacity building of agricultural sector stakeholders on Measuring, Reporting and verification processes	(d) Capacity building on; i. Measurement of GHGs emissions in agricultural sector ii. Management of inventory system iii. Data collection , reporting and verification	• Number of stakeholders conversant with MRV system management	• Identify and source technical assistance for capacity building on MRVs • Conduct training of trainers for stakeholders	• Participate in the trainings • Application of skills and knowledge acquired from the trainings	• Provide technical assistance (Development partners, ILRI, ICRAF, CFOR, CCAFS, CIAT, NGOs)	LT	14,8
Sub-total for mitigation of Greenhouse Gas Emissions							**100**

Strategies	Activities	Measure of achievement	Responsibilities and Institutions			Priority Timeline (ST <3 yrs; MT 3-6 yrs LT >6)	Indicative Budget (Billions in KSh)
			National Government		Other Stakeholders		
Thematic Area 3. Enabling Policy Legal and Institutional Framework							
Strategic issue 7: Inadequate policy, weak regulatory framework and overlap of mandates among institutions involved in CSA							
Strategic Goal: An enabling policy, regulatory and institutional framework							
Strategic Objective: To improve policy, regulations and harmonize institutional mandates for climate smart agriculture							
(i) Develop and review CSA policies and regulatory frameworks	(a) Formulate and review policies and regulations for CSA activities	• Number of policies and regulations formulated and reviewed	• Formulate and review policies and regulations • Build capacity and support formulation and review of county specific regulations (MALF, MENR, MWI and Attorney General's Office)	• Formulate and review county- specific policies and regulations • Participate in the formulation and review of national regulations (County Assembly, Departments responsible for Agriculture, Livestock, Irrigation, Fisheries, and Environment)	• Participation • Technical assistance • Funding (NGOs, CBOs, FBOs, Development Partners, private sector)	ST/LT	4.8
	(b) Establish oversight and accountability systems for enforcement	• Number of systems for oversight and accountability	• Establishment and operationalize oversight and accountability guidelines • Roll out guideline for use by the counties • Support use of the guidelines by the counties (MALF, MENR, MWI, KENAS)	• Participate in the development of national guidelines • Domesticate guidelines for use • Implement the use of guidelines (Departments responsible for Agriculture, Livestock, Irrigation, Fisheries, and Environment)	• Use guidelines • Funding • Technical assistance (NGOs, CBOs, FBOs, Development Partners, private sector)	MT	1.0
	(c) Build physical, human and operational capacities for enforcement at National and County levels	• No and type of infrastructure • No and cadre of personnel recruited / trained • Amount of funds allocated and used	• Funding • Availing of infrastructure • Recruitment and Deployment for national CSA activities • Induction • Carry out training (MALF, MENR, MWI)	• Avail land • Support maintenance of infrastructure • Participate in training • Support through availing operational resources (Departments responsible for Agriculture, Land, Livestock, Irrigation, Fisheries, and Environment)	• Funding • Machines and equipment • Recruitment • Carry out training • Participate in training • Technical assistance (Development partners, private sector, CBO, NGOs, academic institutions)	ST/LT	1.2
	(d) Develop incentive mechanisms for promotion of CSA best practice	• No. of incentives provided	• Identify and provide incentives for best practice • Propose areas for providing incentives for best practice (MALF, MENR, MWI, TNT)	• Participate in identification of incentives for best practice • Identify and provide incentives for county based best practice • Propose areas for providing incentives for county based best practice (Departments responsible for Agriculture, Land, Livestock, Irrigation, Finance, Fisheries, and Environment)	• Participate in identification of incentives for best practice • Identify and provide incentives for best practice • Propose areas for providing incentives for best practice • Lobby for the incentives (Development partners, private sector, CBO, NGOs, CSOs, academic institutions)	ST/LT	1.1

Strategies	Activities	Measure of achievement	Responsibilities and Institutions			Priority Timeline (ST <3 yrs; MT 3-6 yrs LT >6)	Indicative Budget (Billions in KSh)
			National Government		Other Stakeholders		
(ii) Develop and review CSA policies and regulatory frameworks	(a) Review CSA regulations to provide for harmonization of institutional mandates and responsibilities.	• Number of regulations reviewed	• Review regulations • Build capacity and support review of county-specific regulations (MALF, MENR, MWI and Attorney General's Office)	• Review county- specific regulations • Participate in the review of national regulations (County Assembly, Departments responsible for Agriculture, Livestock, Irrigation, Fisheries, and Environment)	• Participation • Technical assistance • Funding (NGOs, CBOs, FBOs, Development Partners, private sector)	ST/LT	1.2
	(b) Carry out joint planning, implementation and M&E by State Agencies and other actors to enhance effective enforcement	• No. of joint planning, implementation and M&E carried out	• Undertake joint planning, implementation and M&E for national level CSA activities • Support joint planning, implementation and M&E at county level (MALF, MENR, MWI)	• Undertake joint planning, implementation and M&E for county level CSA activities • Participate in joint planning, implementation and M&E for national level CSA activities (County Assembly, Departments responsible for Agriculture, Livestock, Irrigation, Fisheries, and Environment	• Participate in joint planning, implementation and M&E for national level CSA activities • Technical assistance • Funding (NGOs, CBOs, FBOs, Development Partners, private sector)	ST/LT	1.2
Strategic Issue 8 : Inadequate capacities and weak coordination among institutions and stakeholders in climate smart agriculture							
Strategic Goal: Improved Coordination of implementation of CSA activities							
Strategic Objective: To improve capacities and coordination among institutions and stakeholders in climate smart agriculture							
(i) Strengthen coordination for CSA implementation	(a) Establish CSA coordination structures	• Structures established and operational at National and County level	• Establishment, facilitation and guidance by MALF	• Establishment, facilitation and guidance by County Ministry for Agriculture	• Participation and support by Development partners and Non state actors	ST	1.1
	(b) Promote partnerships between stakeholders to enhance joint planning and implementation of CSA programs.	• Number and Diversity of CSA stakeholders integrated	• Facilitate mobilization and consultation by MALF and MENR & RDAs	• Facilitate mobilization and consultation by County Ministry for Agriculture	• Participation and support by Development partners and Non state actors	ST	1.0

	(c) Support linkage between National and County CSA institutions with National Climatic Change Council (NCCC) and Climate Change Directorate.	• Coordination linkage supported and operational	• Facilitation, guidance and resource mobilization by MALF and MENR	• Facilitation , collaboration and implementation by county ministries for Agriculture and Environment	• Facilitation and participation by private sector development partners and non-state actors	ST	0.8
(ii) Strengthen institutions involved in CSA	(a) Provide support to CSA institutions at National and County level;	• Number of Institutions and linkages supported and functional	• Guidance and facilitation by MALF and MENR	• Facilitation and collaboration by County ministries for Agriculture and Environment	• Support and collaboration	LT	3.7
	(b) Capacity build institutions	• Number of institutions supported	• Resource mobilization and capacity development by MALF, TNT	• Resource mobilization and capacity development by County ministry for Agriculture	• Support and collaboration	LT	2.9
Subtotal for Enabling Policy Legal and Institutional Framework							**20**
Thematic Area 4. Addressing Cross-cutting Issues that Adversely Impact CSA							
Strategic Issue 9 Inadequate financing of CSA activities.							
Strategic Goal: Sustainable financial sources, efficient and effective utilization of funds.							
Strategic Objective: To increase funding and improve accountability and transparency for CSA activities							
(i) Enhance funding from the National and County exchequer for Climate Smart Agriculture (CSA) activities	(a) Mainstream CSA activities into the government budget cycle	• Recurrent and Development funds allocated for CSA activities	• Develop, analyze, and prioritize CSA activities for exchequer funding • Develop work plans and budgets for CSA activities (TNT, Climate Change Council, MALF, MENR)	• Develop, analyze, and prioritize CSA activities for incorporation into County Integrated Development Plans. • Develop work plans and budgets for CSA activities (Departments. responsible for Finance, Agriculture, Livestock, Forestry and Fisheries)	• Lobby for CSA funding • Develop project proposals • Capacity building on proposal development (CBOs, NGO, CSOs, FBOs, Private Sector,)	ST	0.5
	(b) Coordinate and implement National and County CSA activities (Recurrent, Development)	• Number of National and County activities coordinated and implemented	• Coordinate, monitor and evaluate joint National CSA activities • Develop work plans and budgets for National CSA activities (MALF, MENR, TNT, MDP)	• Implement CSA activities • Develop work plans and budgets for County CSA activities (Departments responsible for Finance, Agriculture, Livestock, Forestry and Fisheries)	• Provide fund through either loans, donations or grants (Development partners -bilateral and multi-lateral; Financial Institutions, CBOs, NGO, CSOs, FBOs, Private Sector)	SR/LT	1.1

Strategies	Activities	Measure of achievement	Responsibilities and Institutions			Priority Timeline (ST <3 yrs; MT 3-6 yrs LT >6)	Indicative Budget (Billions in KSh)
			National Government		Other Stakeholders		
(ii) Promotion of strategic partnerships with private sector and development partners	(a) Formulate proposals for joint programs and projects for CSA s with private, sector and development partners to enhance funding for CSA.	• Number of joint programs / projects proposals developed	• Develop, analyze, and prioritize projects and programs to access climate finance.	• Develop, analyze, and prioritize projects and programs to access climate finance.	• Lobby for CSA funding • Develop project proposals • Capacity building on proposal development (CBOs, NGO, CSOs, FBOs, Private Sector,	MT	0.5
	(b) Coordinate and implement joint CSA programs and projects	• Number of joint programs/ projects funded	• Coordinate, monitor and evaluate joint programs / projects Develop work plans and budgets for CSA programs and projects (MALF, MENR, TNT, MDP)	• Implement CSA programs and projects • Develop work plans and budgets for CSA programs and projects (Departments responsible for Finance, Agriculture, Livestock, Forestry and Fisheries)	• Provide fund through either loans, donations or grants (Development partners –bilateral and multi-lateral; Financial Institutions, CBOs, NGO, CSOs, FBOs, Private Sector)	MT	1.0
Strategic Issue 10: Limited capacity of WY& VG to participate in CSA activities.							
Strategic Goal: WY&VG empowerment for improved participation in CSA activities							
Strategic Objective: Improve participation in CSA by WY&VG.							
(i) Increase the capacity of WY&VG to participate in CSA activities	(a) Create awareness and capacity build WY&VG on CSA	• Number of trainings • Number of participants	• Develop curriculum and training manuals • Capacity building. (MALF, MENR, MPSYGA)	• Identify the target groups to be trained • Capacity building (Departments of Public Service, Environment, Agriculture, Livestock, Fisheries)	• Financial support • Capacity building • Curriculum development (Development partners, CBOs, NGOs, CSOs, FBOs, other stakeholders)	ST/LT	1.0
	(b) Promote CSA-related income generating activities targeted at WY&VG	• No of income generating activities • No of beneficiaries	• Policy guidance • Capacity building (MALF, MPSYGA, MENR and MITC)	• Identify income generating activities. • Provide initially capital to groups that are engaged (Department of Public Service, Environment, Agriculture, Livestock, Fisheries)	• Financial support to upscale the activities. • Capacity building (Development partners, CBOs, NGOs, CSOs, FBOs, other stakeholders)	ST/LT	5.0
(ii) Promote equity and inclusivity of WY&VG participation in CSA activities	(a) Develop inclusive and responsive agricultural value chains.	• Number of agricultural value chains • Number of beneficiaries	• Value chain analysis • Capacity building (MALF, MENR, MPSYGA)	• Value chain analysis • Capacity building • Provide extension services • Enforce standards • Link to markets (Departments of Environment, Agriculture, Livestock, Fisheries)	• Value chain analysis • Capacity building • Provide extension services • Linking to markets • Financing (Development partners, CBOs, NGOs, CSOs, FBOs, other stakeholders)	ST/LT	1.5
	(b) Establishment of Social Protection and Safety net programmes to cushion WY&VG to impacts of climate change	• Number of programmes • Number of beneficiaries	• Provide guidance on identification of targeted WY&VG • Provide funds for social protection and safety net. (MALF, MENR, MPSYGA)	• Participate in identification of target groups. (Departments of Public Administration, Gender, Culture, Environment and Labour)	• Funding • Capacity building of service providers and beneficiaries (Private sector, Development partners, CBOs, NGOs, CSOs, FBOs, other stakeholders)	T/LT	5.0

Strategies	Activities	Measure of achievement	Responsibilities and Institutions			Priority Timeline (ST <3 yrs; MT 3-6 yrs LT >6)	Indicative Budget (Billions in KSh)
			National Government		Other Stakeholders		
Strategic Issue 11: Limited human resource capacity to undertake CSA.							
Strategic Goal: Adequate and effective human resource capacity for CSA activities							
Strategic Objective: To enhance adequacy and quality of human resource for CSA							
(i) Increase the pool of technical personnel with expertise in CSA	(a) Undertake an audit of CSA human resource capacity at both national and county level	• Audit report	• Funding • Audit exercise • Establishing optimal personnel requirements • Staffs (MALF, MENR, MDP)	• Participate in the audit exercise (Departments responsible for Environment, Public Service, Agriculture, Livestock, Fisheries)	• Funding • Participate in the audit exercise (Development partners, private sector, CBO, NGOs,)	ST	1.0
	(b) Recruit qualified personnel	• No and type of expertise of personnel recruited	• Funding • Recruitment and deployment for national CSA activities • Induction (MALF, MENR, MDP)	• Funding • Recruitment and Deployment for Counties • Induction (Departments responsible for Environment, Agriculture, Livestock, Fisheries, County Public Service Boards)	• Funding • Recruitment (Development partners, private sector, CBO, NGOs,)	ST/LT	5.0
	(c) Establish working partnerships and collaboration with institutions with expertise in CSA	• No of institution with working partnerships • No of collaboration activities	• Policy guidance • Institutional framework for coordinating CSA activities • Establish networks and partnerships (MALF, MENR)	• Institutional framework for coordinating CSA activities • Establish networks and partnerships • (Departments responsible for Environment, Agriculture, Livestock, Fisheries)	• Funding • Lobby government • Establish networks and partnerships • (Development partners, private sector, KEPSA, KENAFF, CBO, NGOs, academic and research institutions)	ST/LT	1.0
(ii) Improve CSA knowledge and skills among technical personnel	(a) Undertake training needs assessment for CSA	• Training Needs Assessment report	• Carry out training needs assessment (MALF, MENR)	• Participate in training needs assessment (Departments responsible for Environment, Agriculture, Livestock, Fisheries, County Public Service Boards)	• Funding • Technical assistance • (Development partners, private sector, KEPSA, KENAFF, CBO, NGOs, academic and research institutions)	ST/LT	1.5
	(b) Organize and conduct trainings on CSA	• No. and types of trainings conducted	• Funding • Carry out training (MALF, MENR)	• Funding • Carry out training • Participate in training (Departments responsible for Environment, Agriculture, Livestock, Fisheries, County Public Service Boards)	• Funding • Carry out training • Participate in training • Technical assistance (Development partners, private sector, KEPSA, KENAFF, CBO, NGOs, academic and research institutions)	ST/LT	2.5
	(c) Mainstreaming CSA into training curricula of basic education and tertiary training institutions	• No. of curricula into which CSA is mainstreamed	• Identify content/area for mainstreaming • Incorporate content in curricula (MALF, MENR, MoE, KICD)	• Propose content/area for mainstreaming (Departments responsible for Environment, Agriculture, Livestock, Fisheries, Education)	• Funding • Technical assistance • Lobby for inclusion of content • Identify content/area for mainstreaming in curricula for tertiary training institutions • Incorporate content in curricula of tertiary training institutions (Development partners, private sector, KEPSA, KENAFF, CBO, NGOs, academic and research institutions)	LT/ST	1.5

Strategies	Activities	Measure of achievement	Responsibilities and Institutions			Priority Timeline (ST <3 yrs; MT 3-6 yrs LT >6)	Indicative Budget (Billions in KSh)
			National Government		Other Stakeholders		
Strategic Issue 12: Limited CSA research, technology development and innovations							
Strategic Goal: Enhanced CSA research, technology development, innovations and knowledge management							
Strategic Objective: To improve capacity to undertake CSA research, technology development, innovations and knowledge management							
(i) Enhance capacity of institutions to undertake CSA research	(a) Availing adequate infrastructure for research	• No and type of infrastructure	• Funding • Availing of infrastructure (KALRO, KEFRI, KMFRI, MALF, MENR, NACOSTI, CCC, TNT)	• Avail land • support maintenance of infrastructure (Departments responsible for Agriculture, Land Livestock, Fisheries, Environment)	• Technical support • Funding • Machines and equipment (Development partners, private sector, KEPSA, KENAFF, CBO, NGOs, academic and research institutions)	ST/LT	15.0
	(b) Provide adequate skilled research personnel for CSA Research	• No and cadre of CSA research personnel recruited • No and type of research skills imparted	• Funding • Recruitment and deployment for national CSA activities • Induction • Carry out training (KALRO, KEFRI, KMFRI, MALF, MENR, NACOSTI, CCC, TNT, MDP)	• Participate in training (Departments responsible for Agriculture, Land Livestock, Fisheries, Environment)	• Funding • Recruitment • Carry out training • Participate in training • Technical assistance (Development partners, private sector, CBO, NGOs, academic and research institutions)	ST/LT	5.0
	(c) Increasing operational resources for CSA research	• Amount of funds allocated and used	• Funding (KALRO, KEFRI, KMFRI, MALF, MENR, NACOSTI, CCC, TNT, MDP)	• Fund research on county specific issues • Support through availing operational resources (Departments responsible for Agriculture, Land Livestock, Fisheries, Environment)	• Funding (Development partners, private sector, CBO, NGOs, academic and research institutions)	LT/ST	5.0

(ii) Improve coordination of CSA research, innovation and knowledge generation	(a) Promote public private partnerships in CSA research and technologies / innovations development	• No of institutions with working partnerships • No of collaborative technologies / innovations	• Policy guidance • Institutional framework for coordinating CSA PPP activities • Establish networks and partnerships (MALF,KALRO, KEFRI, KMFRI, MENR, TNT, NACOSTI, CCC, KIRDI)	• Institutional framework for coordinating CSA PPP activities • Establish networks for PPP • (Departments responsible for Environment, Agriculture, Livestock, Fisheries, Finance)	• Establish networks and partnerships • Funding • Lobby government • Technical Assistance (Development partners, private sector, KEPSA, KCIC, KENAFF, CBO, NGOs, academic and research institutions)	ST/LT	4.0
	(b) Mechanisms for prioritization of CSA research needs	• No. of CSA research prioritization mechanisms established • No of CSA research areas prioritized	• Review and develop guidelines for research prioritization • Coordinating the process for prioritization of research needs • Funding (MALF, KALRO, KEFRI, KMFRI, KIRDI, NACOSTI, CCC)	• Participate in research prioritization • (Departments responsible for Environment, Agriculture, Livestock, Fisheries)	• Participate in research prioritization • Funding • Technical Assistance • (Development partners, private sector, KEPSA, KCIC, KENAFF, CBO, NGOs, academic and research institutions)	ST/LT	1.2
	(c) Establishment and maintenance of CSA information and knowledge generation systems	• No of CSA information and knowledge generation systems established and maintained	• Establish systems for CSA information and knowledge generation • Link and manage the national level and county level systems (MALF, MENR, KALRO, KEFRI, NACOSTI, KMFRI, DRSRS)	• Establish systems for CSA information and knowledge generation • Manage county level systems. • (Departments responsible for Environment, Science, Technology, Agriculture, Livestock, Fisheries)	• Funding • Technical support • (Development partners and private sector, KEPSA, KCIC, KENAFF, CBO, NGOs, academic and research institutions)	MT/LT	2.5

Strategies	Activities	Measure of achievement	Responsibilities and Institutions			Priority Timeline (ST <3 yrs; MT 3-6 yrs LT >6)	Indicative Budget (Billions in KSh)
			National Government		Other Stakeholders		
	(d) Promote integration of scientific and indigenous CSA knowledge and technology	• Number of technologies that integrates scientific and indigenous CSA knowledge	• Create a platform for integration of indigenous and scientific CSA knowledge. • Provide scientific CSA knowledge. (MALF, MENR, KALRO, KEFRI, NACOSTI, KEMFRI)	• Source County based indigenous CSA knowledge. • Promote county based indigenous CSA knowledge (Departments responsible for Culture, Environment, Science, Technology, Agriculture, Livestock, Fisheries)	• Provide indigenous CSA knowledge • Funding • Source county based indigenous CSA knowledge • Promote county based indigenous CSA knowledge • (Local ITK Experts, Development partners and International Research Institutions, CBO, farmers)	ST/LT	1.5
	(e) Mechanisms for identifying, incubating and commercialization of innovations	• No. of mechanisms established to identify, incubate and commercialize innovations • Number of innovations identified, incubated and commercialized	• Adapt existing guidelines for identifying, incubating and commercializing innovations to address CSA needs • Coordinating the process for identifying, incubating and commercializing innovations • Create a platform for identifying, incubating and commercializing innovations • Funding (MALF, KALRO, KEFRI, KMFRI, KIRDI, NACOSTI, CCC, KIPI)	• Promote and provide incentives for CSA innovations • Participate in identifying, incubating and commercializing innovations to address CSA needs (Departments responsible for Environment, Agriculture, Livestock, Fisheries)	• Promote and provide incentives for CSA innovations • Commercialization of CSA innovations • Participate in identifying, incubating and commercializing innovations to address CSA needs • Funding • Technical Assistance (Development partners, private sector, , KEPSA, KCIC, KENAFF, CBO, NGOs, academic and research institutions)	MT/LT	2.5

Strategic issue 13: Inadequate data and information on Climate Smart Agriculture							
Strategic goal 13: Functional and accessible data and information management system on Climate Smart Agriculture							
Strategic objective 13: Avail adequate and updated data and information on Climate Smart Agriculture							
(i) Establish and maintain a data and information management system	(a) Develop and use a CSA information management system	• A functional and accessible CSA information management system	• Set up the CSA information management system that is interlinked to counties and other stakeholders • Maintain the CSA information management system (MALF, MENR, KALRO, KEFRI, KMFRI, MICT)	• Participate in the development of the information management system (Departments responsible for Environment, Science, Technology, Agriculture, Livestock and Fisheries)	• Technical assistance • Funding • (Development partners, private sector, KEPSA, KCIC, KENAFF, CBO, NGOs, academic and research institutions)	MT/LT	3.0
	(b) Link the CSA information management system to the NCCRC and other CSA related information management systems	• Linkage to the CCRC • Number of links established	• Facilitate linkage with CCRC • Identify and develop links to appropriate sites • (NCCRC, MALF, MENR, KALRO, MICT, KEFRI, KMFRI,)	• Participate in the identification of the systems to be linked (Departments responsible for Environment, Science, Technology, Agriculture, Livestock and Fisheries)	• Technical assistance • Funding • Participate in the identification of the systems to be linked. • (Development partners, private sector, KEPSA, KCIC, KENAFF, CBO, NGOs, academic and research institutions)	MT	2.5
(ii) Build capacities on data collection and information management	(a) Identify capacity gaps	• Capacity gaps assessment report	• Carry out capacity gaps assessment (MALF, MENR, KALRO, KEFRI, KMFRI, KBS)	• Participate in capacity gaps assessment • (Departments responsible for Environment, Agriculture, Livestock, Fisheries, County Public Service Boards)	• Funding • Technical assistance • (Development partners, private sector, KEPSA, KENAFF, CBO, NGOs, academic and research institutions)	ST/LT	1.5
	(b) Undertake training in data collection and information management	• No. and types of trainings conducted	• Funding • Carry out training (MALF, MENR KALRO, KEFRI, KMFRI, KBS)	• Funding • Carry out training • Participate in training • (Departments responsible for Environment, Agriculture, Livestock, Fisheries, County Public Service Boards)	• Funding • Carry out training • Participate in training • •Technical assistance (Development partners, private sector, KEPSA, KENAFF, CBO, NGOs, academic and research institutions)	ST/LT	3.0

Strategies	Activities	Measure of achievement	Responsibilities and Institutions			Priority Timeline (ST <3 yrs; MT 3-6 yrs LT >6)	Indicative Budget (Billions in KSh)
			National Government		Other Stakeholders		
(iii) Promote data management and information generation and dissemination	(a) Data collection, analysis and information generation	• No. of data collection analysis and information generation activities	• Coordinate data collection analysis and information generation • Collect analyze and generate information on national data (MALF, MENR KALRO, KEFRI, KMFRI, KNBS)	• Coordinate data collection analysis and information generation at county level • Collect analyze and generate information on county data • Provide county specific data for collation and information generation of national data and information • (Departments responsible for Environment, Agriculture, Livestock, Fisheries)	• Funding • Technical assistance • Collect and analyze data and generate information • (Development partners, private sector, KEPSA, KENAFF, CBO, NGOs, academic and research institutions)	ST/LT	3.0
	(b) Information packaging and dissemination	• No. and type of information packages developed • No. and type of information packages disseminated	• Packaging of information • Dissemination of information (MALF, MENR KALRO, KEFRI, KMFRI, KBS)	• Packaging of information (including translation into local languages) • Dissemination of information (including using locally appropriate methods, and translation into local languages) (Departments responsible for Environment, Agriculture, Livestock, Fisheries)	• Funding • Technical assistance • Packaging of information (including translation into local languages) • Dissemination of information (including using locally appropriate methods, and translation into local languages) (Development partners, private sector, KEPSA, Media, KENAFF, CBO, NGOs, academic and research institutions)	ST/LT	2.2
Sub Total Addressing Cross-cutting Issues that Adversely Impact CSA							**80.0**
GRAND TOTAL							**500**