



National Climate-Smart Agriculture and Food Security Action Plan of Ghana (2016-2020)

Working Paper No 139

CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)

George Owusu Essegbey, Delali Nutsukpo, Naaminong Karbo and Robert Zougmore



RESEARCH PROGRAM ON
**Climate Change,
Agriculture and
Food Security**



CCAFS

Working Paper



Republic of Ghana

Ministry of Food and Agriculture

National Climate-Smart Agriculture and Food Security Action Plan of Ghana (2016-2020)

Working Paper No 139

CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)

George Owusu Essegbey, Delali Nutsukpo, Naaminong Karbo and Robert Zougmore



Manure management is a key aspect of soil fertility maintenance in Lawra District

Correct citation:

Essegbey GO, Nutsukpo D, Karbo N and Zougmore R. 2015. National Climate-Smart Agriculture and Food Security Action Plan of Ghana (2016-2020). Working Paper No. 139. Copenhagen, Denmark: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Available online at: www.ccafs.cgiar.org

Titles in this Working Paper series aim to disseminate interim climate change, agriculture and food security research and practices, and stimulate feedback from the scientific community.

The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) is a strategic partnership of CGIAR and Future Earth, led by the International Center for Tropical Agriculture (CIAT). The Program is carried out with funding by CGIAR Fund Donors, the Danish International Development Agency (DANIDA), Australian Government (ACIAR), Irish Aid, Environment Canada, Ministry of Foreign Affairs for the Netherlands, Swiss Agency for Development and Cooperation (SDC), Instituto de Investigação Científica Tropical (IICT), UK Aid, Government of Russia, the European Union (EU), New Zealand Ministry of Foreign Affairs and Trade, with technical support from the International Fund for Agricultural Development (IFAD).

Contact:

CCAFS Coordination Unit – Faculty of Science, Department of Plant and Environmental Sciences, University of Copenhagen, Rolighedsvej 21, DK-1958 Frederiksberg C, Denmark. Tel: +45 35331046; Email: ccaafs@cgiar.org

Creative Commons License



This Working Paper is licensed under a Creative Commons Attribution - NonCommercial–NoDerivs 3.0 Unported License.

Articles appearing in this publication may be freely quoted or reproduced provided the source is acknowledged. No use of this publication may be made for resale or other commercial purposes.

© 2015 CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).
CCAFS Working Paper No 139

Photos: A. Ademiluyi and C. Peterson (CIAT/CCAFS)

Proofreading, graphic design and layout: PAO Bougou

Disclaimer:

This Working Paper has been prepared as an output for Theme 4: Linking Knowledge with Action under the CCAFS Program and has not been peer reviewed. Any opinions stated herein are those of the author(s) and do not necessarily reflect the policies and/or opinions of CCAFS. All images remain the sole property of their source and may not be used for any purpose without written permission of the source.

Acknowledgement

The preparation of this national climate-smart agriculture action plan has been made possible through the active engagement of various public and private institutions and organizations in Ghana. The Task Team committed by the Ghana Science-Policy Platform on Climate Change, Agriculture and Food Security to coordinate the preparation of the action plan would like to thank all these stakeholders for their dedicated contributions. The Task Team is especially grateful for the unqualified cooperation and support of several persons who made time available for consultations and discussions. Even though they are too many to mention, we acknowledge the special time invested by Mr. Krobea Asante, Director of Crops Services Directorate of MoFA, Mr. Kwamena Akorful, Director of the Animal Production Directorate of MoFA. We acknowledge the consultations with Mr. Freddua Agyemang, the Director in charge of environment at the Ministry of Environment, Science, Technology and Innovation (MESTI). The participants of the Accra and Kumasi Stakeholders' Consultation Workshops as listed in Annex 2 are gratefully acknowledged. In particular, we acknowledge the following: Naa Puowelle Karbo III, Paramount Chief of Lawra Traditional Area; Dr. Kofi Boa, Director, No Till Centre, Nkawie; Nana Opoku Ababio, Adontenhene of Bekwai Traditional Council; Nana Amponsah Appau, Dwentoa Hema of Bekwai Traditional Council; and Nana Ababio Achia Obaapanin, Atwima Akosombo Traditional Council.

We are highly indebted for the technical and financial support of the Climate Change, Agriculture and Food Security (CCAFS) Program, West Africa Region, coming through the Ghana Science-Policy Platform. The support from the Platform was instrumental in not only getting the action plan done, but also conducting preliminary studies leading to the formulation of the plan. We also acknowledge CARE International for supporting the Kumasi Stakeholders' Workshop.

Task Team (Dr. George Owusu Essegbey,
Mr. Delali Nutsukpo and Dr. Naaminong Karbo)

Abstract

The policy document – *National Climate-Smart Agriculture and Food Security Action Plan of Ghana (2016-2020)* – provides the implementation framework for an effective development of climate-smart agriculture in the ground. It formulates specific strategies that will contribute developing climate-resilient agriculture and food systems for all agro-ecological zones, as well as the human resource capacity required for a climate-resilient agriculture promotion in Ghana. The action plan is therefore an effort to translate to the ground level the broad national goals and objectives in climate-smart agriculture. Its development has been made possible through the active engagement of various public and private institutions and organizations in Ghana. The methodology comprised desk research, data collection through interviews and participatory workshops and small group meetings. A review of relevant agricultural policy documents such as the Food and Agriculture Sector Development Policy (FASDEP), the METASIP and the Agriculture Sustainable Land Management Strategy and Action Plan was done to analyse the current national agricultural policy environment. Participatory workshops were organized to bring representatives of stakeholder organizations together to discuss various components of the action plans and prepare inputs. These stakeholder consultation workshops were used to carry out prioritization of the action areas by the agro-ecological groupings. The stakeholders included farmers, small-scale agro-entrepreneurs, women groups and local government authorities. In addition, a validation workshop was held to provide a platform for a final discussion of the draft Action Plan with key stakeholders. It brought together representatives from the relevant ministries and public institutions including MoFA, MESTI, NDPC, private sector entities and farmer-based organizations. The Action Plan defined implementation programmes in the respective agro-ecological zones and in the various districts. Activities defined in the action plan have been developed on the premise that the eight programme areas of the Agriculture and Food Security focus area of the NCCP, provide a useful framework for detailing the specific activities and their corresponding implementing agencies. Other key components discussed the cross-cutting issues in the implementation of the plan and the monitoring and evaluation system. What remains crucial now is the allocation of resources to effectively implement the plan. In this regards, the lessons from the prioritization of the action areas by the stakeholders are instructive. Each of the three agro-ecological zones has action areas of emphasis. However, the development and promotion of climate-resilient cropping systems is important for all three zones and national efforts to focus on this since it is at the foundation of food security. More specifically, for the Savannah Zone, water conservation and irrigation systems are critical. For the Transition Zone, the development of livestock production system is important whilst for the Forest Zone, capacity development is a priority. The key message from the prioritization is that, it guides the formulation of the location-specific activities to address climate change and therefore engenders effective allocation of national resources. What needs to be underscored is the fact that, it is not the formulation of plans that creates impact. It is the dedicated implementation and commitment to the ideals and principles undergirding the plans that bring results. The earnest hope is to have commitment manifested with this national action plan.

Authors

Dr. George Owusu Essegbey is the Director of the Science and Technology Policy Research Institute (STEPRI) of the Council for Scientific and Industrial Research (CSIR) in Ghana. With a PhD in Development Studies, he has conducted extensive research in Science, Technology and Innovation (STI) development especially in agriculture and industry. Climate change is one of his key thematic areas of research. Dr Essegbey is a leading member on the Core Team of the Ghana science-policy dialogue platform. He provides critical policy research backstopping to the platform at all levels. He is currently leading the study team to develop the country CSA profile framework in Collaboration with CIAT. Dr. Essegbey has also executed assignments for agencies of the UN including the World Bank, UNESCO, WIPO and UNEP.

Email: goessegbey@csir-stepri.org or george_essegbey@yahoo.co.uk

Mr. Delali Kofi Nutsukpo is currently Director of Agriculture of the Ada West District Assembly, in the Greater Accra Region of Ghana. Mr. Nutsukpo holds a Master of Philosophy degree in Soil Science from the University of Ghana, Post Graduate Certificate in Extension Coordination from Agriculture Academy, Odense, Denmark and Post Graduate Diploma in Organization Development from the University of Cape Coast, Ghana.

Mr. Nutsukpo has during the last 25 years been engaged in promoting improved land resources management within the food and agriculture sector in Ghana with emphasis on building capacity for effective extension service delivery. Before his current appointment, he was the Head of the Environment and Climate Change within the Ministry and responsible for facilitating mainstreaming of environmental sustainability including climate change into sector policies, plans and programmes. Mr. Nutsukpo is the Vice Chairman of the Ghana science-policy dialogue platform on climate change, agriculture and food security, and brings national policy perspectives to the work of the platform. He has contributed to a number of publications related to Climate Change in Ghana including the National Climate Change Policy.

Email: nutsukpodelali@gmail.com

Dr. Naaminong Karbo holds a PhD in Agriculture (Animal Nutrition and Feed Technology) - Timiriazev Agricultural Academy, Moscow, USSR, 1988. Alumini of the International Course in Development Oriented Research in Agriculture (ICRA), Wageningen, The Netherlands (1997).

He is the immediate past Director of the CSIR-Animal Research Institute of Ghana with over twenty years experience in agricultural research and development. Currently, a chief research scientist on post-retirement contract in the CSIR and enjoys mentorship of young scientists and extensive collaborative research partnership programming with both local (Government and non-governmental organizations) and the international research centers (ILRI, ICRISAT, ICARDA, etc.) under the CGIAR system. Actively contributing to the Climate change, Agriculture and Food Security (CCAFS) West Africa programme in Ghana. Chairman of the Ghana CCAFS Science-Policy Dialogue Platform and a member of the country Climate-smart agriculture profiling team. Earlier research project works covered the areas of protein and mineral nutrition in ruminants, smallholder crop-livestock integration and Animal-based Farming systems research.

Email : minongkordam@yahoo.com

Dr. Robert Zougmore is an agronomist and soil scientist with a PhD in Production Ecology & Resources Conservation, University of Wageningen. He is based at ICRISAT Bamako where he currently leads the CGIAR research program on Climate Change, Agriculture and Food Security (CCAFS) in West Africa. His work focuses on the development of climate-smart agriculture technologies, practices, institutions and policies for better climate risk management in West Africa.

Email: r.zougmore@cgiar.org

Preface

This policy document – National Climate-Smart Agriculture and Food Security Action Plan – is produced on the conviction that climate-smart agricultural practices, the bedrock of food security should be deliberately programmed. The National Climate Change Policy provides a broad framework for formulating specific strategies to address local climate change challenges. This Action Plan therefore is an effort to translate to the ground level the broad national goals and objectives in climate-smart agriculture.

A policy document such as this cannot derive solely from the National Climate Change Policy. A key step in preparing this document was the review of the relevant existing policy documents for direction and inputs. In the review, every effort was made to distil the essence of the various policy documents and factor these into the design of contents of the National Climate-Smart Agriculture and Food Security Action Plan.

Another important part of the methodology in preparing this document was consultation with key stakeholders. This document is essentially a document of the Ministry of Food and Agriculture (MoFA). There were strong interactions with the Directors of MoFA and other ministries such as Ministry of Environment, Science, Technology and Innovation (MESTI) and Ministry of Local Government. The consultations extended into public agencies such as the Council for Scientific and Industrial Research (CSIR) and the Environmental Protection Agency (EPA). From the various perspectives of the stakeholders, this Action Plan has been formulated to synchronise with the key institutional programmes and activities of relevant stakeholder institutions. We wish to acknowledge the Ghana CCAFS Science-Policy Platform for offering the opportunity to develop a Climate-Smart Agriculture Action Plan for our country (Ghana).

It is hoped that the Action Plan will contribute in no small measure to the effective implementation of programmes in the respective agro-ecological zones and in the various districts. What needs to be underscored is the fact that, it is not the formulation of plans that creates impact. It is the dedicated implementation and commitment to the ideals and principles undergirding the plans that bring results. The earnest hope is to have commitment manifested with this Action Plan.

On the part of MoFA, we see this Action Plan as a crucial tool that will guide the translation of the NCCP into concrete actionable Climate-Smart Agriculture initiatives in all agroecological zones in Ghana. We in MoFA wish to express our commitment to see through the implementation of this Action Plan in our bid to promoting a climate-smart and sustainable agriculture development.

The leadership and the rank and file of the ministry and indeed the Government of Ghana, have demonstrated the capacity and commitment to work for the larger interest and success of agriculture in the country. In promoting climate-smart agriculture, the ministry can be relied upon to deliver.



HON. DR. AHMED YAKUBU ALHASSAN
DEPUTY MINISTER (CROPS), MOFA

Contents

Acknowledgement	iii
Abstract	v
Authors	vi
Preface	vii
List of Abbreviations and Acronyms	xi
Section I: Introduction	1
1.1. Background.....	1
1.2. The Goal and Objectives of the Action Plan	2
1.3. Methodology.....	2
1.4. Organisation of the Action Plan Document.....	4
Section II: The Linkage Between the Action Plan and Policy	
Documents	5
2.1. The Ghana Shared Growth and Development Agenda (GSGDA) II – 2014 - 2017	5
2.2. National Environment Policy 2014	6
2.3. The National Climate Change Policy (NCCP) 2014	6
2.4. Food and Agriculture Sector Development Policy (FASDEP) II – 2009 - 2015.....	8
2.5. Medium Term Agriculture Sector Investment Plan (METASIP) 2011 - 2015	8
2.6. Ghana Irrigation Policy, 2007.....	9
2.7. Tree Crops Policy	10
2.8. Ghana Strategic Investment Framework (GSIF) for Sustainable Land Management (SLM) (2009 - 2015)	11
2.9. National Action Programme to Combat Drought and Desertification	12
2.10. The National Climate Change Policy – Action Programme for Implementation 2015 - 2020.....	13
2.11. Sub-regional, Regional and International Policies and Strategies.....	14
Section III: The Programme Areas of the Agriculture and Food	
Security Focus Area	15
3.1. Institutional Capacity Development for Research and Development	15
3.2. Development and Promotion of Climate-resilient Cropping Systems	15
3.3. Adaptation of Livestock production systems	16
3.4. Support for climate adaptation in Fisheries and Aquaculture	16
3.5. Support to water conservation and irrigation systems.....	16
3.6. Risk Transfer and Alternative livelihood Systems	17
3.7. Improved Post-harvest Management	17
3.8. Improved Marketing Systems	18
3.9. Prioritisation of the Action Areas by Stakeholders.....	18
Section IV: Cross Cutting Issues.....	20
4.1. Political Commitment.....	20
4.2. Policy Literacy.....	21
4.3. Gender Equality.....	21
4.4. Youth Employment.....	22
Section V: Implementation Arrangement.....	23
5.1. Institutional Roles and Responsibilities	23
5.2. Implementation Challenges and Options for Solutions.....	24

Section VI: Monitoring and Evaluation	25
6.0. Monitoring and Evaluation.....	25
Section VII: Conclusion and Way Forward	26
7.1. Conclusion	26
7.2. The Way Forward	26
References.....	27
Annex 1: The Action Plan: Programme Areas, Corresponding Activities and Lead Actors	29
1.1. District Level Group Discussion Output	29
1.2. National Level Group Discussion	30
2.1. Savannah – District Level Group Discussion Output.....	32
2.2. Savannah Zone: National Level Group Discussion.....	33
2.3. Transitional Zone – District Level Group Discussion Output.....	36
2.4. Transitional Zone – National Level Group Discussion	38
2.5. Forest Zone – District Level Group Discussion Output.....	40
2.6. Forest Zone – National Level Group Discussion	42
Annex II: List of Participants.....	45
1. List of Participants at Workshop on Utilization of Knowledge Product from CCAFS Studies in Ghana, 19 th February 2015, CSIR-STEPRI, Accra.....	45
2. List of Participants at Workshop on Development of National Climate-Smart Action Plan, 22 nd -24 th March 2015, Miklin Hotel, Kumasi	47
3. List of Participants at Workshop on Validation of the National Climate-Smart Action Plan, 23 rd June 2015, CSIR-STEPRI, Accra	49

List of Abbreviations and Acronyms

ADB	Agricultural Development Bank
AESL	Architectural and Engineering Services Limited
AfDB	African Development Bank
AGRA	Alliance for Green Revolution in Africa
APD	Animal Production Directorate
ARI	Animal Research Institute
BMGF	Bill and Melinda Gates Foundation
BRRRI	Building and Road Research Institute
CAADP	Comprehensive Africa Agriculture Development Programme
CARE	Care International, Ghana
CCAFS	Climate Change, Agriculture and Food Security
CCD	Convention to Combat Desertification
CCLEAR	Creating Champions in Livestock Agribusiness
CDM	Clean Development Mechanism
CEDAW	Convention on Elimination of All Forms of Discrimination Against Women
CIDA	Canadian International Development Agency
COCOBOD	Ghana Cocoa Board
COTVET	Council for Technical and Vocational Education and Training
CRI	Crop Research Institute
CSA	Climate Smart Agriculture
CSIR	Council for Scientific and Industrial Research Institute
CSOs	Civil Society Organisations
DA	District Assembly
DANIDA	Danish International Development Agency
DFAT	Department of Foreign Affairs and Trade (Australia)
DFID	Department for International Development (UK)
ECOWAP	Regional Agricultural Policy for West Africa
ECOWAS	Economic Community of West African States
EDAIF	Export Development and Agricultural Investment Fund
EMBRAPA	Empresa Brasileira de Pesquisa Agropecuaria
EPA	Environmental Protection Agency
FAO	Food and Agriculture Organization
FARA	Forum for Agricultural Research in Africa
FASDEP	Food and Agriculture Sector Development Policy
FBO	Farmer-Based Organisations
FC	Forestry Commission
FORIG	Forestry Research Institute of Ghana
FRI	Food Research Institute
GEF	Global Environment Facility
GHGs	Greenhouse Gases
GIDA	Ghana Irrigation Development Authority
GMeT	Ghana Meteorological Agency
GoG	Government of Ghana
GREDA	Ghana Real Estate Developers' Association
GSGDA	Ghana Shared Growth and Development Agenda

GSIF	Ghana Strategic Investment Framework
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IDA	International Development Association
IFAD	International Fund for Agricultural Development
IFDC	International Fertilizer Development Centre
IRR	Institute of Industrial Research
IITA	International Institute of Tropical Agriculture
ILRI	International Livestock Research Institute
INGOs	International Non-governmental Organisations
JICA	Japan International Cooperation Agency
KNUST	Kwame Nkrumah University of Science and Technology
MDG	Millennium Development Goals
MESTI	Ministry of Environment, Science, Technology and Information
METASIP	Medium Term Agriculture Sector Investment Plan
MIAG	Multi-Integrated Adaptation Governance
MLGRD	Ministry of Local Government and Rural Development
MMDAs	Metropolitan, Municipal and District Assemblies
MoFA	Ministry of Food and Agriculture
MoFAD	Ministry of Fisheries and Aquaculture Development
MOTI	Ministry of Trade and Industry
NAP	National Action Programme
NBSSI	National Board for Small Scale Industries
NCCC	National Climate Change Committee
NCCP	National Climate Change Policy
NDPC	National Development Planning Commission
NEPAD	New Partnership for Africa's Development
PPP	Public Private Partnership
R&D	Research and Development
RTIMP	Root and Tuber Improvement and Marketing Programme
SARI	Savannah Agricultural Research Institute
SIA	Systemic Integrated Adoption
SIDA	Swedish International Development Cooperation Agency
SLM	Sustainable Land Management
SRI	Soil Research Institute
UDS	University for Development Studies
UG	University of Ghana
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
WAAP	West Africa Agricultural Productivity Programme
WAFS	West Africa Forest Strategy
WB	World Bank
WIAD	Women in Agricultural Development
WRI	Water Research Institute

Section I: Introduction

1.1. Background

In Ghana, agriculture remains a major contributor to the economy although with a reducing rate over the years, e.g. from about 39% in the 1990s to about 21% currently with the services sector of the economy contributing almost 50% and industry 29% (ISSER, 2014; NDPC, 2014). In terms of employment, the sector is the most important, employing about 65% of the population with great impact on the key development goal of poverty reduction. Given its importance, every effort needs to be made to enhance productivity in the sector.

Ghanaian agriculture and food systems are climate dependent and recognized as one of the most vulnerable sectors to climate change. The initial national response to addressing the vulnerability is the preparation of the National Climate Change Strategy in 2008. The Strategy specified 10 cross-sectoral programme areas for implementation. However, implementation of these programmes had been ad hoc and not effective because of insufficient integration into sectoral policies and plans.

To improve the effectiveness of programme implementation and the efforts to address climate change challenges in Ghana, a National Climate Change Committee (NCCC) was established in 2010 under the leadership of the Ministry of Environment, Science and Technology. The NCCC worked to develop the National Climate Change Policy (NCCP), which was launched by His Excellency, the Head of State of Ghana, President John Dramani Mahama, on 22nd July 2014 in Accra.

The need to use scientific and technological interventions to address the challenges posed by climate change cannot be over-emphasized and it is imperative to bring Science and Technology more decidedly into the efforts of addressing climate change at the operational (farmer) level. It is in this connection that the Ministry of Food and Agriculture (MoFA) initiated action to develop a Climate-Smart Agriculture and Food Security Action Plan to operationalize the NCCP. The Ghana Science Policy Platform on Climate Change, Agriculture and Food Security hosted by CSIR and financially supported by CCAFS/ICRISAT supported the process for formulating the action plan both financially and technically. This action plan is therefore the result of a ministerial (MoFA) commitment to ensure effective operationalization of the NCCP. Furthermore, the role of the CCAFS Platform in spearheading the preparation of this action plan, underscores the importance of its functions in contributing to promote climate-smart agriculture in Ghana.

This policy document (Action Plan) adopts the FAO definition of Climate-Smart Agriculture as its point of reference. According to the FAO, Climate-Smart Agriculture is that “Agriculture that sustainably increases productivity, resilience (adaptation), reduces/removes Greenhouse Gasses (GHGs) ((mitigation), and enhances achievement of national food security and development goals”. CSA is an approach to developing the technical, policy and investment conditions to achieve sustainable agricultural development for food security under climate change.

The Action Plan is an attempt to analyse and define activities that take into account the three pillars of CSA simultaneously. This Action Plan focuses on the smartness of the following: weather information, energy, water, nitrogen within the Ghanaian agriculture and food system; and effectiveness of institutional (policy and finance) collaboration under climate change.

1.2. The Goal and Objectives of the Action Plan

The overall goal of the Action Plan is to facilitate and operationalize the NCCP for effective integration of Climate Change into Food and Agriculture sector development policies and programmes. Consistent with the policy objectives of the focus area of the Agriculture and Food Security in the NCCP, this Action Plan specifically aims to:

- Develop climate-resilient agriculture and food systems for all agro-ecological zones;
- Develop human resource capacity for climate-resilient agriculture;
- Elaborate on the implementation framework and the specific climate-smart agriculture activities to be carried out at the respective levels of governance.

Expected Outputs from Implementation of the Action Plan

The expected outputs from the implementation of the Action Plan will include the following:

- Climate-resilient agriculture and food systems for all agro-ecological zones;
- Enhanced expertise for climate-resilient agriculture at all levels, e.g. researchers, agriculture extension officers and farmer;
- Policy makers sensitized on climate-smartness in agriculture;
- Multi-sectoral institutional mechanisms that support climate-smart agriculture (policy and finance).

1.3. Methodology

Data collection: The methodology comprised desk research, data collection through interviews and participatory workshops and small group meetings. There was a review of relevant agricultural policy documents such as the Food and Agriculture Sector Development Policy (FASDEP), the METASIP and the Agriculture Sustainable Land Management Strategy and Action Plan.

Interviews in the Relevant Institutions: Interviews and consultations were conducted to collect data on functions and capacities as they relate to climate change, agriculture and food security in key institutions such as MoFA, the Ministry of Environment, Science, Technology and Innovation (MESTI) and the Ministry of Local Government and Rural Development. MoFA is the lead institution responsible for the food and agriculture sector in Ghana. It has responsibility for the formulation of national food and agricultural policies and programmes and coordination of the implementation of these policies and programmes by the responsible agencies. It also performs monitoring and evaluation functions in respect of the national agricultural policies. MESTI has responsibility for ensuring overall environmental sustainability and implementation of Ghana's responsibilities under all international environmentally related treaties/conventions. MESTI hosts the National Climate Change Committee, leads the development of the NCCP and has overall responsibility for coordinating its implementation. The MESTI and its key technical agencies (including EPA and CSIR) are major collaborators in developing and promoting climate-smart agricultural technologies in the country. The Ministry of Local Government has oversight responsibility for the Metropolitan, Municipal and District Assemblies (MMDAs), which are important partners in the implementation of the Action Plan. Other key public institutions were covered in the consultations such as the Environmental Protection Agency (EPA) and Council for Scientific and Industrial Research (CSIR). Directors of the various CSIR research institutes were consulted on the Action Plan for their inputs. The interviews were not only meant to gather information or inputs for the Action Plan but also to create opportunities for buy-in for stakeholders. The inputs included elaboration of the institutional roles and options for sustainability of the Action Plan activities.

Consultation Workshops: Two participatory workshops were organized to bring representatives of stakeholder organizations together to discuss various components of the action plans and prepare inputs. The workshops were held in Accra and Kumasi catering from participants in the Southern and Northern parts of Ghana respectively. The workshops were intended to take the participants through the multi-stakeholder analysis process, which was designed to get the stakeholders analyse the programme areas of the agriculture and food security strategies of the NCCP and come out with specific activities for each of the programme areas. The stakeholders included farmers, small-scale agro-entrepreneurs, women groups and local government authorities (MMDAs). The important aspect of the stakeholder consultation was the effort made to ensure agro-ecological considerations in the preparation of the Action Plan. Three main agro-ecological zones were featured in the groupings and participants made their inputs on account of the needs of these zones. These were the Savannah, Transitional and Forest. (See Annex 1).

The Stakeholder Consultation Workshops were used to carry out prioritization of the action areas by the agro-ecological groupings. For each of the three groupings, namely Savannah, Transitional and Forest, there were sub-groupings into District level and National Level. The groupings of the stakeholder participants discussed the action areas and ranked them according to what were the most important. The prioritization was necessary to give insight into where emphasis should be placed in addressing climate change challenges in the respective zones at the respective levels of governance. (The results of the prioritization are discussed in Section III).

Apart from the agro-ecological consultations, there was also a validation workshop that was held to provide a platform for a final discussion of the draft Action Plan with key stakeholders. It brought together representatives from the relevant ministries and public institutions including MoFA, MESTI, NDPC, private sector entities and farmer-based organizations.

Data Analysis: The preparation of the draft Action Plan was done with the analysis of the assembled data and information. The process facilitators carried out the multi-stakeholder analysis of the climate change policy documents, the information gathered from interviews and outputs of participatory workshops. The participatory workshops, e.g. multi-level stakeholder analysis, were integral components of the process of analysis and enabled the experts to prepare the Action Plan.

The Multi-level Stakeholder Analysis was also adopted as an analytical process. This approach involved bringing the relevant stakeholders together to analyse the prevailing climate change conditions to generate information for the Action Plan. The stakeholders were drawn from the four main levels of governance, namely National, Regional, District/Municipal and Community. The participants were however put into two main groups. Group 1 was made up of participants from the national and regional levels of governance such as MoFA, the National Development Planning Commission (NDPC), the CCAFS National Platform, the Environmental Protection Agency (EPA) and the international or donor agencies. Group 2 was made up of district and community level participants representing active farmer organizations in the districts and communities, the district assemblies, traditional authorities, among others. The methodology was patterned along that of the Multi-Integrated Adaptation Governance (MIAG).

The report of a previous MIAG Workshop held in Accra under the CCAFS Systemic Integrated Adaptation (SIA) Programme was used as input for group discussions, which provided content for the Action Plan. The groupings of the stakeholders and the facilitation of the discussions to reflect participants' views at the levels of governance were in accord with the MIAG approach.

Drafting the Action Plan: The programme areas of the Agriculture and Food Security focus of the NCCP constitute the key components of the Action Plan. In order to achieve more relevant climate-smartness at the district and community levels, participants discussed the programmes and activities with respect to the six agro-ecological zones of Ghana. The organization of the

workshop ensured representation from all the agro-ecological zones and more importantly, care was taken to address gender representation across the sub-sectors of agriculture such as crops, livestock and fisheries. In the second workshop particularly, participants were further guided to discuss and specify activities for the following:

- (i) the Savannah agro-ecological zones (Coastal, Guinea and Sudan);
- (ii) the transition zone of the middle belt;
- (iii) the Forest agro-ecological zone (Semi-deciduous and Evergreen (Rain) forest).

The detailed activities were then assigned to specific lead agencies and collaborating organizations as in Annex 1. The draft Action Plan document was sent to a broad range of stakeholder organizations for comments. Then there was the validation workshop with the key stakeholders being represented. The final Action Plan was sent to MoFA for ministerial approval before publishing.

1.4. Organisation of the Action Plan Document

The CSA Action Plan document is in four sections. Section I is the introduction. Section II presents the review of the relevant policy (national and international) documents including the National Climate Change Policy, Ghana Goes for Green Growth, the Food and Agriculture Sector Development Policy (FASDEP) and the Ghana Shared Growth and Development Agenda (GSGDA). Section III presents the programme areas as defined under the Agriculture and Food Security Focus Area of the NCCP. The expected activities of the programme areas are elaborated along with the lead agencies and collaborating agencies in the detailed Annex 1. Section IV discusses the cross-cutting issues in the implementation of the plan. The implementation arrangement is presented in Section V with monitoring and evaluation in Section VI. Conclusion and the presentation on the way forward is in Section VII.

Section II: The Linkage Between the Action Plan and Policy Documents

The first step in elaborating the Action Plan is to review the various policy documents, which constitute the policy regime within which various stakeholders are undertaking climate change initiatives. The specific objective of this review is to highlight the main strands in the policy documents that form the basis for further action in climate-smart agricultural practices. In this regard, the policy documents are linked to the action plan in that they define some of the key elements that go into the action plan.

Moreover, the documents being reviewed benefited in some parts from contributions coming from the CCAFS Platform. Leading members of the platform such as Dr. Naaminong Karbo, Delali Nutsukpo and Dr. George Essegbey were instrumental in the preparation of some of the policy documents. For example, Delali Nutsukpo was a member of the drafting committee of the National Climate Change Policy. Dr. Essegbey led a team of experts to implement the Technology Needs Assessment (TNA) Project in Climate Change Adaptation hosted by the EPA. The experiences of the team drafting the Action Plan provide a basis for analysis of the policy documents and extracting the relevant content for inclusion in the Action Plan.

2.1. The Ghana Shared Growth and Development Agenda (GSGDA) II - 2014 - 2017

The national development framework, Ghana Shared Growth and Development Agenda (GSGDA II) is an important document for reference on all aspects of national life. Specifically on climate change challenge, the GSGDA explicitly states the centrality of climate change in development planning. It articulates the development agenda revolving around the climate change issues with respect to, among other things, agriculture and food security. The document highlights the prioritized policy interventions in favour of environmental governance areas such as natural resource management and extraction, biodiversity management, climate variability and change, natural disasters, risks and vulnerability. It is stated that: “Climate variability and change constitute a major threat to national development. From a decline in precipitation to floods, climate change imposes a limitation on national development.” (NDPC, 2014; p. 67).

That climate change is captured in the national development framework is a major step in ensuring that climate change is not ignored in the subsequent national discourse and consequential actions such as prioritization of programmes and resource allocation. It needs to be mentioned though that the synchronization of national budgeting and resource allocation with the national development framework has not been as effective as necessary. However, the efforts continue and therefore it is important that the highlight on climate change remains in order to facilitate mainstreaming in the regional and local government (MMDAs) plans.

The GSGDA II further notes the different manifestations of the climate change impacts – the increasing levels of desertification in the northern savannah, and the undermining of the potential and economic variability of the northern ecological zone and its capacity to contribute to Ghana’s national development. There is the financial cost of provision of economic and social infrastructure and the resettlement of coastal dwellers in times of disaster. Still, there are opportunities that come with climate change and the GSGDA II envisages capitalizing on such opportunities to expand national output and productivity.

Furthermore, the impact of increased greenhouse gas emissions and effects of rapid industrialization has become important development issues globally. Government policy will be aimed at “enhancing the capacity of the relevant agencies to adapt to climate change impact, mitigate the impact of climate variability and generally promote a green economy” (NDPC, 2014; p. 71). The emphasis on stakeholder and community participation in implementation of policies and programmes generally underscore the driving principle of addressing the climate change challenge across the length and breadth of the country.

2.2. National Environment Policy 2014

The importance of environmental management emphasized by the GSGDA II was further elaborated by the National Environment Policy. The policy commits to the principle of optimum sustainable exploitation of the ecosystem resources. The main purpose of the National Environment Policy is to help policy makers think about the national policy actions and programmes needed to achieve a balance between economic growth and environmental sustainability.

The policy recognizes serious environmental challenges including loss of biodiversity, land degradation, deforestation and desertification, air and water pollution, wildfires and illegal mining facing Ghana. It also recognizes the fact that some socio-cultural practices have contributed to amplifying these challenges. It is against this background that the National Environment Policy aims at:

- improving the commitment to environmental objectives, policies and interventions;
- controlling rapid population growth, promoting economic growth, reducing poverty, promoting good governance and strengthening institutional capacity, improving quality and flow of information;
- creating an understanding of the nature and causes of environmental problems;
- mainstreaming international relations into the national environmental agenda;
- taking appropriate measures to protect sensitive ecosystems.

The policy commits the nation to salient operational principles including accountability in policy formulation and implementation, allocation of functions and coordination, capacity building and education, due process, equity and environmental justice. These are important pillars for driving sound environmental management and sustainability.

The National Environment Policy document underscores Ghana’s vulnerability to climate change effects stating that “Ghana is particularly vulnerable due to lack of capacity to undertake adaptive measures to address environmental problems and socio-economic costs of climate change. These include climate change-associated health problems, climate-induced disruption of agricultural systems, flooding of coastal areas which are already undergoing erosion and low operating water level of the major hydro-[electricity]-generating dam in the country” (MESTI, 2014; p. 14). It is in this regard that the overall policy goal, which is “to bring economic development in balance with ecological processes”, encapsulates the holistic approach to environmental sustainable management in Ghana including addressing climate change issues.

2.3. The National Climate Change Policy (NCCP) 2014

As far as national policy formulation for climate change goes, the discussion document ‘Ghana Goes for Green Growth’ could well be the most cogent paper put together to set the stage for subsequent climate change policies. It outlines the climate change policy framework and elaborates on the rationale for climate change adaptation and mitigation.

The vision stated in the Ghana Goes for Green Growth in 2010 is carried over into the 2014 National Climate Change Policy (NCCP) and predictably so. The vision remains through time as long as climate change remains a development challenge. It envisions low carbon growth, effective adaptation to climate change and social development. It elaborates seven pillars for implementation of the climate change policy namely:

- Governance and coordination
- Capacity building
- Research and knowledge management
- Finance
- International cooperation
- Communication and
- Monitoring and Reporting.

It very well argues for the setting-up of a body (National Climate Change Committee) to ensure effective coordination of initiatives that are implemented in the country to address the climate change challenge. This is one of the most important recommendations in the policy framework given that with the universal acceptance of the need for national response to climate change, all manner of initiatives are being formulated internally and externally. It is crucial for Ghana to have a point of national coordination.

The NCCP spells out the vision, goals and objectives of the national efforts to address climate change. It outlines the strategic areas of focus and the identifiable plans for addressing climate change. The vision of the NCCP is to:

“Ensure a climate-resilient and climate-compatible economy while achieving sustainable development through equitable low-carbon economic growth for Ghana.”

Flowing from the vision, the broad objectives stated for the NCCP are:

- Low Carbon Growth;
- Effective Adaptation to Climate Change;
- Social Development.

Climate-smart agriculture is consistent with these broad objectives of the NCCP. Five broad Policy Areas have been identified within the policy for focus. These include:

- Agriculture and food security – climate resilient agriculture and food systems;
- Disaster preparedness and response – climate resilient infrastructure;
- Natural Resource Management – carbon sinks and resilient ecosystems (terrestrial, marine and aquatic);
- Equitable Social Development – health, water and sanitation, gender and migration;
- Appropriate Energy and Infrastructure Development – minimize greenhouse gas emissions.

For most sectors of the economy, the vision is pertinent and crucial. However, attaining the vision is a challenge. In the specific sector of agriculture, the vision constitutes a herculean task given the currently limited technological inputs in agricultural practices. Farming activities are climate-dependent and the socio-economic practices are often environmentally degrading which do not promote climate-resilience.

Broad action areas have been identified (strategies) to guide the implementation of the policy at the sectoral and decentralized levels. The action areas for the agriculture and food security sector include:

1. Institutional capacity Development for Research and Development;
2. Develop and promote climate resilient cropping systems;

3. Adaptation of Livestock production systems;
4. Support climate adaptation in Fisheries and Aquaculture;
5. Support to water conservation and irrigation systems;
6. Risk Transfer and Alternative Livelihood Systems;
7. Improved Post-harvest Management and
8. Improved Marketing Systems.

To ensure effectiveness of implementation, there is the need to translate the defined actions into sectoral and decentralized plans. This document is an Action Plan for Agriculture and Food Security to operationalize agriculture and food security component of the NCCP. This is in line with the implementation arrangements outlined in the Policy document.

2.4. Food and Agriculture Sector Development Policy (FASDEP) II - 2009 - 2015

FASDEP II (2007) was formulated as a follow-up to FASDEP I (2002) which was aimed at modernizing Ghana's agriculture. FASDEP II draws on the lessons in implementing FASDEP I, with emphasis on environmental sustainability and the application of science and technology. It underscores the important role of the private sector and efforts to enhance productivity in the commodity value chains.

FASDEP II states the national vision for the food and agriculture sector as “a modernized agriculture culminating in a structurally transformed economy and evident in food security, employment opportunities and reduced poverty” (MoFA, 2007; p. 20).

This agricultural policy document resonates with the Comprehensive African Agricultural Development Programme (CAADP) which envisages an agricultural growth rate of 6% annually and a 10% of national budgetary allocation to agriculture. FASDEP II outlines the objectives for the food and agriculture sector policy as follows:

- Food security and emergency preparedness
- Improved growth in incomes
- Increased competitiveness and enhanced integration into domestic and international markets
- Sustainable management of land and environment
- Science and Technology Applied in food and agriculture development
- Improved Institutional Coordination.

The emphasis on environmental sustainability in FASDEP II provides the necessary connection with NCCP and with the climate change issues specifically. The development of the METASIP to elaborate the implementation framework for the policy document also highlights the efforts in ensuring a logical and coordinated approach to achieving the policy vision and objectives.

2.5. Medium Term Agriculture Sector Investment Plan (METASIP) 2011 - 2015

The METASIP was adopted in September 2010 as the strategic tool for implementing FASDEP II over the five-year period of 2011 to 2015. It is designed to achieve an agricultural growth rate of 6% annually, and reduce poverty by 50% in line with the MDG 1. It is based on the Maputo Declaration, which requires African national governments to allocate 10% of their national budgets to agriculture. It is thus consistent with the ECOWAS Agriculture Policy (ECOWAP) and NEPAD's Comprehensive Africa Agriculture Development Programme (CAADP), which

provides the overall framework for agricultural growth, rural development and food security in Africa.

One of METASIP's key features is its sector-wide approach to implementation, which involves a wide range of stakeholders. It underscores the greater involvement of the private sector for the growth and development of the sector and its transformation in service delivery, as well as investment and management of the sector. The sector ministry, MoFA and other Ministries, Departments and Agencies (MDAs) whose policies impact on the agricultural sector are expected to play lead roles in implementation at their respective levels of governance. A third level of participation relates to service delivery to smallholders, especially the poor, by reducing transaction costs. The METASIP document elaborates various types of linkages between smallholders and agribusiness, to facilitate access to input, research, technology and product markets, as well as other essential services. At the fourth level, agricultural sector policies are supported with technical and financial assistance from development partners and financial institutions. A key aspect of the objective of coordination of stakeholder participation is the harmonisation of actions of government and partners for synergy of operations and maximum results for accelerated growth. The above arrangement is most suitable for addressing climate change and its impact on the sector in a comprehensive and effective manner.

In the Volume II of METASIP, specific activities are detailed along with the lead agencies and collaborating institutions. There are indicative budgets and the programme of action in Volume II reflects the attempt to define in great detail the investment plan. Some of these activities are crucial for addressing the climate change challenge, especially in terms of the underpinning concepts of the METASIP. With respect to the climate-smart agriculture concept, the entry points – land management, institutional collaboration, STI in agriculture – are very well covered. For example, it is envisaged that 62,000 hectares of sustainable water harvesting and agricultural water management schemes will be developed in the Northern and Southern Savannah zones. Another programme aims at developing and implementing sustained awareness creation programme on environment and land degradation at all levels. There is also a programme aiming to facilitate the dissemination and adoption of SLM technologies at the farm level in all the regions. Yet another programme aims at enhancing the capacities of at least 12 extension service providers in approaches to climate change adaptation and mitigation processes. All these are programmes that contribute to CSA and are likely to enhance climate change adaptation of farmers.

2.6. Ghana Irrigation Policy, 2007

The Irrigation Policy aims at opening up the investment space for intensified and diversified irrigated crop production in Ghana where there is clear comparative advantage. In doing this, the policy addresses four key 'problem' areas concerning the formal, informal and commercial irrigated sub-sectors namely:

- (a) Low agricultural productivity and slow rates of growth;
- (b) Constrained socio-economic engagement with land and water resources;
- (c) Environmental degradation associated with irrigated production; and
- (d) Lack of irrigation support services.

The policy proposes four objectives or 'thrusts' to address the above problems with the view to achieving accelerated and sustained irrigation development in Ghana.

Policy Thrust A. Performance and Growth: Realize the productive capacity of existing assets and respond to new demands for irrigated production through a mix of well-coordinated public and private initiatives.

Policy Thrust B. Socio-Economic Inclusion: Remove constraints to a balanced socio-economic engagement with land and water resources.

Policy Thrust C. Responsible Production: Raise the environmental performance of all types of irrigation and related agricultural practice.

Policy Thrust D. Enhanced Services: Extend cost-effective, demand driven irrigation services to public and private irrigators.

To ensure effectiveness in policy implementation, the Policy is predicated on a commitment to decentralization of irrigation services and private sector participation from individual farmers to commercial operators. For climate change adaptation, this is an important principle. The grass root of society must be effectively engaged to ensure the translation of the policy activities to the respective local levels.

2.7. Tree Crops Policy

The Tree Crops Policy was formulated to give orientation and guidance to the strategic actions necessary for the development of the tree crops sub-sector. Tree crops include coconut, cashew, cocoa, rubber, kola and shea nut. These are well distributed throughout the four main agro-ecological zones namely, the forest, transitional, Northern savannah and coastal savannah.

The policy states the vision as “a competitive and sustainable tree crops sub-sector, with focus on value chain development and improved technologies to create job opportunities, ensure food security, enhance the environment and improve livelihoods.”

Linked to the vision, the objectives are to:

- (i) support increased production and productivity;
- (ii) promote investment and increase processing capacities;
- (iii) improve marketing through value chain development
- (iv) promote sustainable practices for environmental protection;
- (v) support research and development;
- (vi) improve coordination and management of the policy.

The above objectives are consistent with the principles of climate-smart agriculture. The Tree Crops Policy enumerates a number of activities under each of the objectives to be pursued. For example, to enhance public extension delivery to increase the adoption of Good Agricultural Practices, the policy highlights the diffusion and adoption of improved technologies and practices. It also emphasizes the important role of FBOs in the value chain given the limited resources for extension services. The policy defines Good Agricultural Practices as covering all aspects of production such as land clearing, production of seedlings, planting, spacing, weeding, pruning, harvesting, grading, and pest and disease control. Good Agricultural Practices have to be implemented by well-trained, adequately equipped and skilled extension officers, close to and readily available to service the farmers and FBOs. Various intervention measures are stated.

Again, the policy aims to promote sustainable practices for environmental protection. This is to address both the negative environmental effects of Tree Crops cultivation, including pollution, deforestation, loss of biodiversity, declining soil fertility and erosion, climate change, bush fire, and the positive effects such as carbon sequestration and soil conservation. The environmental footprints of the Tree Crops sub-sector should be reduced to a minimum through the promotion of protective measures and improved regulation.

Set-up a conservation and reforestation programme:

- Promotion of Agroforestry practices
- Monitor and address climate change issues
- Promote biodiversity
- Increase collaboration for Social and Environmental Impact Assessment
- Support private initiatives for environmental protection
- Mitigate the impact of production and processing.

Overall, the approach to tree crops development resonates well with the efforts to address climate change impacts and take advantage of the opportunities. Concepts of value chain and community participation and private sector investment, are practical strategies to work with for the implementation of the policy.

Actions have gone far in the development of the tree crops especially in terms of private sector participation e.g. Tropical Fruits growing and exporting mangoes in the northern savannah zone. There are out-grower schemes involving farmers in the communities. Cashew plantation development is also an example of private investment in tree crops. In the past, there has been the implementation of tree crop programmes in partnerships with development partners and private sector organisations. Millions of dollars have been invested in the development of oil palm, rubber, shea and cashew. Given the importance of tree crops in exports, these initiatives can only be strengthened and improved.

2.8. Ghana Strategic Investment Framework (GSIF) for Sustainable Land Management (SLM) (2009 - 2015)

The GSIF is a 15-year programme to ensure sustainability of the country's land use and exploitation. GSIF is a programme adopted to address land degradation issues and promote sustainable land management in a holistic and coordinated manner. It is designed to create the enabling environment for policy development and incentives, knowledge generation and dissemination, promotion, adoption and up-scaling of SLM practices.

The goal of the GSIF is to “support the country's priorities in improving natural resource-based livelihoods by reducing land degradation, in line with the Millennium Development Goals 1 (Extreme Poverty and Hunger) and 7 (Extreme Environmental Sustainability). “ The objective is to “mainstream and scale-up sustainable land management decisions and secure ecosystem services and improve rural livelihoods” (EPA, 2011; p. 45).

The GSIF describes the various aspects of climate change impacts. The documented changes in rainfall patterns point to the climate change experience in Ghana with drought events increasing from once in a decade to once in every three years according to Adiku and Stone, 1995. For a country, which depends largely on rainfall in agricultural practices, the rainfall swings affect both crop agriculture and livestock rearing as forage availability is important.

The GSIF underscores the point that in reversing land degradation, it is important to establish permanent and temporary vegetative cover on the land. Activities under the GSIF are outlined in the following broad components:

- Investment in field-based programmes and projects;
- Strengthening national, regional, district and community coordination on SLM;
- Building the capacity of public and private sector SLM related service providers;
- Improving the enabling policy, legal, institutional and financial environment for SLM;

- Building the GSIF knowledge base;
- Management and implementation of the GSIF.

Each of these components is explained accordingly and the practical actions elaborated. For example, on land use and soil management, the approach is integrated soil management involving soil fertility management and soil water conservation methods. There is sustained promotion of use of simple agronomic soil and water conservation measures e.g. agroforestry, crop rotation, tied ridging, mulching, contour earth bunds, multiple cropping, minimum tillage, establishment of vegetative barriers, improved fallow and stone lining. These are the basic soil management practices, which contribute to climate change adaptation strategies.

The GSIF for sustainable land management is one of the pivotal policy documents for climate change adaptation strategies in the country. Climate-smart agriculture is rooted in land resources and their sustainable exploitation. The contents of the policy document is very much in tune with the adaptation strategies outlined in the NCCP.

2.9. National Action Programme to Combat Drought and Desertification

Desertification is defined as “land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities” (UNCCD, 1997). The Convention to Combat Desertification (CCD) considers arid, semi-arid and dry sub-humid regions as dry lands with aridity indices ranging from 0.05 to 0.65, where aridity index is the ratio of the mean annual precipitation to the mean annual evapotranspiration of a given region (EPA, 2002; p.2).

Under the CCD, parties to the convention have the obligation to formulate their National Action Programme to combat desertification and mitigate the effects of drought. Among other things, countries acceding to the convention must:

- Establish strategies and priorities within the framework of sustainable development;
- Address the underlying causes of desertification with emphasis on the socio-economic factors contributing to the desertification process;
- Promote awareness and facilitate the participation of local population, particularly women and youth, non-governmental organisations, in efforts to combat desertification and mitigate the effects of drought.

It was against this background that a National Action Programme (NAP) was formulated to combat drought and desertification in the desertification-prone zones of Ghana such as the Upper East, Upper West, Northern, parts of Brong Ahafo, Ashanti, Central, Greater-Accra and Volta Regions. The overall objective of the NAP is to “emphasize environmentally sound and sustainably integrated local development programmes for drought-prone semi-arid and arid areas, based on participatory mechanisms, and on integration of strategies for poverty alleviation and other sector programmes including forestry, agriculture, health, industry and water supply into efforts to combat the effects of drought (EPA, 2002; p.7-8).

The importance of the NAP is in its elaborate details on how to attain its overall objectives in terms of the specific activities and the institutional framework and institutional relationships for reaching out to the stated objectives. Perhaps the crucial exercise is the analysis of the extent of implementation given that the NAP has been in existence for more than 12 years. Still, the benefit of the document is in the exhaustive details, which can always be referred to for guidance in combating drought and desertification.

A major challenge is promoting climate-smart agriculture by eliminating all practices which contribute to deforestation and desertification, especially bush burning. The NAP-CCD provides an important framework for addressing this challenge. The agro-ecological focus of the document, mainly the Savannah regions of the North and the Accra plains as well as the transitional zones of the mid-belt, also underscores the importance of NAP-CCD as a policy document for promoting CSA.

2.10. The National Climate Change Policy - Action Programme for Implementation 2015 - 2020

This document provides a national framework for the implementation of the component of Agriculture and Food Security of the National Climate Change Policy. It elaborates detailed strategies covering a five-year period (2015 – 2020). Prepared under the auspices of MESTI, and specifically the National Climate Change Committee, it is considered as the Phase II of the NCCP in that it elaborates Action Programmes for implementation in terms of the sectors, initiatives and with estimated budgets. It is meant for the responsible actor institutions and organizations to be able to mainstream the Action Programmes into their mandate areas.

Developing climate-smart agriculture and food security systems comes with the concern that planning for agriculture development in Ghana to increase productivity and production has not placed adequate emphasis on addressing climatic constraints. The need for mainstreaming climate change and variability into food and agriculture development planning has become necessary to ensure sustainability of achievements. Awareness creation, capacity building, improved training curricula and appropriate integration into existing processes will effectively mainstream climate change into the food and agricultural sector policies (MESTI, 2015).

A major strength of the Action Programme is the bold decision to provide tentative costs to the envisaged initiatives. Whilst there may be questions as to how close the figures come to reality, the estimated budgets are rough guides to inform partners on what it takes to implement the initiatives. The Ministry of Food and Agriculture in collaboration/support with the Ministry of Finance and Economic Planning is piloting a programme-based Estimated Costing process. This is based on the six programme areas of the METASIP. The programme-based Estimated Costing is to ensure appropriate funding and delivery of all programmes within the METASIP. In relation to climate change adaptation – mitigation measures, once tied to specific programmes within the METASIP, will be appropriately covered during the Estimated Costing process. It is important to note that these measures will not be stand-alone measures but those that aim at improving the delivery of each programme (MESTI, 2015).

The crucial issue at stake is whether another action plan is necessary once the NCCP Phase II document has been produced. Or put bluntly, what is the difference between this NCCP Phase II document and this Action Plan? The answer lies in the fact that this Action Plan was prepared with the view of accounting for agro-ecological imperatives. In the consultations, stakeholders were drawn from the Forest, Transition and Savannah agro-ecological zones. The thrust of the workshop discussions and analysis was to enable effective harnessing of information to formulate actions for the specific localities. The details as provided in the Annex I of this Action Plan are to enable the respective districts to undertake their context-specific climate-smart agriculture actions. In this regard, this Action Plan is complementary to the NCCP Phase II document.

2.11. Sub-regional, Regional and International Policies and Strategies

This section reviews relevant policies and strategies addressing environmental sustainability and climate change vulnerability including land degradation, water conservation, etc. Ghana is committed to the Comprehensive Africa Agriculture Development Programme (CAADP), which all African Union members have committed to. CAADP has its overall objective to improve livelihoods, food security, and environmental resilience in Africa. Specifically, CAADP supports country-driven agricultural development strategies and programmes that contribute to the attainment of an average annual growth rate of 6% in agriculture. The main goal of the Comprehensive Africa Agriculture Development Programme (CAADP) is to stimulate agriculture-led development that eliminates hunger and reduces poverty and food insecurity. More specifically, the NEPAD vision for Africa holds that, by 2015, Africa should:

- attain food security;
- improve agricultural productivity to attain a 6 percent annual growth rate;
- develop dynamic regional and sub-regional agricultural markets;
- integrate farmers into a market economy; and
- achieve a more equitable distribution of wealth.

To the extent that the goals and objectives of CAADP resonate with Ghana's agricultural policies and specifically with the METASIP, the action plan to operationalize NCCP needs to take CAADP into consideration.

Apart from CAADP, there is also the Regional Agricultural Policy for West Africa (ECOWAP) which elaborates on the strategies for agricultural development across the 15 anglophone and francophone countries of the West African region (ECOWAS Commission, 2008). ECOWAP sets out a vision of "a modern and sustainable agriculture based on effective and efficient family farms and promotion of agricultural enterprises through the involvement of the private sector" (ECOWAS Commission, 2008). The stated objectives coming with the vision affirm the principle of regional food sovereignty. In this regard, the concept and implementation of the CSA are very crucial in the overall implementation of ECOWAP.

Beyond Africa, Ghana is a signatory to the United Nations' Framework Convention on Climate Change (UNFCCC) and apart from participating in the international deliberations on how to address climate change through mitigation and adaptation, has benefited from the programmes and projects initiated within the framework of the UNFCCC. The relevant ministries including the Ministry of Environment, Science, Technology and Innovation and the Ministry of Food and Agriculture have provided some of the linkages into these projects. There are also bilateral collaborations involving several countries including Denmark, Norway, The Netherlands, Germany and Britain. The formulation of the action plan takes account of the opportunities that come with these multi-lateral and bilateral relationships with Ghana and provision is made to take advantage of the opportunities in the action plan.

Section III: The Programme Areas of the Agriculture and Food Security Focus Area

The National Climate Change Policy (NCCP) of Ghana identifies five key strategic focus areas including Agriculture and Food Security, which will fundamentally address critical issues to ensure that the overall goals and objectives of the policy are achieved. This section elaborates the actions or activities for each of the eight programme areas of the thematic and focus area of Agriculture and Food Security against the background of the stated principles namely:

- Understanding that sustainability of natural resources, including land, forest, water and genetic biodiversity is significantly influenced by agricultural practices.
- Need for sustainable agricultural systems as the fundamental basis for achieving national food security and poverty reduction.

It is important that for the development of the Action Plan, the programme areas are used as the basis for identifying and elaborating on the specific activities relevant for each area. This provides consistency with the NCCP and ensures that the Action Plan is implemented within the framework of the NCCP. The elaboration of the activities also incorporates information generated at the multi-stakeholder analysis workshop and the consultations with the relevant persons. Specifically in the group work at the workshop, participants from the districts made presentations reflecting the real situations on the ground and developed scenarios useful for the implementation of the NCCP. However, we have comments with regards to some areas such as land & water management, bush burning, and the scenarios. There were specific contributions on the activities to be carried out in land and water management in the respective districts. These are inter-laced with the policy actions enumerated in the NCCP.

3.1. Institutional Capacity Development for Research and Development

Developing capacity for Research and Development is a fundamental step for climate change policy implementation. Researchers are key actors in innovation. Ghana's Research and Development institutions have important roles to play to ensure that Research and Development programmes make the necessary impact on climate change adaptation and mitigation. Among the policy actions detailed in the NCCP under the Agriculture and Food Security Focus Area are the following relevant ones:

- Improve and harmonize research activities in climate-smart agriculture;
- Document and promote appropriate indigenous knowledge and best practices;
- Generate meteorological data and disseminate appropriate information to farmers to support climate-smart agricultural practices.

3.2. Development and Promotion of Climate-resilient Cropping Systems

Linked to the Research and Development efforts are the strategies to develop and promote climate-smart agricultural practices with emphasis on cropping systems:

- Develop climate-resilient cropping and livestock systems as well as crop varieties and livestock breeds tolerant to flooding, drought and salinity;

- Promote diversified land use practices, including agroforestry, dry-land farming, urban/backyard vegetable production, to reduce risk and increase the capacity of farmers to cope with droughts and floods;
- Provide sustained support in the use of simple agronomic soil and water conservation measures (e.g. agroforestry, crop rotation, tied ridging, mulching, contour earth mounds, vegetative barriers and improved fallow);
- Improve productivity through improved farming technologies and practices, such as the integration of trees into farming systems, integrated nutrient management under various crops, green/organic farming, etc.;
- Capacity to further enforce the law of bush burning is still minimal and therefore there is the need for more bye-laws to be enacted in the districts to facilitate enforcement;
- Promotion of good fertilizer use on farms with more effective implementation of fertilizer programmes targeting smallholder farmers;
- More effective linkages between input suppliers and farmers.

3.3. Adaptation of Livestock production systems

Livestock farming constitutes an important component of agriculture in Ghana. For the most vulnerable geographical regions of the country, livestock production activities are key agricultural practices. Two key proposals are here envisaged:

- Prepare and enforce spatial plans to address conflicts between crop and livestock farmers;
- Promote and support agricultural diversification (livestock-crop integration as well as management practices) as a coping strategy and for income generation.

3.4. Support for climate adaptation in Fisheries and Aquaculture

Ghana's fish consumption is significantly high. The fishery value chain is a critical economic system in Ghana especially for the coastal and riparian communities. In this regard, there are the following key proposed initiatives:

- Design and implement programmes on fisheries management and disease control, which integrate climatic and hydrological parameters.
- Build and strengthen capacity of extension officers in climate-smart agriculture to enhance support to farmers and fishermen.
- Promote private sector investment in aquaculture.

3.5. Support to water conservation and irrigation systems

In agriculture, water resource management is very vital. Whereas Ghana cannot be described as a water-stressed country, the practices of agriculture demand effective and efficient water conservation and management practices. For the drier agricultural zones, irrigation systems are important. In this connection, the proposals are as follows:

- Promote appropriate technologies for small-scale irrigation, water re-use and water harvesting (e.g. waste/water recycling, rainwater harvesting systems);
- Watershed management around major rivers must be enhanced e.g. the Black Volta in Nandom-Lawra area;

- District Assemblies must take responsibility for the maintenance of the irrigation systems in their respective districts and expand irrigations systems for farming;
- Capacity building within communities for basic maintenance of dugouts and small-scale irrigation systems;
- Stakeholders, especially NGOs, must train members of the local communities on buffer zones along the river banks on how to avoid farming in the banks of waterways, siltation and infill of rivers;
- Promote afforestation along the banks of waterways;
- Promote rainwater harvesting;
- Private sector should be encouraged to invest in irrigation systems e.g. along the Black Volta to enhance crop production in the Savannah zones.

3.6. Risk Transfer and Alternative livelihood Systems

At the base of CSA is the sustainability of livelihoods of human communities. Where livelihoods are at risk and there is a threat to socio-economic survival, people's tendency is to adopt any means to protect themselves and their livelihoods. In such instances, insistence on people strictly adhering to CSA principles becomes difficult. It is therefore necessary to avert risks and adopt alternative livelihood systems through the following:

- Build and strengthen the capacity of extension officers in climate-smart agriculture to enhance support to farmers and fishermen;
- Promote capacity building for farmers and fisher-folk and build awareness on climate change issues;
- Build capacity for community-level weather data collection, analysis and dissemination for agricultural planning;
- Institute risk transfer schemes (e.g. insurance) against local supply changes, harvest failure or weather risk;
- Stem the tide of youth rural-urban migration to ensure sustainability of farming in the rural districts;
- District assemblies must strengthen agricultural systems in their localities by formulating and implementing agricultural plans for the district going down to the communities;
- Local authorities should create partnerships including traditional authorities to protect and sustain biodiversity;
- use mass media channels especially radio and television to reach the farming communities with information to promote good agricultural practices and climate-smart socio-cultural practices.

3.7. Improved Post-harvest Management

Agricultural production in Ghana is constrained by ineffective post-harvest practices, which sometimes lead to substantial losses of up to 40%. To address this problem, the focus on improved post-harvest management envisages the following:

- Improve post-harvest capacity, e.g. storage and processing facilities and infrastructure;
- Build capacity for recycling and conversion of agricultural waste;
- Enhance investment in facilities for bulk storage of grains to assist farmers to sustain production and sell for good profit.

3.8. Improved Marketing Systems

Marketing is crucial to the success of agricultural practices irrespective of scale or commodity. In the various agricultural policy documents such as FASDEP and METASIP, enhancement of marketing systems is underscored. In the focus area of the NCCP, there are specific proposals namely:

- Promote marketing policies that increase competitiveness for the domestic and international market;
- Improve efficiency of farming practices through secure land tenure, effective pricing policies and access to credit;
- Commodity boards must be established or made more effective, especially for economic tree crops e.g. shea nut board and cashew board;
- Agribusiness enterprises should be encouraged to operate especially in the marginalized agricultural areas.

What the enumeration of the activities in the programme areas has illustrated is the wide diversity of actions that need to be taken to ensure climate-smartness in agriculture. There are even more details of activities which add on to the completeness of the action plan. These are further elaborated in terms of activities, lead agencies, collaborating institutions and sources of budget that came up in the workshops as in Annex 1.

3.9. Prioritisation of the Action Areas by Stakeholders

The approach in analysing stakeholder needs from the perspectives of the agro-ecological zones and from the national and district levels ensures elaboration of concrete and specific actions to address climate change challenges in the respective localities. At the Stakeholder Consultation Workshops, an important exercise carried-out was the prioritization of the action areas by the agro-ecological groupings. It gave insight into where emphasis should be placed in addressing climate change challenges in the zones. Table 1 shows the results of the prioritization.

Table 1: Rankings of the Groups by Agro-Ecology

Broad Action areas/strategies	Savannah		Transitional		Forest Zone	
	Scoring	Ranking	Scoring	Ranking	Scoring	Ranking
Institutional capacity Development for Research and Development	38	7	7%	6	20	1
Develop and promote climate resilient cropping systems	52	2	25%	1	20	2
Adaptation of Livestock production systems	42	5	22%	2	10	6
Support climate adaptation in Fisheries and Aquaculture	34	8	4%	8	5	7
Water conservation and irrigation system	56	1	9%	5	15	3
Post-harvest management	47	4	11%	4	10	5
Risk transfer and alternative livelihood	40	6	6%	7	5	8
Improved marketing	48	3	16%	3	15	4
Total		357	100%			

As seen in Table 1, for the Forest Zone, institutional capacity development for R&D is a topmost priority followed by the development and promotion of climate-resilient cropping systems. For the Transition Zone, development and promotion of climate-resilient cropping systems is the leading priority action area followed by adaptation of livestock production systems. The topmost priority for the Savannah Zone is water conservation and irrigation systems and then development and promotion of climate-resilient cropping systems. Given that the development and promotion of climate-resilient systems is important for all three zones, national efforts need to focus on this. However, it is significant that the core needs of the agroecological zones have been highlighted in the prioritization. The action areas are further detailed in terms of the specific activities in the Appendices.

Section IV: Cross Cutting Issues

There are cross-cutting issues which need to be taken into account in the preparation and implementation of the action plan. These are issues, which, although may be incorporated in the respective components of the plan, absolutely need to be highlighted for special attention to ensure successful implementation.

4.1. Political Commitment

Political commitment is often assessed with focus on the political hierarchy of government. However, political commitment goes beyond that. Political commitment transcends vertically to the levels of governance of politics, society and economy. Indeed, the first point of national commitment is at the top of the hierarchy where the ultimate decisions are made concerning policies and resource allocation for policy implementation. However, at the various levels, commitment must manifest to translate the plan into action.

Decentralization is a constitutional obligation in Ghana. Article 34 Section 5 (d) of the Constitution demands of the state to “make democracy a reality by decentralizing the administrative and financial machinery of government to the regions and districts and by affording all possible opportunities to the people to participate in decision-making at every level in national life and in government”. The prerequisites for achieving this objective are stated in Chapter 20 as:

- Transfer of functions, powers, responsibilities and resources from the centre to local government;
- Measures to build the capacity of local authorities to plan, initiate, coordinate, manage and execute policies;
- Establish a sound financial base with adequate and reliable sources of revenue;
- Vest control of persons in the service of local governments in local authorities, as far as possible; and
- Create opportunities for people to participate effectively in governance to ensure the accountability of local authorities.

The country has now committed itself to a system where authority descends from the top hierarchy of government ministries to the districts. A number of laws have been passed that require that ministerial and other government functions have to be devolved to the districts e.g. the Local Government Act, 1993, Act 462, the National Development Planning (System) Act, 1994, Act 480, the Civil Service Law, 1993, PNDCL 327, the District Assemblies’ Common Fund Act, 1993, Act 455 and the Local Government Service Act, 2003, Act 656. Also, there are subsidiary legislations including Legislative Instruments (LI) establishing the respective District Assemblies, and the Local Government (Urban, Town, Zonal Councils and Unit Committees) (Establishment) Instrument, 1994 (L.I 1589). The important point to note is the extent to which the institutional framework has been well defined for the implementation of the decentralization policy.

The implication of decentralization is that political commitment, taken simply as the commitment of political authorities, should manifest at all levels of governance. It should manifest at the national level with the executive arm of government formulating appropriate policies and programmes and committing to their implementation. At the Metropolitan, Municipal and District levels, commitment should manifest similarly. Within local communities in the districts, political authorities, including traditional authorities, should commit to effective implementation of the policies and programmes relevant to their socio-economic conditions.

4.2. Policy Literacy

The study of the policy and institutional context for climate-smart agriculture highlighted the very limited policy literacy at the regional, district and community levels of governance (Essegbey, 2014). The study showed that at the regional level, awareness of the policies and awareness of the contents of these policies were limited or entirely absent. In the specific case of the NCCP, policy literacy became quite negligible. There was some awareness that the policy was being formulated, some heard on the news about the launching of the policy. However, they did not know the contents. The situation was much worse at the district level. Most of the interviewees in the study did not even know that a NCCP has been formulated let alone the contents.

In fact, even the copies of the NCCP were not available in the districts. The point needs to be emphasized that the issue is not about possessing copies of the policy document but about knowing the contents. However, one has to have a copy of the NCCP to read before one can have knowledge of the contents. The effective implementation of public or national policies depends a great deal on the extent to which the critical actors in the policy cycle are knowledgeable in the contents of the policy. Public officers such as those in the Departments of Agriculture in the regions and districts, farmers, traditional authorities and Assembly members need adequate knowledge of the national policies to facilitate implementation. For climate change, policy literacy is essential in creating the enabling environment for addressing climate change impacts (Essegbey, 2014).

4.3. Gender Equality

As far back as 1979, Ghana was one of the countries to adopt the Convention on Elimination of All Forms of Discrimination Against Women (CEDAW) when it was passed by the United Nations, entering into force on 3rd September 1981. Consequently, Ghana has enshrined the principle of the equality of women and men in the national constitution and passed legislations to protect the dignity and security of women in all aspects of socio-cultural life.

Ghana has set up the Ministry of Gender, Children and Social Protection to address the challenge of ensuring equity and equality for women and related issues. In pursuit of the goals of eliminating all biases against women, gender desks are opened in the various sector ministries. In the specific agricultural ministry, there is the Women in Agricultural Development (WIAD) which has been set-up as one of the seven technical directorates of MoFA. WIAD is to promote women agricultural practices. WIAD undertakes activities to promote appropriate technologies for improved farming, micro and small entrepreneurship, better nutrition, and home economics. The specific mission stated for WIAD is to develop effective policies and programs that promote the delivery of improved technologies and information in agricultural production and post-production in an environmentally sustainable manner. In this regard, the Directorate operates through four units namely: Nutrition, Food Safety, Value Addition and Gender/Livelihoods. With decentralization, WIAD operations should be translated to the district level where the Department of Agriculture within the District Assemblies should support and promote their programmes.

4.4. Youth Employment

One of the major development challenges facing Ghana is youth unemployment. The Ghana National Youth Policy was published in 2010 on the theme: “Towards an empowered youth, impacting positively on national development.” The policy was formulated on the premise that the youth constitutes the true wealth and future of Ghana.

By empowerment, the policy advocates for the creation of a congenial environment for equipping the youth with knowledge, skills and attitudes, values and ethics. It envisages the provision of resources to enable the youth contribute meaningfully to the economic, social and cultural advancement of themselves, their families and their nation.

Among the challenges the policy aims at addressing are equitable access to education for the youth at all levels, unemployment, negative effects of urbanization, erosion of traditional social support systems and growing incidences of youth in social and political conflict and violence. To address these challenges and others, Ghana has set-up the National Youth Authority, which has come out with the National Youth Policy Implementation Plan 2014 – 2017. The 19 priority areas in the implementation plan include:

- Education and skills training,
- Science, research and technology,
- ICT,
- Youth in modern agriculture,
- Gender mainstreaming,
- Environment,
- Health/HIV/AIDS,
- Networking and partnerships (National Youth Policy, 2014).

It is important that in considering actions to implement the NCCP, the activities that engage and address youth concerns are highlighted. Some of the challenges outlined in the National Youth Policy Implementation Plan relate to the challenges of climate change. For example, encouraging youth occupation in agriculture in the rural districts with the adoption of climate-smart technologies and practices will contribute significantly to lessening the negative impact of climate change.

Section V: Implementation Arrangement

5.1. Institutional Roles and Responsibilities

The Climate-Smart Agriculture Action Plan is designed as a vehicle for ensuring sustainability of agriculture and food systems within the context of climate change. The plan is envisaged to be implemented as an integral part of on-going sector policies. The Ministry of Food and Agriculture is committed to take responsibility for ensuring the overall implementation of the Action Plan. The Environment and Climate Change Unit currently under Crops Services will have direct responsibility for the dissemination, capacity building and coordination of the implementation. To ensure effectiveness, the Environment and Climate Change Unit will be given more visibility by appointment of a management level officer (Director grade) who will be responsible for reporting on status of implementation to the management (Chief Director) of MoFA. The officer shall also be responsible for linkage and collaboration with relevant sectors, ministries (including fisheries and aquaculture development) and research institutions to ensure implementation of relevant portions of the action plan.

The Environment and Climate Change Unit will also work in close collaboration with the Ministerial Climate Change Task Force to ensure that relevant activities under the Action Plan are integrated into the annual work-plans and budgets of all national Directorates of the Ministry of Food and Agriculture.

The implementation process shall provide a broad framework within which Non-State actors including CCAFS Platform shall operate. The CCAFS Platform has important roles to play at the national and district levels. At the national level, it shall collaborate with the public institutions and NGOs to address specific actions including sensitization of stakeholders, policy advocacy, information gathering and dissemination, and promoting linkages with similar Platforms in the sub-region.

At the decentralized level, the Departments of Agriculture of the Metropolitan, Municipal and District Assemblies (MMDAs) will be responsible for the implementation of on-the-ground activities. These will be done mainly through awareness creation, farmer training and demonstration of best practices. The MMDAs, through their composite budgeting system, shall ensure the provisioning of adequate funding for activities on annual basis. The Departments of Agriculture of the Regional Coordination Councils shall be responsible for technical support to and coordination of activities of the MMDAs within their jurisdiction. At the district level, the Department of Agriculture shall therefore collaborate with and coordinate activities of relevant Civil Society Organizations to ensure synergy and achievement of economies of scale.

At the community level, farmers and farmers' groups will be responsible for the implementation of activities on their management units. Community leaders including traditional authority and political leaders (Assembly Members) shall be responsible for leading community level activities and serve as liaisons between their communities and external actors.

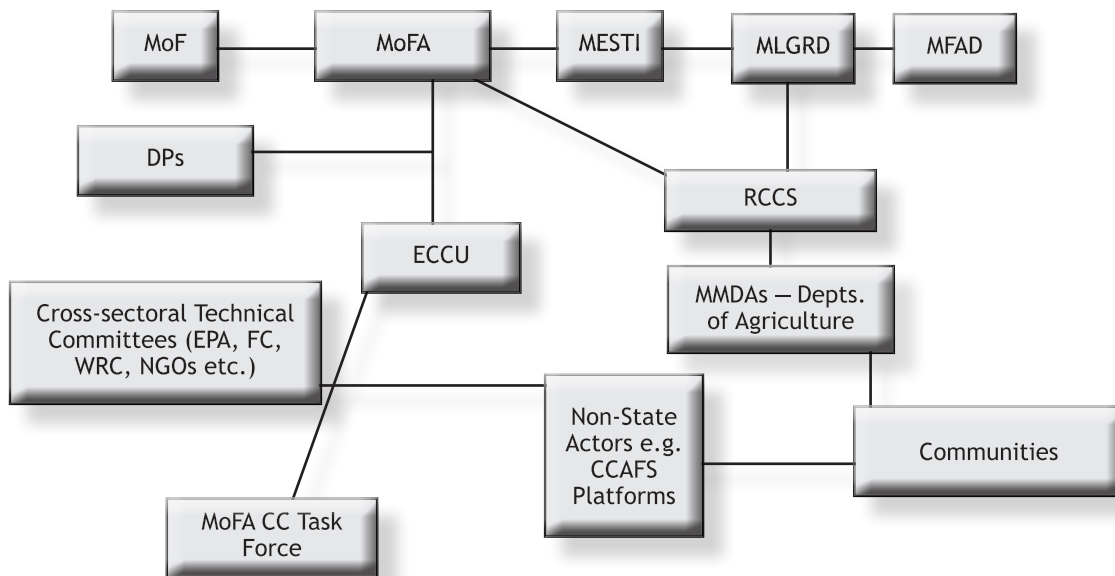


Figure 1: Institutional Relationships for CSA in Ghana

5.2. Implementation Challenges and Options for Solutions

A crucial challenge to address in the implementation of the action plan is the provision of adequate financial resources for implementation at all levels. In this regard, there is the need for an elaborate and detailed investment plan for financing the action plan. However, it is beyond the scope of this document to present such a plan. But there are clear options for mobilizing financial resources. One option is to mainstream the implementation of activities into the annual budgeting cycles of the responsible and collaborating institutions. This is where institutions with the conventional budgetary resources will implement the proposed climate change actions as part of their routine mandate. Another option is sourcing for climate funds, which the actions presented in the action plan can target for funding. At the national and international levels such funds exist e.g. Green Economy Fund and the CDM. Various organizations and institutions could tap into these funds to carry out climate-smart activities. A third option is where donors are engaged with specific project proposals, especially from the sub-national level for funding support. Most development partners and donors e.g. UNEP, UNDP, FAO, GEF, GIZ, DFTDA, DANIDA, SIDA, etc., have interests in the broad thematic area of climate change.

There is need for capacity building especially at the sub-national level to enable the leaders and responsible agencies to know where and how to source for climate funds for the implementation of the action plan. The points of coordination for this activity should rest with the Ministry of Local Government and Rural Development and MoFA.

The role of private sector actors is critical for successful implementation of the action plan. Entrepreneurs at all levels – micro, small, medium and large – need to see climate change as presenting business opportunities. The entire agricultural value chain including the financial institutions will be needed for addressing climate-smart agriculture.

Section VI: Monitoring and Evaluation

6.0. Monitoring and Evaluation

Monitoring and evaluation of the implementation of the action plan shall be within the broad framework of the national system specifically for the food and agriculture sector.

The Environment and Climate Change Unit shall be responsible for overall monitoring and evaluation of the implementation of the action plan. The Unit shall produce two half yearly-consolidated reports capturing activities from all districts. Additionally, the Unit shall, through the Ministerial Task Force, conduct reviews of work-plans and budgets of Technical Directorates to ascertain the extent of integration of CSA including budgetary allocations. In addition, the Unit shall undertake scheduled field monitoring visits to districts and communities to verify reports and assess technical quality of activities on the ground. The Unit shall undertake regular (every two years) evaluation of implementation of the action plan with the sole purpose of reviewing activities where necessary and emphasizing areas of strength.

The Departments of Agriculture of MMDAs shall include in their regular reports the status of implementation of specific activities including data relating to technologies, coverage area and number of participating farmers. The reports of the MMDAs shall include budgetary allocations, expenditures and sources of funding. The reports of the MMDAs shall be consolidated at the regional level and submitted to the Chief Director of MoFA with copy to the Environment and Climate Change Unit.

At the community level, the Departments of Agriculture shall facilitate farmers and farmers' groups to undertake community level monitoring and evaluation of CSA activities. This will be done twice a year through review and planning meetings before the farming season and field monitoring exercise at the peak of the growing season. Such meetings will focus on extent of implementation of planned activities, assessment of technologies being promoted, factors constraining uptake of technologies, best practices and lessons being learnt. Important information from these community level exercises shall be captured within district reports.

In the case of implementation of special projects carved out of the CSA Action Plan, special reports based on formats agreed with the funding agency(ies) shall be prepared and submitted at least twice a year. Information from districts through regions shall be consolidated into one report by Environment and Climate Change Unit and submitted as such.

Section VII: Conclusion and Way Forward

7.1. Conclusion

The implementation of the NCCP needs to be done with well-elaborated, effectively focused activities in the broad sector of agriculture, food systems and food security. There are imperatives and guiding principles. Among these are: political commitment at all levels of governance, policy literacy and the participation of key stakeholders such as policy makers, farmers, agricultural extension workers, traditional authorities, researchers, entrepreneurs and mass media workers.

This action plan has been developed on the premise that the eight programme areas of the Agriculture and Food Security focus area of the NCCP, provide a useful framework for detailing the specific activities and their corresponding implementing agencies. As summarized in the Annex, these activities are extracted from the various components of study carried-out to develop the action plan – the review of policy documents and literature, the multi-stakeholder analysis and the consultations with the relevant key informants. What is crucial now is the allocation of resources to effectively implement the plan. When this is done, Ghana will be addressing the development challenge of climate change within the food and agriculture sector.

In allocating resources to addressing climate change challenges, the lessons from the prioritization of the action areas by the stakeholders are instructive. Each of the three agro-ecological zones has action areas of emphasis. However, the development and promotion of climate-resilient cropping systems is important for all three zones and national efforts to focus on this since it is at the foundation of food security. Nevertheless, the core needs of the agro-ecological zones have been highlighted in the prioritization. For the Savannah Zone, water conservation and irrigation systems are critical. For the Transition Zone, the development of livestock production system is important whilst for the Forest Zone, capacity development is a priority. The key message from the prioritization is that, it guides the formulation of the location-specific activities to address climate change and therefore engenders effective allocation of scarce national resources.

Nevertheless, every effort needs to be made to attract funding for implementation of activities. There are some clear options such as mainstreaming the identified actions in the annual budgetary cycles of the responsible institutions. Funding can also be attracted from donor sources and existing climate funds. It is important that all actors in the implementation of the plan take necessary steps to establish a sound funding base for their activities.

7.2. The Way Forward

The Action Plan, as elaborated in this document, provides content to the overall approach to the development of climate-smart agriculture in Ghana. However, there are important steps to actualizing the implementation. The following are the key steps:

- sensitise and disseminate the Action Plan to all stakeholders at all levels;
- carry-out advocacy for inclusion of the Action Plan in up-coming reviews of agricultural sector policy and investment plans;
- Action Plan to serve as the basis for the development and funding of all climate change agriculture and food security projects, e.g. regional CSA project under FAO.

References

- CCAFS. 2014. *Multi-level Integrated Adaptation Governance*. Ghana Workshop Report, held at the Ghana Institute of Management and Public Administration (GIMPA) Conference Hall 14 – 16 April, 2014, Accra.
- ECOWAS Commission. 2008. *Regional Agricultural Policy for West Africa: ECOWAP*, downloaded on 20th August 2015 at http://www.diplomatie.gouv.fr/fr/IMG/pdf/01_ANG-ComCEDEAO.pdf
- EPA. 2011. *Ghana Strategic Investment Framework (GSIF) for Sustainable Land Management (SLM)*. Environmental Protection Agency, Accra.
- EPA. 2002. *National Action Programme to Combat Drought and Desertification*. Environmental Protection Agency (EPA), Accra.
- Essegbey GO. 2014. *Assessment of Climate Change Policy and Institutional Context: The Case of Ghana*. CCAFS Science-Policy Platform, Animal Research Institute, Accra.
- Ghana Trade and Livelihood Coalition (GTLC). 2014. *2013 Agro-Policy Performance Barometer Report (2013 APPB Report)*. GTLC, Accra.
- ITU. 2012. *Information and Communication technologies (ICTs) and climate change adaptation and mitigation: The case of Ghana*. International Telecommunications Union (ITU) and the Environmental Protection Agency (EPA), Accra.
- Mahama JD. 2014. *The Coordinated Programme of Economic and Social Development Policies 2014 – 2020 – An Agenda for Transformation*. Parliament, Accra.
- MESTI. 2015. *Ghana National Climate Change Policy Action Programme for Implementation 2015 – 2020 – Policy Focus Area 1: Agriculture and Food Systems*. MESTI, Accra.
- MESTI. 2014. *National Climate Change Policy*. Ministry of Environment, Science, Technology and Innovation (MESTI), Accra.
- MEST. 2010. *Ghana Goes for Green Growth – National Engagement on Climate Change*. Ministry of Environment, Science and Technology, Accra.
- MoFA. 2011. *Medium Term Agriculture Investment Plan – 2011 – 2015*. Ministry of Food and Agriculture, Accra.
- MoFA. 2010. *Procedures for Release and Registration of Crop Genetic Material*. Ministry of Food and Agriculture, Accra.
- MoFA. 2008. *Agriculture Sustainable Land Management Strategy and Action Plan (2009 – 2015)*. Ministry of Food and Agriculture, Accra.
- MoFA. 2007. *Food and Agriculture Sector Development Programme (FASDEP)*. Ministry of Food and Agriculture, Accra.
- NDPC. 2014. *Ghana Shared Growth and Development Agenda (GSGDA) II, 2014 – 2017*. National Development Planning Commission, Accra.

Annex 1: The Action Plan: Programme Areas, Corresponding Activities and Lead Actors

1.1. District Level Group Discussion Output

PROGRAMME AREA	DEFINED ACTIVITIES	LEAD ACTOR	COLLABORATING INSTITUTIONS	BUDGET SOURCES
CAPACITY DEVELOPMENT	High-level human resource development	UG (Centre for Climate Change)	CSIR, NCTE	UNEP/GEF
	Engage and train community-based extension volunteers in CSA technologies	Dept. of Agric.	NGOs, SARI	District Ass. & NGOs
	Intensive awareness creation on climate change activities	Dept. of Agric.	NGOs	DA
	Organize training on climate change related activities	District CCAFS	DA	CCAFS/NGOs
CLIMATE RESILIENT CROPPING SYSTEM	Strengthen linkage between research institutions and farmers through traditional festivals	District CCAFS platform	NGOs, DA	SARI, NGOs
	Undertake field demonstration on various crops	Dept. of Agric.	SARI, UDS	SARI, IITA
	Conduct research into short/early maturing and drought tolerant varieties	SARI	UDS, CCAFS, DA	SARI
	Establish Farmer Field Schools (FFS)	NGOs, DA	SARI	NGOs
ADAPTATION OF LIVESTOCK PRODUCTION	Promote agroforestry	FC	EPA, NGOs, Dept. of Agric.	Dept. of Agric., FC
	Train farmers on animal diseases management	Dept. of Agric.	District Platform	ARI
	Promote small ruminant production through relay systems	Dept. of Agric.	Animal Research Institute	NGOs, ARI
	Form and train community volunteers in livestock management	Dept. of Agric.	Animal Research Institute	NGOs, ARI, DA
ADAPTATION IN FISHERIES	Train fish farmers in aquaculture	Dept. of Fisheries	District CCAFS	Dept. of Fisheries, DA
	Support interested farmers to construct ponds and rear fish	Dept. of Fisheries	District CCAFS	-do-
	Planting of trees around water bodies	FC	EPA, Dept. of Agric., DA	FC, EPA, DA
	Train farmers on appropriate methods of farming along watersheds	Dept. of Agric.	District CCAFS	DA, CCAFS
WATER CONSERVATION	Facilitate the creation of buffer zones	Traditional leaders	District CCAFS	DA, NGOs
	Formulate and enforce bye-laws in managing water bodies	Traditional leaders	District CCAFS	DA, NGOs
	Facilitate rain water harvesting through small scale dug-outs	NGOs	District CCAFS	NGOs, CCAFS
	Training farmers in dry season gardening	District CCAFS	NGOs	NGOs, CCAFS
RISK TRANSFER	Integrate livestock in crops production	ARI	Dept. of Agric.	ARI, DA
	Promote small and medium industries	NGOs	DA	DA
	Establishment of community woodlots	FC	NGOs	NGOs
	Promote proper storage of farm produce	Dept. of Agric.	NGOs	DA, NGOs
POST-HARVEST MANAGEMENT	Facilitate proper processing of farm produce	-do-	-do-	-do-
	Promote the addition of value to farm produce	-do-	-do-	-do-
MARKETING SYSTEM	Promote the availability of market information to farmers	-do-	-do-	-do-

1.2. National Level Group Discussion

PROGRAMME AREA	ACTIVITIES	LEAD ACTOR	COLLABORATING INSTITUTION	BUDGET SOURCES
INSTITUTIONAL CAPACITY DEVELOPMENT FOR RESEARCH AND DEVELOPMENT	Awareness creation/lobbying for budgetary allocation for research and development	CCAFS Platform	Ministry of Finance, NDPC, MESTI, GMET, Civil Society Actors and Farmer-based organisations	GoG, Global Climate funds (Adaptation funds)
	Development of relevant database	CGIAR-CSIR,	MoFA, GMET	GoG, Global Climate funds (Adaptation funds), UNDP
	Build capacity of stakeholder institutions on resource mobilization	MoFA	Financial institutions: Africa Development, Bank, MESTI, EPA, ECOWAS	GoG, FAO
	Strengthening the existing links that are non-functional	CCAFS Platform	All stakeholders	GoG, MoFA
DEVELOP AND PROMOTE CLIMATE RESILIENT CROPPING SYSTEMS	Identify climate resilient cropping systems	MoFA- DCS (Directorate of Crop services)	SARI, Crop Research Institute, AGRA, EMBRAPA, FARA, FAO	GoG, CCAFS, FAO, DPs
	Sensitizing local farmers on the use of new climate resilient varieties	MoFA - Extension Services	FBO, Private sector	GoG, INGOs
	Promote the use of indigenous breeds	MoFA-APD	CSIR-ARI	GoG, DPs, INGOs
ADAPTATION OF LIVESTOCK PRODUCTION SYSTEM	Developing new and resilient breeds that are climate-friendly	CSIR-ARI	MoFA-VSD, Livestock farmers	GoG, DPs, Private sector
	Development of pasture for livestock	MoFA-APD	CSIR-ARI, FBOs	GoG, DPs
	Promoting the use of crop residue and other Agro industrial by-products as dry season feed	MoFA-APD	CSIR-ARI, Academia	GoG, DPs, INGOs
SUPPORT CLIMATE ADAPTATION IN FISHERIES AND AQUACULTURE	Strengthen capacity for extension services for climate smart fisheries and aquaculture development	Ministry of Fisheries and Aquaculture	CSIR-WRI, Min. of Fisheries, Civil society Organization	GoG, DPs, INGOs
	Management of inland and coastal ecosystems	Ministry of Fisheries and Aquaculture	CSIR, Fisheries, Civil society Organization	GoG, DPs, INGOs, Private Sector

PROGRAMME AREA	ACTIVITIES	LEAD ACTOR	COLLABORATING INSTITUTION	BUDGET SOURCES
SUPPORT TO WATER CONSERVATION AND IRRIGATION SYSTEMS	Introduce and promote rain water harvesting technologies	GIDA, MWRWH	MMDAs, Ministry of Education, Faith Based Organization, GREDA, GHA, BRRI, Road and building contractors Association	GoG, DPs, INGOs, Private Sector
	Expand National irrigation facilities	GIDA	Private sector, MMDAs	GoG, DPs, INGOs, Private Sector
	Maintain National irrigation facilities	GIDA	Private sector, MMDAs	GoG, DPs, INGOs, Private Sector
RISK TRANSFER AND ALTERNATIVE LIVELIHOOD SYSTEM	Increase local and community irrigation systems (Dug-outs)	GIDA	Private sector, MMDAs	GoG, DPs, INGOs, Private Sector
	Institute and promote Agriculture insurance schemes for farmers	GoG *	Private sector (Insurance Companies), MoFA, INGOs	GoG, DPs, INGOs, Private Sector
	Increase agricultural credit facilities for farmers	Financial institution	MoFA, Farmers Organization, GoG	GoG, DPs, INGOs, Private Sector
	Increase access to credit for farmers	CSOs	NGOs, GoG, financial institution	GoG, DPs, INGOs, Private Sector
	Promotion of micro-finance schemes	Farmer-based organization	Private sector, GoG	GoG, Private sector- financial institutions, FAO
IMPROVE POST-HARVEST MANAGEMENT SYSTEMS	Train and empower local farmers in alternative livelihood schemes i.e. grasscutter rearing, beekeeping, bead-making, etc.	FBOs	INGOs, NGOs, CSOs	GoG, INGOs, NGOs, Religious bodies
	Identify and disseminating information on post-harvest technologies and tools	CSIR	INGOs, Media	INGOs, GoG, FAO, FARA
IMPROVE MARKETING SYSTEMS	Promoting demand-driving production systems	FBO	MoFA-AGRI business	GoG, INGOs

2.1. Savannah - District Level Group Discussion Output

PROGRAMME AREA	ACTIVITIES	LEAD ACTOR	COLLABORATING INSTITUTION	BUDGET SOURCES
ADAPTATION OF LIVESTOCK PRODUCTION	<p>Develop climate compliant guidelines for the construction of housing for ruminants</p> <p>Promote housing for livestock/poultry</p> <p>Promote fodder production/feed for livestock</p> <p>Train Disaster Volunteer Groups (Bush fire prevention)</p>	DoA	<p>CSIR, Relevant University Departments, Livestock/Poultry Associations</p> <p>International Livestock Research Institute (ILRI), Private sector</p>	CSIR, DA, SADA
POST-HARVEST MANAGEMENT	<p>Promote the use of intermediate transport</p> <p>Provide community drying source/facilities</p> <p>Improve farm tracks to allow for the use of motorised tricycles</p> <p>Encourage the use of proper processing of farm produce such as threshers, winnowers, mills, packaging</p>	DoA	CSIR, Universities, NGOs, Private sector actors, Apostle Kwabena Safo	GoG, DoA
MARKETING SYSTEM	<p>Promote the availability of market information to farmers (community radio, ESOKO)</p> <p>Diversification of farm produce (Information on demands at the market)</p>	DoA	ESOKO, NGOs	NGOs, DoA
CLIMATE RESILIENT CROPPING SYSTEM	<p>Strengthen linkage between research institutions and farmers through demonstration farmers</p> <p>Provide rain gauges to the communities</p> <p>Promote Participatory Scenario Planning</p> <p>Conduct participatory research into early maturing and drought tolerant varieties?</p> <p>Enforce bye-laws on tree cutting/deforestation</p> <p>Provide financial package for agriculture inputs</p> <p>Promote integrated soil fertility management</p> <p>Promote agricultural mechanization</p>	CSIR, DoA	<p>FC, GMET,</p> <p>Universities Departments,</p> <p>No-Till Agriculture Centre, USAID,</p> <p>Private sector</p>	GIZ, DoA, DoA, CARE, CSIR, USAID
WATER CONSERVATION	<p>Promote in-situ rain water harvesting</p> <p>Develop technologies to reduce evaporations through mulching, cover cropping</p> <p>Facilitate rain water harvesting through small scale dug-outs/ponds/roof tops/streams</p>	CSIR	IDA	CSIR, IDA

2.2. Savannah Zone: National Level Group Discussion

PROGRAMME AREA	ACTIVITIES	LEAD ACTOR	COLLABORATING INSTITUTION	BUDGET SOURCES
INSTITUTIONAL CAPACITY DEVELOPMENT FOR RESEARCH AND DEVELOPMENT	Establish & strengthen M&E systems among stakeholders	MoFA (LWMU), CSIR	CCAFS Platform, Care Int, GIZ, Universities, Private sector	GoG, DFATD, NGOs, GIZ, DANIDA, DFAT, USAID
	Institutionalize regular reviews			
	Establish virtual platform for information sharing			
	Documenting best practices			
	Capacity building for implementers and stakeholders	MoFA (LWMU), CSIR	CCAFS Platform, Care Int, GIZ, Universities, IFDC, Private sector	GoG, DFATD, NGOs, GIZ, DANIDA, DFAT, USAID
	Short courses			
	Seminars and knowledge sharing workshops/exhibitions			
	Institute motivational periodic award schemes			
	Awareness creation among donors for financial support			
	Train stakeholders on writing winning proposals			
DEVELOP AND PROMOTE CLIMATE RESILIENT CROPPING SYSTEMS	Institute exchange programs			
	Map and catalogue best practices on climate resilient cropping system (CRS)	CSIR	MoFA, Universities, CCAFS Platform, Care Int, GIZ, Private sector	GoG, DFATD, NGOs, GIZ, DANIDA, DFAT, USAID
	Share information on platforms (Farmer excursions/field days)			
	Aggressive research into climate resilient varieties	CSIR	CCAFS Platform, Care Int, GIZ, Universities	GoG, DFATD, NGOs, GIZ, DANIDA, DFAT, USAID
	Information dissemination			
	Support farmers to conduct trials and demonstrations	MoFA	CCAFS Platform, Care Int, GIZ, Universities	IFAD, GoG, DFATD, NGOs, GIZ, DANIDA, DFAT, USAID
	Develop educational materials	MoFA	CCAFS Platform, Care Int, GIZ, Universities	GoG, DFATD, NGOs, GIZ, DANIDA, DFAT, USAID, IFDC
	Develop improved livestock breeds (heat & disease tolerant)	CSIR	MoFA, CSIR	GoG, DFATD, NGOs, GIZ, DANIDA, DFAT, USAID
	Promote use of indigenous breeds			
	e.g. credit and kind system	MoFA	CCAFS Platform, Care Int, GIZ, Universities, Private sector	GoG, DFATD, NGOs, MMDAs, GIZ, DANIDA, DFAT, USAID
ADAPTATION OF LIVESTOCK PRODUCTION SYSTEM	Promote crop livestock integration system (use of agro and industrial by-products)	MoFA	CCAFS Platform, Care Int, GIZ, Universities, Private sector	GoG, DFATD, NGOs, MMDAs, GIZ, DANIDA, DFAT, USAID
	Promote improved husbandry practices (health management, housing, feeding, watering)	MoFA	CCAFS Platform, Care Int, GIZ, Universities, Private sector	IFAD, GoG

PROGRAMME AREA	ACTIVITIES	LEAD ACTOR	COLLABORATING INSTITUTION	BUDGET SOURCES
SUPPORT CLIMATE ADAPTATION IN FISHERIES AND AQUACULTURE	Capacity building on knowledge, skills and attitudes	Ministry of Fisheries and Aquaculture Development (MoFAD)	CCAFS Platform, Care Int, GIZ, Universities, NGOs, Private sector	GoG, DFATD, NGOs, MMDAS, GIZ, DANIDA, DFAT, USAID, IFAD
	Research and adapt suitable species for rearing	CSIR	CCAFS Platform, Care Int, GIZ, Universities	GoG, DFATD, NGOs, MMDAS, GIZ, DANIDA, DFAT, USAID, IFAD
	Provide supportive infrastructure along the value chain (storage, processing and marketing)	MoFAD	EDAIF, IFDC	GoG, DFATD, NGOs, MMDAS, GIZ, DANIDA, DFAT, USAID, IFAD
	Promote environmentally sustainable fishing methods (KAPs)	MoFAD	Private sector	
	Create awareness on existing water policy framework	Ministry of Water Resources	CSIR, SNV	GoG, DFATD, NGOs, GIZ, DANIDA, DFAT, USAID, IFAD
SUPPORT TO WATER CONSERVATION AND IRRIGATION SYSTEMS	Sensitization on water harvesting process (e.g. harvesting flood water)	Ministry of Water Resources	CSIR, SNV	
	Soil water conservation techniques	MoFA	CSIR, IFDC	GoG, DFATD, NGOs, GIZ, DANIDA, DFAT, USAID, IFAD
	Participatory review of existing bye-laws and regulations	Ministry of Local Govt	MoFA, NGOs	GoG
	Promote formal and informal irrigation schemes for crops and livestock	GIDA	IFAD, GIZ, NGOs, Private sector	GoG, DFATD, NGOs, GIZ, DANIDA, DFAT, USAID, IFAD
	Promote use of conservation agricultural practices		Private sector	
RISK TRANSFER AND ALTERNATIVE LIVELIHOOD SYSTEM	Grain Banking through Agric Banks	MoFA	Financial Institutions	GoG, DFATD, NGOs, GIZ, DANIDA, DFAT, USAID, IFAD
	Provide reliable weather information for early warning/action	GMet	Media, MoFA	GoG, NGOs
	Risk mitigation measure (Insurance)	Insurance companies	Financial Institutions	
IMPROVE POST-HARVEST MANAGEMENT SYSTEMS	Support livelihood diversification (grasscutter, rabbit, beekeeping, gari processing)	MoFA, CSIR	CCAFS Platform, Care Int, GIZ, Universities	GoG, SDF-COVET, DFATD, NGOs, GIZ,
	Promote supportive infrastructure along the value chain (processors, marketers, researchers)	PPP	MoFA, NGOs, CSIR, Associations	GoG, SDF-COVET, DFATD, NGOs, GIZ, DANIDA, DFAT, USAID, IFAD
	Promote inventory credit system (warehouse receipt system, Grain banking, etc.)	MoFA		GoG, DFATD, NGOs, GIZ, DANIDA, DFAT, USAID, IFAD

PROGRAMME AREA	ACTIVITIES	LEAD ACTOR	COLLABORATING INSTITUTION	BUDGET SOURCES
IMPROVE MARKETING SYSTEMS	Strengthen producers and marketers linkages	MoFA	CCAFS Platform, Care Int, GIZ, Universities, NGOs, CSOs, Private sector	GoG, DFATD, NGOs, GIZ, DANIDA, DFAT, USAID, IFAD
	Strengthen FBOs	MoFA		
	Reorganize and structure marketing systems of commodities along the cocoa marketing strategy	MLGRD, MOTI	GSA, MoFA, FBOs	WB, IFAD, GoG
	System to provide market information	MoFA, MOTI	NGOs, FBOs	GoG, FBOs, NGOs
	Promote market-oriented agriculture	MoFA	GIZ, NGOs, Export Promotion Council	GoG, DFATD, NGOs, GIZ, DANIDA, DFAT, USAID, IFAD

2.3. Transitional Zone - District Level Group Discussion Output

PROGRAMME AREA	ACTIVITIES	LEAD ACTOR	COLLABORATING INSTITUTION	BUDGET SOURCES
INSTITUTIONAL CAPACITY DEVELOPMENT FOR RESEARCH AND DEVELOPMENT	<p>Training of DoA Field Staff on CSA:</p> <p>Disaster management - Early warning systems</p> <p>Post-harvest - post-harvest handling and packaging</p> <p>NB: Need for capacity building for all the activities outlined under the programme areas</p>	Department of Agric	GIZ, MMDAs, MoFA, District assembly, CSIR-CRI, KNUST, RELC	GoG, GIZ, CIDA, NGOs, MMDAs
CLIMATE RESILIENT CROPPING SYSTEM	<p>Early maturing dual-purpose crops (legumes)</p> <p>Dry season farming</p> <p>Drought tolerant crops - e.g. cereals, legumes</p> <p>Conservation agric (e.g. minimum/no till, mulching, crop rotation)</p> <p>Use of improved varieties</p> <p>Generation of seasonal weather data</p> <p>Promote agricultural mechanization</p>	DoA, CSIR	CARE, CCAFS, MoFA	GoG, MMDAs, IFAD, AGRA, WAAP, BMGF
ADAPTATION OF LIVESTOCK PRODUCTION	<p>Disease surveillance and control e.g. PPR/CBPP</p> <p>Fodder conservation - for dry season feeding</p> <p>Improved livestock housing</p> <p>Improved breeds of livestock (breeds for heat and disease tolerance)</p> <p>Generation of seasonal weather data</p> <p>Promote mechanization of livestock agriculture</p>	DoAs, CSIR-ARI, KNUST - DAS	MoFA, Private sector	GoG, MMDAs, MoFA, ILRI
ADAPTATION IN FISHERIES	<p>Temperature tolerance fish strains</p> <p>Introduction of fish farming in dugouts and reservoirs</p> <p>Introduction of small cages in dugouts and reservoirs</p> <p>Salinity tolerance fish strains</p> <p>Introduction of new species e.g. shrimps, tilapia</p> <p>Introduction of new fish culturing systems e.g. aquaponics</p>	DoAs, MMDAs	MoFA, MoFAD, CSIR -WRI, KNUST - Dept of Fisheries, Private sector	GoG, MMDAs, MoFA, MoFAD,

PROGRAMME AREA	ACTIVITIES	LEAD ACTOR	COLLABORATING INSTITUTION	BUDGET SOURCES
WATER CONSERVATION	<p>Contour ploughing</p> <p>Bonding e.g. stone or vetiver grass</p> <p>Introduction of small irrigation schemes (drip irrigation)</p> <p>Rain water harvesting on individual farms</p> <p>Screen house farming</p> <p>Water efficient cropping systems (e.g. cover crops/intercropping, alley cropping/minimum tillage)</p>	DoAs,	MoFA, CSIR - SRI/CRI	GoG, MMDAs, MoFA
RISK TRANSFER AND ALTERNATIVE LIVELIHOOD SYSTEMS	<p>Diversification of activities (fruit tree cropping/processing of crops - cassava, groundnut/beekeeping/snail rearing establishment of woodlots)</p> <p>Crop-livestock integration - fodder for feeding ruminants during the lean season</p> <p>Crop and Animal insurance</p>	DoAs	MoFA, CARE, private sector	GoG, MMDAs, MoFA, NGOs/CSOs
POST-HARVEST MANAGEMENT	<p>Good Storage structures (warehouse, silos, cribs, packhouses)</p> <p>Good processing (cassava)</p> <p>Solar drying</p>	DoAs	MoFA, MMDAs, KNUST - Fac. of Agric. Private sector	GoG, IFAD, MoFA, MMDAs
MARKETING SYSTEM	<p>Good processing and packaging</p> <p>Good grading and standardization of commodities</p> <p>Targeted production for both domestic and export (MRLs and adhered standards)</p> <p>Market driven production of commodities</p>	MMDAs	MoFA, MoFAD, CCLEAR	GoG, MMDAs, MoFA, USAID, DFID, DFAT, DANIDA

2.4. Transitional Zone - National Level Group Discussion

PROGRAMME AREA	ACTIVITIES	LEAD ACTOR	COLLABORATING INSTITUTION	BUDGET SOURCES
INSTITUTIONAL CAPACITY DEVELOPMENT FOR RESEARCH AND DEVELOPMENT	<p>Training of human resources on Smart Agriculture technologies</p> <p>Resourcing of Research Centers</p> <p>Development and fine tuning of climate-smart agriculture</p> <p>Conferences, seminars and workshops to exchange programs</p> <p>Policy and funds support for research</p>	CSIR, Universities	MoFA, NGOs	GoG, Donors
DEVELOP AND PROMOTE CLIMATE RESILIENT CROPPING SYSTEMS	<p>Identification of climate resilient technologies</p> <p>Technologies to improve soil conservation, fertility and health</p> <p>Identification and use of certified seeds</p> <p>Improved farmer saved seeds</p> <p>GAP & GPPP</p> <p>Dissemination of technologies</p>	MoFA	CSIR, Universities, NGOs	GoG, Donors
ADAPTATION OF LIVESTOCK PRODUCTION SYSTEM	<p>Identification and use of improved breeds (livestock & poultry)</p> <p>Use of improved pastures</p> <p>Development of feed storage and Ration formulation technologies</p> <p>Improved animal health technologies</p> <p>Improved housing and animal management</p>	MoFA	CSIR, Universities, NGOs, Private sector	GoG & Donors
SUPPORT CLIMATE ADAPTATION IN FISHERIES AND AQUACULTURE	<p>Promotion of cage and tank fishing</p> <p>Hatcheries for quality fingerlings</p> <p>Availability of quality feed formulation</p>	Min. of Fisheries and Aquaculture	CSIR, Universities, NGOs	GoG & Donors

PROGRAMME AREA	ACTIVITIES	LEAD ACTOR	COLLABORATING INSTITUTION	BUDGET SOURCES
SUPPORT TO WATER CONSERVATION AND IRRIGATION SYSTEMS	Rain harvesting technologies Use of Irrigation and dugouts Monitoring and maintenance of already constructed dams Planting of trees in watershed Enforcement of water catchment area laws	MoFA - IDA (Irrigation Development Authority)	CSIR, Universities, NGOs (Nana Dwomor), mass media	GoG, Donors
RISK TRANSFER AND ALTERNATIVE LIVELIHOOD SYSTEM	Integration of crops and animals (Livestock, Poultry) Intercropping Development of appropriate Insurance package Mushroom, beekeeping, grasscutter rearing, rabbit rearing	MoFA	CSIR, Universities, NGOs, Insurance Companies	GoG, Donors
IMPROVE POST-HARVEST MANAGEMENT SYSTEMS	GAP (timely harvest, site selection etc.) Conducive storage structures and conditions (Renovation of existing ones) Value addition, Processing and packaging Handling and Transportation (Vegetable and Yam package) Training and Dissemination Patenting of Technologies	MoFA, Private sector	CSIR, Universities, NGOs, Private sector	Private sector, Donors
IMPROVE MARKETING SYSTEMS	Standardization of produce and products Formation of FBOs for advocacy (Credit, Price negotiation) Improved road infrastructure	Gh. Standard Authority, MoFA, MOTI	FBOs (Women Farmers & GNAFF) Regional and District Assemblies, MoFA, Private sector	GoG, FBOs

2.5. Forest Zone - District Level Group Discussion Output

PROGRAMME AREA	ACTIVITIES	LEAD ACTOR	COLLABORATING INSTITUTION	BUDGET SOURCES
CAPACITY DEVELOPMENT	Build the capacity of agricultural extension staff at the district level	Dept. of Agriculture	MoFA/CSIR, Universities, Tree Plantation companies/Ghana COCOBOD/DA	UNEP/GEF/CIDA, USAID, DAS, GIZ, NGOs/Mining companies
	Identify and train FBO leadership (at least 30% females) in CSA technologies	District Department of Agriculture	NGOs, Universities	DAs/NGOs/Mining companies
	Sensitization and awareness creation	District Department of Agriculture	EPA, NGOs, CCAFS,	DAs/NGOs/Mining companies
	Form and train district CCAFS on climate change activities	Environmental Committee	CCAFS	CCAFS/NGOS/ADB/UNEP/FAO
CLIMATE RESILIENT CROPPING SYSTEM	Identify and undertake field adaptive trials on climate resilient technologies in crops	CSIR (CR/SRI)	MoFA/Universities	UNEP/GEF/CIDA, USAID, DAS, GIZ, NGOs/Mining companies
	Strengthen the activities of Research and extension linkage committee (RELC)	CSIR	MoFA/Dept. of Agric.	UNEP/GEF/CIDA, USAID, DAS, GIZ, NGOs/Mining companies
	Undertake field demonstrations on crops (FFS, FFF etc.)	Dept. of Agriculture	FBOs/NGOs	DAs/NGOs
	Promote tree crop plantations and silviculture	Dept. of Agriculture	Forestry Commission/ FBOs/NGOs, Private sector	DAs/NGOs
ADAPTATION OF LIVESTOCK PRODUCTION	Educate opinion leaders, and communities on land tenure and user rights	Traditional authorities	Dept. of Agriculture /Forestry Commission, DAs, Stool Lands, Land Commission, House of Chiefs	DAs/NGOs
	Train livestock farmers on improved animal husbandry practices (housing, feeding and breeding)	Dept. of Agriculture	Animal Research Institute/APD, MoFA	DA/NGOs
	Train farmers on small ruminant diseases management	Veterinary (MoFA)	Animal Research Institute/APD, MoFA	Veterinary (MoFA)/DA/NGOs
	Provide animal health care	Veterinary (MoFA)	DoA/ARI/APD, MoFA	Veterinary (MoFA)/DA/NGOs
	Form and train community livestock volunteers in disease management	Veterinary (MoFA)	DoA/ARI/FBOs	Veterinary (MoFA)/DA/NGOs
	Promote swine production	Dept. of Agriculture	Animal Research Institute/APD, MoFA	DA/NGOs

PROGRAMME AREA	ACTIVITIES	LEAD ACTOR	COLLABORATING INSTITUTION	BUDGET SOURCES
ADAPTATION IN FISHERIES	Train fish farmers in aquaculture	Ministry of Fisheries and Aquaculture	Animal Research Inst./Universities	Ministry of Fisheries and Aquaculture
	Support interested farmers to construct fish ponds	Ministry of Fisheries and Aquaculture	Animal Research Inst./Universities	Ministry of Fisheries and Aquaculture
	Support established farms and aquaculture centre to produce fingerlings	Ministry of Fisheries and Aquaculture	Animal Research Inst./Universities	Ministry of Fisheries and Aquaculture
	Provide fish health care	Ministry of Fisheries and Aquaculture	Animal Research Inst./Universities	Ministry of Fisheries and Aquaculture
WATER CONSERVATION	Facilitate inland valleys and lowlands development for rice, sugar cane and aquaculture production	MoFA	GIDA, DA	AfDB/IFAD
	Planting of trees around water bodies	FC	Dept. of Agric., Traditional authorities	FC/DA
	Facilitate rainwater harvesting through small scale dams and dugouts	GIDA	DoA/DA/MoFA	GIDA/MoFA/DA
	Train farmers on appropriate methods of farming along watershed	GIDA	DoA/DA/MoFA	GIDA/MoFA/DA
RISK TRANSFER	Train farmers in dry season gardening	Dept. of Agric.	CR/Universities/GIDA	MMDA/MoFA
	Promote pump irrigation for supplementary and dry season farming	Dept. of Agric.	MoFA/GIDA/CSIR- Water Research Institute, private sector	GoG/DA/CIDA
	Integrate livestock into tree crop plantation (semi intensive)	Dept. of Agric.	MoFA/CSIR	GoG/DA/CIDA
	Promote alternative livelihood activities e.g. beekeeping, mushroom etc.	Dept. of Agric.	BAC/MoFA/NGOs/DA, Private sector	MMDAs/NGOs
POST-HARVEST MANAGEMENT	Train farmers on post-harvest management	Dept. of Agric.	MoFA-AESD/NGOs	GoG/MMDAs/NGOs
	Promote processing of farm produce	NBSSI	MoFA-DAES, Dept. of Agric. FBOs, BAC, Private sector	MoFA-DAES
	Promote proper storage of farm produce	Dept. of Agric.	MoFA - AESD/NGO	GoG/MMDA
MARKETING SYSTEM	Promote grading and packaging and use of weight and measures	GSB	DoA/MoFA/Traders/DA	GoG/MMDA
	Promote linkages between actors in the value chain	Dept. of Agric.	MoFA - DAES/NGO, MMDAs	GoG/MMDA
	Develop value chain for specific commodities	Dept. of Agric.	MoFA - DAES/NGO/MMDAs, Private sector	GoG/MMDA
	Promote the availability of market information to farmers and other stakeholders	Dept. of Agric.	MoFA-SRID/NGOs/WAAPP E-AGRICULTURE	GoG/MMDA

2.6. Forest Zone - National Level Group Discussion

PROGRAMME AREA	ACTIVITIES	LEAD ACTOR	COLLABORATING INSTITUTION	BUDGET SOURCES
INSTITUTIONAL CAPACITY DEVELOPMENT FOR RESEARCH AND DEVELOPMENT	1. Identification of gaps in knowledge and research	CSIR	MoFA, Researchers, IITA & WAFS	Development partners (UNDP, WB, JICA, AGRA, CIDA)
	2. Scoping of global technologies	CSIR	MoFA, Researchers, IITA & WAFS	Development partners (UNDP, WB, JICA, AGRA, CIDA)
	3. Identification and provision of infrastructural activities e.g. lab equipment and transport	CSIR, AESL	Universities, AESL & Private suppliers	GoG, WB, AfDB, Development partners
	4. The need for programs, strategies and plans for building the capacity	Universities and training institutions	CSIR, NGOs & MoFA	Stand Chart Bank, Development partners
	5. Monitoring, evaluation and making improvement	MoFA	Academia	GoG, Development partners
DEVELOP AND PROMOTE CLIMATE RESILIENT CROPPING SYSTEMS	1. Identification of climate resilient crop varieties, etc.	CSIR (SARI)	MoFA & Farmers	WB, GoG & IFAD
	2. Research proposal and protocols	CSIR	Universities and CSIR	WB, GoG & IFAD
	3. Source for and secure funding	CSIR, individual scientist	NGOs (CARE), Private sector	WB, GoG & IFAD
	4. Come out with finding on actual research	CSIR	MoFA, Universities & Farmers	WB, GoG & IFAD
	5. Roll out findings	MoFA	NGOs, CSOs & FBOs	WB, GoG & IFAD
ADAPTATION OF LIVESTOCK PRODUCTION SYSTEM	1. Identify climate change adaptive breeds.	CSIR-ARI	Universities & CSIR (SARI), Private sector	GEF, UNED, FAO INGOs, USAID, DANIDA
	2. Pasture development (climate change resilient)	CSIR-ARI	Universities & CSIR (SARI)	
	3. Multiplication and distribution of breeds	MoFA,	Universities & CSIR (SARI)	
	4. Promotion of pasture adoption		Private sector	
	5. Explore the production of hay and silage		Universities & CSIR (SARI)	

PROGRAMME AREA	ACTIVITIES	LEAD ACTOR	COLLABORATING INSTITUTION	BUDGET SOURCES
SUPPORT CLIMATE ADAPTATION IN FISHERIES AND AQUACULTURE	1. Identify climate resilient varieties	Min. of Fisheries and Agriculture	CSIR-WRI, Volta Basin fisheries, KNUST,	GoG, WB, AfDB, FAO, NGOs
	2. Identification and protection of wetlands and other water bodies	Forestry Commission/ Game and Wildlife	Agricare, Private sector	
	3. Promotion and adoption of appropriate techniques for fish pond construction	MoFAD	CSIR, Conservation Organisations	
	4. Climate-smart production techniques	MoFAD	CSIR, Private sectors	
SUPPORT TO WATER CONSERVATION AND IRRIGATION SYSTEMS	1. Rain harvesting technologies	MoFA	CSIR, NGOs, FC, CSIR-FORIG	USAID, FAO, DANIDA, GoG, JICA
	2. Small-scale irrigation	MoFA/GIDA	MMDAS	
	3. Rehabilitation and protection of watersheds	MoFA/GIDA	MMDAS	
	4. Undertake cost-benefit analysis of small-scale irrigation production systems	MoFA/GIDA	MMDAS	
	5. Integrated farming systems (fish, crops, trees and livestock)	MoFA/GIDA	MMDAS, Private sector	
RISK TRANSFER AND ALTERNATIVE LIVELIHOOD SYSTEM	1. Identify potentially viable alternative livelihood (mushroom production, apiculture, grass-cutter rearing, rabbit production)	MoFA	FBOs, FORIG, Polytechnic Institutions	DANIDA, USAID, GET, GIZ, Netherlands Government, JICA, MEF
	2. Develop climate adaptive techniques	CSIR	MoFA	
	3. Promote the adoption of alternative livelihood techniques	MoFA	MMDAS, Private sector	
	4. Encourage farmer group formation for risk management	MoFA	Private sector	
	5. Undertake cost-benefit analysis of the production systems to inform potential producers	MoFA		
	6. Promote inventory credit schemes	MoFA		

PROGRAMME AREA	ACTIVITIES	LEAD ACTOR	COLLABORATING INSTITUTION	BUDGET SOURCES
IMPROVE POST-HARVEST MANAGEMENT SYSTEMS	1. Determine the demand and supply levels	MoFA	CSIR (IIR, CRI, SARI, FRI), Private sector	FAO, USAID, DANIDA, GoG
	2. Promote the use of pest-resistant varieties	MoFA	Private sector	
	3. Identify climate-friendly preservative and storage techniques	CSIR	Universities, MoFA	
	4. Develop affordable preservative and storage facilities	CSIR	MoFA, universities	
	5. Facilitate access to storage and preservation facilities	MoFA	Private sector	
IMPROVE MARKETING SYSTEMS	1. Determine the demand and supply (market survey)	Ghana Stats Service	MoFA, FBO, NGOs, DAs, Media, STEPRI, MOTI, Min. of Communication	UNESCO, UNICEF, FAO, IFAD, RTIMP, CARE
	2. Establish a national platform well-publicized for marketing of agricultural products (ESOKO)	MoFA	Mass media, private sector	
	3. Facilitate use of mobile money to purchase agriculture products	MoFA	Private sector	
	4. Improve packaging of farm produce	CSIR	Private sector	
	5. Semi-processed, processed and packaging	CSIR	Private sector	
	6. Promote national producers and consumers day	MoFA	Private sector, the mass media	
	7. Establish weekly farm-gates at various towns and communities	MoFA	MMDAS	

Annex II: List of Participants

1. List of Participants at Workshop on Utilization of Knowledge Product from CCAFS Studies in Ghana, 19th February 2015, CSIR-STEPRI, Accra

NO.	NAME OF PARTICIPANT	SEX	ORGANIZATION/INSTITUTION	DESIGNATION	TELEPHONE	EMAIL ADDRESS
1	Kingsley Odum Sam	M	CSIR-ARI/CCAFS PLATFORM	RESEARCH SCIENTIST / M&E FOCAL PERSON	0273237889	kingsam704@yahoo.co.uk
2	Nikki Asuming Bediako	F	CSIR - ARI	RESEARCH SCIENTIST	0244233895	nikkiabde@yahoo.com
3	Felix Hagan	M	CSIR - ARI	ADMIN	0243060971	khagan2002gah@yahoo.com
4	Naa Puovele Karbo Iii	M	CHAIRMAN LAWRA DCC/LTC	CHAIRMAN	0208189919	epkarbo@gmail.com
5	Bongkyere John Bosa	M	LAWRA TRAD. COUNCIL	SECRETARY LAWRA DCC	0209249971	bosio2009@y.mail.com
6	Karbo Justice	M	ATTENDANT LAWRA		0207700661	
7	Alexander Addo	M	MoFA DAES	P.P.O	0545950958	alexaddo75@gmail.com
8	V. A Botchway	M	CSIR - ARI	SNR SCI. OFFICER	0270217361	kingnavy@yahoo.co.uk
9	Samuel Dotse	M	UNIDO	NATIONAL COORDINATOR	0207360517	samuel.dotse@hotmail.com
10	Mary Jane Enchill	F	HATOF	ACTING C. E.O	0246346698	mjane.enchill@gmail.com
11	John A. Dziwornu	M	GNAN	VICE PRESIDENT	0244115537	dziroh@gmail.com
12	Mrs Elsie A. Klinogo	F	GFWH	PRESIDENT	0208132526	globalfarmerswives@yahoo.com
13	Asaasiba George A.	M	MoFA, JIRAPA	M & E OFFICER	0208395375	asaasibag@yahoo.com
14	Zolko-Ere M. John	M	MIHOSO INST. JIRAPA	SECRETARY	0204096074	johnzolkoeere@gmail.com
15	Stans Nasarl	M	NANDIRDEP	CHAIRMAN	0208541415	stanislansasar@yahoo.com
16	Liebo Augustine	M	NANDIRDEP	SECRETARY	0208941546	augustineliebo@yahoo.com
17	Kingsley Agyemang	M	MoFA, ACCRA	A.A.O.	0505122083	kingsleykagyemang@yahoo.co.uk
18	Francis Obeng	M	B.T.U COTTBUS	STUDENT	0206714664	kwasiobeng@yahoo.co.uk
19	Charles Agboklu	M	RELBONET	COORDINATOR	0244616768	relbonet@gmail.com
20	Edward Decker	M	CSIR	RESEARCHER	0201334850	e.decker@csir.org.gh
21	Oswald K. Nyamebaare	M	CSIR - ARI	SNR. ACCOUNTANT	0244752254	noswah@yahoo.com
22	Anthony A. Fletcher	M	NDPC	ASST.ADM. OFFICER (TECHNICAL)	0243959803	anthony.fletcher@ndpc.gov.gh
23	Gp Capt. S. Y. Kormla	M	G MeT	D.G.	0208135896	stephenyaokumo@hotmail.com

NO.	NAME OF PARTICIPANT	SEX	ORGANIZATION/INSTITUTION	DESIGNATION	TELEPHONE	EMAIL ADDRESS
24	Dr. Karbo N.	M	CSIR - ARI	CRS	0208129300	minongkordam@yahoo.com
25	Dorcas Osei A.	F	DAILY DEMOCRAT	REPORTER	0264727294	dorcisweet01@gmail.com
26	Sheila Aikins-Wilson	F	CSIR - ARI	R.S.	0244933611	sheilaaikins@gmail.com
27	Mavis Afutu	F	APD - MoFA	SAHO	0243974832	mavisafutu@yahoo.com
28	Gifty M. Agyemang	F	THE INSIGHT	REPORTER	0242836930	dogbe3664@gmail.com
29	Benjamin De R.	M	FAO - RAF	CLIMATE CHANGE OFFICER	0508097326	Benjamin.DeRidder@fao.org
30	Dr. G. O. Essegbey	M	CSIR - STEPRI	DIRECTOR	0243753314	goessegbey@csir-strepri.org
31	Prince Avortri	M	CSIR - ARI	SNR. SC. SEC	0244711305	princeavor@yahoo.com
32	Victor K. Agyeman	M	CSIR	D.G.	0302774772	agyemangvictor@yahoo.com
33	Noah Aguh	M	EDAIF	SNR. RES. OFF.	0244613141	n-aguh@yahoo.com
34	Janet N. Acquaful	F	CSIR - ARI	PRIN. ADMIN. ASST.	0244659730	nanaacquaful1970@yahoo.com
35	Dr. E. T. Obeng	M	EPA	PRIN. PROJ. OFF.	0208196879	etachiobeng@gmail.com

2. List of Participants at Workshop on Development of National Climate-Smart Action Plan, 22nd-24th March 2015, Miklin Hotel, Kumasi

NO.	NAME OF PARTICIPANT	SEX	ORGANIZATION/INSTITUTION	DESIGNATION	LOCATION	TELEPHONE	EMAIL ADDRESS
1	Akurugu Baba Jourigo	M	Akurugu Farmers	CEO	Ejisu-Bonwire	0249397455	
2	Dr. N. Karbo	M	CSIR-ARI (GCCAFS)	CRS	Accra		
3	Dr. George O. Essegbey	M	CRS-STEPRI ACCRA	Director	Accra	0243753314	
4	Dr. C. Domezoro	M	CSIR-ARI	RS	Accra	0506091387	
5	V. A. Botchway	M	CSIR/GCCAFS	RS	Accra	0270217361	
6	Alexander Addo	M	MoFA	S.T.O	Accra	0545950958	
7	John A. Dziwornu	M					
8	Dr. Mrs Victoria Attoh-Kotoku	F	KNUST	Lecturer	Kumasi	0244252764	
9	Delali Nutsukpo	M	MoFA	Director	Accra	0540825209	
10	Martina Addai	F	NFF-G		Kumasi	0244478156	
11	Mrs. Elsie Augustt	F	GFWA	President	Accra	0208132528	
12	Philip K. Avomah	M	MoFA	Director	Yilo Krobo	0244996652	
13	Kate Sarpong	F	CSIR-SRI	Accountant		0246713863	
14	Salifu A. Ziblim	M	MoFA- W/R	RDA	Sekondi	0246713863	
15	Wilfred Anonadaga	M	MoFA-BAR	DDA	Atebubu	0244950664	
16	Dr. Kofi Boa	M	Centre for no Tillage Agriculture	Director	Nkwawie	0208179161	
17	Joseph Y. Faalong	M	MoFA	Director	Wa-UWR	0202026411	
18	Katia Albrecht	F	GIZ	Advisor	Tamale	0247924892	katia.albrecht@giz.de
19	Francesco Rubino	M	GIZ	Stafiaire	Tamale		francesco.rubino@giz.de
20	Antwi-B Amoah	M	EPA	PPO	Accra	0243987871	
21	Nana Amponsah Appau	F	Bekwai Traditional Council	Queen mother (Dwantoa Hema)	Bekwai-Kumasi	0244740875	gladysnanaappau@yahoo.com
22	Nana Abena Achia	F	Atwima Akosombo Traditional Council	Queen mother (Obaapanin)	Atwima Akosombo	0246364232	
23	Eric Fofie	M	MoFA	District Director	Nyinahin	0244867379	
24	B. O. Antwi	M	CSIR-SRI	Head of Water	Kumasi	0244848538	

NO.	NAME OF PARTICIPANT	SEX	ORGANIZATION/INSTITUTION	DESIGNATION	LOCATION	TELEPHONE	EMAIL ADDRESS
25	Nana Opoku Ababio	M	Bekwai Traditional Council	Chief (Adontenhene)	Bekwai	0203679112	nanaopokuababio@gmail.com
26	Gloria Djaagleley	F	CSIR-FORIG	SRS	Kumasi	0244780068	
27	Frank Mattah	M	MoFA	REDO	HO	0209185704	
28	Atakorah-Yeboah Yaw	M	CARE	PF	Mankrunso	0208208317	
29	Luke Anglaaere	M	CSIR-FORIG	SRS	Kumasi	0208346537	
30	Alex Asare	M	Forestry Commission	Forestry Manger	Kumasi	0208149194	
31	Kingsley Odum Sam	M	CSIR-ARI/Ghana CCAFS Platform	Research Scientist/ M&E Focal Person	Accra	0273237889	
32	Eric Owusu Danquah	M	CSIR-CRI	Research Scientist	Kumasi	0242357061	
33	Felix Frimpong	M	CSIR-CRI	Research Scientist	Kumasi	0206633367	
34	Mavis Alutu	F	APD-MoFA	SAHO	Accra	0243974852	
35	Mildred Suglo	F	WIAD-MoFA	AO	Accra	020968053	
36	Solomon Mebamasun	F	CARE	PO	Kumasi	0206461664	
37	Dr Charles Kwoseh	M	KNUST	HOD	Kumasi	0244466123	
38	Dr. Christopher Antwi	M	KNUST		Kumasi		
39	Marvo Joseph	M	ARI		Accra	0244930682	
40	Asante Asubonteng		Ghana Meteorological Agency	Regional Head	Kumasi	0202018768	
41	Dr. Daniel Adjiei-Boateng	M	Fisheries/KNUST	HOD	Kumasi	0265633529	
42	Alhassan M. Muntala	M	CARE	L.O	Tamale	0208272123	
43	Kalian Sampoa Gumah	F	CARE	Volunteer	Tamale	0204128528	
44	Nafisah Alaabun Akudbillah	F	CARE	Intern	Tamale	0240299616	
45	Romanus Gyang	M	CARE	PM	Tamale	0243533686	
46	Prof. E.L.K. Osafo	M	KNUST	Lecturer	Kumasi	0501349039	
47	Oswald k. Nyimebaare	M	CSIR-ARI	Snr. Acct	Accra	0208344414	

3. List of Participants at Workshop on Validation of the National Climate-Smart Action Plan, 23rd June 2015, CSIR-STEPRI, Accra

NO.	NAME OF PARTICIPANT	SEX	ORGANIZATION/INSTITUTION	DESIGNATION	TELEPHONE	EMAIL ADDRESS
1	Kingsley Odum Sam	M	CSIR-ARI/GHANA CCAFS PLATFORM	RESEARCH SCIENTIST/ M&E FOCAL PERSON	024 694 2277	kingsam704@yahoo.co.uk
2	Clarke Noyoru	M	MOGOSP	PROG. OFFICER	024 498 8327	clarkenoyoru@gmail.com
3	V. A. Botchway	M	GCCAFS, ACCRA	RES. OFFICER	027 021 7361	kingnavy@yahoo.co.uk
4	Dr. P. Wallace	M	CSIR - ARI	PRES	020 663 7769	pwallaus@yahoo.com
5	Hilma Manan	F	FORESTRY COMMISSION	ASST. DISTRICT MANAGER	024 409 4186	hiitlyn88@gmail.com
6	Owusu Sekyere K.	M	MoFAD	ASST. GOV'T PLANNING OFFICER	027 153 5352	kwasi-sekyere@yahoo.co.uk
7	Maame Serwaa	F	AESD - MoFA	A.A.E.	024 237 7131	saduamoah@gmail.com
8	Brahene Sebastian W.	M	FAO		027 714 6372	sebastian.brahene@fao.org
9	Dr. Stephen Narh	M	SIREC - UG	RES. FELLOW	024 486 5215	sknarh@gmail.com
10	Emmanuel Nartey	M	LGSS	PBA	024 890 8360	nomonat@yahoo.com
11	Ayeh D. Vera	F	CSIR - ARI	REGISTRY	024 647 4303	veradanquah.VD@gmail.com
12	Emmanuel A. Addo	M	MoFA - PPBD	A.A.E.	024 351 6143	angelademad@yahoo.com
13	Mavis K. Afutu	F	MoFA - APD	SAHO	024 397 4832	mavisafutu.yahoo.com
14	Gp Capt. S Y Komla	M	GMeT	D.G.	020 813 5896	stephenyaokuma@hotmail.com
15	Shaibu Muniru	M	MoFA - DAES	AGRIC OFFICER	020 899 4242	bashaiot@yahoo0o.com
16	Winfred Nelson	M	NDPC	DEPUTY DIRECTOR	024 448 2407	winfrednelson@yahoo.co.uk
17	George Essegbey	M	CSIR - STEPRI	DIRECTOR	024 375 3314	geoesgebey@csir-stepri.org
18	Samuel Dotse	M	PAGE GHANA	COORDINATOR	020 736 0517	samuel.dotse@hotmail.com
19	Mary Jane Enchill	F	HAT OF FOUNDATION	A. CEO	024 634 6698	mjane.enchill@gmail.com
20	Oswald K. Nyimebaare	M	CSIR - STEPRI	SENIOR ACCOUNTANT	024 475 2254	noswk@yahoo.com
21	Victoria Aniaku	F	WIAD/MoFA	DEPUTY DIRECTOR	024 475 6101	aniaku05@yahoo.com
22	Prospera Anku	M	MoFA/DAES	ASSISTANT DIRECTOR	024 460 5710	pros0014@gmail.com
23	Prof. Paa-Nii. T.J.	M	CSIR	T.S.	024 460 1763	paaniijohnson@gmail.com
24	Antwi-B. Amoah	M	EPA	PPO	024 398 7871	aantwib@gmail.com
25	Delali Nutsukpo	M	AWDA	DIRECTOR	054 082 5209	nutsukpodelali@gmail.com
26	Asante Krobe	M	MoFA	DIRECTOR	020 812 7765	krobeasant@gmail
27	Hon. Dr. Alhassan A. Y.	M	MoFA	DEPUTY MINISTER	024 483 8977	yalhassan57@gmail.com

NO.	NAME OF PARTICIPANT	SEX	ORGANIZATION/INSTITUTION	DESIGNATION	TELEPHONE	EMAIL ADDRESS
28	Dr Karbo	M	CSIR - ARI	CRS		
29	Kofi Darko	M	SRID/MoFA	ASSISTANT DIRECTOR	026 994 6254	kofidarko20.@gmail.com
30	James Ayarik	M	MIN. LOCAL GOV'T	FSEF COORDINATOR	020 817 8922	jayariki@yahoo.com
31	Kingsley Amoako	M	MoFA - DCS	A. D.	024 459 9596	kingkwaw@yahoo.com
32	Mrs Elsie Augustt K.	F	GFWA	PRESIDENT	020 813 2526	globalfarmers wives@yahoo.com
33	Janet N. Acquafal	F	CSIR - ARI	P. A. A.	024 465 9730	nanaacquafal1970@yahoo.com
34	Stephen Asante	M	CSIR - ARI	A. T. O.	020 149 0920	
35	Eunice Kuor	F	CSIR - ARI	ACCOUNTS OFFICER	020 739 2516	e.kuor@yahoo.com
36	Eric N. Mensah	M	CSIR - ARI	ACCOUNTS	024 479 7503	
37	Dr. A. N. A Ayitey	M	VSD	DEPUTY DIRECTOR	024 328 0901	angayitey@yahoo.co.uk
38	Edward Decker	M	CSIR - HO	SEN. SCIENTIFIC OFFICER	020 133 4850	edecker@csir.org.gh



RESEARCH PROGRAM ON
**Climate Change,
Agriculture and
Food Security**



The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) is a strategic initiative of the Consultative Group on International Agricultural Research (CGIAR) and Future Earth, led by the International Center for Tropical Agriculture (CIAT). CCAFS is the world's most comprehensive global research program to examine and address the critical interactions between climate change, agriculture and food security.

For more information, visit www.ccafs.cgiar.org

Titles in this Working Papers series aim to disseminate interim climate change, agriculture and food security research and practices and stimulate feedback from the scientific community.

CCAFS is led by:



Strategic partner:



Research supported by:

