PLATFORM FOR STAKEHOLDERS IN AFRICAN FORESTRY

STRENGTHENING ADAPTATION POLICIES AND AFOLU BASED CLIMATE CHANGE MITIGATION INTERVENTIONS RELEVANT TO AFRICAN FORESTRY AND PEOPLE IN ANGLOPHONE AFRICA



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Strengthening adaptation policies and AFOLU based climate change mitigation interventions relevant to African forestry and people in Anglophone Africa

Francis E. Bisong

Table of Contents

List of Figures

List of Tables

Acronyms and Abbreviations

AfDB	African Development Bank
AFOLU	Agriculture, forestry and other Land Uses
CBFP	Congo Basin Forest Partnership
CCIAM	Climate Change Impacts Adaptation and Mitigation
CDM	Clean Development Mechanisms
CRGE	Climate Resilient Green Economy
CSA	Climate Smart Agriculture
CSOs	Civil Society Organizations
DTMA	Drought Tolerant Maize for Africa
ECOWAS	Economic Community of West African States
ECREEE	ECOWAS Centre for Renewable Energy and Energy Efficiency
FORIG	Forest Resources Institute of Ghana
GGWA	Great Green Wall Agency
GHG	Green House Gas
GtCO2e/yr	Giga tonne of Carbon dioxide equivalent per year
IITA	International Institute of Tropical Agriculture
INDCs	Intended Nationally Determined Contributions
IPCC	Intergovernmental Panel on Climate Change
KII	Key Informant Interviews
MDAs	Ministries Departments and Agencies
MOA	Ministry of Agriculture
NAMAs	Nationally Appropriately Mitigation Actions
NAPAs	National Adaptation Programs of Action
NCCAPs	National Climate Change Adaptation Plans
NCF	Nigerian Conservation Foundation
NGOCE	NGO Coalition for Environment
NGOs	Non-Governmental Organizations
NTFPs	Non-Timber Forest Products
PRA	Participatory Rural Appraisal
REDD+	Reducing Emission from Deforestation and Forest Degradation

SADC	Southern African Development Community
SLM	Sustainable Land management

EXECUTIVE SUMMARY

BACKGROUND

Climate change is one of the greatest global challenges of the contemporary times. Its prominence in global discourse arises from the impact it has on nearly all sectors of the economy. Records show increase across Africa of climate related environmental problems in Agriculture and Forestry sectors as floods, drought, crop failure, loss of biodiversity and decline in forest ecosystem services among others.

IPCC Fourth Assessment Report identifies agriculture, forestry and other land uses (AFOLU) as contributing 30% of the total anthropogenic GHG emissions (FAO, 2010). Agriculture and forestry also have the potential to mitigate, respectively, between 5.5 – 6 GtCO2e/yr. and 5.4 GtCO2e/Yr. (FAO, 2010). Forest ecosystems thus serve the dual roles of fuelling global warming as GHG sources when degraded or converted to other uses through deforestation, and becoming sinks for carbon during regrowth or expansion. This puts to context the role of forests in climate change mitigation through programmes like REDD+, sustainable forest management and conservation/enhancement of carbon stocks. Despite considerable understanding of the role of forests in climate change mitigation via carbon sequestration policies and programmes, far little, however, is said to be known on their roles in climate change adaptation.

OBJECTIVES

This study, focused on Anglophone countries of Africa and framed around eight major tasks, sought to:

1. Evaluate the prospects of promising practices on forest-based adaptation measures and the conditions for their wider adoption.
2. Analyze and document relevant forest-related mitigation approaches in AFOLU and assess the conditions of their adoption as applied in the African context.
3. Assess and document the impact of applicable AFOLU mitigation activities on food, fuel and fibre production.
4. Assess applied policies in forest NAMAs and identify best practices for their implementation.

5. Identify and evaluate policies and activities that incorporate both adaptation and mitigation characteristics in view of key approaches and practices.
6. Assess carbon policies and practices at selected national and sub-regional levels that support and/or constrain development and implementation of initiatives on carbon.
7. Assess selected key African institutions that have the potential to effectively address governance of climate change in forestry.
8. Assess potential high-impact pathways and mechanisms to address governance of climate change in forestry.

THEORETICAL FRAMEWORK

This study is based on adaptation theory, which draws from several related concepts and theories of climate change/variability, risk, sensitivity, vulnerability and adaptation. The theory revealed patterns of adaptation and the framework of its operation.

METHODOLOGY

Seven Anglophone countries comprising Nigeria, Ghana, Tanzania, Zambia, Kenya, Ethiopia and Zimbabwe were selected for the study considering the geo-political and ecological settings.

A mix of methods were used to gather qualitative and quantitative primary and secondary data for a broad assessment of the existing AFOLU adaptation and mitigation policies and strategies in Anglophone countries of Africa. Data were collected using Agency/Establishment questionnaire surveys, Key Informant Interviews (KII), desk review, document analysis, policy analysis. Assessment of Institutions' capacities to handle climate change interventions and other related issues was carried out using various governance criteria.

RESULTS

Climate change vulnerability patters

The highest ranked climate change impacts in Africa occur as droughts, floods, crop failures and bush fires. The most significant socio-economic consequences are on hunger/food insecurity and poverty, while the most significant biophysical consequences include deforestation, land degradation and loss of biodiversity among others. The most vulnerable of the resource user groups are farmers, livestock grazers/pastoralists, and NTFP collectors; the social group most affected are women.

Patterns of Climate Change adaptation in Africa

Practices adopted by farmers and other resource users to cope with climate change encompass water resource management, irrigation techniques, use of drought tolerant cultivars/breeds, conservation agriculture, early warning systems, agroforestry systems among others.

These interventions are largely planned i.e. driven or implemented by public institutions (government agencies, NGOs, or development partners), or a blend of autonomous (driven by individual, household or community resources and skills that rely on indigenous and local knowledge) and planned adaptation.

Promising practices on AFOLU based adaptation measures and conditions for their wider adoption

The most successful practices at country specific levels are: Agroforestry (Nigeria, Tanzania, Zimbabwe), Alternative livelihood (Ghana, Zambia), Control of Forest fire (Nigeria), Ecological Restoration (Nigeria), Enterprise Diversification (Zambia), Extension services for CSA (Zambia), Irrigation (Ghana), REDD+ (Zimbabwe), Use of high yielding cultivars (Kenya) and Drought resistant cultivars (Ghana) among others.

These practices are widely adopted on the basis of low cost and easy technique, community support and participation, relevance to addressing needs of people, high level of sensitization and awareness, proper implementation strategies, cultural acceptance, engagement, sense of project ownership and political will.

Limiting factors include poor community engagement, poor perception, and irrelevance to people's needs, inadequate funding, cultural barriers and cost/technology barriers.

Forest-based mitigation interventions and determinants of their wider adoption

The most successful mitigation interventions in different countries in descending order of priority include: Agroforestry; forest conservation/protection; water management/ protection; conservation agriculture; policy and legal framework; capacity building; early warning.

These practices can be widely adopted if they are in tandem with peoples' preferences and needs, made to involve community stakeholders, and provision of incentives among others.

On the other hand, the barriers to wider adoption include: inadequate funding, lack of stakeholder engagement and high cost of implementation etc.

Impact of AFOLU mitigation activities on food, fuel and fiber production (3Fs)

The impact of forest mitigation activities on 3Fs was explored from the perspective of policy makers and analysis of production data. Mitigation interventions from view point of policy makers were perceived to have differential effects on food, fuel and fiber production across the region. Analysis of food and fuel production statistics for most of the countries investigated show inverse relationships between production increases for food and fuel wood and size of forest estates. This implies that mitigation interventions are not effective in the production of food and fuel wood. Food production statistics show no significant relationship to fiber production with the exception of Ghana and Nigeria.

Impact of Climate Change adaptation/mitigation projects on women and resource user groups

Several resource user groups have been reached by intervention projects, the proportion by gender shows that an appreciable number of women were reached in farm and forestry (NTFP) related interventions.

Nationally appropriate mitigation actions (NAMAs) relevant to the forestry sector

With respect to agriculture, NAMA priority actions comprise sustainable land management (Ethiopia, Nigeria, Zimbabwe)); climate smart agriculture (Nigeria, Tanzania, Kenya, Zambia), and agricultural diversification, sustainable intensification (In Ghana, Zambia & Zimbabwe). In the forestry sector, priority actions include sustainable management and utilization of forest resources (Ethiopia, Nigeria), emission reduction through forestry and alternative energy (Ghana, Nigeria, Kenya, Zambia).

Policies that incorporate both adaptation and mitigation characteristics

Sector based policies and activities have been noted to possess both adaptation and mitigation characteristics. The relevant policies include policies on agriculture, forestry, environment and biodiversity conservation among others. The same nexus of adaptation and mitigation interventions can be found in some activities which include Agroforestry

systems; Afforestation/Reforestation which provide ecological services and enhance carbon stock. Others include watershed protection and clean energy system.

Carbon policies and practices at select national and sub-regional levels supporting / constraining development of initiatives on carbon

Key production sectors such as forest, environment, agriculture and biodiversity support carbon initiatives. These include: conservation agriculture afforestation/reforestation and agroforestry systems among others. Conversely, some policies and activities particularly in Agricultural sector impede the development of carbon initiatives.

Key African institutions that have the potential to effectively address governance of climate change in forestry

Different countries have capacity and policy commitment for climate change governance particularly those involving natural resource management, environment, biodiversity etc. Interagency coordination, access to and sharing information are the major constraints to agencies' ability to effectively commit to climate change mitigation and adaptation.

At the regional level, institutions with capacity to effectively address governance of climate change in forestry include, AfDB, The African Conservation Centre, ECOWAS, SADC, CBFP, ECREEE.

Potential high-impact pathways and mechanisms to address governance of climate change in forestry

The pathways and mechanisms considered critical to address governance of climate change in forestry in Africa among others include:

- Climate Change education, communication / Awareness and Shared knowledge on vulnerabilities, risk, vulnerable areas, opportunities and options on adaptation and mitigation measures to stakeholders
- Assessment, monitoring and evaluation of interventions to ascertain the achievement and other requirement for success.
- Research and technology development including, on resilience, adaptation and mitigation is critical to tackling climate change e.g. action on DTMA

- Capacity building/human resource development in different related institutions at different levels including local stakeholders among others

CONCLUSION

Climate change has made African countries susceptible to severe problems of hunger/food insecurity and poverty; and ecological distortions such as deforestation, land degradation and loss of biodiversity caused by droughts, floods and crop failures. Several adaptation interventions are being implemented across the region by farmers and other resource users. Agroforestry, alternative livelihood, control of bushfires, and ecological restoration among others are adaptation practices with high potentials for the region. Up-scaling these promising adaptation interventions are critical to stimulate extensive adoption for improved productivity. Promising mitigation practices as agroforestry; forest conservation/protection; water management/protection; conservation agriculture; capacity building among others will also require further harnessing and up scaling.

RECOMMENDATIONS

Given the conclusion drawn from this study, some recommended policy measures are:

- MDAs and NGOs involved in forest-based adaptation interventions should utilize information provided on vulnerability patterns including vulnerable areas, sectors, resource users and social groups to better understand and implement more targeted and purposeful adaptation intervention policies and practices. Specifically:

- The most successful and promising adaptation practices identified by stakeholders in country specific contexts should be up scaled, promoted and accorded greater priority in extant policy of agriculture and forestry for greater effectiveness.

- AFOLU based institutions to create enabling environment for wider adoption and replication of successful adaptation and mitigation practices should be promoted.

- Indigenous knowledge systems with high sustainability potentials in terms of productivity and resource management should be incorporated into suitable sectors and programmes geared towards forest management and climate change mitigation.

- Successful integration of national NAMAs into all sectoral policies in the management of forest resources should be coordinated and implemented by AFOLU MDAs for sustainable 'delivering as one' in forestry programmes.

- Government should enhance and motivate the economic (agriculture and forestry) and energy sector institutions to support transformation toward low-emission pathways.

- Identified policies and activities with dual capacity for forest based adaptation and mitigation should be encouraged and up scaled by AFOLU based sectors for wider adoption.

CHAPTER 1 INTRODUCTION

Climate change is the current global phenomenon that has stimulated diverse concerns due to its potential threat to human existence. The concerns are more directed to ecologically and economically vulnerable countries, where such threats are expected to multiply the already existing environmental problems (Morrell and Scialabba, 2009; Kojwang and Larwanou, 2015). Undeniably, there is much scientific evidence of the risk of climate change-induced damage to human and economic development (FAO, 2009; Bilcha 2013, Eriksen et al., 2008,). The evidence has become so glaring and prompted high anticipation that climate change will significantly affect different economic sectors, including agricultural development, water resources, forestry and food security. The effect will be more intense in Africa where a greater percentage of the populace directly depends on the natural environment for livelihood, and there are a high level of poverty, slow response mechanism, a high level of vulnerability and persistent environmental change (Stockholm Environmental Institute, 2008).

Tea pickers in Kenya's Mount Kenya region, for the Two Degrees Up project, aimed at reviewing the impact of climate change on agriculture. Photo by Neil Palmer via Wikimedia Commons at https://upload.wikimedia.org/wikipedia/commons/3/38/2DU_Kenya16_%285367334314%29.jpg

The assertion by FAO (2009) puts Africa and parts of Asia on the red end, particularly smallholders threatened by climate change, which without resilience, will increase food insecurity and poverty.

In the Forestry sector, many forest products offer subsistence support for small-scale, household-based enterprises that provide income and employment for rural people, especially women. The rate of deforestation coupled with the variability in climate will affect availability of medicinal plants, fruits, seeds, leaves, roots and other non-timber forest products. Furthermore, trees have long played pivotal roles in traditional agroforestry systems by providing shelter, shade and protection against the ravages of wind and sun (Morrell and Scialabba, 2009). The intensity of climate change will aggravate the problems of resource accessibility and ethnic conflict in shared resources (Brown and Crawford, 2008). Besides, forests provide many unseen ecosystem services and functions (Asare and Kwakye, 2013). In the face of climatic variability, sustainable development is undermined by destroying the natural capital that supports livelihoods and climate.

According to the Fourth Assessment Report from IPCC, agriculture, forestry and other land uses (AFOLU) account for approximately 30% of the total anthropogenic GHG emissions (FAO, 2010). Agriculture and forestry have the potential to mitigate between 5.5 – 6 GtCO2e/yr. and 5.4 GtCO2e/yr. respectively (FAO, 2010). The major drivers creating the observed patterns in the anthropogenic emissions are, generally, increased economic activities driven by population growth, accelerated urbanization, weak legislative framework for agricultural practices and use of agricultural lands, and natural resource exploitation (World Bank, 2005).

These challenges call for holistic approaches to landscape management that increase synergies among multiple land-use objectives. Thus, there is an urgent need for long-term management of ecosystems including sustainable land management planning and decision making as well as climate change adaptation and mitigation strategies at a variety of spatial scales (Janowiak, Butler, Swanston, Parker, St. Pierre and Brand, 2012; Pramova Locatelli, Djoudi and Somorin, 2012, Smith et al, 2014).

Sub-Saharan African countries, in line with concerted global efforts are paying significant attention on how to mitigate and adapt to the impacts of climate change. Different governments have, therefore, commenced the implementation of globally accepted instruments in combating climate challenge, in accordance with their national contexts. Examples of these are the nationally based collaborative initiatives such as the Nationally Determined Contributions by countries to UNFCCC, IPCC, UN-REDD+ programmes, Clean Development Mechanisms (CDM), Carbon Markets and Trade, Nationally Appropriate Mitigation Actions (NAMAs) and National Adaptation Programs of Action (NAPAs) frameworks, among others.

Considerable understanding thus exists in the self-expressed documents of many African countries on their actual or intended policies and measures to mitigate and adapt to climate change. Within AFOLU context, these documents and few studies (Kojwang and Larwanou, 2015; Son wa, et al., 2011) provide a fair knowledge of the role of forests in climate change mitigation via carbon sequestration policies and programmes. Far little however, is said to be known on their roles in climate change adaptation. An integrated understanding of these approaches will be required to strengthen climate change adaptation and mitigation policies and measures in the renewable natural resource sectors of Africa.

1.1 STUDY OBJECTIVES

This study, focused on Anglophone countries of Africa, will provide information, knowledge and capacity to stakeholders to contribute to adaptation to the adverse effects of climate change in various landscapes; and in ways that will improve livelihoods, sustain biodiversity and the quality of the environment, in addition to strengthening the capacity of Africa's forests to adapt to climate change and contribute to mitigation efforts.

The study had the key objectives to:

I. Improve knowledge and capacity of African stakeholders in managing forests and landscapes in the context of climate change;

II. Inform and contribute to the shaping of policies and initiatives relevant to forests and climate change.

III. Enhance the role of African forestry and its contribution to adaptation to the adverse effects of climate change in various landscapes; and in ways that will improve and sustain livelihoods, biodiversity and the quality of the environment

IV. Strengthen the capacity of Africa's forests to adapt to climate change and to contribute to mitigation efforts.

1.2 SPECIFIC TASKS

Drawing from the above objectives and within the context of Anglophone African countries and representative forest types (rain forest, mangroves, woodland and savanna, parklands of the Sahel), the following specific tasks were accomplished:

- Evaluated the prospects of promising practices of forest-based adaptation measures, and assessed the conditions and determinants of their wider adoption;

- Analyzed and documented relevant forest-related mitigation approaches in AFOLU and assessed the conditions and determinants of their adoption as applied in the African context;
- Assessed and documented the impacts of applicable AFOLU mitigation activities on food, fuel and fiber production;
- Assessed applied policies in forest NAMAs, identifying best practices for their implementation;
- Identified and evaluated policies and activities that incorporate both adaptation and mitigation characteristics as key approaches and practices;
- Assessed carbon policies and practices at selected national and sub-regional levels that support and/or constrain development and implementation of initiatives on carbon;
- Assessed selected key African institutions that have the potential effectively to address governance of climate change in forestry; and
- Assessed potential high-impact pathways and mechanisms to address governance of climate change in forestry.
- Provide appropriate key recommendations in relations to the outlined tasks.

CHAPTER 2: THEORETICAL BACKGROUND

2.1 LITERATURE REVIEW

Studies dealing with forest-based adaptation to climate change have either focused on the endogenous/autonomous policies and measures or the planned interventions for climate change adaptation and mitigation. Some of these studies (e,g. Bola et al., 2014; Bishaw et al., 2013; Kalame, et al, 2011; Paavola, 2008) deal with adaptation interventions targeted at smallholder farmers. They highlight the critical roles of exogenous or planned adaptation measures, focused on the resilience of agro-ecosystems through agronomic interventions that are socially, economically and ecologically sustainable. The conclusions derived from some of these studies suggest that adaptation efforts should involve effective governance of natural resources (Paavola, 2008, Kalame, et al., 2012).

The role of capacity building through extension services to small farmers is increasingly being recognized as a critical tool in promoting planned climate change adaptation. Studies by Hassan & Nkemechena (2008), Adisa (2012), Nwakwasi et al. (2012) and Bishaw et al. (2013) in African countries identified a number of agricultural production support systems such as extension, credit, technology, and information about adaptation to climate change as critical for helping African farmers adapt to climate change.

Several other studies, however, have focused on the value of indigenous (endogenous/autonomous) adaptation practices including crop rotation, shifting cultivation, mulching, bush fallowing, use of organic manure, minimum/zero tillage, as well as polycultures or multicropping (Yaro, Bisong & Okon, 2016; Adejo, Edoka, & Adejoh, 2012; Adesiji & Obaniyi, 2012; Adisa, 2012; Bryan et al., 2009; Hassan & Nkemechena, 2008). However, some studies present a contradictory scenario of traditional practices in floods and drought interventions

In a study of Kanyemba, Mbire District, of Zimbabwe by Bola et al. (2014), adaptation strategies for flood and drought were poorly achieved. Whereas, in the rural coastal communities of Nigeria, principally among the Ilajes, Itshekiris and Ijaws (Fabiyi & Olukoi, 2013), the indigenous knowledge of local meteorology to predict flooding in real time were able to adapt livelihood and social events to the vagaries of climate change. Thus, the study by Yaro, Bisong & Okon (2016), recommends synergies between indigenous and planned adaptation in building adaptive capacity of local people.

Delineating the pattern of climate change adaptation policies within the forestry sector is of great interest. Bele, Sonwa & Tiani (2015) in a study of forest based management adaptation in the countries of the Congo Basin acknowledged that forests have received very little attention in national planning and policies. A few existing studies highlight the role of NTFP markets and agroforestry in appraising forest based adaptation to climate change (Nkem et al., 2010, Kalame et al., 2011). The study by Nkem et al. (2010), while noting the role of markets in NTFPs as rural safety nets for forest-based communities, reveals that their contribution to adaptation is marginal due to the restricted nature of the markets. Delineating the contribution of forest management interventions and adaptation to climate change remains a critical gap to be filled in the literature.

The contribution of forestry to carbon emission reduction has been given a fair level of attention in the literature especially in the area of carbon sequestration, mitigation and credit earnings through afforestation, reforestation and AFOLU related CDM projects (Niles et al., 2002, Siyanbola et al., 2002; Zomer et al., 2008a, Zomer et al., 2008b, Garcia-Quijano, 2007; Siyanbola, 2002). A study carried out in Nigeria depicts afforestation as a double-edged sword with projected impact to reduce global warming in afforested areas and coastal zones, while accentuating warming and reducing rainfall in the north-east of the country (Abiodun et al., 2013). Afforestation policies need, therefore, to be critically examined and implemented in ways that maximize gains and minimize losses.

REDD+ strategies are increasingly being recognized in the literature as vital to climate change mitigation viewed in the context of the huge stock of carbon in natural forest stands (Sonwa, et al, 2011). However, the slow pace of implementation and framework for investment and payment may trigger activities that disrupt carbon pools (Minang, Noordwijk & Swallow, 2009). Given the scenario above Henry et al (2011) advocated the need to go beyond the forestry sector to situate REDD+ interventions within agricultural and land use policies in sub-Sahara Africa.

The experience of adopting the practise of Conservation Agriculture in sub-Saharan Africa is very limited and slow despite its numerous social, economic and environmental benefits (Milder, Majanen & Scherr, 2011; Thierfelder & Wall, 2010; Giller et al., 2011; Corbeels et al., 2013). However, the slow or non-adoption is tied to the absence of immediate increase in farm income (Corbeels, et al., 2013).

Sustainable intensification of livestock production necessarily integrates crop and livestock production. Livestock production contributes 12% of GHG emissions from human causes and as such a critical factor in climate change mitigation (Havlik et al., 2014). Study by Seo (2010) conducted across 9000 farms in Africa demonstrate that integrated farms are more resilient to global warming than specialized farms in crops, financial and ecological terms.

It has been argued that climate change adaptation and mitigation should be pursued simultaneously in agricultural and forestry contexts (Matocha et al., 2012). This is because synergies between climate change adaptation and mitigation actions are particularly likely in projects involving income diversification with tree and forest products among other reasons. Kongsager, Locatelli & Chazarin (2016) state that international and national institutions can provide incentives for projects to harness synergies and avoid trade-offs between adaptation and mitigation

A critical operation showing great promise as a forest-relevant adaptation and mitigation approach and a forest-based adaption measure is the practice of Agroforestry in the AFOLU context. Verchot et al. (2007), Mbow et al., (2014), Kandji et al., (2006) and Syampungami et al., (2010) examined agroforestry as a climate change adaptation and mitigation measure to sustain the agricultural productivity and livelihoods of farmers in Southern Africa. The studies discussed the need for further selection and release of new tree germplasm (i.e. living tissue from which new plants can be grown) with superior capacity to adapt to the changing climatic and ecological conditions.

The position is strengthened in research by Cain et al. (2012) highlighting the importance of climate-ready germplasm to offset large crop yield losses, particularly within sub-Saharan Africa, further stressing that given the time lag between the development of improved germplasm and adoption in farmers' fields, the development of improved breeding pipelines needs to be a high priority. Syampungani et al. (2010) concluded their work on the need to find incentive mechanisms for farmers during the initial establishment of fallow plots before they attain the break-even point, to encourage the accelerated adoption of agroforestry.

Moreover, Bisong, Andrew-Essien, Animashaun & Utang (2009) and Bisong, Ambo & Ogar (2007) in studies using socio-economic surveys and PRA methodologies in 'support zone' settlements of the Cross River National Park and communities in Obudu Cattle Ranch, South-Eastern Nigeria, respectively, showed agroforestry to have short and long-term protective and socio-economic benefits in taking off pressure from natural forest, mitigating problems of fuel wood shortage, checking erosion, adverse change in ecology, and decline in soil productivity. Liyana et al. (2014) posit that Agroforestry, if widely adopted as an integrated strategy together with improved kilns and stoves, can have a significant impact in reducing pressure on forests for wood energy.

Identifying and evaluating policies and strategies that incorporate both adaptation and mitigation characteristics across countries of sub-Saharan Africa is a crucial knowledge gap needing to be filled. Others include tracking and characterizing the extant patterns of indigenous and exogenous AFOLU based adaptation and mitigation interventions, and evaluating their success levels in addressing the climate change challenge.

2.2 THEORETICAL FRAMEWORK

The theoretical underpinning for studies on adaptation and mitigation to climate change and variability draw naturally from several related concepts as climate change/variability, risk, hazard, sensitivity, vulnerability, adaptation and adaptive capacity. The meaning and interrelatedness of these concepts have been clarified and expatiated in the literature (Brooks, 2003; Sumelius et al., 2009; Eisenack & Stecker, 2012; FAO, 2014)

2.2.1 Climate Change theory

Several theories of climate change are recognized in the literature that is thought to be responsible for changes over time (several decades to millions of years) in the average surface temperature of the earth. These theories are either woven around natural or human causes of climate change, and or stabilizing, declining or rising temperatures. They include anthropogenic global warming (AGW) (IPCC, 2007; Bast, 2013), bio-thermostat, cloud formation and albedo, human forces apart from GHGs (Bast, 2013; Singer & Fred, 2009; Lindzen & Choi, 2009; Sud et al, 1999). Ocean currents, planetary movements and solar variability or cosmoclimatology (Bast, 2013; Vardiman, 2008; Gray (2009); NOAA, Scafetta (2009); Svensmark (2007), and modification of natural land cover of the earth to cultural landscapes (Pielke., 2008; Blast, 2013)

While the above theories are valid in their contribution to appreciating the multi-dimensional approach required to understand the climate change phenomenon, this study is situated on the anthropogenic global warming theory as it seeks to understand the risk and response patterns (adaptation and mitigation interventions) to human induced climate change in the context of AFOLU

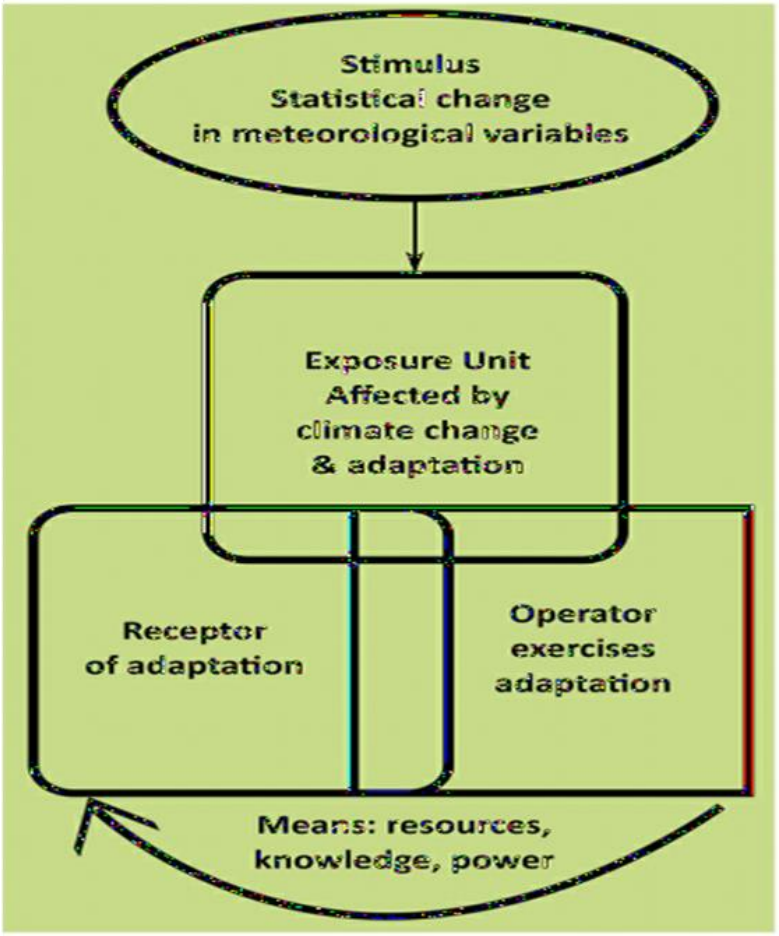
2.2.2 Theory of adaptation

Perhaps more than any author, the seminal work by Eisenack & Stecker (2012) gleaned from several studies provide a unified framework for understanding climate change adaptation. They conceptualize “climate change adaptation as actions” with actors and the barriers associated with given adaptations. Using a schematic diagram (Fig. 1) to highlight the various components of the framework, adaptation is viewed as a response to stimuli in this case climatic stresses which affects systems and entities necessitating adjustments in the affected systems and entities. The framework is built around interrelated concepts and processes as ‘stimuli’, ‘exposure units’, ‘operators’ and ‘receptors’.

In this framework, stimulus is defined as ‘change in biophysical variables associated with climate change’. Exposure units are all actors – social, technical, ecological and non-human systems that depend on climate conditions and as a result, exposed to its stimulus. Impact of climate change is defined by the interface between a stimulus and an exposure unit, or a

set of stimuli with a corresponding set of exposure units. The term operator is used in reference to individuals or collective actors (i.e. communities, institutions, etc.) that exercise response. The operator may thus range from the individual, household, firm, NGO or government agency. Operators in the context of usage are social entities and therefore do not include infrastructure, machinery, and ecological systems. Not every activity of the operator necessarily qualifies as actors, but those with purpose (by design) which directly or indirectly relate to adapting to climate change. The actor or system that is the target of an adaptation (the purpose) is called the receptor. Receptors can be both biophysical entities (e.g. the crops of a farmer) and social systems (e.g. the farmer household), depending on the objective or unit of analysis.

To carry out adaptation, the operator needs resources referred to in the framework as means which may include finance, legal authorization, technical capacity, information, networks, etc.



Source: Eisenack & Stecker, 2012

Figure 1: Schematic diagram of adaptation framework

The barriers are defined as factors that could impede the execution of specific adaptation. Barriers identified in framework include 'missing operator' where none exist, 'missing means' where an operator exists but the means or resources to function are not available. This may be in the form of weak institutional capacity or budget constraints. Others are 'unemployed means' where means exist but not adequately employed due to mismanagement or improperly aligned incentive and 'complex actor relations' where the interface between exposure units, operators and receptors are ambiguous. The barriers in the framework are by no means exhaustive. They help provide a way of thinking and organizing adaptation actions and processes including tracking or mapping adaptation barriers that may be addressed through the development of effective rules and institutions.

2.2.3 Application to the study

In AFOLU context, the theory tracks climate change adaptation and mitigation policies and measures by multiple actors across seven African countries in diverse ecological zones. Figure 2 modified from Eisenack & Stecker (2012) is conceptualized to highlight the adaptation actors among stakeholders of relevance to the study.

Adaptation actions naturally originate as responses to climate stresses by at least one or several actors such as Adaptation Implementers (Operators: Households/Firms/Gov./Civil society Agencies, etc.) or Adaptation Targets/Beneficiaries (Receptors: Communities/Farm Families, etc.). The exposure units to climatic stresses are social, technical and ecological systems that experience significant alterations from climate stresses which may impair their functionality, or affect their productivity and/or resilience in the case of natural resource systems and livelihood production systems of communities. The status and success levels of given adaptation is dependent on the balance of influence exerted by barriers or determinants.

CHAPTER 3: METHODOLOGY

3.1 THE STUDY AREA

Nigeria, Ghana, Tanzania, Zambia, Kenya, Ethiopia and Zimbabwe were the Anglophone countries in Sub-Saharan Africa selected as sample sites for the study. Selection of the countries was based on the geo-political and ecological settings for adequate reflection of the diversity in the continent. Nigeria and Ghana represented Anglophone West-Africa, Kenya and Tanzania represented East Africa, Ethiopia the Horn of Africa, and Zambia and Zimbabwe Southern Africa.The southern African region is experiencing significant economic growth as shown by a 5.1% Gross Domestic Product (GDP) growth average across the 15 member states (SADC Green Economy Strategy, 2015 cited in SADC, 2015). The services, industry and agriculture sectors of the economy contribute approximately 51%, 32%, and 17% of GDP, respectively. Projections indicate a steady but increasing growth rate of between 5 – 8% up to 2025. This positive projection is expected to be anchored on growth in agriculture and mining exports, with emphasis on increased manufacturing and primary industry activity and output, among other regional and national level initiatives (SADC, 2015).

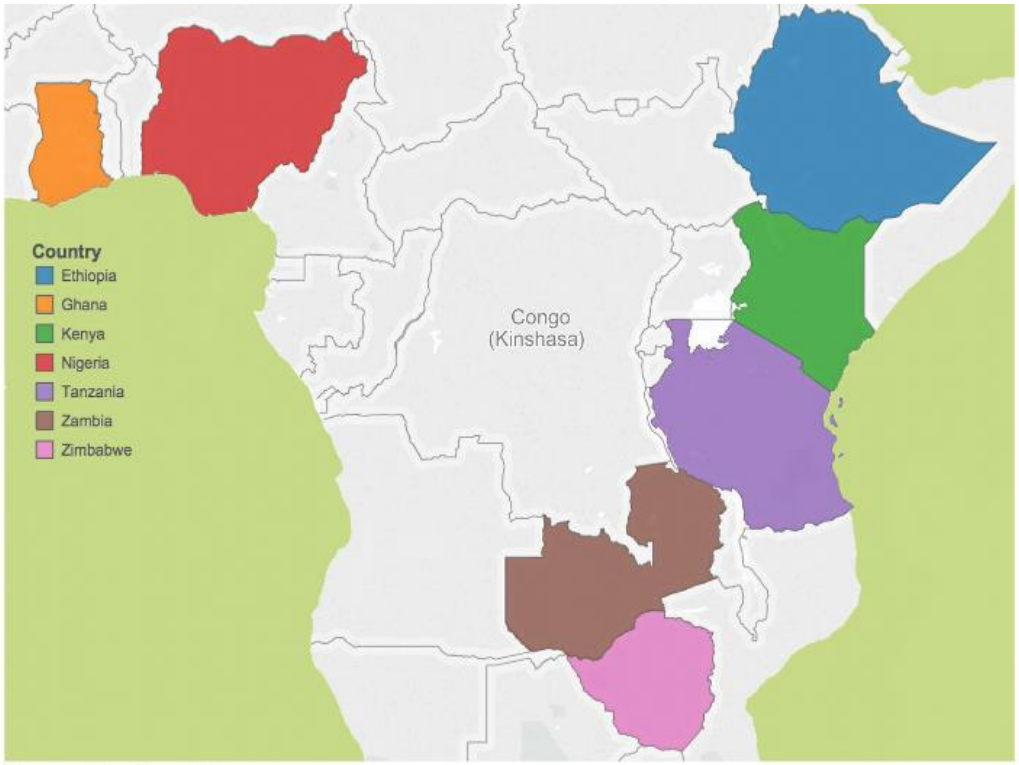


Figure 3: Map of the study area

3.2 DATA COLLECTION AND METHOD OF INVESTIGATION

3.2.1 Stakeholders' analysis

A collaborative process of research, debate, and discussion that draws from multiple perspectives across the entire stakeholder spectrum was used. Experts and professionals in the public sector i.e. Ministries, Departments and Agencies (MDAs), Development Partners, CSOs/NGOs and the academia within AFOLU sectors in the selected countries were identified and interviewed on AFOLU climate change adaptation and mitigation interventions relevant to their respective sectors and countries. The websites of MDAs, CSOs/NGOs, and Research Institutes focused on climate change and renewable natural resources management were visited. These included sites of studies carried out by development partners, CSOs/NGOs and academic institutions on climate change adaptation and mitigation. The names of the relevant experts in these sites were drawn and complemented with the roll of experts from AFF. These constituted the target population for administering the survey instruments. Interactive group discussion sessions were held with the experts within their respective agencies in the course of country visits.

3.2.2 Policy document analysis

A textual analysis of relevant policy documents namely, NDCs, NAMAs, NAPAs, NCCAPs, etc. was carried out with a view to delineating, characterizing and evaluating existing or planned climate change adaptation and mitigation interventions in AFOLU context. This consists of a rigorous analysis of the documents to track extant adaptation and mitigation patterns in the relevant AFOLU sectors (through identifying the key operators, receptors, exposure units, means and types for each adaptation and mitigation interventions) guided by the AFOLU based climate change adaptation and mitigation framework (Figure 2) modified from Eisenack & Stecker (2012). Cross-regional and country comparisons of the adaptation and mitigation patterns were undertaken.

3.2.3 Institutional/agency survey

Two e-questionnaires containing both structured and unstructured questions were designed to obtain data on climate vulnerability patterns, critical adaptation and mitigation interventions. The success levels of given interventions on livelihood improvement, reaching intended beneficiaries, levels of adoption, women participation, resolving the climate change problem and impacts on food, fibre, fuel and timber/NTFP availability were also examined. The questions also sought to evaluate the adaptation and mitigation policies in the given sectors, and the effectiveness of the institutions responsible. The first questionnaire (Instrument 1 – Annex 23) is a corporate questionnaire intended for policy makers and corporately responded to by MDAs, NGOs & CSOs involved in climate change adaptation and mitigation interventions. The second questionnaire (Instrument 2 – Annex

24) was directed to project managers of specific climate change adaptation and mitigation projects intended as case studies of the impacts of such interventions. Three hundred and six (306) copies of Instrument 1 were therefore sent to Heads/Focal persons of AFOLU related MDAs, CSOs, and Research Institutions, while seventy-seven (77) copies of Instrument 2 were sent to specific adaptation and mitigation projects in the countries sampled (Table 1 and 2)

The capacity of Institutions to handle climate change interventions and other related issues vis-à-vis their stated mandates and achievements in the projects or programmes embarked on was assessed using various governance criteria. These criteria include climate change mandate, capacity for adaptation intervention, capacity for climate change mitigation, collaboration with other stakeholders, sole funding of any intervention and information sharing. The assessment covered government establishments - National and State MDAs, academic institutions, and civil society organizations. The websites of these entities were visited to ascertain their capacities based on the stated criteria as reported in their periodicals i.e. newsletters, bulletins and annual reports. The institutional capacity of the agencies was therefore ranked on a six point scale based on their attainment of the six key governance attributes utilized.

3.2.4 Data analysis

The success levels of various adaptation and mitigation interventions were assessed on a weighted scale of 0 – Nil, to 5 – High, and applied to various impact areas on the basis of their effects on livelihood improvement, extent to which target beneficiaries were reached, extent of the adoption and utilization of the interventions, extent of the participation of women and the extent to which the targeted climate change challenge was resolved. . They were therefore evaluated based on the achievement of targeted outcome of the interventions through assigning the weighted scale to the criteria identified from the perspective of decision/policy makers and experts. The scores were transformed to percentages to determine their success levels on their aggregated or specific impact areas. Descriptive statistics as means and standard deviations were calculated and used to analyze the frequency of responses.

The assigned success levels were:

< 20 = No Impact; 20 - < 40 = Very Low; 40 - < 60 = Low; 60 - < 80 = Moderate;

80 - 100 = High.

Data collation and analysis was carried out using Excel and R statistical language. A two-pronged analysis involving aggregate data representing the continent and disaggregated

data for specific scenarios or cross country analysis was adopted. Matrix ranking was used in rating.

Statistical analysis using Pearson Product Moment Correlation Analysis was carried out to establish the relationship between mitigation interventions and food, fuel and fiber (3Fs). The correlation coefficients (r) were used in describing the relationship between variables. The variables used include:

- ✓ Annual Forest area in 1000 ha
- ✓ Annual yield per hectare of food crops (Root, Tubers and Cereals) in tonnes/ha
- ✓ Annual Fuel (Wood Fuel) Production in metric tons (MT)
- ✓ Annual Fiber (Primary fiber Crop-Sisal, Flax, Kenaf, Jute) production in tonnes.

Table 1: Distribution of Instrument 1

Countries	No. Sent	No. Returned
Ethiopia	30	0
Ghana	63	10
Kenya	30	4
Nigeria	70	18
Tanzania	15	3
Zambia	49	8
Zimbabwe	49	5
Total	306	48

Table 2: Distribution of Instrument 2

Countries	No. Sent	No. Returned
Ethiopia	14	0
Ghana	12	3
Kenya	10	5
Nigeria	10	3
Tanzania	4	0
Zambia	17	4
Zimbabwe	10	3
Total	77	18

Source: Authors Field Survey, 2016

CHAPTER 4: RESULTS

The results highlight for aggregate and specific levels AFOLU based climate change impacts, vulnerability patterns and adaptation interventions. The most promising adaptation patterns across the continent were also delineated with their conditions for wider adoption. Case studies on impacts of climate change adaptation and mitigation interventions on food, fuel and fiber are also reported for the continent including existing institutional capacities for climate change governance. Details of data derived from textual analysis of relevant policy documents to track adaptation and mitigation patterns are reported in the annexes. Data derived from the agency questionnaire survey for policy makers and practitioners to highlight the promising adaptation and mitigation interventions are reported in the text. For much of this information however, values from Ethiopia are unreported as no response was received from the survey instruments sent to the agencies concerned (See Tables 1 & 2).

4.1 CLIMATE CHANGE IMPACT AND VULNERABILITY PATTERNS

From the Institutional/ Agency survey, a two-track analysis was carried out on climate change impacts and vulnerabilities patterns which include aggregated impacts for the study area and disaggregated impacts based on country's specific scenarios below highlighted.

4.1.1 Climate Change impacts

Droughts, floods, crop failures and bush fires rank highest among the reported climate change impacts in the continent (Fig. 4). The country specific scenario follows the same pattern with the overall aggregate for the continent.

4.1.2 Climate Change vulnerability patterns

The reported socioeconomic vulnerabilities to the first order impacts of climate change are diverse. The most significant in country specific terms are hunger/food insecurity (Nigeria, Kenya, Zambia and Zimbabwe) and poverty (Ghana and Tanzania) (Fig. 5). Biophysical vulnerabilities are equally diverse with deforestation, land degradation and loss of biodiversity featuring among those of high significance (Fig. 6). The perception of water insecurity is of particular significance to Ghana (Fig. 6).

4.1.3 Vulnerable groups

Several social and resource user groups are reportedly vulnerable to climate change. The most vulnerable among the resource user groups are farmers and livestock grazers/pastoralists, while women top the chart among the social groups (Fig 7). Reference

to rural communities deserves to be mentioned in the groups identified as vulnerable to climate change in sharp contrast to the non-identification of urban communities.

4.1.4 Climate impact by sectors

The critical climate change challenge in the development sectors across the continent were captured (Fig. 8 & 9). Four vital AFOLU related sectors are reported to be affected namely, agriculture, forestry, energy and environment.

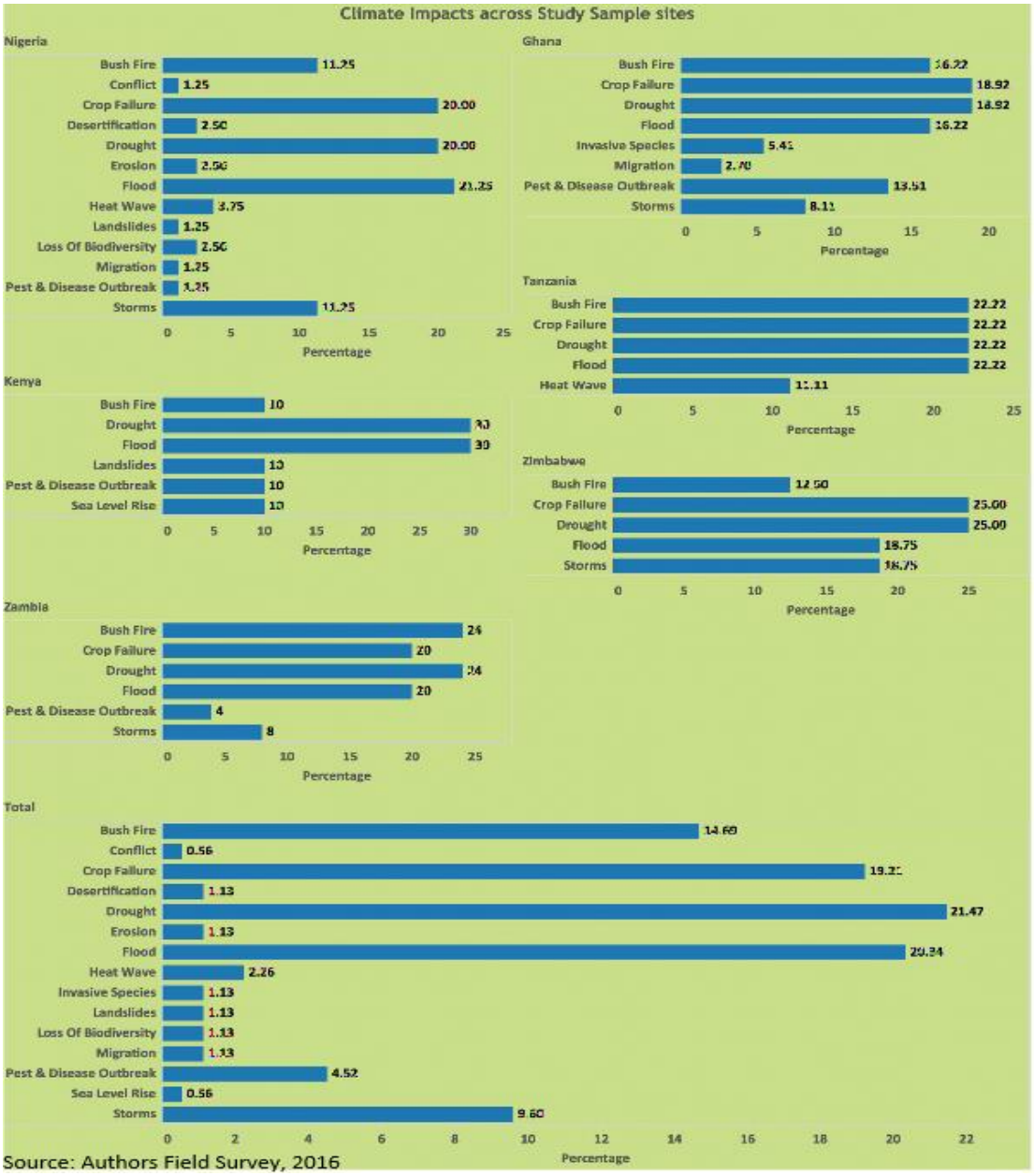


Figure 4: Climate change impacts

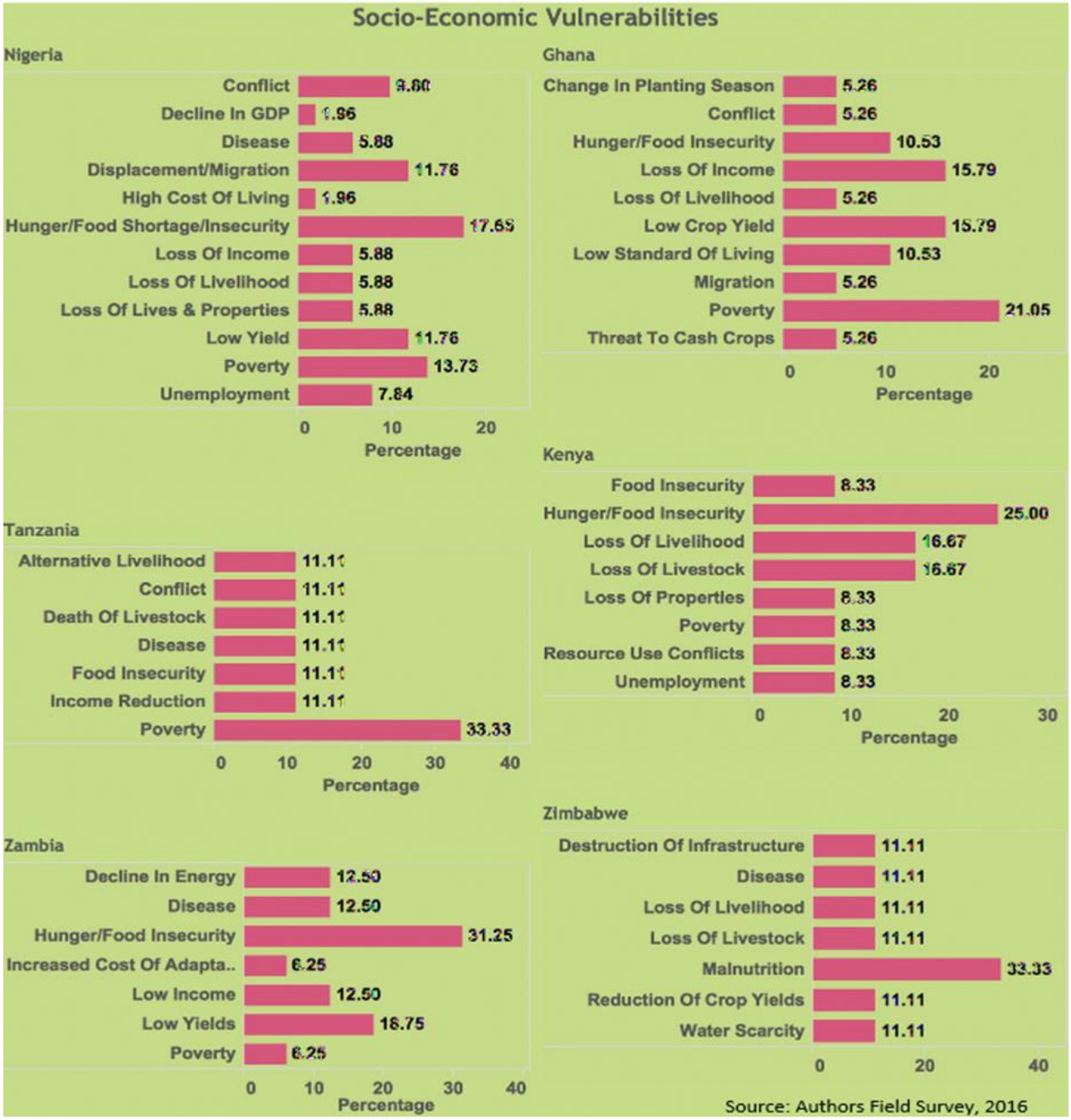


Figure 5: Socio-Economic Vulnerabilities

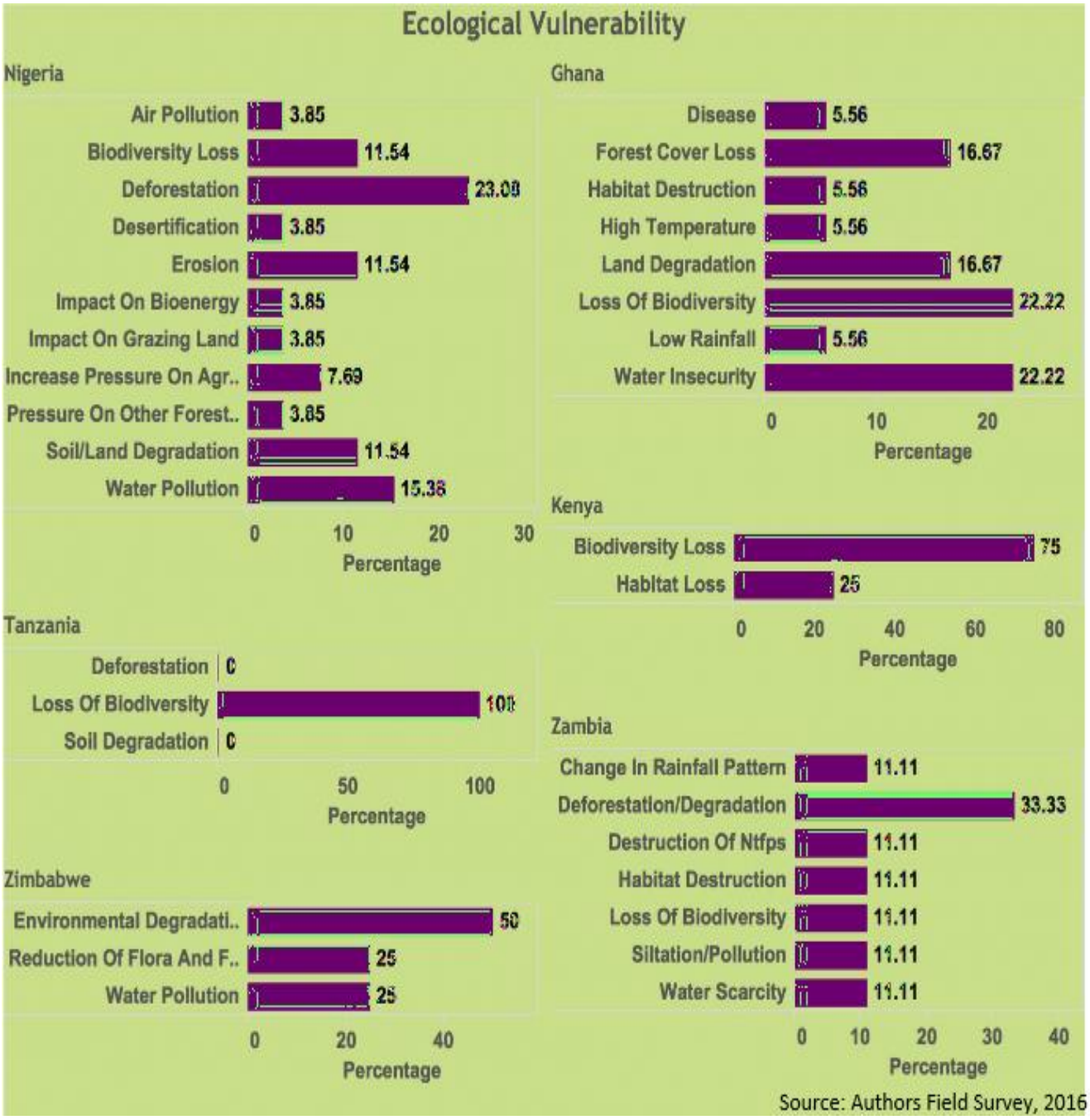


Figure 6: Bio-physical vulnerability

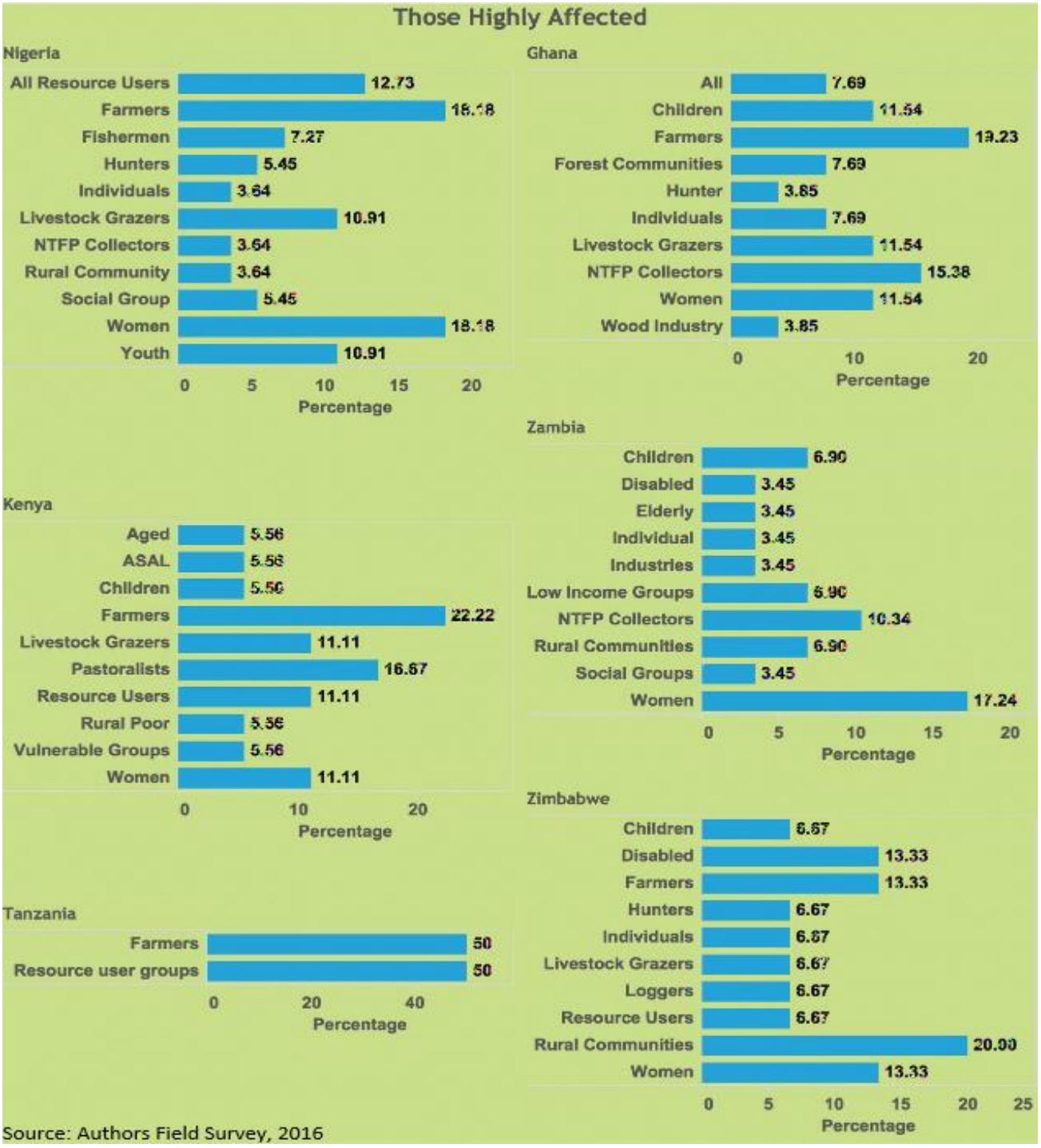


Figure 7: Vulnerable groups

4.2 PATTERNS OF CLIMATE CHANGE ADAPTATION IN AFRICA

This section highlights existing adaptation patterns in Africa in response to major climatic impacts such as droughts and floods in AFOLU sector. Utilizing the stated adaptation interventions from country policy documents as NAPAs, NCCAPs and INDCs, it characterizes the adaptation patterns for the respective countries largely under drought and flood conditions.

4.2.1 Adaptation practices in drought condition in Africa's Agricultural sector

Extant adaptation practices in drought conditions within the agricultural sector are discussed under water resource management, irrigation techniques, drought tolerant cultivars/breeds, conservation agriculture, and early warning systems. It takes note of the operators or implementers that drive each intervention, receptors or adaptation targets, exposure units, means or resources available to the implementers, and the adaptation type in question.

4.2.2 Water resource management interventions

Adaptation interventions for water resources management are either largely planned i.e. driven or implemented by public institutions (government agencies, NGOs, or development partners), or a blend of autonomous (driven by individual, household or community resources and skills that rely on indigenous and local knowledge and planned adaptation. Rainwater harvesting and watershed protection are largely carried out as autonomous interventions, while dams, reservoir construction, boreholes, desilting of reservoirs, river basin management, etc. are planned interventions (Annex 1).

Moreover, water harvesting (in-situ and ex-situ) and storage in dams and reservoirs are common in Ethiopia, Zambia, Kenya and Ghana. In Nigeria, desilting of reservoirs and protection of catchments are given high priority in the southern region with numerous sources of water. In the northern drier areas where water is scarce and surface streams are not large, water management requires a more methodical approach with Suppressants used to reduce evaporation, and reforestation of the catchment. Zimbabwe focuses on Inter-catchment water transfers to move water from areas of abundance to areas of scarcity to improve crop and livestock production. Traditional systems throughout Africa utilize rain water harvesting and catchment protection. In Tanzania, traditional water harvesting techniques adopts the excavated bunded basins

4.2.3 Irrigation interventions

Irrigation adaptation interventions are largely autonomous in Ethiopia, Ghana and Nigeria with some elements of the planned intervention in the case of the furrow irrigation system. For the east and southern African countries of Tanzania, Zambia and Zimbabwe these interventions are largely driven by public agencies and or in cooperation with CSOs/NGOs (Annex 2).

Furrow irrigation is commonly used in Ethiopia and Nigeria because it is economical and reliable. Whereas Zambia, Kenya share the same characteristics in irrigation system through the construction of dams. However, in the arid and semi-arid zones of Zambia, a new practice is irrigating during the night hours due to reduced water table which pose challenge to irrigation.

In Zimbabwe, sprinkler and surface irrigation system are common Ghana irrigation intervention is unique in some areas with the building of multipurpose dams for hydroelectricity generation, fishing and irrigation. While the arid and semi-arid areas the digging of shallow wells is predominantly used. In Tanzania, irrigation practice is characterized by reliance on gravity-fed irrigation schemes through the run-of-the river water.

Traditionally, Ethiopia and Tanzania rely on diversion of surface water from streams to farmlands. This involved cultivation in valleys bordering rivers and streams, so that in dry seasons the water can be diverted to the farms. Specifically, in Tanzania, the system is traditionally called “Ntambo” as described in (Matee, 2000 and Kato 2001 in Shemdoe, 2011). Africa has large numbers of smallholder farmers, most of who produce under unfavorable conditions characterized by low and erratic rainfall and poor soils (Mutsvangwa, 2011). Irrigation is therefore a major adaptation measures mostly carried out to boost cereals and grains production.

4.2.4 Drought tolerant cultivars and breeds

These interventions in most parts of the continent are exogenous and planned being driven by research institutes, international development partners and MDAs. They are therefore highly resourced with reasonable funding support (Annex 3).

The Drought Tolerant Maize for Africa Project is a typical example of drought intervention projects which has contributed tremendously towards improving seed system in sub-Saharan Africa for the past years between 2007–2015, the introduction of drought-tolerant maize hybrids and open-pollinated varieties help farmers within 13 African countries in eastern, west and southern Africa (Angola, Benin, Ethiopia, Ghana, Kenya, Malawi, Mali, Mozambique, Nigeria, Tanzania, Uganda, Zambia and Zimbabwe) cope with drought condition cereals and grains farming. In 2014 alone, the project supported production of

nearly 54,000 tons of certified DT maize seed benefitting an estimated 5.4 million households (43 million people) across the project countries (DTMA, 2013; Buah et.al, 2013). In Ghana, the cultivation of drought tolerant species include species that are tolerant to Striga (a parasitic weed that affects cereal crops, especially maize and sorghum)

4.2.5 Early warning systems

Most countries have weather monitoring and information systems to provide data to resource users on drought and flood conditions. They are therefore planned interventions driven by public agencies and reasonably funded. In Africa, the timeliness and availability of data sharing is of grave concern. The hallmark is making meteorological data available to farmers. The indigenous knowledge systems for weather conditions are also utilized but hardly integrated with the scientific systems of monitoring weather. They are however utilized by local resource users necessitating the need for synergies between both systems (Annex 4).

4.2.6 Agroforestry interventions

Agroforestry interventions perhaps more than any other can be considered a climate change adaptation as well as mitigation strategy. It is here discussed as an adaptation tool with tremendous mitigation benefits (Annex 5).

Agroforestry systems exist as either planned adaptation interventions driven by public agencies, NGOs and development partners such as, the selection and mass production of fast growing trees on farm lands or yet as autonomous adaptation relying on indigenous knowledge as the mixed tree and crop farming in Ghana or the fodder banks and pasture management in Nigeria that is a blend of autonomous and planned adaptation intervention.

In almost all the countries, particularly Zambia and Ghana, agroforestry is carried out to enhance regeneration of degraded areas and it is interwoven with alternative livelihoods such as bee-keeping and mushroom to diversify farmers' income and forestry extension. Apart from planting of hybrid species, the practice of agroforestry evolves from the traditional knowledge. Agroforestry helped farmers to reduce vulnerability and increase productivity (Thorlakson and Neufeldt, 2012).

4.2.7 Adaptation practices in flood conditions in Africa for Agricultural sector

Adaptation interventions in flood prone areas of Africa are highlighted in (Annex 6). These interventions essentially comprise of construction of dams and ponds, timing of planting seasons, use of species with short maturing period, embankment along coastal areas and inter-basin water transfer to areas of scarcity among others

4.2.8 Adaptation practices in drought condition in forestry Sector

Adaptation patterns in the forestry sector under drought conditions are presented in Annex 7. Common forms of forestry sector adaptation in drought conditions include the control of forest fire, woodlot establishment, and shelter belts against desertification, alternative energy, alternative livelihood and watershed management. They are largely planned adaptation driven by government agencies with the exception of control of forest fire and agroforestry that are both autonomous and planned.

4.2.9 Adaptation practices in flood condition in Forestry Sector

Adaptation interventions in flood prone areas of the study region are largely planned, direct and driven by public agencies in practically all countries investigated. These projects range from protecting riparian vegetation and area enclosure for gully re-vegetation practised in Ethiopia, watershed and river basin management in Nigeria, Tanzania, Zambia and Zimbabwe, to wetlands and natural flood plain protection practised in Ghana and Kenya. The interventions are resourced by governments and NGOs intended to aid communities whose livelihood systems are prone to flood related hazards. Unfortunately, however, the adaptation interventions in the expressed NAPA and NAMA documents for areas exposed to floods do not take into consideration the role of indigenous knowledge systems and autonomous interventions in dealing with the challenge (Annex 8).

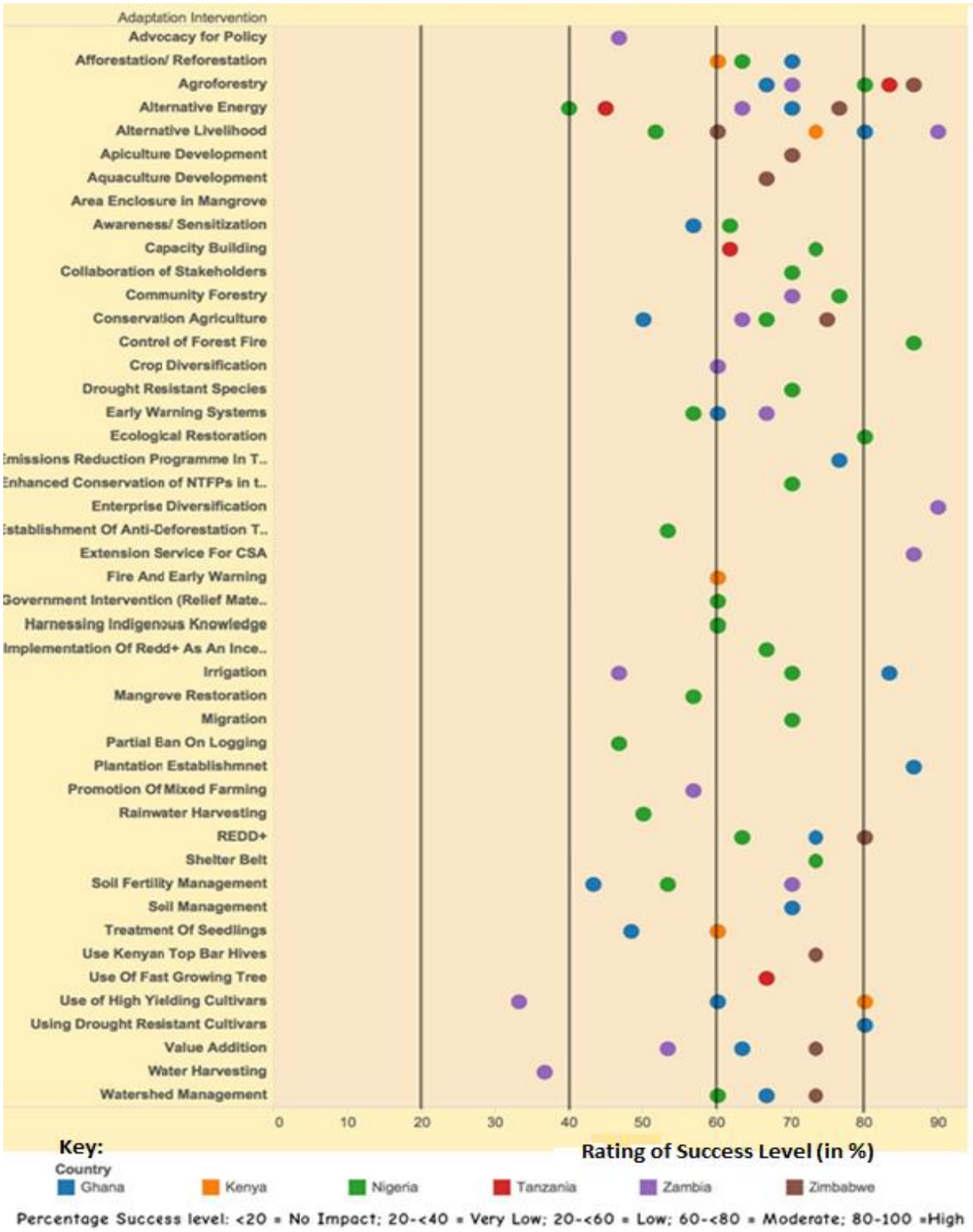
4.3 PROMISING PRACTICES ON AFOLU BASED ADAPTATION MEASURES AND CONDITIONS FOR THEIR WIDER ADOPTION

The most successful adaptation interventions were determined by a pooled or aggregated rating of each intervention on the basis of their effects on livelihood improvement, extent to which target beneficiaries were reached, extent of the adoption and utilization of the interventions, extent of the participation of women and the extent to which the targeted climate change challenge was resolved. The assessments using the criteria identified were rated by policy makers and project managers based on their perceived impacts. The result is presented in Figure 8.

At aggregate levels of generalization on a continent-wide basis, eleven climate change adaptation interventions are deemed highly successful attaining the score of 80% and above on the weighted scale. They are:

- ✓ Agroforestry – Nigeria, Tanzania, Zimbabwe
- ✓ Alternative Livelihood - Ghana, Zambia
- ✓ Control of Forest Fire - Nigeria
- ✓ Ecological Restoration - Nigeria
- ✓ Enterprise Diversification - Zambia
- ✓ Extension Services for Climate Smart Agriculture - Zambia
- ✓ Irrigation - Ghana
- ✓ Plantation Establishment - Ghana
- ✓ REDD+ - Zimbabwe
- ✓ Use of High Yielding Cultivars/Breeds - Kenya
- ✓ Use of Drought Resistant Cultivars - Ghana

The above therefore represent the most successful and promising adaptation interventions in the continent from the perspective of the policy makers and practitioners



Source: Author's Field Survey, 2016

Figure 8: Adaptation intervention success levels

4.3.1 Women participation in adaptation interventions

Participation of women is one of the criteria used in assessing successful levels of adaptation interventions across the different countries. The assessment considered among other things the ratio of women to men involved in the interventions, the number of women that take part in such interventions relative to the population of women and the rate of adoption of the interventions in percentage. Women are extensively involved in interventions attaining a success rating of ≥ 80% in farming and forestry related activities, their participation and adoption of the adaptation practices determines wider adoption that can easily spread. Figures 9a & b respectively, highlights the extent of women participation in adaptation interventions at aggregate and country specific levels.

4.3.2 Conditions for wider adoption of adaptation practices

The most significant reasons advanced for the wider adoption of the more successful adaptation interventions are shown in Figure 10. The circles are proportional to the rating in percentage of the adaptation practices. The more obvious being, easy to adopt in cost and technique, community support and participation, more directly addressing the needs of people, and more obvious results.

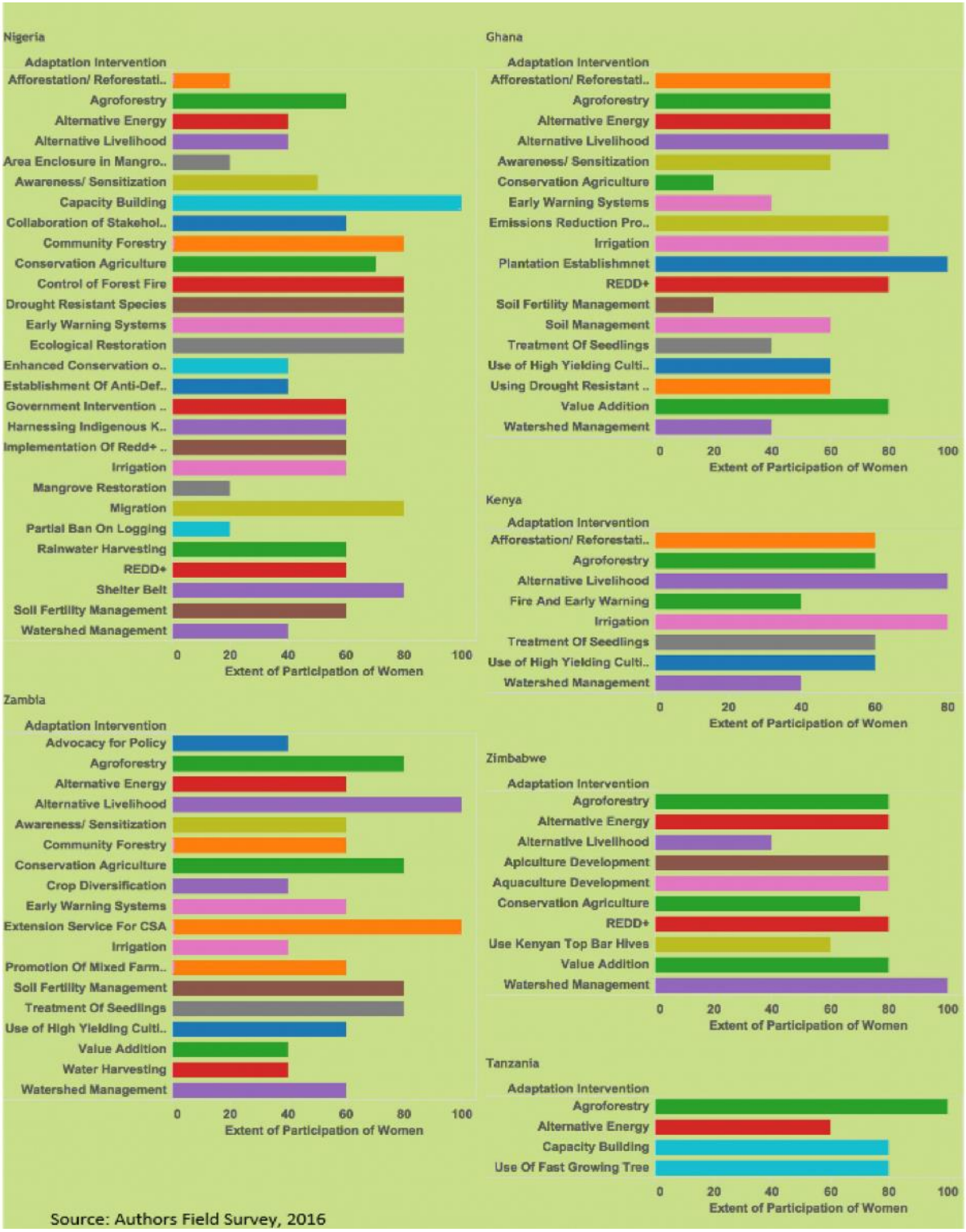


Figure 9a: Extent of Women Participation in Adaptation at Aggregate Levels

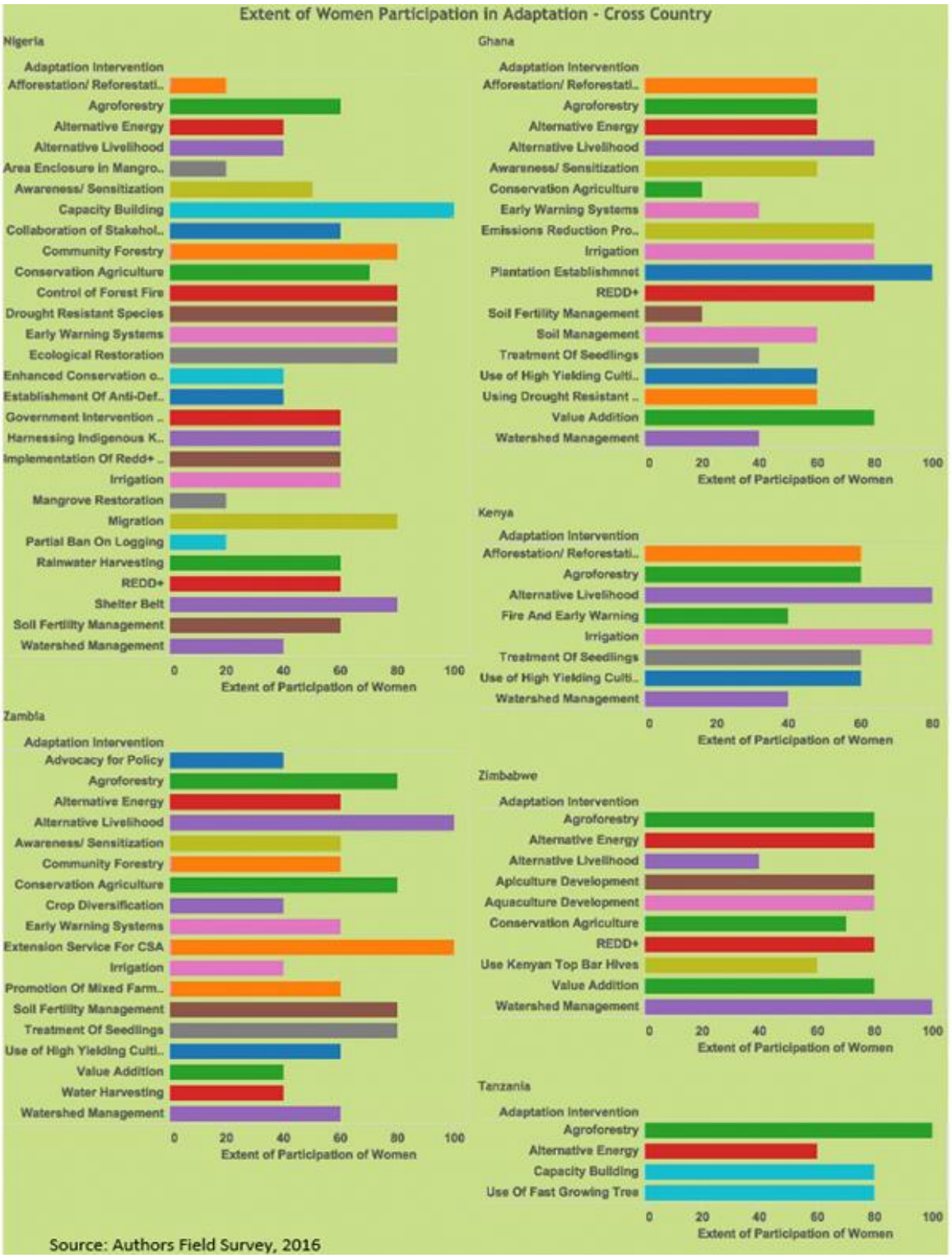


Figure 9b: Extent of Women Participation in Adaptation – Cross Country

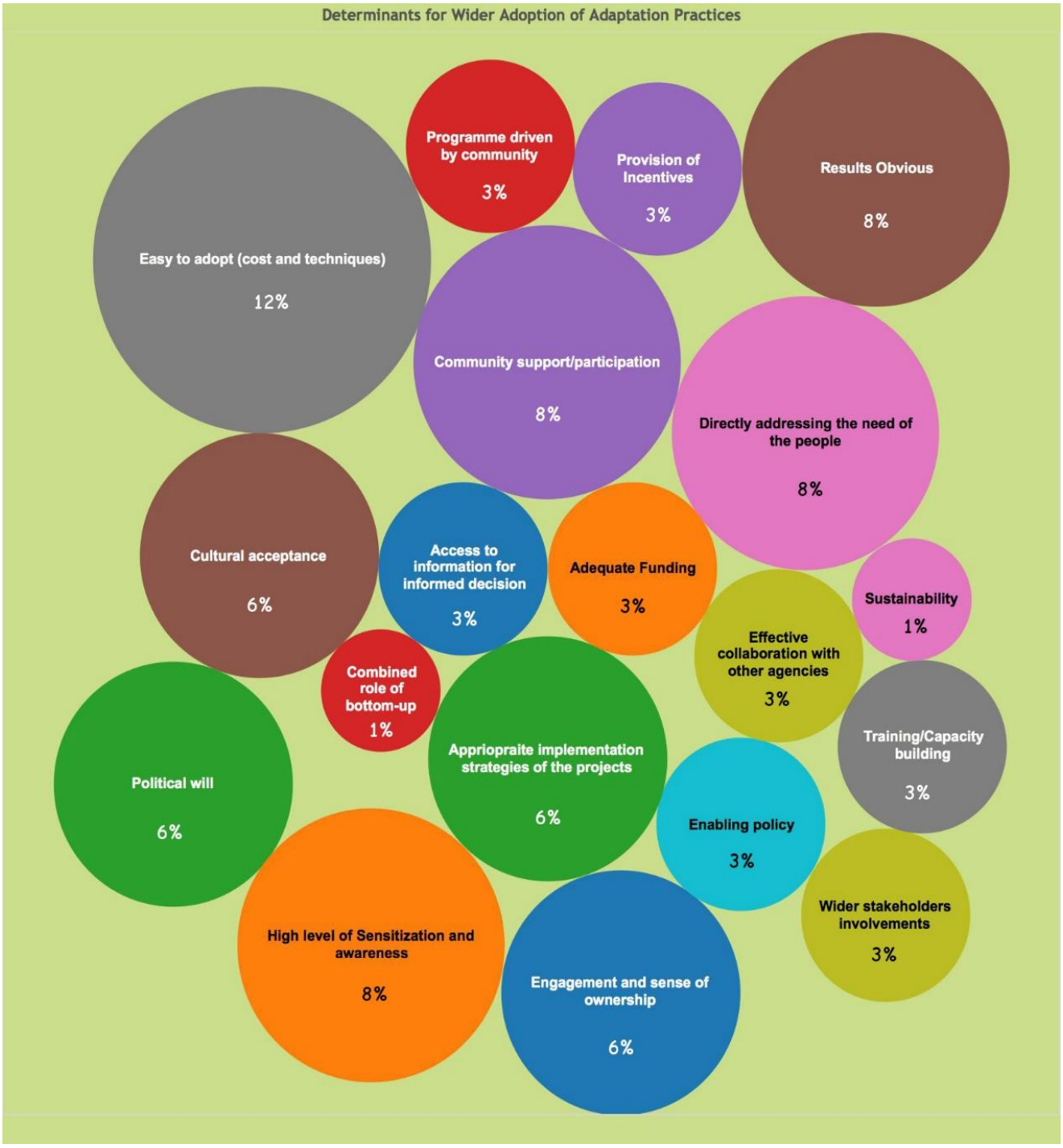


Figure 10: Determinants for Wider Adoption of Adaptation Practices

Source: Author's Fieldwork, 2016

4.3.3 Barriers to successful adaptation

Low adoption of adaptation interventions was attributed to the following most significant barriers, in descending order of importance: poor community engagement, poor perception, not considered relevant, inadequate funding, cultural barriers and cost/technology barriers (Fig. 11). These barriers are consistent with the theoretical postulations by Eisenak & Steker (2012). The replicability of the more successful adaptation interventions across the continent must therefore take into consideration the need to maximize what made them successful and minimize the reported constraints to their wider adoption.

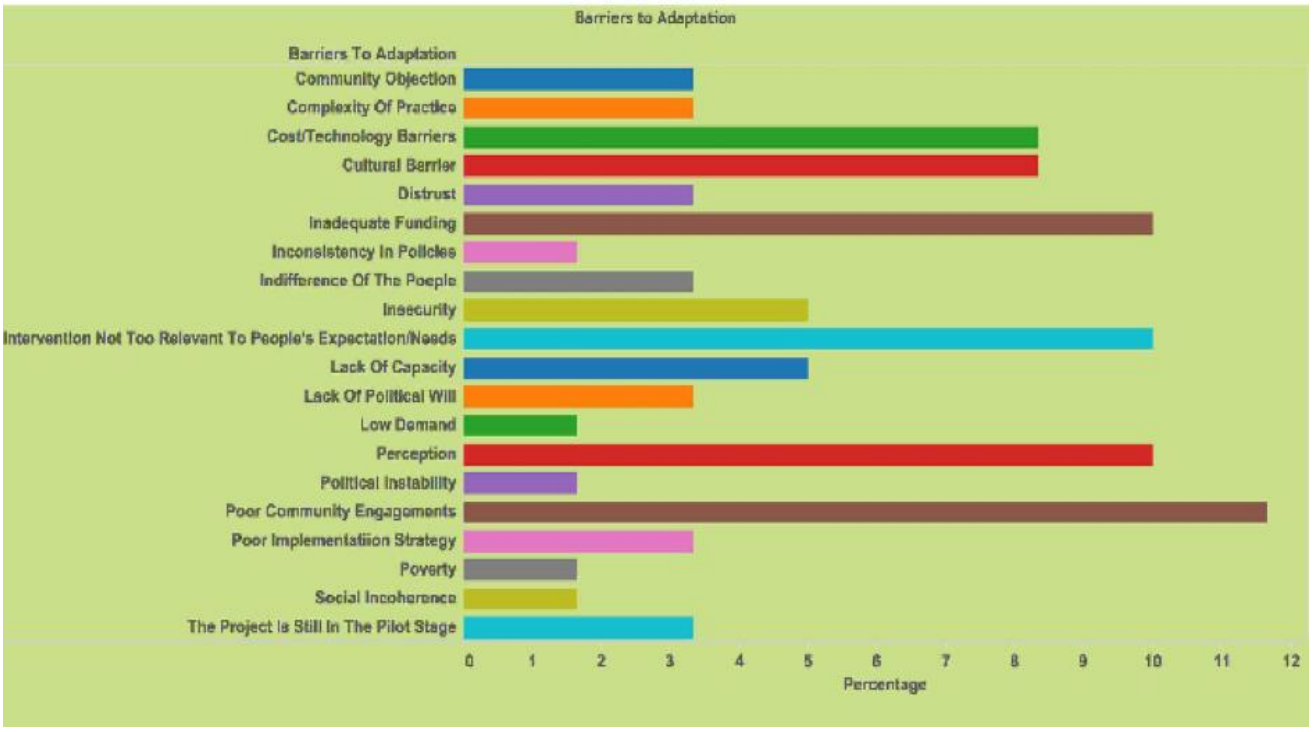


Figure 11: Barriers to Adoption of Adaptation Interventions in Anglophone African countries studied. Source: Authors Field Survey, 2016

4.4 AFOLU- BASED MITIGATION INTERVENTIONS AND DETERMINANTS FOR THEIR WIDER ADOPTION

Forest-based mitigation approaches include activities that increase the sequestration of carbon and also those that reduce greenhouse gas emissions to the atmosphere from forest related operations. The extant and promising AFOLU based mitigation interventions are highlighted in this section. This is based on the stated mitigation interventions from country policy documents as NAMAs, NCCAPs, INDCs, etc., and characterizes the mitigation patterns for the respective countries largely under drought and flood conditions.

4.4.1 Extant mitigation patterns in AFOLU

4.4.1.1 Conservation agriculture

Conservation agriculture serves the dual purpose of climate change mitigation and adaptation. Annex 9 highlights the varied forms of this intervention for the continent. These practices essentially comprise of zero or minimum tillage and use of cover crops, crop and livestock integration, intercropping, soil fertility enhancement via crop residue application, crop rotation, etc. They play important roles in sequestering carbon in soil, in addition, the use of organic manures, planting legumes, use of crop residues and recycling wastes of plants and animals help return nutrients to top soil. Throughout the continent, these adaptations are autonomous systems built on local traditional knowledge. They are largely operated by individual farmers and farm families and supported through farmers' resources. In some cases, NGOs, governments and development partners provide support.

4.4.1.2 Afforestation and reforestation

At the heart of climate change mitigation intervention in the forestry sector are varied forms of afforestation/reforestation programmes. These range from ecosystem rehabilitation projects through tree planting in degraded areas as practised in Ethiopia, Tanzania, Kenya, Zambia and Zimbabwe; tree planting as shelter belts to stem desertification in Nigeria; afforestation for bio-energy purposes in Ghana and Zambia, to sundry interventions as Bamboo development, area enclosure for natural regrowth and forest enhancement programmes. They are largely planned interventions implemented by MDAs, NGOs and development partners (Annex 10) and resourced with budgetary provisions from the implementing agencies. Some of the species are exotic including species as Gmelina arborea and Tectona grandis.

4.4.2 Forest protection mitigation interventions

The forest reserves and national parks across the continent legally authorized to protect and or sustainably manage forests represent climate change mitigation interventions. The mitigation interventions for forest protection (Annex 11) are planned and largely implemented by governments and in some cases NGOs and development partners. The main issue in forest protection/ conservation is the enforcement of forest laws to reduce incursion on forests.

4.4.3 Alternative energy interventions

Alternative energy interventions in various forms of bio-fuels play a crucial role in both adaptation and mitigation to climate change. Annex 12 provides a profile of these interventions across countries in the study sample. They are largely planned interventions implemented by MDAs, NGOs and development partners.

Unfortunately, however, these forms of mitigation and adaptation interventions are more in policy documents than in concrete practise.

4.4.4 Promising mitigation measures and determinants for wider adoption

The most promising of the mitigation interventions were determined by a pooled or aggregated rating of the success levels of each intervention derived from the scores provided by the relevant experts utilizing the scale provided (see methodology section) on the basis of their effects on livelihood improvement, extent to which target beneficiaries were reached, level of adoption and utilization of the interventions, extent of women participation and the extent to which the targeted climate change challenge was resolved. The result is presented in Figure 12. Agroforestry clearly tops the chart as the most successful mitigation intervention evident by its very high rating in many countries

4.4.5 Women participation in mitigation interventions

Some mitigation interventions have very high level of women participation. Among such are agroforestry interventions in Kenya and Tanzania; forest conservation in Kenya and Zimbabwe; conservation agriculture in Zimbabwe; and integrated crop management in Zambia (Figure 13). Women participation in local level water and forest management enable them to contribute to the household livelihoods and ensure effective management of resources using their skills. This is worth scaling up and replicating for a resilience-building strategy in other areas (MoSTE, 2015; Gurung & Bisht, 2014; Kiplot and Franzel, 2012).

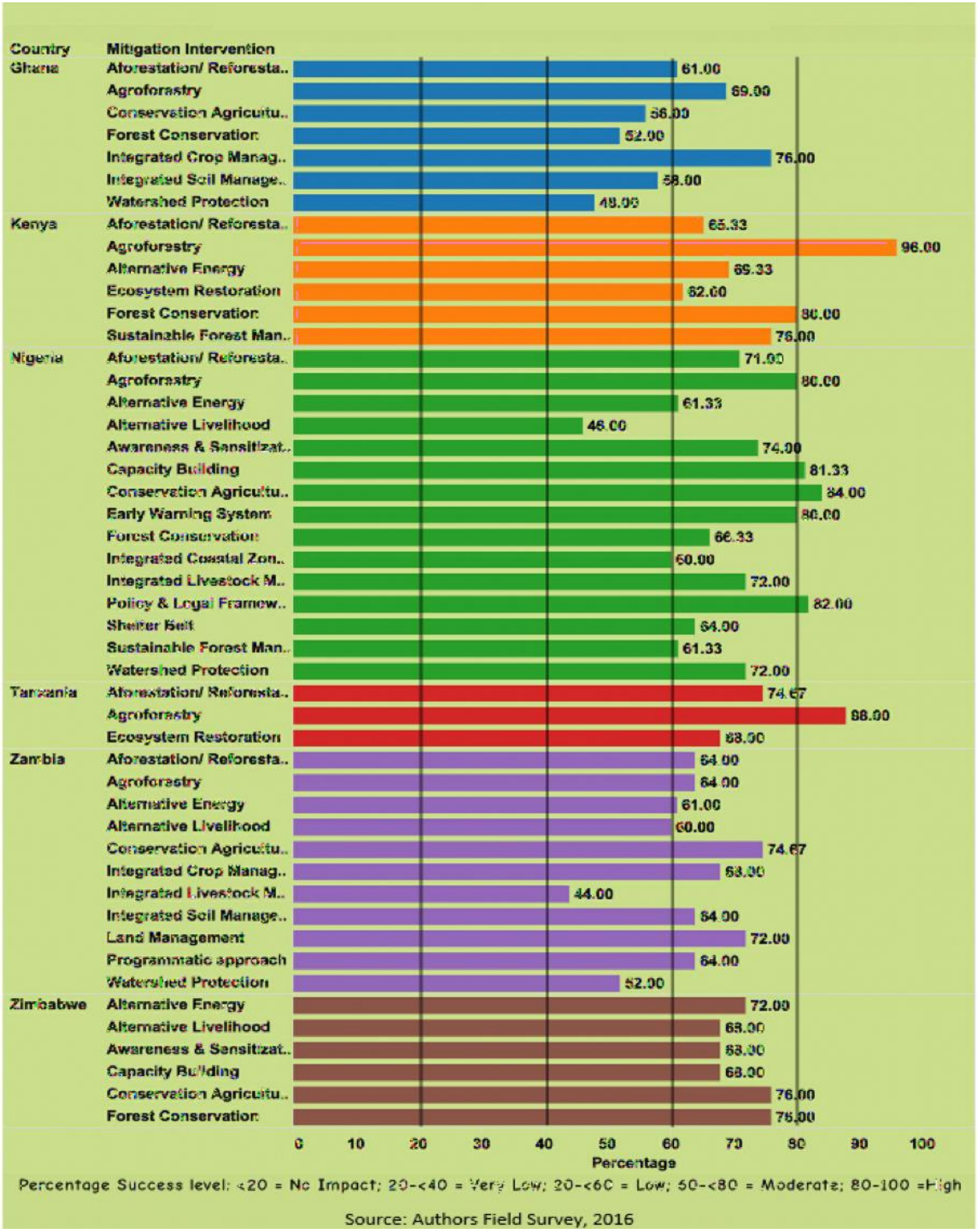


Figure 12: Promising Mitigation Measures by Country

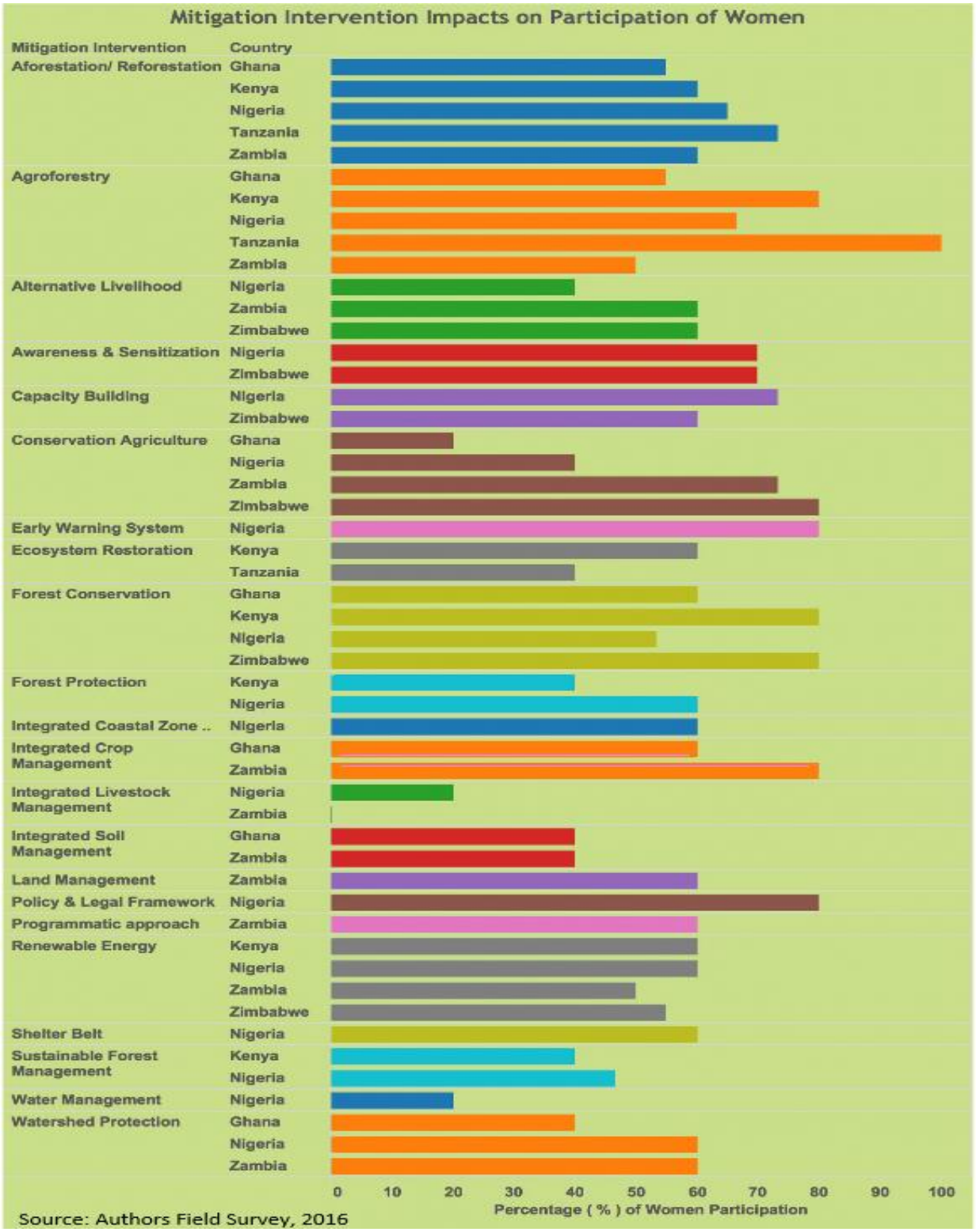


Figure 13: Mitigation Intervention Impact on Participation of Women

4.4.6 Determinants for wider adoption of successful mitigation interventions

Conditions for wider adoption of promising mitigation interventions are shown in Figure 14. These in descending order of priority include peoples' preference, addressing needs, involvement of community stakeholders, provision of incentives, training and capacity building and adequate funding among others.

4.4.7 Barriers to successful intervention and wider adoption

Where the success level of a given intervention is considered low, the commonly alluded to barriers in descending order of importance (Figure 15) are inadequate funding, lack of stakeholder engagement and high cost of implementation. Others low technical capacity, lack of incentives/facility, lack of an implementation strategy/plan, and cultural inhibitions.

This is consistent with the adaptation theory put forward by Eisenack & Stecker (2012) which can be applied to mitigation, where barriers are linked to 'Missing Means' such as lack of funding or misapplied resources where they exist. Low institutional capacity, unwillingness to adapt through cultural inhibitions or ignorance and misinformation are among the barriers captured by the theory.

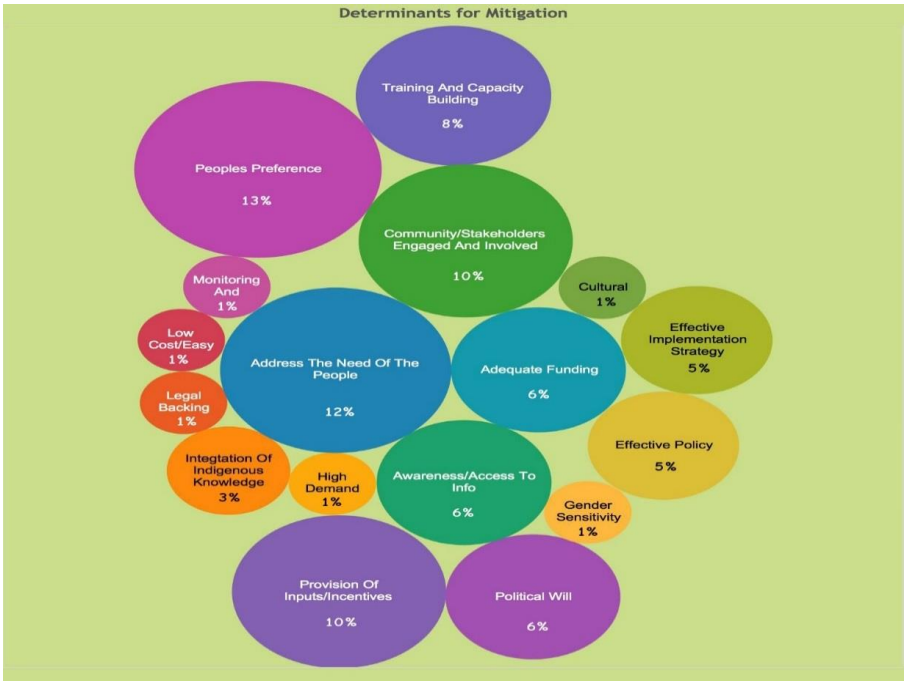


Figure 14: Determinants of success of Mitigation interventions in Anglophone African countries studied.
Source: Authors Field Survey, 2016.

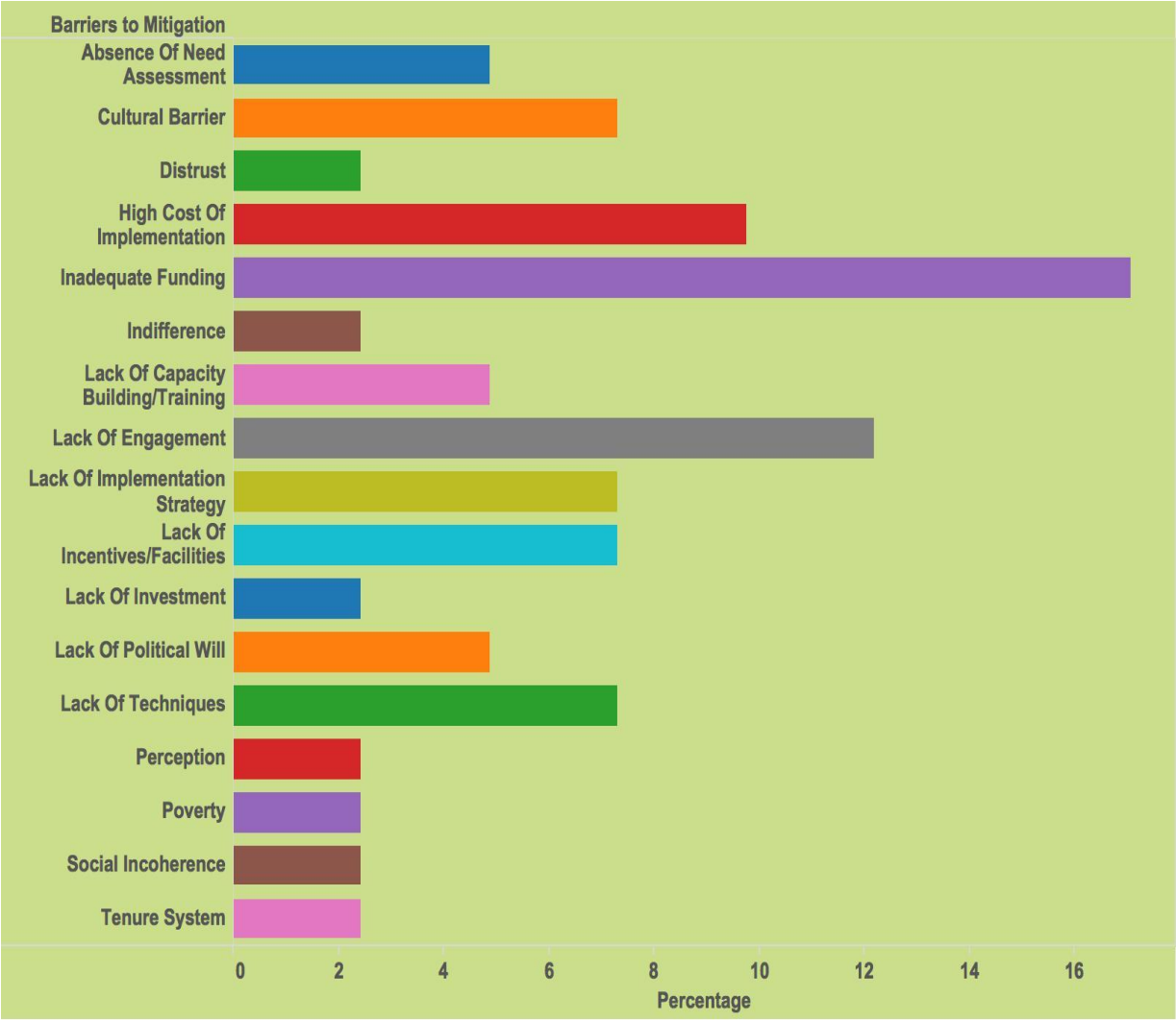


Figure 15: Barriers to wider mitigation adoption of intervention

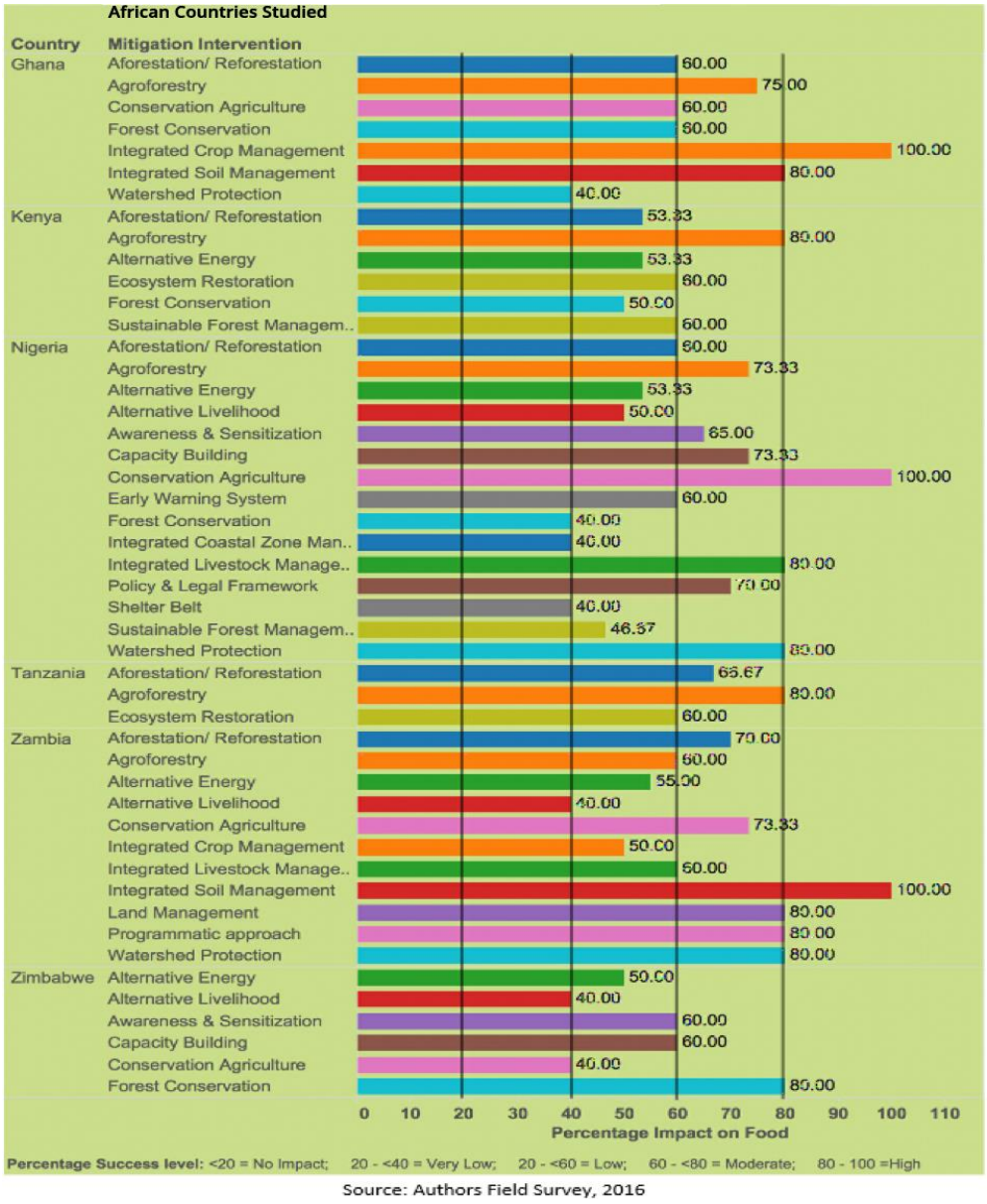
4.5 IMPACT OF AFOLU MITIGATION ACTIVITIES ON FOOD, FUEL AND FIBER PRODUCTION

This section highlights the impact of AFOLU based mitigation practices on food, fuel and fiber production. It utilizes both survey data and production statistics to draw inferences on these relationships.

4.5.1 Food

Figure 16 shows result of survey data on the perceived impact of mitigation activities on food production. The mitigation activities thought to have impact on food production are

those related to crop and livestock management, conservation agriculture and water resource management. Though, perception differs across the continent, in general terms Agroforestry system is perceived to have the highest positive impact on food production. Other mitigation interventions with high (positive) impact include watershed protection, forest conservation, and afforestation/reforestation. Agroforestry system which is highly practised by different countries is characterized by mixed trees with annual crops, woody perennials integrated with crops and/or animals on the same parcel of land to produce food, feeds and other multiple benefits.



Source: Authors Field Survey, 2016

Figure 16: Perception of level of positive impact of mitigation interventions on food production in Anglophone countries

4.5.2 Fuel

The relationship between AFOLU mitigation interventions on fuel production from the view point of policy makers and practitioners are provided in Figure 17. While country level differences may be evident on the mitigation interventions thought to impact fuel biomass production, the common thread for most countries allude to the relationship between forest based interventions as afforestation/reforestation (in Kenya, Tanzania, Zambia), forest conservation (in Ghana, Kenya and Zimbabwe), and Agroforestry (in Kenya, Nigeria and Tanzania), as being highly successful in influencing fuel biomass production.

Africa is largely dependent on fuel wood for energy, which has increased the rate of deforestation over the years. Alternative energy is critical for reducing the rate of deforestation and emission thereby increasing forest enhancement. Woodlots of Jatropha and Bamboo are developed for bio-fuel such as in Zambia and Ethiopia as well as other species for sustainable charcoal production as obtained in Ghana and Tanzania. Other forms of energy include use of ethanol and Liquefied Petroleum Gas (LPG) stoves, and electric stoves, Methane gas capture in landfill in Kenya and use of off grid renewable energy technologies for rural electrification as decentralized systems in Nigeria.

4.5.3 Fiber

The links between AFOLU based mitigation interventions and fiber production is highlighted in Figure 18. Basically, agriculture related interventions as agroforestry, conservation agriculture, integrated livestock management and water management/watershed protection are considered highly successful in promoting fiber production.

4.5.4 Case studies on impact of AFOLU based climate change adaptation/mitigation projects on food, fuel and fiber

Samples of AFOLU-based climate change adaptation and mitigation projects across the continent were qualitatively assessed for their perceived impact in advancing the production of food, fuel and fiber (3Fs). Their effectiveness in advancing the 3Fs was assessed on a five-point scale of 1 – Low to 5 – High. The rating was based on the objectives of the projects which included: alternative livelihoods; ecological restoration; women empowerment and capacity building; sustainable resource utilization; agroforestry; natural resource management; reducing carbon emission, and renewable energy provision. Generally speaking, climate mitigation intervention projects are adjudged more effective with respect to enhancing food and fuel production and less on fiber

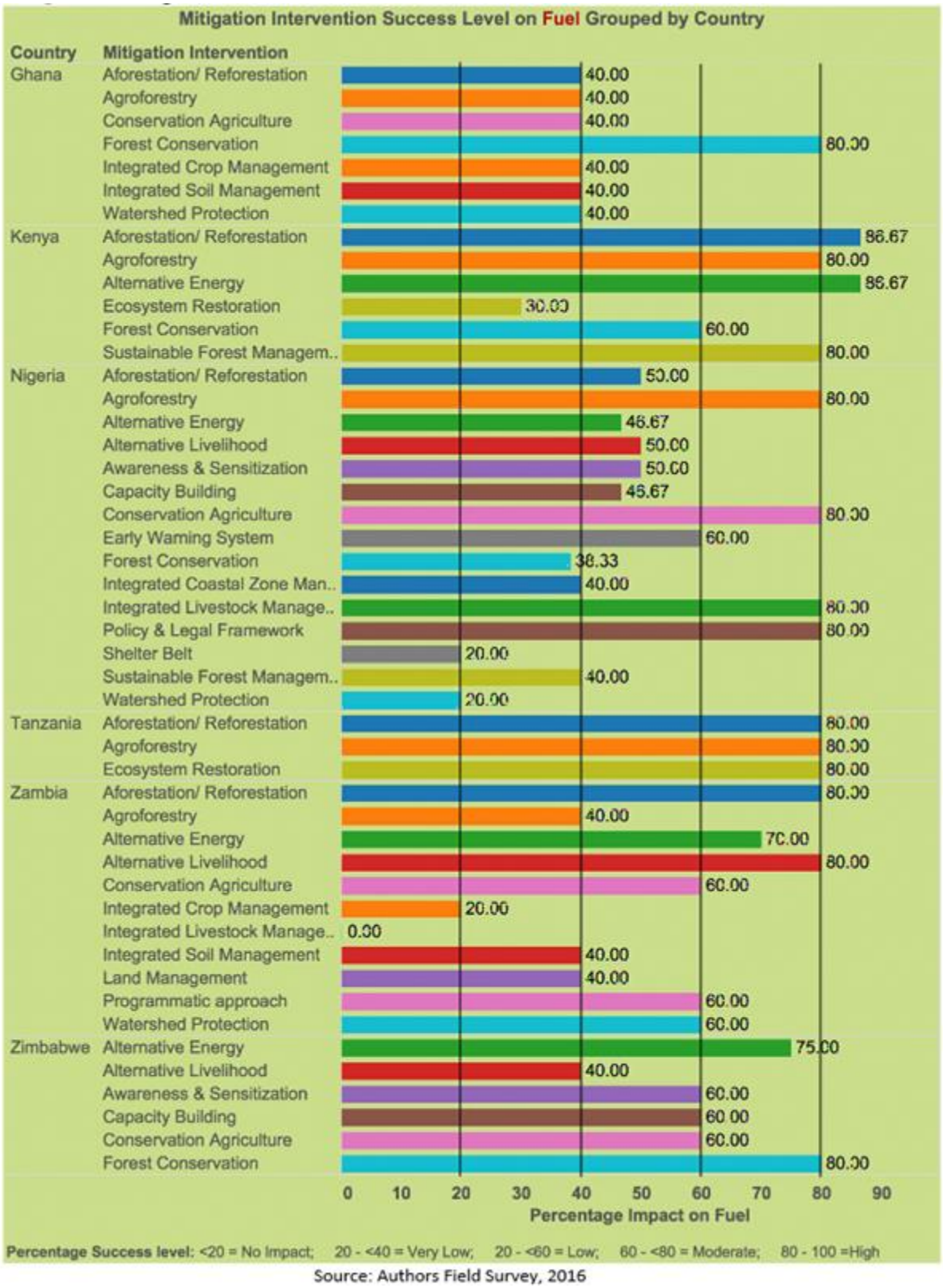
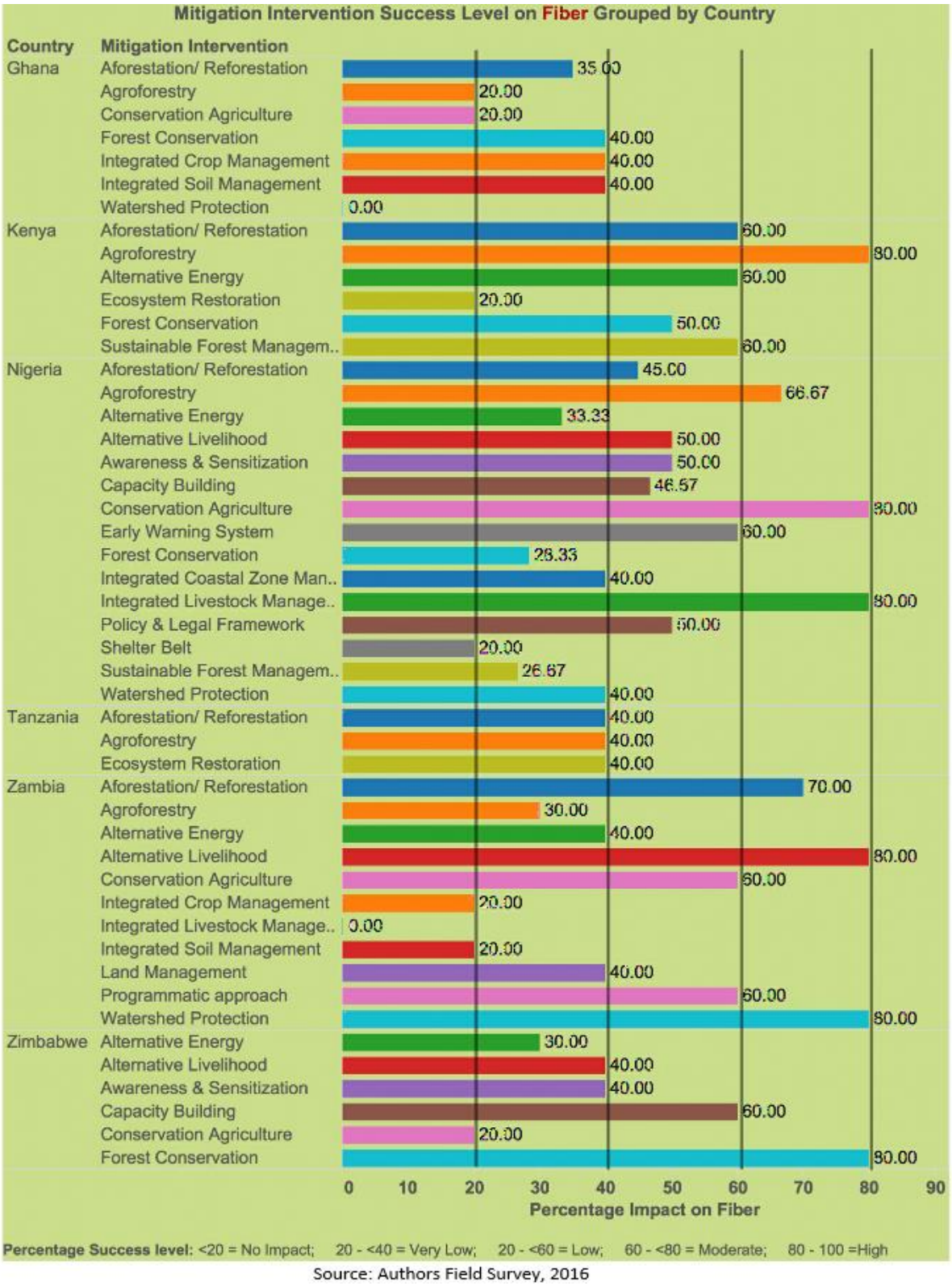


Figure 17: Mitigation intervention success level on fuel



Source: Authors Field Survey, 2016

Figure 18: Mitigation Intervention Success level on Fiber

4.5.5 Correlation analysis of the links between climate change mitigation activities on food, fuel and fiber production

4.5.5.1 Impacts of Mitigation on 3Fs

The impact of mitigation intervention on 3Fs (Food, Fuel and Fiber) was explored using correlation analysis of data from countries in the study sample, culled from FAO STAT, 2015. The variables used and their unit of measurement includes:

- Annual Forest area in 1000 ha
- Annual Yield in tonnes/per hectare of food crops (Root, Tubers and Cereals)
- Annual Fuel (Wood Fuel) Production in metric tonnes (MT)
- Annual Fiber production (Primary fiber Crop-Sisal, Flax, Kenaf, Jute)

The product moment correlation analysis was applied to the annual statistics (2000 to 2015) of variables expressed above.

4.5.5.2 Impact on food

A negative correlation between forest area and food production was obtained in all the countries except in Ghana and Kenya. For instance, in Ethiopia, the relationship between forest area and food production was negative and statistically significant (correlation coefficient (r) =-621; $p<0.05$);

The implication is that, as food production increases annually, forest area diminishes Thus; mitigation actions have not been effective viewed in relation to food production trends. However, the relationship is positive and statistically significant in Ghana ($r=0.957$; $p<0.05$) and Kenya ($r=0.841$; $p<0.05$). This means that increasing yield/productivity of food is not at the expense of forest area, implying that mitigation efforts have been effective in both countries.

4.5.5.3 Impact on Fuel

The relationship of forest area with fuel wood production shows a perfect negative relationship in Nigeria ($r=-1.000$; $p<0.05$) and Zambia ($r=-1.000$; $p<0.05$). In Ethiopia, Tanzania and Zimbabwe, the correlation is also negative and statistically significant. This indicates that fuel wood production increases at the expense of forest area. The exception is in Ghana (0.999; $p<0.05$) and Kenya (0.909; $p<0.05$) with positive correlation, signifying

effectiveness of mitigation measures with positive impact on fuel wood without undermining forest growth in forest estates.

4.5.5.4 Impact on Fiber

The relationship between forest area and fiber production was not statistically significant except in Ghana with significant negative relationship ($r=-0.689$; $p<0.05$) and Nigeria ($r=0.541$; $p<0.05$) with significant positive relationship. Other correlation coefficients show no significant relationship. This implies that fiber production has no clearly discernable relationship with forest mitigation measures.

4.6 NATIONALLY APPROPRIATE MITIGATION ACTIONS (NAMAS) IN THE FORESTRY SECTOR

NAMA, is considered to be a key policy tool for developing countries to address their emissions reductions through the identification of specific mitigation actions and developing detailed plans to implement these actions (Sharma and Desgain, 2014). Different mechanisms, such as the REDD+ mechanism, have been adopted by countries in reducing emission, to implement NAMA. Some have used their forest management/protection strategies (Bockel, 2011). International efforts at finding solutions to climate change have recognized the role of adaptation as a policy option (Pielke et al., 2007).

4.6.1 Applied Policies in Forest NAMA

This section provides assessment of policies and best practices of mitigation actions in the forestry sector expressed in country NAMA and INDC documents. The tracking of the respective priority actions, strategies, and enabling policies is provided in Annex 13. Priority actions in the agricultural sector are framed around sustainable land management (Ethiopia, Nigeria, Zimbabwe), climate smart agriculture (Nigeria, Tanzania, Kenya, Zambia), and agricultural diversification, sustainable intensification and commercialization (Ghana, Zambia and Zimbabwe). In the forestry sector, priority actions include the sustainable management and utilization of forest resources (Ethiopia, Nigeria), emission reduction through forestry and alternative energy (Ghana, Nigeria, Kenya, and Zambia), mainstreaming climate change in forest management policies and practices (Tanzania), and low carbon development programmes (Kenya, Zimbabwe). Some actions taken and issues involved in taking action, by the study countries in addressing NAMA are briefly discussed below.

a) *Sustainable Land Management interventions*: essentially help in reducing agricultural expansion and land use change thereby reducing emission. This has been recognized implicitly in all countries. Land management will be effective in this case

by changing production technologies and practices (Zilberman et al, 2008, Börner and Wunder, 2012).

b) *Integrating climate change mitigation into existing national policy:* This is implicitly or explicitly recognized by all countries. In Tanzania and Nigeria, climate change issues have been mainstreamed into existing plans, policies, programmes and projects. In Zimbabwe, it is being mainstreamed in economic and social development at national and sectoral levels through multi-stakeholder engagement (Annex 13).

c) *Characterizing the mitigation options that support transformation of development path toward low-emission pathways*: Building capacity and the political framework to mainstream climate change in agriculture and forestry strategies is a complex and dynamic process. The priorities of African countries studied to reduce GHG emission in Agriculture and Forestry is expressed in their INDCs. These include bio-carbon initiatives in Zambia, energy efficient initiatives in Ghana, and restoration of degraded lands in Kenya. The initiatives create opportunities for achieving deviation from Business as Usual (BAU) emissions, and transforming development towards low-emission pathways in order to meet the 2°C goal (DeFries, and Rosenzweig, 2010, Asare and KwaKye, 2013).

d) *Development of Alternative and Renewable Energy Sources:* the search for renewable energy in Africa is anchored on commercial cultivation of Jatropha to avert deforestation for fuel wood and the use of improved cook stoves and LPG stoves, as components of Low Emission Development Strategy expected to generate multiple benefits in emission and fast track mitigation. In the Nigeria and Ghana for instance, the development of Jatropha serves multiple-purposes as feedstock and for biodiesel production. In Ethiopia, commercial production of Jatropha is om-going in (Regions of Oromiya, Tigray, Southern Nations, Nationalities and Peoples, Beni-Shangul Gumuz, and Amhara) (Annex 13).

e) *Climate Abatement Policy:* NAMAs are a promising instrument for boosting climate change abatement policies and measures in developing countries, particularly in the coming years when funds will become available (Bockel, 2011). For instance, in Ghana economic and fiscal instruments are sought for, to implement policies related to NAMA.

f) *Multi-Stakeholder Engagement Policy:* African countries hope to achieve climate change adaptation and mitigation strategies, in economic and social development at national and sectoral levels, through multi-stakeholder engagement processes anchored on policies for promoting land tenure and access rights to natural resources by indigenous peoples, including vulnerable group. This is in the context of mitigation and adaptation measures such as biofuel plantations or carbon offset

projects. This will help to address issues of risks such as social and environmental safeguards, as it helps to bring NAMAs to recognize indigenous peoples' rights to participate and actively take part in decision-making.

g) *Fiscal policy:* finance is required for NAMA implementation and capacity building support, which reduce or avoid emissions relative to human activities. In Kenya, climate compatible development is pursued by mobilizing private investment and channeling targeted international climate finance and technical support towards implementation of NAMA.

h) *Institutional strengthening*: The capacity of both agricultural and forestry institutions is still ineffective in some countries. This is the cause of the high rate of deforestation. Strengthening the capacity of institutions to engage communities in participating in forest management programmes is ideal.

i) *Women's rights and participation*: it is globally recognized that women are more vulnerable to climate change, while they are not equally involved in decision making process (Petrie 2010). NAMA policies in addressing gender imbalance will yield high participation.

j) *Need for conformity:* All projects must be in line with all national and sectoral laws and policies including the Constitutions, Climate Change Laws, National Climate Change Policies, Climate Change Action Plans, National Climate Change Strategies; National Adaptation Plans, Environmental Management and Coordination Acts, Visions 2030 and other sectoral laws and policies.

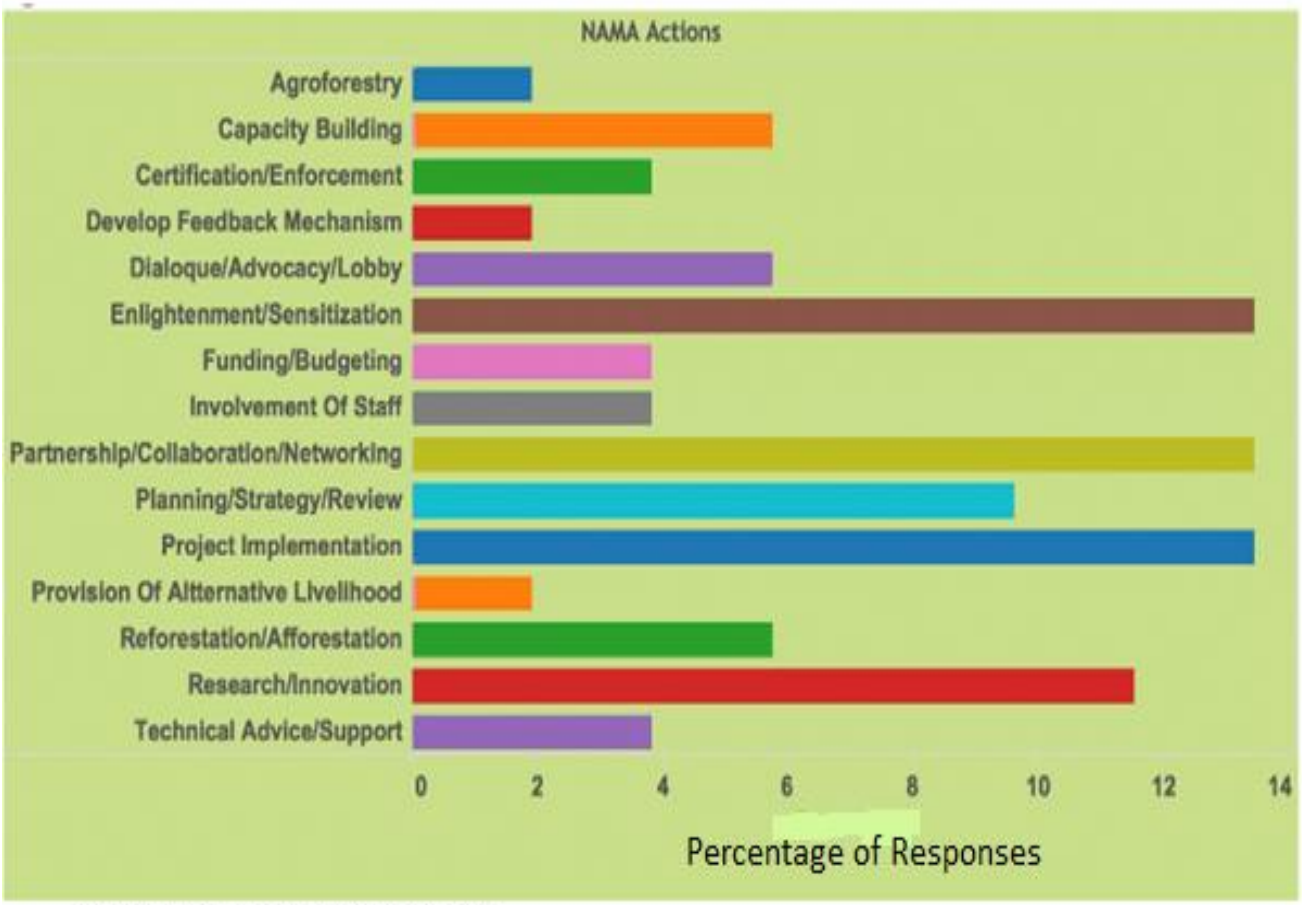
4.6.2 NAMA policy actions

Actions carried out to implement NAMA policies by agencies in the continent are depicted in Figure 19. The more common actions are public enlightenment and sensitization, partnership/collaboration, networking, and project implementation. Others of note are research & innovation and planning/strategy and review, and the not too obvious but equally relevant policy implementation actions as capacity building, dialogue and advocacy, technical support from experts and development partners, certification and enforcement, staff involvement, and funding/budgetary provisions.

4.6.3 Conditions for Implementation of Forest-Based NAMAs

The criteria for best practise in implementing forest-based NAMA are captured in Figure 20. The most significant best practices determinant is mainstreaming NAMA in development policy and practise. This implies that for mitigation actions to be effective, they are captured

in policies geared toward development of the country. Other notable conditions for best practise in NAMA policy implementation are the presence of forest, which enables countries to enhance carbon stock and reduce emission. Political will of government, participation of community and other relevant stakeholders, existence of enabling laws and funding are also critical because they convey acceptance of the action by all stakeholders in view of the legal backing.



Source: Authors Field Assessment, 2016

Figure 19: NAMA Actions

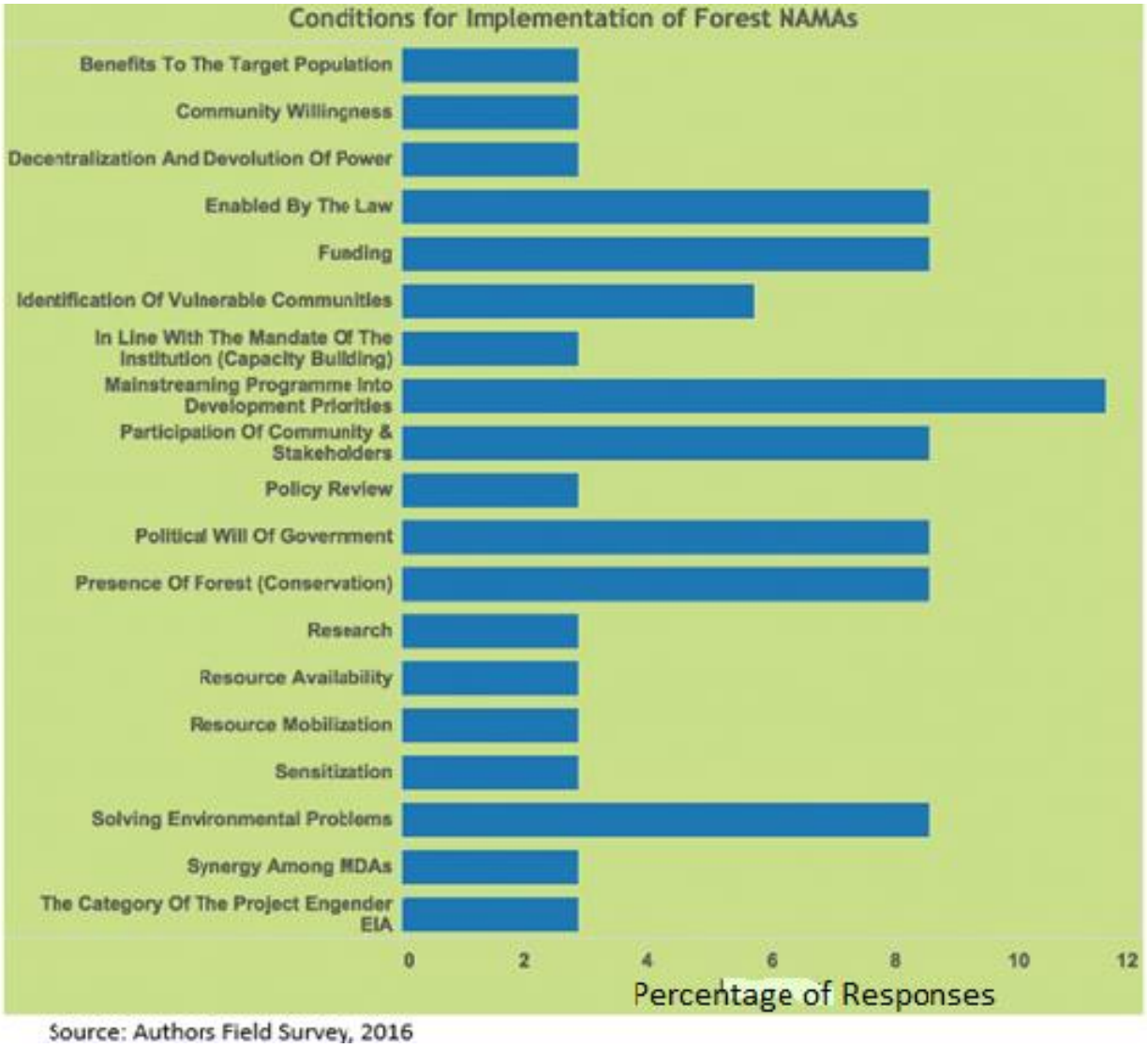


Figure 20: Conditions for implementation of forest NAMA

4.7 POLICIES THAT INCORPORATE ELEMENTS OF BOTH ADAPTATION & MITIGATION

This section describes policies and activities that incorporate both adaptation and mitigation characteristics. Common to the different countries, these policies are sector based, driving the efficiency of the sectors in line with the development goals while supporting climate change mitigation and adaptation within the sectors. The policies cut across forestry, agriculture, land use, water and energy (Annex 14).

4.7.1 AFOLU Activities with Both Mitigation and Adaptation Characteristics

Among the numerous AFOLU interventions, activities to build resilience against the vagaries of climate change impacts include agroforestry systems and afforestation/reforestation. They represent activities which are the interventions with high potential to deliver both adaptation and mitigation benefits in response to climate change in Africa (Figure 21). This figure highlights the perception of responding policy makers and practitioners across the continent on high impact AFOLU activities that advance both adaptation and mitigation objectives.

Agroforestry systems integrate food crops with trees such as Irvingia gabonensis and, Faidherbia albida in various forms, one of which is the taungya system. Afforestation/Reforestation, on the other hand, restores degraded ecosystems. Both interventions provide ecological services, increase carbon sequestration, enhance/ increase ecosystem resilience to climate change and increase opportunity for food and energy production, in addition to increasing income and livelihood of farmers and other resource users. Others with positive benefits on both adaptation and mitigation include, capacity building to increase productivity while maintaining the sustainability of the natural environment, watershed protection and clean renewable energy systems, to reduce pressure on forest for fuel wood and GHG emission.

From the country specific analyses, it is apparent that agroforestry and afforestation/reforestation apart from being the most common interventions with highest priority for adaptation and mitigation remain the commonest interventions practiced in all the countries (Annex 15).

4.7.2 Rating of projects on their adaptation and mitigation benefits

Several adaptation and mitigation intervention projects across the sampled countries were evaluated for their incorporation of both adaptation and mitigation characteristics. The projects were evaluated on a 5-point scale (1 – very low, 5 – high) on the basis of their contribution to the production of food, fuel, fiber and timber/NTFPs on the basis of the judgment of project managers and other relevant experts in the agency survey carried out. A strong contribution to food and fiber production is deemed an adaptation benefit, while a strong contribution to fuel and timber/NTFP production is deemed to be of benefit to mitigation. A comparison of the dual benefits of the projects in promoting adaptation and mitigation was then deduced. Annex 16 highlights this nexus.

Of the eight projects evaluated across five of the selected countries, six of these projects had a favorable rating with a minimum score of 3 out of the total score of 5 on impacts related to both adaptation and mitigation. Four of such projects namely, Pro-forest Alternative Livelihood Options (Nigeria), Community Based Climate Change Mitigation Action (Nigeria), Forest and Landscape Mitigation for Climate Change (Kenya), production and sales of cook stoves and fuel (Zambia), had a rating of a minimum score of 3 out of 5 in their contribution to at least three of either food, fuel, fiber and timber/NTFP production. The reasons advanced for the ratings are provided. One of the projects, Systems for Land Sector Emissions Estimation in Kenya (SLEEK) was rated 4 out of 5 with respect to food and fuel production. Its high rating for food production is hinged on the consideration that the project collected data to support the improvement of land for increased food production.

Pro-forest project in Nigeria driven by NGO Coalition for Environment (NGOCE) is focused among others on alternative livelihood activities as Honey and Bee Keeping and Mushroom farming. The project is considered to have strong adaptation and mitigation benefits and rated 4 out of 5 for food production, 3 out of five for fuel and 4 out of 5 for timber/NTFPs. Its efficient role in promoting pollination will help increase crop yield and contribute to pollinating flowering plants and healthier forest ecosystems. The project also creates community woodlots with concomitant effects on fuel wood production.

4.8 CARBON POLICIES & PRACTICES AT SELECTED NATIONAL & SUB-REGIONAL LEVELS SUPPORTING / CONSTRAINING DEVELOPMENT OF INITIATIVES ON CARBON

This section highlights the carbon policies and activities that support or constrain initiatives on carbon removal in sinks and enhancement in pools.

4.8.1 Policies that support development of carbon initiatives

There are policies in different countries that support development of carbon initiatives. These include policies of key production sectors of the economy such as forest, environment, agriculture and biodiversity. National climate change action plan and REDD+ programme are examples of the plans and strategies with promising potentials across the continent. These policies and strategies also differ among the countries depending on their priorities. In Ethiopia, the policy on Biodiversity Conservation and CRGE Strategy are devoted to promoting the conservation of biological diversity leading to enhancement of carbon stocks in the forest. Forest policies are the common instruments in countries such

as Tanzania, Ghana Zambia and Kenya with high impact support for the sequestration of carbon (Annex 17).

4.8.2 Activities that support carbon management

Highlighted in Annex 18 are key activities in the respective countries that support the enhancement of carbon stock and therefore have the potential to support carbon initiatives. The most common of these activities include conservation agriculture focused on the conservation of soil carbon, afforestation/reforestation which reduces GHG emission and increase carbon sequestration, and agroforestry systems among others. Some countries have unique activities that also support carbon management. Tanzania, for instance, has a programme on Climate Change Impacts Adaptation and Mitigation (CCIAM) focused on research on climate impacts, adaptation and mitigation. The findings help the country to address the issue of carbon management. Nigeria's Sustainable Land Management (SLM), which entails land use plan to forestall extensive use of land, is key to carbon management. Recently, the REDD+ programme has been adopted by nearly all countries of sub-Saharan Africa to reduce deforestation and enhance above and below ground carbon stocks. REDD+ has a promising potential for carbon conservation and management in Africa in addition to promoting livelihoods for forest dependent communities.

4.8.3 Policies and activities that constrain carbon initiative

Annex 19 presents some policies and activities that hamper the development of carbon initiatives. Although the governments of many countries have made concerted efforts to mainstream and synergize development actions and climate change mitigation within environmental management framework, the implementation of some programmes and projects sometimes has some negative impact on carbon pools. The policies on agriculture in the different countries, in particular, have some key activities such as commercialization, mechanization and value chain addition that allow expansion of production without recourse to or synergies with climate resilient agro-production systems. This has resulted in widespread deforestation and land cover changes across the African landscape. There are, therefore, elements in policies relating to agriculture that are invaders of soil and above ground carbon. Other activities acting as barriers to carbon initiative include, logging, uncontrolled resource exploitation, and burning of charcoal. These also lead to accelerated deforestation. Lack of coordination among different institutions and agencies related to land, climate change and renewable natural resources gives rise to conflicting policies in forest management with tradeoffs in favor of economic growth.

4.8.4 Institutional Assessment of Policies that Support or Hinder the Development of Carbon Initiatives

The study revealed policies and activities that support or hinder the development of carbon initiatives. The REDD+ programme, climate change strategy and policy on forest and wildlife are commonly identified across the countries to support carbon initiatives. Others are policies on agriculture and environment.

The country specific scenarios highlight carbon development initiatives driven by public institutions in the respective countries. In Nigeria and Ghana, REDD+ holds the highest potential for carbon management. For Kenya priority area includes forestry and wildlife and climate change strategy, while in Zambia policies on wildlife and agriculture stand out among others. These policies ensure conservation/sustainable management of forest and provide prospects for carbon enhancement.

4.8.5 Constraints to Carbon Management Policies in Africa

Though the REDD+ programme with major focus on reducing emissions from deforestation and forest degradation combined with conservation of carbon stocks, sustainable forest management, and the enhancement of carbon stocks is highly pursued by many countries, there are still constraints in this regard. In Nigeria, the major constraints on REDD+ strategy/programme include corruption and lack of clear policy direction for the programme. In Ghana, conflicting land use policies involving major economic sectors (agriculture, forestry and mining) hamper the effectiveness of policies on carbon management. Also, monoculture, investment policy, and land tenure practices deter carbon initiatives. Land tenure for instance is prone to conflicts with respect to ownership of the resources. The forest protection and management hinges on community and statutory laws to guide the sustainable management of natural resources. They are ineffective without political will to actualize the initiative on carbon management. Policy and legal framework analysis of climate change adaptation and mitigation with emphasis on economic efficiency and ecological effectiveness requires political will (Hepworth, 2010).

4.9 KEY AFRICAN INSTITUTIONS THAT HAVE THE POTENTIAL TO EFFECTIVELY ADDRESS GOVERNANCE OF CLIMATE CHANGE IN FORESTRY

4.9.1 Potential of key national institutions to effectively address governance of climate change in forestry

Assessment of the capacity of key African institutions to address the governance of climate change at the national level was carried out using six governance criteria, which include related climate change mandate, capacity for adaptation intervention, capacity for climate change mitigation, collaboration with other stakeholders, funding of any intervention and information sharing. Annex 20 highlights the scores of the assessment of these institutions based on their capacity in the different areas of governance. The result suggests that nearly all the institutions have little or no capacity for internal funding of climate related interventions without donor aid. Additional areas of low capacity include collaboration with other institutions and sharing information with other stakeholders. Lack of collaboration hinders effective implementation of different climate change interventions.

The potentials of the institutions at country level based on the assessment (Annex 21), indicates that Ministries, Departments and Agencies in environment, tourism, climate change, forestry and conservation, water resources and natural resources have the highest capacity, legitimacy and policy commitment for climate change governance in the different countries.

Some of the institutions are unable to meet the scale of the challenge posed by climate change. Their strength lies on political will, manpower/human resource capacity, enabling policies, international funding and collaboration with others, which capacity may in one way or the other be constrained by low political commitment in terms of funding for tackling change. Besides interagency coordination, access to and sharing information are the major constraints to agencies' abilities to effectively commit to climate change mitigation and adaptation.

4.9.3 Assessment of potential of regional institutions to effectively address governance of climate change in forestry

The number of institutions actively involved in climate change interventions, policymaking, funding and governance at the sub-regional level has increased substantially. Annex 22 presents institutions at sub-regional level that can effectively address climate change governance. The areas of strength of these institutions are also highlighted. These institutions include African Development Bank, The African Conservation Centre, ECOWAS, Southern African Development Community (SADC), Congo Basin Forest Partnership (CBFP), and ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE). The strengths of the institutions in terms of their effectiveness among other things include collaboration with local or national institutions, funding, cooperation and policies implementation support (Table 29).

4.10 POTENTIAL HIGH-IMPACT PATHWAYS AND MECHANISMS TO ADDRESS GOVERNANCE OF CLIMATE CHANGE IN FORESTRY

High impact pathways and mechanisms to effectively tackle the problem of climate change in Africa provide the framework that will improve multi stakeholder involvement in deliberation, decision-making, planning and management of climate change related issues at regional, national and sub-national levels. The pathways and mechanisms identified in the literature include:

a) *Climate Change Education, Communication/Awareness Raising and Knowledge Sharing:* to address the impact of climate change, climate change issues and progress need to be communicated to stakeholders. In Article 6 of the UNFCCC, implementing education, awareness and training on climate change at the national and sub- national levels has been strongly recommended for harnessing Information and decision support systems into forms that are directly relevant to institutional decisions in different countries ((Zimbabwe Ministry of Environment, Water and Climate, undated; IPCC, 2007; Hansen et al. 2007; Antwi-Agyei et.al, 2013).

b) *Assessment, monitoring and evaluation:* assessments of the issues related to climate change and the impact of the interventions carried out require monitoring and evaluation to ascertain the achievement and learn other requirements for success. Review of approaches and mechanisms enable the suitability of the approach in managing climate change to be assessed. (Task Force Report on Science and Technology Diplomatic Strategy, 2010).

c) *Research and technology development:* initiation of research and technology development on climate change including work on resilience, adaptation and mitigation is critical to tackling climate change. The findings from the research are vital to strengthen existing response measures. For instance, improved variety such as drought tolerant maize for Africa (DTMA) is among other research innovations that aid adaptation to climate change (Lybbert and Sumner 2010; Enete and Achike 2008 and Cavane 2011; Chichongue et.al 2015).

d) *Capacity building/human resources development:* enhancing human resources for effective climate change governance entails training and capacity building for stakeholders in different institutions at different levels including local stakeholders. The workshops and conferences at national and regional levels, creating opportunities for stakeholders to share knowledge and prospects for combating climate change (ATPS, 2013).

e) *Institutional and Policy Framework:* for climate change problems to be effectively addressed, appropriate institutional and policy frameworks are some major criteria. Supportive institutional framework at the local, national and international levels are critical in enabling successful climate adaptations (Schipper and Pelling, 2006).

f) *Cross-Country collaboration:* collaboration of countries at regional level provides an effective way to tackle climate change problems. Especially where the problems affect many countries and the solution lies in the management of common resources such as river basins and biomes. Thus, the countries involved collaborate to manage the resources to cope with climate stress (Lankford and Beale, 2007).

g) *Networking:* networking among local NGOs/CSOs and working groups on climate change is important for sharing knowledge and experiences and identifying high-impact pathways and mechanisms to address governance of climate change in forestry. For instance, capacity-building in the Least Developed Countries on Adaptation to Climate Change (CLACC) strategy in interventions for some African countries by International Institute for Environment and Development (IIED) began by identifying regional partners from the Regional and International Networking Group (RING). Building on successful experiences, working through regional and sub-regional "support platforms" in Africa, is required to promote communities of practise (Masih et.al, 2014).

h) *Participation/coordination amongst stakeholders*: participation and coordination among stakeholders including institutions involved in climate adaptations and mitigation projects service delivery is one of the ways that engenders a sense of responsibility among stakeholders. Local participation in natural resource management initiatives to a large extent determines the success of any project.

i) *Integration of cultural norms and traditional practices into climate change strategy:* Climate change adaptations are not undertaken in a "stand-alone fashion" but rather within prevailing societal norms and cultural practices (Adger et al., 2012). Therefore, adaptation practices should take cognizance of these cultural norms and belief systems in order to increase their appeal and acceptance by local communities. For instance, indigenous knowledge system in weather prediction has been acknowledged to be effective in climate change mitigation (Fabiyi & Olukoi, 2013). Other practices have been integrated with scientific knowledge to develop coping strategies as buffer against risk and uncertainties in the weather (Roncoli et al., 2002). Figures 22 and 23 highlight indigenous adaptation and mitigation strategies that have been practiced in Africa over the years. Prominent adaptation practices relate to mixed cropping, water harvesting and use of high yielding species, while prominent mitigation practices relate to traditional conservation agriculture, agroforestry systems and use of alternative energy.

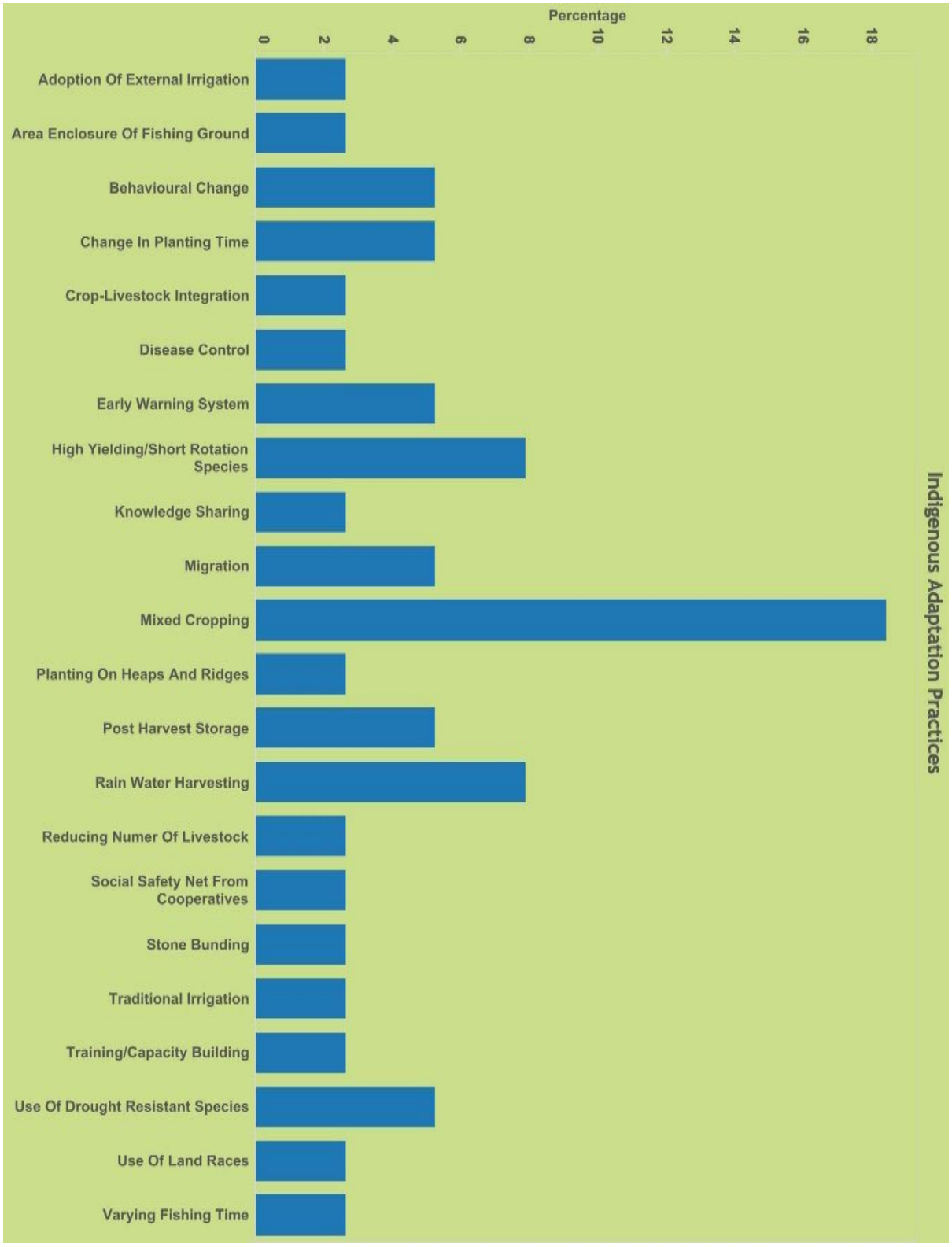


Figure 22: Indigenous Adaptation Practices

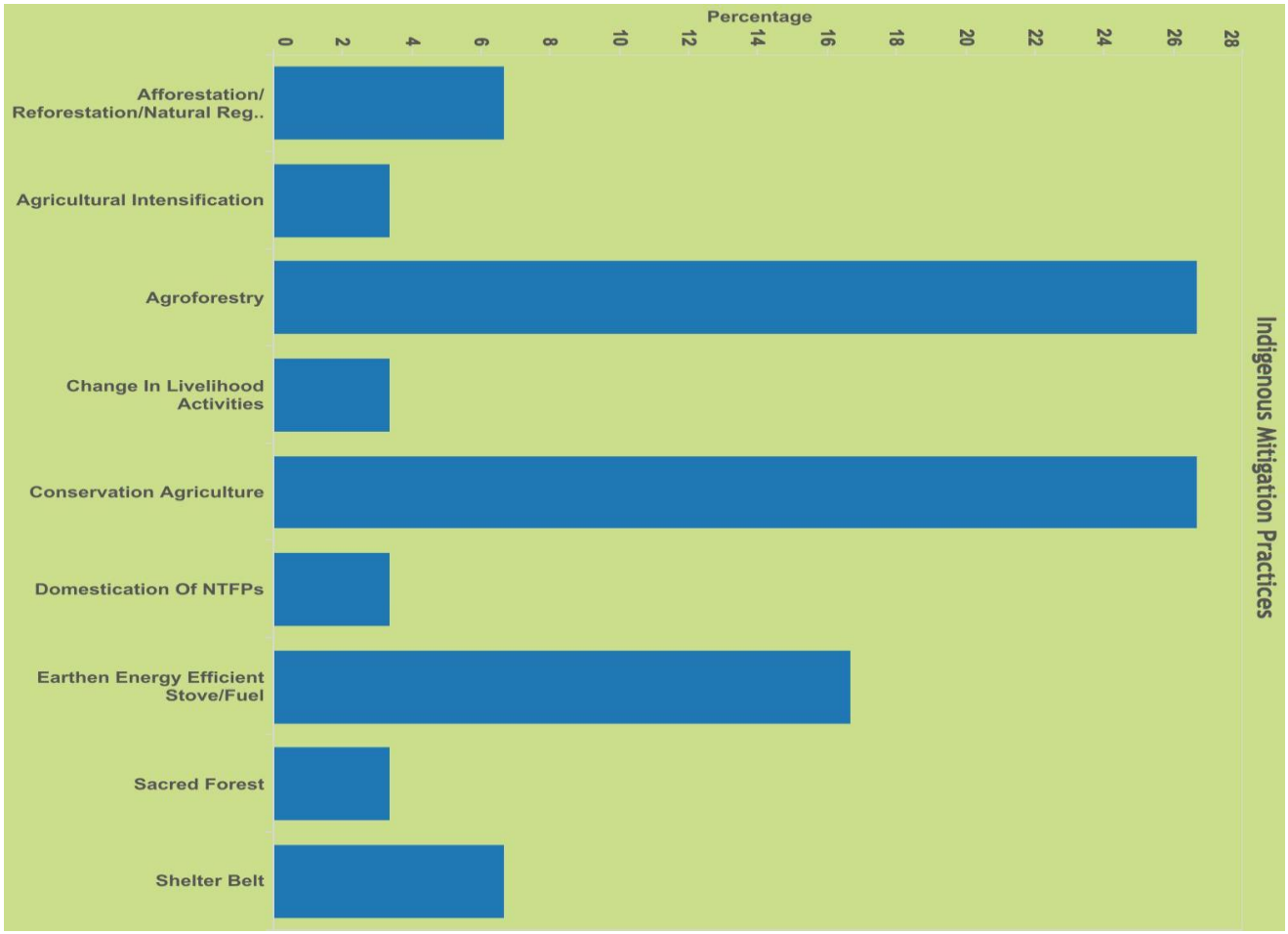


Figure 23: Indigenous mitigation Practices

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

CONCLUSION

African countries are largely susceptible to droughts, flood and crop failure caused by climate change. These impacts have resulted to severe problems of hunger/food insecurity and poverty; and ecological distortions such as deforestation, land degradation and loss of biodiversity. Interventions need to focus on the most vulnerable resource user groups such as farmers, livestock grazers and NTFP collectors. Special attention should be focused on the women who represent the most vulnerable social group affected by climate change.

Tracking vulnerability patterns to determine the intensity and extent of exposure of social, technical and ecological systems to climate stimulus, and the corresponding adaptation intervention required, taking cognizance of available means, adaptation target, types of adaptation, barriers and conditions for success are critical to successful adaptation interventions. Adaptation intervention measures presently on-going in the continent are either largely planned, or autonomous, or a combination of both. Given the potential value but limited resource capacity of indigenous adaptation practices, there is need for collaboration and synergies with planned adaptation interventions of public agencies for maximum impact.

Numerous adaptation measures/interventions have been adopted by farmers and other resource users in different countries. Agroforestry, alternative livelihood, control of bushfires, and ecological restoration among others are adaptation practices across Africa with high potential. Up-scaling these promising adaptation interventions are critical to stimulate extensive adoption for improved productivity.

In addition, promising mitigation practices as agroforestry; forest conservation/protection; water management/protection; conservation agriculture; capacity building among others will require further harnessing and upscaling. This is critical in countries where the practices are yet to be highly successful.

Mitigation activities related to crop and livestock management, conservation agriculture and water resource management as well as agroforestry are perceived by policy makers in the continent to have positive impact on food and fuel but low on fiber production. The statistical analysis of food, fuel and fiber production trends did not confirm the perspective of the policy makers. A plausible reason for this is that mitigation intervention is at its infancy and of very limited application in much of the continent. Women are highly involved in farm and

forestry related mitigation interventions. Building the capacity of women will be critical to enhance livelihood and promote environmental stewardship in the forestry sector.

Sustainable land and forest management are the prominent NAMA action in Africa. Policies need to be mainstreamed into development plans and practise and also granted political will by government. Sustainable development and Low carbon pathways are the prominent guiding principles to policy implementation. Collaboration among the implementing agencies is imperative. The strengthening of stakeholders' capacities across the various sectors in the implementation of policies is therefore of particular importance.

RECOMMENDATIONS

Patterns of Climate Change Adaptation in Africa:

i) Stakeholders involved in forest based adaptation interventions should utilize information on existing vulnerability and adaptation patterns to better understand adaptation context with potential for more targeted and purposeful adaptation policy and practise.

ii) Government and donor agencies should empower public agencies including MDAs and Research Institutions, as well as CSOs, to effectively implement planned adaptation interventions driven by the agencies.

iii) Collaboration of public agencies, NGOs and institutions with local/community stakeholders should be fostered for effective implementation of adaptation interventions

iv) Indigenous knowledge systems should be strengthened through capacity building and provision of incentives by MDAs, government, and NGOs to upscale autonomous adaptation.

v) Further research and dialogue will be required to improve synergies between endogenous adaptation interventions that rely on indigenous knowledge systems with exogenous and planned interventions for coping with climate change risks and hazards in flood and drought prone areas of the continent.

Promising practices on AFOLU based adaptation measures and conditions for their wider adoption

i) The most successful and promising adaptation practices identified by stakeholders in country specific contexts, such as agroforestry, alternative livelihood schemes from forest based enterprises, high yielding cultivars and breeds and drought resistant species, should be up-scaled, promoted and accorded greater priority in extant policies of agriculture and forestry for greater effectiveness.

ii) Indigenous knowledge systems (IKS) with high sustainability potentials, in terms of productivity and resource management, should be incorporated by environment policy planners into suitable sectors and programmes geared toward climate change adaptation. Community institutions and organizations that have proven effective in managing natural resources should in this respect be strengthened and empowered to more effectively drive adaptation practices. The appropriate public policy agencies with AFOLU related responsibilities should utilize IKS to support public policy programmes where autonomous adaptation is practised.

iii) Fostering partnership between public institutions, local communities, NGOs and donors in the natural resource management sectors is required to build capacity for synergies between planned and autonomous interventions that demonstrate high potentials for climate change adaptation.

iv) Capacity of women should be built by relevant AFOLU MDAs to adopt the successful adaptation interventions relevant to their livelihood.

Forest Based Mitigation Interventions and Determinants of Their Wider Adoption

i) The most successful and promising mitigation interventions such as conservation agriculture, varied forms of afforestation & reforestation, and ecological restoration programmes should be up-scaled, given greater priority in forestry and agricultural sector policies and practices, and integrated into on-going REDD+ programmes for their intrinsic value of enhancing productivity, reducing emission and enhancement of carbon stocks.

ii) Adequate funding and technical capacity should be built especially into interventions that are capital intensive and require technical skills

Impact of AFOLU Mitigation Activities on Food, Fuel and Fiber Production (3fs)

Given the statistically inverse relationship of annual trends (decline) in forest area with trends (growth) in the production of food, fuel and fiber across countries in the region, which suggests the low performance of mitigation interventions relative to the outputs in 3Fs, a vigorous drive is required by MDAs and development partners in the forestry and renewable natural resource management sectors in stabilizing the decline of forest land areas through appropriate mitigation interventions that correspondingly promote advances in 3Fs via:

i) Sustainable Land Intensification programmes integrated with other growth enhancing practices as integrated soil nutrient and crop management to curtail expansion of agricultural land and other land uses at the expense of forest as carbon stocks.

ii) Mitigation practices such as woodlot establishment in degraded land areas, agroforestry, and sustainable forest management with high potential to enhance carbon sequestration should be up scaled correspondingly with the sustainable production of food, fuel and fiber without undermining carbon sequestration

iii) SWOT analysis on forest based mitigation practices should be carried out by ministries of environment and related agencies to ascertain the practice with little or no impact on forest and those with high impact for best approach to implementation.

iv) Capacity building programme for improved productivity should be carried out for women to engender their participation in mitigation programmes.

Nationally Appropriate Mitigation Actions (NAMAS) in the Forestry Sector

i) Integration of all sectoral policies in the management of forest resources should be implemented by coordinating agency in forest and natural resources for sustainable 'delivering as one' in forestry sector.

ii) Synergy between NAMA policies and development strategies of countries should be given priority in project plans and implementation.

Policies That Incorporate Both Adaptation & Mitigation Characteristics

i) Policies and activities with dual capacity for forest based adaptation and mitigation have been clearly identified and should be encouraged and up-scaled for wider adoption.

Carbon Policies & Practices at Select National & Sub-regional Levels Supporting/ Constraining Development of Initiatives on Carbon

i) Policies and activities in the respective countries that support the enhancement of carbon stock should be made more functional and practicable. While those that evade carbon, stock should be regulated by focal agency in climate change and environment. Tax and certification with enforcement should be made effective to deter implementation of such projects or programmes that cause emission.

ii) Incentives should be given to activities with potential to protect and enhance carbon stock to encourage wider adoption of such activities.

iii) Policy dialogues in collaboration with related stakeholders at national and regional levels should be carried out to incorporate climate change issues into sectoral policies and programmes. This should advocate policy development and implementation with environmental concerns.

iv) Land reforms that curtail land use change but strengthen land rights of the vulnerable groups such as women should be effectively implemented in all the countries

v) Research should be conducted to ascertain that activities of institutions, including private sector institutions, are in tandem with low carbon pathways, coherence with cultural sensitivities and equity in property and human rights of communities, women groups and the poor.

Key African Institutions That Have the Potential to Effectively Address Governance of Climate Change in Forestry

i) As institutions with capacity to effectively address climate change in forestry were delineated, interagency collaboration should be fostered among these institutions. This should be coordinated by sub-regional international organizations for purposes of capacity building and shared experiences.

ii) Capacity building for in Internal funding and budgeting should be promoted in the identified institutions to reduce over-dependence on foreign funding.

High Impact Pathways for Climate Change Governance in Africa

i) Better coordination among relevant stakeholders including MDAs, NGOs and Research institutions fostered by the coordinating agencies in climate change should be undertaken.

ii) Multi-stakeholder engagement to achieve climate change adaptation and mitigation strategies in economic and social development at national and sectoral levels should be adopted.

iii) Land tenure practices and access rights to natural resources that favour indigenous peoples, especially vulnerable groups in the context of forest based mitigation should be promoted

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ANNEX 1: WATER RESOURCE MANAGEMENT INTERVENTIONS DURING DROUGHT IN THE AGRICULTURAL SECTOR

Country	Adaptation Practices	Operator (Implementer)	Receptor	Exposure unit	Means	Type
Ethiopia	Rain water harvesting (Afar, Somali and Gambella regional states)	Individual/household of resource users	Community livelihood	Natural resource systems	Individual/household resources, Capacity building by NGOs & donor agencies	Autonomous reactive & direct
	Water shed protection (Tigray)	Community; MDAs	Community resource users	Water resources, community livelihood systems	Donor Agencies; Community resources, NGOs capacity building; legal authority	Autonomous/planned, direct & facilitating
	Weather information	Meteorological Dept,	Community resource users	Community livelihood systems	Funding by government;	Anticipatory, Indirect, direct & facilitating
	Dams and reservoir construction (Afar, Gambella, Somali and SNNPRS)	Mins. of Water, Irrigation & energy	Community resource users	Water resources, community livelihood systems	Funding by donor agency	Planned, anticipatory & Facilitating
	Water pond for livestock (Afar, Borena)	Ministry of Agriculture	Livestock production systems	Grazing lands	Funding by govt.;	Planned & Direct
	Fish ponds development	Ministry of Agriculture	Aquaculture farmers	Fish ponds & rivers	Community resources, capacity building by NGOs	Planned, direct & facilitating

Ghana	Protection of catchment (Ashanti region- Brong-Ahafo Region)	Community	Stream, reservoir, lake	Stream, reservoir, lake, community livelihood	IK; community resources; legal authority	Autonomous, direct & reflexive
	Construction of Dams (Tamale)	Ministry Of Water Resources Housing And Works	Community	Community	Funding from govt. and donor agencies.	Planned, anticipatory; direct & facilitating
	Crop integration with livestock (Northern region)	Farmers; MOFA	Farmer	Livestock, livelihood of community	Funding from govt. and donor agencies	Planned, Autonomous, direct & reflexive
	Development of pond (Brong-Ahafo Region)	MOFA	Farmer	Fish, community livelihood	Funding from govt. and donor agencies	Planned, Facilitating
Nigeria	• Reducing evaporation of surface water using depressant (Lake Chad)	Ministry of water resources	Farmer	River/stream; community livelihood	Funding from govt. and donor agencies, community resources	Planned; Direct & Facilitating
	• Desilting of reservoir.	Ministry of water resources and Agriculture	Farm, fishery resources	community livelihood	Government funding, Community resources	Planned & Direct
	• Construction of Boreholes, wells	Ministry of water resources and Agriculture	Community	Community	Government funding,	Planned & Indirect
	• Protection of water shed (Cross River Region, Lake Chad, Lower Kaduna-Middle Niger Floodplain)	Community	Stream, reservoir, lake	Stream, reservoir, lake	IK	Autonomous; direct & reflexive
	• Reinforcing reservoirs pollution control,	Ministry of water resources and Agriculture	Farm, fishery resources	Reservoir; community livelihood	Government funding	Planned & Reactive

	• Desilting of ponds (Northern region)	Ministry of water resources and Agriculture	Farm, fishery resources	Water resources; community livelihood	Government funding	Planned & Direct
Kenya	• Water harvesting and storage technologies. (ASAL)	Ministry of Agriculture & Rural Development; Irrigation Water User Associations (IWUA)	Farmers	Streams/river; community livelihood	Government funding; Irrigation Water User Associations (IWUA)	Planned, direct & facilitating
	• Irrigation and Drainage systems and management. (Soko & Kokwang)	Ministry of Agriculture & Rural Development; community;	Stream, reservoir, lake	Stream, reservoir, lake, community livelihood	Government funding; Irrigation Water User Associations (IWUA)	Planned, Direct & facilitating
	• De-silting and rehabilitation of Dams • (Agieige-Nyamarka, Soko & Kokwang)	Ministry of water resources and Agriculture	Farm, fishery resources	Water resources, community livelihood	Government funding; Irrigation Water User Associations (IWUA)	Planned & Direct
	• Ponds for fingerlings	Ministry of Livestock Development and Fisheries	Fishery resources	Fishery resources; community livelihood	Government funding; Irrigation Water User Associations (IWUA)	Planned & Direct
	• Ponds for livestock (North Eastern Region)	Ministry of Livestock Development and Fisheries	Fishery resources	Fishery resources; community livelihood	Government funding; Irrigation Water User Associations (IWUA)	Planned & Direct
Zambia	Water harvesting (Eastern and Central, Western	Community	Farmers	Streams/river; community	Community resources, IK	Autonomous & Facilitating

	provinces)			livelihood		
	River basins Basin management, (African dams project) (Eastern, Central, Western and Southern provinces)	Zambezi River Authority (ZRA); Ministry of Energy and Water Development; Swiss competence center of environment and sustainability (CCES)	Ministry of Agriculture, Energy and water resources	Water resources; community livelihood	Donor funding (CCES)	Planned and Facilitating
	Networking of dams and weirs; water transfer	Ministry of water resources; Ministry of Tourism Environment and Natural Resources	Stream, reservoir, lake	Water resources; community livelihood	Donor Funding; national government	Planned; direct & Facilitating
	Introduction of well-adapted livestock;	Ministry of Agriculture, Ministry of Energy and Water Development	Herders	Livestock; community livelihood	Capacity building; community resources	Planned, reactive and Facilitating
	restocking the lakes, rivers and dams (Kazungula & Shangombo, Mopani and Konkola)	Ministry of Agriculture and Cooperatives	Farmer	Fishery resources; community livelihood	Donor funding; NGOs and government	Planned and Direct
Tanzania	Water shed protection (Bagamoyo, Pangani, Rufiji)	Community	River/stream	River/stream, water resources; community livelihood	IK	Reactive; autonomous and Direct

	Water recycling and reuse; (Dar es Salaam)	Community	Resource users	Water resources	Community resources, capacity building, IK	Planned, reactive, Facilitating
	Rain water harvesting using excavated bunded basins	Individual, community	Farmers	Streams/ri; community livelihood ver	IK, capacity building by NGOs	Reactive, Autonomous, direct & Reflexive
	Cross breading for resistant livestock breeds	Individual	Herders	Livestock; community livelihood	Funding by government, capacity building by NGOs	Planned & Direct
	Water storage technology for communities (Pangani, Rufiji, Mtera and Mbeya, Shinyanga)	Ministry of Agriculture, Food Security and Cooperatives, Ministry of Water	Farmers	Water resources; community livelihood	Funding by government, capacity building by NGOs	Planned & Direct
Zimbabwe	Protection of surface and groundwater resources;	Ministry of Environment, Water and Climate; (MEWC) ZINWA	Farmers, Herders	Streams/river	Government Treasury; Multi-Donor Funds (UN, SADC)	Planned and Direct
	Multipurpose storage dam.	MEWC; Ministry of Agriculture, Mechanisation and Irrigation Development	Resource users	Rivers/streams	International Cooperating Agencies; UN Agencies; SADC; Multi-Donor Funds	Planned & Facilitating
	Inter-catchment water transfer	MEWC	Resource users	Rivers/streams	International Cooperating Agencies; UN Agencies; SADC; Multi-Donor Funds	Planned, Direct & facilitating

	improved livestock breeds	Ministry of Agriculture, Mechanisation and Irrigation Development (Livestock department)	Herders	Livestock; community livelihood	International Cooperating Agencies; UN Agencies; SADC; Multi-Donor Funds	Planned and Direct
	Improving hydrological regime of wetland for fishing	Ministry responsible for water resources	Resource users	Wetland; community livelihood	funding from government, capacity building by NGOs	Planned/facilitating

ANNEX 2: IRRIGATION INTERVENTIONS IN DROUGHT CONDITION FOR AGRICULTURAL SECTOR

Country	Adaptation Practices	Operator	Receptor	Exposure unit	Means	Type
Ethiopia	Furrow irrigation (Construction of Canals to carry excess water to farms). (Afar and Gambella)	Ministry of Agriculture & natural resources	Farmers	Farmers; crop; community livelihood	Funding by Government,	Planned, Facilitating, Direct and reflexive
	Water diversion from streams for dry season cropping (Afar, Gambella, Somali and SNNPRS)	Community	Community	Farmers' crop; community livelihood	Ik, capacity building	Autonomous, planned, Direct and facilitating
	Development of drinking water sources for human and livestock	CSOs; community	Famers	Farmers/ community livelihood	Ik, capacity building	Autonomous & facilitating
	Earthen ponds	CSOs; community	Community/	Farm land	IK, Capacity building,	Autonomous

			Famers		community resources	& facilitating
Ghana	water resources management in dams and reservoir	Ministry of Agriculture & natural resources	Community	Water resources	community resources	Direct
	Traditional Shallow wells irrigation	Community	Farmers' household	Crops; community livelihood	IK, Community resources, network	Autonomous, direct and facilitating
	Development of Pond	CSOs & Community	Community	Fishery resources; Farmland	Community resources	Direct and facilitating
Nigeria	Cheap furrow irrigation system (Northern region)	Ministry of Agriculture & natural resources; community	Farmers' household	Farms; community livelihood	IK, Capacity building, community resources	Planned & Direct,
	Reservoir/Wells (Central region, Benue, Taraba and nassarawa)	Ministry of Agriculture & natural resources; Community	Farmers' household	Water resources	Technical capacity	Planned, Direct, facilitating
	Watershed protection	Community, CSOs, Ministry of Environment, Water resources, community	Community	Community, Water resources	Ik, Capacity building, community resources, legal authorization	Autonomous, Planned, direct and facilitating
Kenya	Provision of irrigation, drainage, and water storage services (Small holder farm improvement project)	Ministry of Environment, Water resources; Ministry of Agriculture & Rural Development, National	Community	Community livelihood	African development fund (ADF), technical capacity & Government funding; Kenya	Planned, direct & facilitating

	(Kilifi District)	Irrigation Board			Agricultural Research Institute (KARI)	
	water harvesting and storage	Community, CSOs, Ministry of Environment, Water resources,	Community	Community livelihood	Capacity building; community resources	Planned and direct
	De-silting and rehabilitation of Dams	Ministry of Environment, Water resources,	community	community	Community resources, funding from government	Planned & Direct
	Watershed management	CSO, Community	Community, wetland ecosystem	Community, wetland ecosystem	Farmer-to-Farmer training, CSOs; funding from donor agencies	Planned; Autonomous; Direct, facilitating
Tanzania	Drip and piped irrigation (Dodoma and Tabora)	CSOs, Ministry of Agriculture Food Security and Cooperatives; Individual, community	Farmers' household	Crops; community livelihood	IK, Capacity building, community resources	Autonomous; Planned and Direct
	Gravity-fed irrigation schemes through the run-of-the river water. (Dodoma)	CSOs, Ministry of Agriculture Food Security and Cooperatives; Individual, community	Farmers' household	Crops; community livelihood	IK, Capacity building, funding from government community resources	Planned, Autonomous & Direct
	Diversion of surface water into cropland (West –Unguja, West- Unguja, Chakechake- Pemba)	CSOs, Individual, community	Farmers' household	Crops; community livelihood	IK, Capacity building, community resources	Autonomous; Planned, direct, Facilitating & reactive

	Dam and shallow ponds for watering of livestock (Morogoro region)	CSOs, Individual, community	Farmers' household	Crops; community livelihood	IK, Capacity building, community resources	Autonomous; direct, & reactive
	ponds and dams for fingerlings (Msolwa Ujamaa)	CSOs, Ministry of Agriculture Food Security and Cooperatives; Individual, community	Community	community livelihood	IK, Capacity building, community resources	planned; Direct, Planned and facilitating
Zambia	Creating canals and pipes to crop lands	CSOs, Ministry of Agriculture & natural resources; Individual, community	Farmers' household	Crops; community livelihood	Capacity building, community resources	Reactive and planned; facilitating
	dip tanks and supply;	Ministry of Agriculture & natural resources;	Farmers' household	Crops; community livelihood	Capacity building, community resources	Reactive and facilitating
	Supply of water from dams in fish pond	Ministry of Agriculture & natural resources;	Fish pond	Fish pond; community livelihood	Community resources	Direct, Reactive, facilitating
Zimbabwe	Sprinkler and surface irrigation (Chinnoyi,)	Ministry of Agriculture, Mechanisation and Irrigation Development (MAMID)	Farm land	Crops; community livelihood	Funding government, community resources	Planned & Direct
	Construction of drinking Ponds for livestock	MAMID; Agriculture extension agent (livestock Department)	livestock	Livestock; community livelihood	Community resources, Capacity building,	Planned and direct

ANNEX 3: DROUGHT RESISTANT SPECIES INTERVENTION DURING DROUGHT CONDITION IN AGRICULTURAL SECTOR

Country	Adaptation Practices	Operator	Receptor	Exposure unit	Means	Type
Ethiopia	Drought resistant and early maturing crop varieties; (Drought Tolerant Maize for Africa (DTMA) Project) (Amhara, SNNPRS, Tigray, Oromia)	Ethiopian Institute of Agricultural Research; MOA; International Maize and Wheat Improvement Center (CIMMYT); International Institute of Tropical Agriculture (IITA); IFAD; NGOs & CBOs	Farmers	Farmers' crop; community livelihood	Capacity building IITA & CIMMYT; funding by the Bill & Melinda Gates Foundation and the Howard G. Buffett Foundation.	Planned, Reactive; Direct, facilitating
	Promotion of improved/productive animal breeds	Ethiopian Institute of Agricultural Research; MOA;	Herders	Livestock; community livelihood	Climate Resilient Green Economy (CRGE)	Planned; direct
	Natural resource conservation (soil, water, forestry, etc.) (Regions of Oromiya, Tigray, Amhara, Somali and Beni- Shangul Gumuz)	Ministry of Environment and Forest; Institute of Agricultural Research; MOA;	community	community livelihood	Government funds	Planned and direct
Ghana	Drought resistant crops such as cassava and maize (DTMA Project) (Tamale)	Ministry of food and agriculture (MOFA); IITA; CIMMYT,	Farmers	Crops; community livelihood	Capacity building IITA & CIMMYT; funding by the Bill & Melinda Gates	Planned, direct
	Cultivation of striga tolerant species	Ministry of food and agriculture (MOFA);	Farmers	Farmers' crops; community livelihood	Capacity building, community resources, IK	Planned, Reactive; direct

	Planting drought resistant feeds.	Ministry of food and agriculture (MOFA);	Livestock	Livestock; community livelihood	Funding from government; Capacity building, community resources	Planned, Direct
Nigeria	Adopting drought-tolerant and early maturing varieties of crops (DTMA Project) (Northern region)	Ministry of Agriculture, Crop Research Institute of Nigeria; IITA,	Farmers	Farmers' crop; community livelihood	IITA & CIMMYT; funding by the Bill & Melinda Gates; Support from Government and research institutes	Planned, Reactive, Direct and facilitating
Tanazania	Promoting early maturing and drought tolerant crops (DTMA Project) (Bagamoyo, Pangani, Rufiji, Mtera, Mbeya, Shinyanga and Dar es Salaam)	Ministry of Agriculture, Food Security and Cooperatives,	Farmers	Crops; community livelihood	Support from IITA & CIMMYT; funding by the Bill & Melinda Gates Funding by government; capacity building by NGOs	Planned & Direct
	Water efficient varieties	Ministry of Agriculture, Food Security and Cooperatives,	Farmers	Crops; community livelihood	Funding by government, capacity building by NGOs,	Planned & Direct
Kenya	Drought-tolerant maize Africa Project (Soko & Kokwang)	Kenya Agricultural Research Institute; IITA, CIMMYT	Farmers	Farmers' crops; community livelihood	Support from IITA & CIMMYT; funding by the Bill & Melinda Gates Funding by government; capacity building by NGOs	Planned & direct

Zambia	Promotion of early maturing/drought resistance crops	Ministry of Agriculture and Cooperatives	Farmers	Farmers crops; community livelihood	Government funding; international donors	Reactive; Planned and facilitating
	Improved rangeland and feed management (Mopani and Konkola)	Ministry of Agriculture and Cooperatives, community	Herders	Pasture field; livestock; community livelihood	Government funding; IK	Planned, Direct and facilitating
	Management and use of drought-tolerant breeds. (Mopani and Konkola)	Ministry of Agriculture and Cooperatives	Herders	Livestock; community livelihood	International donor funding; government funding	Planned and facilitating
Zimbabwe	Drought tolerant breeds of livestock. (Mashonaland west)	Ministry of Agriculture, Mechanisation and Irrigation Development	Herders	Livestock; community livelihood	International donor funding; government funding	Planned and direct
	Drought tolerant crops	MAMID; Agricultural Extension Services & CIMMYT; IITA	Farmers	Farmers' Crop; community livelihood	International donor funding; IK, government funding	Planned and direct

ANNEX 4: EARLY WARNING SYSTEM DURING DROUGHT CONDITION IN AGRICULTURAL SECTOR

Country	Adaptation Practices	Operator	Receptor	Exposure unit	Means	Type
Ethiopia	Using scientific knowledge and advanced technological information on drought and flood to enhance the resilience of vulnerable communities	Ethiopian Institute of Agricultural Research; Ministry of Environment and Forest; MOA; NGOs & CBOs	Farmers; Community	Farmers' crop; community livelihood	Weather information; Funding from government	Planned; Anticipatory & Direct
Ghana	Provision of weather information on drought and flood	Ghana Meteorological Services Agency (GMet)	Community	Crops; forest community livelihood	Funding from government; capacity building from NGOs	Planned; Anticipatory & Direct
	Indigenous knowledge system using various indicators for predictions;	Community	Community	Farmers' crops; community livelihood	IK	Autonomous; Anticipatory & Direct
Nigeria	Provision of weather information to farmers by meteorological agency	Nigerian Meteorological Agency (NIMET)	Community	Farmers' crop; community livelihood	Funding from Government and research institutes	Planned; Anticipatory & Direct
	Indigenous weather prediction	Community	Community	Farmers' crops; community livelihood	IK	Autonomous; Anticipatory & Direct
Tanzania	Using indigenous knowledge system to strengthen early	Meteorological Agency Ministry of Agriculture, Food	Community	Crops; community	Funding by government; capacity building	Planned/autonomous, Anticipatory & Direct

	warning system, (Bagamoyo, Pangani, Rufiji, Mtera, Mbeya and Shinyanga)	Security and Cooperatives,		livelihood	by NGOs	
Kenya	Using indigenous knowledge system to strengthen early warning system,	Kenya Meteorological Department (KMD); National Drought Management Authority	Community	Farmers' crops; community livelihood	Funding by government; capacity building by NGOs	Anticipatory & Direct
	Indigenous weather prediction	Community	Community	Farmers' crops; community livelihood	IK	Anticipatory & Direct
Zambia	Strengthening of the early warning systems and preparedness by local prediction and related agency	Zambia Meteorological Department (ZMD); Climate Change Facilitation Unit (CCFU) of Ministry of Tourism, Environment	Community	Farmers crops; community livelihood	Government funding; international donors	Anticipatory & Direct
	Indigenous weather prediction	Community	Community	Farmers' crops; community livelihood	IK	Anticipatory & Direct
Zimbabwe	Research and provision of data	Meteorological Service Department	Community	community livelihood	Government funding	Anticipatory & Direct
	Use of indigenous knowledge for climate change forecasting and early warning systems.	Community; Meteorological Service Department; NGOs	Community	community livelihood	IK	Autonomous and Direct

ANNEX 5: AGROFORESTRY INTERVENTIONS DURING DROUGHT IN AGRICULTURAL SECTOR

Country	Adaptation Practices	Operator	Receptor	Exposure unit	Means	Type
Ethiopia	Multipurpose trees used to conserve soil and produce fruits for human consumption; (Tigray,and Northern Afar, Amhara)	Community & Ministry of Agriculture (MOA); community	Community	Famers' crops; community livelihood	IK, Environment Protection Authority; Forestry Commission	Autonomous/planned & Direct
	Improved fodder crops and pasture management (Tigray and Afar)	Ministry of Agriculture (MOA); Environment Protection Authority	Community	Livestock; community livelihood	Adaptive capacity	Planned & reflexive
	Plant multipurpose trees for feed, (Northern Afar)	Ministry of Agriculture (MOA)	Community	Livestock; community livelihood	Adaptive capacity by NGOs	Planned & reflexive
Ghana	Mixed tree and crop farming (Eastern region)	Community	Community	Community livelihood, crops; fuelwood	Adaptive capacity by NGOs	Autonomous
	Livestock--crop integration, (northern region)	Community, MOA	Community	Livestock; soil, crop; community livelihood	IK; Government Funding, CSOs capacity building	Autonomous & facilitating ,
	Fish ponds in catchment areas (Western region)	Ministry of fishery and aquacultural development	Community	Fishery resources, community livelihood	Government Funding, CSOs capacity building, REDD+	Planned & Facilitating

					Mechanism	
Nigeria	Rehabilitation of degraded area and trees in cocoa plantation; Taunya system	NGOs, ministry of climate change and Forestry, community	Community	Forest; soil; community livelihood	IK, legal authorization; REDD+ mechanism	Planned and Autonomous
	Fodder banks and pasture management (North central region)	NGOs, ministry of climate change and Forestry & Agriculture	Community	Community	IK, legal authorization; REDD+ mechanism	Planned and Autonomous
	Fish pond in a rice paddy (Benue and Cross river region)	Ministry of fishery and aquacultural development	Individual fishing folks	Fishery resources; community livelihood	Funding by govt.; capacity building by NGOs	Planned and facilitating
Tanzania	Production of fast growing tree like eucalyptus clonal trees,	Department of Land Use Planning (DLUP, Ministry of Agriculture Food Security and Cooperatives	Community	Forest; fuel wood; community livelihood	Funding by Government	Planned, direct and facilitating
	Establishing tree nurseries/woodlots establishment	(DLUP	Community, Forestry Department	Forest resources; fuel wood; community livelihood	Farmer field schoo, Funding by govt. and donors & capacity building by NGOs	Planned, direct and facilitating
Kenya	Planting of trees on-farm (farm forestry) (Meisori)	ICRAFT, CSOs and community	Community	community livelihood; fuel wood	REDD+ mechanism; ICRAFT	Planned and direct
	Selection and mass production fast growing tree species;	ICRAFT, Ministry of State for Development of	Community	community livelihood; fuel	Swedish Cooperative	Planned and direct

	(Nyakach)	Northern Kenya and Other Arid Lands (MSDNKOAL)		wood	Centre (SCCA)	
Zambia	Enhanced regeneration & bee-keeping (Southern and Central Provinces)	Ministry of agriculture; Forestry department	Community	Community livelihood system	Government funding; IK	Planned and facilitating
	Planting of feedstuff to the effect heat (Central and northern area)	Ministry of agriculture; Forestry department	Community	Livestock; community livelihood	Community; legal framework	Planned
	natural regeneration (Area enclosure) (Mopani and Konkola)	Community	Community	Forest; community livelihood	Community; legal framework	Autonomous and relexive
Zimbabwe	Catchment area rehabilitation through agro-forestry, (Karima and binga)	MAMID; Ministry of Environment, Water and Climate & Forestry department	Community	Community livelihood system – crop yield and fuel wood production etc.; watersheds; food & Energy supply	Incentive by govt.	Planned and direct
	Planting fodder with trees and other crops (Kariba)	NGOs; MAMID; Forestry department,	Community	Crops; livestock, community livelihood	Funded by government; community resources	Planned and direct

ANNEX 6: ADAPTATION INTERVENTION DURING FLOOD CONDITION IN AGRICULTURE SECTOR

Country	Adaptation Practices	Operator	Receptor	Exposure unit	Means	Type
Ethiopia	Construction of Dams and ponds (Gambella, Somali and SNNPRS regions)	Farmers, Ministry of Agriculture & natural resources, Ministry of Environment and Forest, NGOs	Farmers, community	Soil, Farmers' crop, community livelihood	Community resources, extension services	Autonomous/planned, direct & reflexive
	timing planting period	Community, Farmers, Ministry of Agriculture & natural resources,	Farmers, community	Soil, Farmers' crop, livelihood	IK, community resources, extension services	Autonomous/planned, direct & reflexive
	Migration	Farmers/community	community	Farmers' livelihood	IK	Autonomous & Reactive
Tanzania	Collection of water in pond, (Bagamoyo, Pangani, Rufiji, Mtera, Mbeya, Shinyanga, and Tabora)	CSOs, Ministry of Agriculture Food Security and Cooperatives; Individual, community	Farmers' household	community livelihood	Funding from government; NGOs; Capacity building, community resources	Planned and Direct
	timing planting period	Farm families, CSOs, Ministry of	Farmers' household	Crops; soil; community	Funding from government;	Autonomous/Planned and Direct

		Agriculture Food Security and Cooperatives;		livelihood	NGOs; Capacity building, community resources	
Kenya	Dam Construction,	Ministry of Environment, Natural Resources and Regional Development Authorities; Ministry of Water and Irrigation	Farmers' household; community	Crop, Farmers livelihood; water resources; soil	Funding from government; NGOs; Capacity building, community resources	Planned and Direct
	changing planting time, use of early maturing species	Ministry of Agriculture Food Security and Cooperatives;	Farmers' household	community livelihood	Funding from government; NGOs; Capacity building, community resources	Planned and Direct
Ghana	Dam construction and embankment at flood plains , migration to other areas, use of species with short maturity time	Ministry of water resources and housing; Water resource commission; MOFA	Farmers' household; community	Crop, Farmers livelihood; water resources; soil	Funding from government; NGOs; Capacity building, community resources	Planned and Direct

	use of species with short maturity time	Community, MOFA	Farmers' household; community	Crop, Farmers livelihood; water resources; soil	Funding from government; NGOs; Capacity building, community resources	Planned and Direct
Nigeria	River basin management, embankment in areas along coastal areas	Ministry of Water Resources; River Basin Development Authority, Ministry of Environment; Niger delta development commission	Farmers' household; community	Crop, Farmers livelihood; water resources; soil	Funding from government; NGOs; Capacity building, community resources	Planned and Direct
Zambia	Inter-basin water transfer to areas of scarcity, (Kabwe, Kaputa, Shangombo, Mopani and Konkola)	Ministry of Tourism Environment & Natural Resources (MTENR); Ministry of Energy and Water Development	Farmers' household; community	Crop, Farmers livelihood; water resources; soil	Funding from international donors & government; NGOs; Capacity building, community resources	Planned and Direct
	Migration	Community	community	Community livelihood	community	Reactive and reflexive
Zimbabwe	Inter-basin water transfer,	Ministry of Environment, Water and Climate	Farmers' household; community	Crop, Farmers livelihood; water	Funding from government; NGOs; Capacity	Planned and Direct

				resources; soil	building, community resources	
	Migration	Community	community	Community livelihood	community	Reactive and reflexive

ANNEX 7: ADAPTATION DURING DROUGHT CONDITION IN FOREST SECTOR

Country	Adaptation Practices	Operator	Receptor	Exposure unit	Means	Type
Ethiopia	Enhancing control of forest fire	Farmers, Ministry of Agriculture & natural resources, Ministry of Environment and Forest, NGOs	Farmers,	Soil, Farmers' crop, community livelihood	Community resources, extension services	Autonomous, direct & reflexive
	Supporting alternative livelihood	Ethiopia Wildlife Conservation Authority	Community	Community's livelihood, forest resources	NGOs, Government intervention, donor funded programme	Planned, Direct & reactive
	Promoting establishment of woodlot	Ministry of Environment and Forest, NGOs	Community	Community's livelihood, forest resources	Government intervention fund; NGOs, donor fund	Planned, Reactive, facilitating
Nigeria	Plantation establishment (woodlots),	Ministry of Environment, Department of	Community, Department of forestry	Forest, soil; fuel wood; community	Donor funds; Government support &	Planned, Reactive, reflexive &

		Forestry, Academic institutions		livelihood	NGOs	facilitating
	Shelter belt against desertification (green wall project)	Great Green Wall Agency	Community	Community; soil; forest; water resources	Donor funding and regional government support	Planned, Reactive; Direct; facilitating
Ghana	Plantation establishment (woodlots)	Ministry of Lands and natural resources (Forestry commission)	Community; Forestry commission	Forest; fuel wood; community livelihood	Capacity building, government & NGO's support	Planned, Reactive; Direct and facilitating
	Alternative livelihood	NGOs, Community	community	Community livelihood	Capacity building and incentives from NGOs	Planned, Reactive, Autonomous
	Alternative energy	Energy Commission; Ministry of Lands and natural resources (Forestry commission)	Community; Forestry commission	Forest; fuel wood; community livelihood	Capacity building, government & NGO's support	Planned, Reactive; Direct and facilitating
Tanzania	Enhancing control of forest fire (Bagamoyo, Rufiji, Mtera, Mbeya, Shinyanga,)	MNRT, Private Sector, NGO,	Community	Community's livelihood, crops; soil	Capacity building, government & NGO's support	Planned; Reactive; Direct and facilitating
	Alternative livelihood	Ministry of Energy and Minerals	Community	Community's livelihood, crops;	Capacity building, government & NGO's support	Planned, Reactive; Direct and facilitating
	Alternative energy	MNRT, Private Sector, NGO, CBO,	Community	Community's Energy source	Capacity building, government & NGO's support	Planned, Reactive; Direct and facilitating

Kenya	Watershed management	Arid Lands Resource Management Project (ALRMP); Ministry of State for Development of Northern Kenya and other Arid Lands	Community	Forest, water resources	Funding and support by government and NGOs	Planned;
	Agroforestry	Agricultural Development Corporation	Community	Crop; fuel wood; community livelihood	Community resources, NGOs and government support	Planned;
Zambia	Improvement of fire management systems and soil conservation in Miombo woodlands (plateau and hills) to semi evergreen forests; Riparian, Swamp and the lake basin, grasslands etc.	Ministry of Environment, Natural Resources and Regional Development Authorities	Community; Ministry of Environment, Natural Resources and Regional Development Authorities	Forest, soil, swamp, grassland	Government funds, NGOs community resources	Planned, reactive
Zimbabwe	Promote catchment protection/ catchment area rehabilitation through agro-forestry,	Ministry of Environment, Water and Climate; Forestry Commission; CSOs;	community	Forest and water resources	Funding from Government & NGOs	Planned and reactive

ANNEX 8: ADAPTATION PRACTICES IN FLOOD CONDITION IN FORESTRY SECTOR

Country	Adaptation Practices	Operator	Receptor	Exposure unit	Means	Type
Ethiopia	Protection and enlargement of riparian vegetation; area enclosure to re-vegetate gullies	Ministry of Agriculture & natural resources, Ministry of Environment and Forest,	Community	community livelihood system; forest and water resources	extension services; legal authority, funding by government	Planned and direct,
Tanzania	Watershed management; Control habitat destruction and fragmentation along coast forest resources (Zanzibar, Mafia and Kilwa)	Ministry of Natural Resources and Tourism (MNRT); Private Sector, CSOs	community	Community livelihood, and water resources	capacity building by NGOs & funding from government	Planned and Direct
Nigeria	River basin management; watershed management, SLM	Ministry of Environment; Forestry commission, Basin development authority; NGOs	community	Community cropland; fuel wood and livelihood	capacity building by NGOs & funding from government	Planned and Direct
Ghana	Natural floodplain protection,	Forestry commission; environmental protection Agency	community	Community livelihood and water resources	capacity building by NGOs & funding from government	Planned and Direct
Kenya	Protection of wetland and SLM	National Environment Management Authority (NEMA); Ministry of State for Development of Northern Kenya and Other Arid	community	Community livelihood	capacity building by NGOs & funding from	Planned and Direct

		Lands (MSDNKOAL)			government	
Zambia	Catchment-wide management and livelihoods	Ministry of Environment, Natural Resources and Regional Development Authorities; Forestry department	Community	Community livelihood system	Government funding; capacity building by NGOs	Planned and Direct
Zimbabwe	Implement catchment protection measures; land-use plans	Ministry of Environment, Water and Climate; Forestry Commission; CSOs	Community	Community livelihood system	Government funding; capacity building by NGOs	Planned and Direct

ANNEX 9: CONSERVATION AGRICULTURE INTERVENTIONS DURING DROUGHT CONDITION IN AGRICULTURAL SECTOR

Country	Adaptation Practices	Operator	Receptor	Exposure unit	Means	Type
Ethiopia	Zero or low tillage, cover crops, use of crop residue	Individuals; Farmers, NGOs & Ministry of Agriculture (MOA),	Farmers	Farm/cropland; soil carbon	IK, Support from, NGOs	Autonomous & direct
	Crop and livestock integration	Individuals; Farmers & Ministry of Agriculture (MOA)	Farmers and herders	Farm/cropland & Livestock; community livelihood	IK, Support from Ministry of Agriculture, NGOs & Funding from govt. and donor agencies	Autonomous & Direct
Tanzania	Minimum tillage/direct seeding, Cover cropping, Crop rotation,	Farmers, NGOs & Ministry of Agriculture	Farmers	Soil; Farmers' livelihood;	IK; Support from NGOs and	Autonomous & Direct

	Contour cropping; Intercropping (Pangani, Rufiji, Mtera, Mbeya, Dodoma and Tabora)	Food Security and Cooperatives		Livestock	Ministry of Agriculture	
	Mixed farming-Integrating Crop with livestock production (Pangani, Rufiji, Mtera, Mbeya, Shinyang, Mafia, Kilwa Dodoma and Tabora)	Farmers, NGOs	Farmers	Livestock; community livelihood	IK; support from NGOs and ministry of agriculture	Autonomous & Direct
Ghana	Vegetable gardening at the river plains	Farmers/individuals	Farmers	Crops; community livelihood	IK, with support from NGOs	Autonomous & Reflexive
	Crop rotation	Farmers/individuals	Farmers	Soil, Farmers livelihood	IK, with support from NGOs	Autonomous & Reflexive
	Agro biodiversity	Farmers/individuals	Farmers	Forest; crops; community livelihood	IK, with support from NGOs	Autonomous & Reflexive
Kenya	Mixed farming of tree intercropped with crops	Farmers, Ministry of Agriculture & Rural Development	Farmers, community	Cropland; Farmers' livelihood	IK, capacity building by NGOs & extension workers	Autonomous & Direct
Zambia	Cropping with nitrogen-fixing fertiliser trees and bushes, including Faidherbia and other genera such as Gliricidia and Tephrosia;	Ministry of agriculture; Forestry department	Community	Soil; crops; fuel wood; Community livelihood system	Government funding	Planned and facilitating

	Trees are intercropped in annual food crop and livestock**.**	Ministry of agriculture; Forestry department, Community	Community	Crops; livestock; soil; Community livelihood system	Government funding; IK	Planned and facilitating
	Use of technologies for fertility improvement and moisture,	Ministry of agriculture; Forestry department, Community	Community	Community livelihood system; soil; crops	Government funding; IK	Planned and facilitating
Zimbabwe	Soil fertility enhancement through the use of crop residue	Farmers	Farmers	Soil, Farmers' crop, community livelihood	IK, community resources	Autonomous, direct & reflexive
Nigeria	Use of crop residue, mulching, leguminous cropping, rotation of crop land with grazing land.	Farmers, ministry of agriculture, NGOs	Farmers,	Soil, Farmers' crop, community; livelihood	IK, community resources, extension services	Autonomous, direct & reflexive
	Rotational farming (exchanging grazing areas with crop land	Farmers, ministry of Agriculture, NGOs	Farmers,	Soil, Farmers' crop; community livelihood	IK, community resources, extension services	Autonomous, direct & reflexive
	Fish pond in a rice paddy	Farmers, Ministry of Agriculture, NGOs	Farmers,	Soil, Farmers' crop, community livelihood	IK, community resources, extension services	Autonomous, direct & reflexive

ANNEX 10: MITIGATION IN DROUGHT IN FORESTRY SECTOR (AFFORESTATION/REFORESTATION)

Country	Mitigation Practices	Operator	Receptor	Exposure unit	Means	Type
Ethiopia	Rehabilitation of Degraded Land through tree planting	Ministry of Agriculture & natural resources, Ministry of Environment and Forest, NGOs, Community	Community	Soil, forest; community livelihood	IK, community resources, extension services; government fund	Planned; direct & reflexive
	Sustainable development of Bamboo	Ministry of Environment and Forest, NGOs, Community	Community	Soil, forest; community livelihood	IK, community resources, extension services; government fund	Planned/autonomous, direct & reflexive
	Area enclosure for natural regrowth of forest	Ethiopia Wildlife Conservation Authority; Ministry of Environment and Forest, NGOs	Community	Forest, wildlife and natural resource system	NGOs, Government intervention, donor funded programme	Planned, Direct & reactive
Nigeria	Planting of trees which usually exotic e.g Gmelina and Teak; Shelter belt to reduce impact of desertification	Ministry of Environment, Department of Forestry, Academic institutions	Community, Department of forestry	Forest, soil; fuel wood; community livelihood	Donor funds; Government support & NGOs	Planned, Reactive, reflexive & facilitating
	Shelter belt against desertification (green wall project)	Great Green Wall Agency	Community	Community; soil; forest; water	Donor funding and regional government	Planned, Reactive; Direct; facilitating

				resources	support	
Ghana	Bio-energy for fossil fuel substitution, afforestation of degraded lands such as old mines	Ministry of Food & Agriculture; community, NGOs, Nature conservation and research centre, crop research institute; environmental protection Agency	Community; Forestry commission	Crops, soil, community livelihood and energy (fuel wood)	Capacity building, government & NGO's support,	Planned/Autonomous, Reactive, direct
	short rotation forestry and natural regeneration	Ministry of Lands and natural resources (Forestry commission)	Community; Forestry commission	Forest; fuel wood; community livelihood	Capacity building, government & NGO's support	Planned, Reactive; Direct and facilitating
Tanzania	Nursery establishment and tree planting in bare areas, alongside rivers and water catchments (Mafia and Kilwa Dodoma and Tabora	MNRT, Private Sector, NGO,	Community	Community's livelihood, crops; soil	Capacity building, government & NGO's support	Planned; Reactive; Direct and facilitating
	Tree planting campaign, beekeeping in natural forests, Afforestation programmes in degraded lands using more adaptive and fast growing tree species	Ministry of Energy and Minerals	Community	Community's livelihood, crops;	Capacity building, government & NGO's support	Planned, Reactive; Direct and facilitating
	Alternative energy	MNRT, Private Sector, NGO, CBO,	Community	Community's Energy source	Capacity building, government &	Planned, Reactive; Direct and facilitating

					NGO's support	
Kenya	Afforestation in crop-livestock systems in the cultivated watersheds.	Arid Lands Resource Management Project (ALRMP); Ministry of State for Development of Northern Kenya and other Arid Lands	Community	Forest, water resources	Funding and support by government and NGOs	Planned;
	Reclamation of degraded lands; rehabilitation and restoration of all water catchments	Agricultural Development Corporation	Community	Crop; fuel wood; community livelihood	Community resources, NGOs and government support	Planned;
	Agroforestry					
Zambia	Reclamation of degraded mines (Kaputa; Kazungula, Shangombo, Mopani and Konkola)	Ministry of Environment, Natural Resources and Regional Development Authorities	Community; Ministry of Environment, Natural Resources and Regional Development Authorities	Forest, soil, swamp, grassland	Government funds, NGOs community resources	Planned, reactive
	Commercial Jatropha plantation					
	Forest enhancement including natural regeneration and					

	afforestation/reforestation					
Zimbabwe	Rehabilitation of degraded forest lands to address impacts of climate change and desertification.	Ministry of Environment, Water and Climate; Forestry Commission; CSOs;	community	Forest and water resources	Funding from Government & NGOs	Planned and reactive

ANNEX 11: FOREST PROTECTION INTERVENTION

Country	Mitigation Practices	Operator	Receptor	Exposure unit	Means	Type
Ethiopia	Using legal instrument to protect reserves and forest corridor around degraded Land and buffer for NTFPs	Ministry of Environment and Forest,; community, NGOs	Community/ecological systems	forest, soil, community livelihood and energy (fuel wood)	Capacity building, government & NGO's support,	planned, Reactive & direct
Nigeria	Forest reserves and protected areas.	Ministry of Environment; forestry, community, NGOs	Community/ecological systems, biodiversity	Forest; soil, community livelihood and energy (fuel wood)	Capacity building, government & NGO's support,	planned, Reactive, direct
Ghana	Bio-energy for fossil fuel substitution; short rotation forestry and natural regeneration.	Forestry Commission; community, NGOs, Nature conservation and research centre, environmental protection Agency; Forestry Research Institute of Ghana	Community; Forestry commission	Forest; soil, community livelihood and energy (fuel wood)	Capacity building, government & NGO's support,	Reactive, direct

Tanzania	Enhancing the protection of buffer zones and providing alternative sources of energy for both domestic and industrial use (Mtera, Mbeya, Shinyanga, Mafia and Kilwa Dodoma and Tabora	Ministry of Agriculture Food Security and Cooperatives; Ministry of Natural Resources and Tourism (MNRT); Private Sector, CSOs; Arid Lands Resource Management Project (ALRMP); Ministry of State for Development of Northern Kenya and other Arid Lands	Community/ ecological systems, biodiversity	Community's livelihood, forest; soil	Capacity building, government & NGO's support	Reactive; Direct and facilitating
Kenya	Agroforestry	Agricultural Development Corporation	Community	Crop; fuel wood; community livelihood	Community resources, NGOs and government support	Planned;
Zambia	Protection of Miombo woodlands (plateau and hills),	Ministry of Environment, Natural Resources and Regional Development Authorities	Community; Ministry of Environment, Natural Resources and Regional Development Authorities; community	Forest, soil, swamp, grassland	Government funds, NGOs community resources; legal authority	Planned, reactive
Zimbabwe	**REDD+**	Ministry of Environment, Water and Climate; Forestry Commission; CSOs;	community	Forest and water resources	Funding from Government & NGOs; legal authority	Planned and reactive

ANNEX 12: ALTERNATIVE ENERGY INTERVENTION

Country	Mitigation Practices	Operator	Receptor	Exposure unit	Means	Type
Ethiopia	Sustainable Development of Bamboo and commercial cultivation of Jatropha (Regions of Oromiya, Tigray, Southern Nations, Nationalities and Peoples, Beni-Shangul Gumuz, and Amhara)	Individuals; Farmers, NGOs & Ministry of Agriculture (MOA); Bamboo Development Unit (NABDU)	Farmers	Farm/cropland; soil carbon	Support from Ministry of Agriculture, NGOs	Autonomous & direct
Tanzania	Use of briquette for alternative energy. Bagamoyo, Zanzibar)	Farmers, NGOs & Ministry of Agriculture Food Security and Cooperatives	community	Community cropland; fuel wood and livelihood	Capacity building by NGOs & funding from government	Planned and Direct
Nigeria	Wood Fuel efficient stove project;	Ministry of Environment; NGOs	community	Community cropland; fuel wood and livelihood	capacity building by NGOs & funding from government	Planned and Direct
Ghana	Improved cook stoves and use of of LPG; capacity building for cultivation of bamboo	Energy commission; Forestry commission	community	Community cropland; fuel wood and livelihood	capacity building by NGOs & funding from government	Planned and Direct
Kenya	Methane gas capture in landfills; Energy saving	National Environment Management Authority (NEMA);	community	Community cropland; fuel wood and	capacity building by NGOs &	Planned and Direct

	stove project (Dandora Landfill, Nairobi)	Ministry of State for Development of Northern Kenya and Other Arid Lands (MSDNKOAL)		livelihood	funding from government	
Zambia	Bio-fuels- Commercial Jatropha plantation (Mpongwe, Kabwe, Kaputa)	Ministry of Energy and Water Development – Energy Department	Community	fuel wood; Community livelihood system	Government funding; capacity building by NGOs	Planned and facilitating
Zimbabwe	Waste to energy; cultivation of Jatropha curcas plant, sugarcane, blending of petrol with ethanol for bio-fuels and cook stoves for household use (Chiredzi; Chisumbanje; Hippo valley	Ministry of Energy and Power Development; Community and NGOs	Community	fuel wood; Community livelihood system	Government funding; capacity building by NGOs	Planned and facilitating

ANNEX 13: APPLIED POLICIES IN FOREST NAMA

Country	NAMA Priority in Agriculture sector	NAMA Priority in forest sector	Strategy	Enabling Policy
Ethiopia	Sustainable Land Management)	Sustainable Management, Conservation and Utilization of Forests	Sustainable Land Management Program (SLMP)	National strategy policy
Ghana	minimizing climate change impact and socio-economic development through agricultural diversification	Emission reduction Afforestation of degraded lands, improved the used of cook stove and LPG stove	REDD+; managing energy efficiency; Ghana shared development agenda; economic and Fiscal instrument	Forestry acts, National climate change policy, 2014
Nigeria	Sustainable land management (SLM) practices; capacity-building, to promote the adoption of climate-smart agriculture (CSA) techniques.	Sustainable forest management, increasing afforestation and reforestation, Strengthening the implementation of the national Community-Based Forest Resources Management Programme.	Mainstreaming Climate Change into Sustainable Development; low-carbon technologies Mainstreaming Climate Information into National Planning and Policy Making;	National policy on environment; NARF
Tanzania	Climate resilience agriculture to enhance productivity in the agricultural sector,	mainstreaming climate change aspect into forest management practices	REDD+ mechanism; Mainstream resilience actions where opportunities exist, scale up what works and fill existing gaps: designed to mainstream actions into	National Climate Change Strategy, Agriculture Climate Resilience Plan, 2014–2019, Tanzania National

			planned and existing policies, programmes and projects	Adaptation Program of Action
Kenya	low-carbon, climate- resilient development,; implement sound land use, water and natural resource management policies	Low carbon development actions include the restoration of forests on degraded lands and reforestation of degraded forests.	Climate compatible development; mobilizing private investment by channeling targeted international climate finance and technical support.	National Climate Change Action Plan (NCCAP, 2013 -2017; The Economic Recovery Strategy for Wealth and Employment Creation
Zambia	Diversification and promotion of conservation/Climate Smart Agricultural (CSA)	Sustainable Forest Management and cultivation of jatropha; reduce deforestation through enhanced regeneration and reforestation	Africa Bio-Carbon Initiative	National Policy on Climate Chang
Zimbabwe	Sustainable management of natural resources and protection of the environment; Sustainable intensification and commercialization of agriculture at different scales across agro-ecologies.	Design carbon projects for accessing different carbon financing mechanisms and to implement and support the projects; Maintain, account for, and expand carbon sinks	Mainstream climate change adaptation and mitigation strategies in economic and social development at national and sectoral levels through multi-stakeholder engagement.	Environmental Management Act (EMA), Act No.13 of 2002 (Chapter 20:27), revisions under Act No.5 of 2004 (s.23) and Act No. 6 of 2005 (s.28); Zimbabwe's National Climate Change Response Strategy

ANNEX 14: POLICIES THAT INCORPORATE BOTH, ADAPTATION & MITIGATION CHARACTERISTICS

Country	Policy	Key relevance to Adaptation	Key relevance to mitigation	Evaluation based on guiding principle
Ethiopia	Environmental Policy	Protection of environment	Conservation and sustainable utilization of forest, soil water resources	Participation and empowerment of people
	Agriculture and Rural Development Policy and Strategy,	Watershed development for environmental adaptation.	Sustainable Land Management to build resilience	Accelerated and Sustainable Development to End Poverty (PASDEP),
	Energy policy	Use of renewable energy	Conservation of forest	Improving energy with attention to climate change and environment
	water policy	Regulating floods through sustainable mitigation and rehabilitation of watersheds	Protection of watersheds	Participation of stakeholders in the management of water resources
	Climate Resilient Green Economy (CRGE)	Overcome risk of climate change	protection of forest to increase carbon stocks	Low carbon pathway
	National Policy on Biodiversity Conservation	Regulate exploitation	Forest conservation	Sustainable development
	Forest Development, Conservation and Utilization Policy	Restoration of degraded areas	Conservation of watershed	Conservation of natural resources
Tanzania	The National Food Security Policy	Strengthen capacity of agricultural sector line Ministries to use analytical tools.	Promoting early maturing and drought tolerant crops	Food security

	National Environment Policy	Protection of environment		Strengthen knowledge and systems to target climate action
	National forest policy	Supporting alternative livelihood initiatives for forest dependent communities.	Enhancing and conservation of carbon stocks.	implementation of integrated resource management
	Agricultural policy	Promoting minimum tillage and efficient fertilizer utilization.	Promoting agro-forestry systems.	Utilizing natural resources in a sustainable manner
	The irrigation policy	Irrigation and livestock		Resolving conflict in water use
Kenya	National Forest Policy,	Adaptation in drought condition through irrigation drainage systems and watershed management.	Sustainable management of forest, and other natural resources.	Sustainable management of natural resources
	National Policy for the Sustainable Development of Northern Kenya and other Arid Land	Rehabilitation of degraded lands through afforestation	Support to biofuels in alternative energy to mitigation of Green House Gas Emissions.	Increase resilience and strengthening livelihoods.
	National Agriculture Sector development Policy	CSA	Promote agroforestry system	Sustainable food production
	National Irrigation and Drainage Policy	Irrigation systems	Watershed and drainage basin management	Sustainable production
	The National Disaster Management Policy,	Disaster management and mainstreams disaster risk reduction.	Conservation of natural resources	The policy aims to increase and sustain resilience of vulnerable communities to hazards.
	The Energy Policy	indigenous renewable energy sources	renewable energy system to reduce GHG emission	Climate change mainstreaming in policy

Ghana	National Forest and Wildlife Policy.	Wild fire management	Forest enrichment to enhance carbon stock	Promote Sustainable utilization of forest resource using REDD+ mechanism
	Food and Agriculture Sector Development Policy	Conservation agriculture approach	Low tillage	Building agricultural resilience in vulnerable landscape
	National Energy Policy/ renewable energy policy	Governance framework for utilization of forest product	Reduced consumption of fossil fuel	Value addition-based utilization of forest resources
	National Climate Change Policy (NCCP), 2013	Promotion of alternative livelihoods	Improved land use management	Sustainable development
	National Environment policy	Mainstreaming climate change into developmental strategy	Reducing destruction of resources	Sustainable environment
Nigeria	National Environmental Policy	Addressing land degradation	Regulating activities to reduce GHG emission	sustainable development
	National Policy on Drought and Desertification;	Checking desertification	Great green wall project	Reducing desert encroachment
	National Energy Policy	Renewable energy development	Renewable energy development	Reducing GHG emission
	National Policy on Erosion, Flood Control and Coastal Zone Management	Dams and watershed management	Restoration of degraded area	Sustainable ecosystem management
	National Forest Policy;	Establishment of woodlots	Ecosystem restoration	Sustainable natural resource management
	National Biodiversity Strategy and Action Plan;	Conservation of biodiversity	Reducing exploitation	Sustainable natural resource management

	National Policy on Irrigation,	Irrigation during drought	Water management	Water resource management
Zambia	Energy policy	Use of fuel efficient stove such as ethanol stove	Promotion of biofuels to partially replace +fossil fuels.	promotion of renewable energy
	forestry policy	Agroforestry/farm forestry	protection and maintenance of biodiversity for the benefit	sustainable forest management
	National Policy on Environment	Cross-cutting with that of agriculture and forestry	Cross-cutting with that of agriculture and forestry	avoids environmental degradation
	Agriculture policy	promotion of early maturing/drought resistance crops	Conservation agriculture through Minimum-tillage	increase production and productivity of the agricultural sector
	Water policy	Inter-Basin Water Transfers	Protection of water catchment	Improved water security for ecological, domestic and industrial processes
Zimbabwe	National Environmental Policy	Protection and conservation of natural resources	In line with the goals of the forestry sector	natural resources protection,
	National Land Policy	Land use plane and zonation	Expand sinks by protecting and practicing agro-forestry and restoring degraded lands	Regulate change in land use
	Water management	irrigation system	rehabilitation of existing systems, including dams, irrigation systems, canals, pumps, rivers and wetlands	Ensuring water availability
	National Energy Policy	renewable sources	Reducing impact on the use of fuel wood	Cleaner energy option
	Agricultural policy	promotion of drought-tolerant crops	Changing cultivation practices	Help farmers cope with climate change

ANNEX 15: ACTIVITIES THAT INCORPORATE BOTH ADAPTATION AND MITIGATION

S/N	Adaptation Mitigation Practices	Kenya	Tanzania	Ghana	Zambia	Zimbabwe	Nigeria
1	Tree planting/Reforestation	X		X		x	X
2	Capacity Building	x		X	X		X
3	Policy on Environment	x					X
4	Education, Awareness and Sensitization	x					X
5	Funding	x	X				x
6	Agroforestry	x	X	X	X	x	x
7	Integration Soil fertility management			X			x
8	Conservation agriculture			X			x
9	Wildfire Prevention			X			
10	Mangrove restoration			X			x
11	Watershed protection and management	x	X	X	X		x
12	Plantation development			X			
13	Value Addition			X			x
14	Improved seed varieties				X		
15	Clean energy	x	X		X		x

16	Early maturing Crops				X		
17	Livelihood diversification			X	X		x
18	Mixed farming				X		
19	Alternative livelihood				X		
20	Drought resistant species				X	x	
21	Post-harvest storage facilities				X		
22	Shelter belt						x
23	Conservation						x
24	Water harvesting						x

ANNEX 16: AGENCIES INVOLVED IN MITIGATION AND ADAPTATION OPTIONS IN THE CONTEXT OF 3FS

Country	Agency	Project type	Food	Fuel	Fiber
Nigeria	NGO Coalition for Environment (NGOCE)	Mitigation/Adaptation	4	3	1
		mitigation			
		Adaptation			

	Wise Administration of Terrestrial Environment and Resources (WATER)	Adaptation/Adaptation	4	3	
	Mangrove Watch	adaptation	3	1	
Ghana	CSIR-Forestry Research Institute of Ghana (CSIR-FORIG)	mitigation			
Kenya	Green Belt Movement	Adaptation/Adaptation	5	4	3
	National adaptation programme under the Adaptation Fund	Adaptation			
	Ministry of Environment, Natural Resources and Regional Development Authorities - SLEEK Program	Mitigation	4	4	1
Zambia	Miombo As	Adaptation/Mitigation	5	5	2
		Adaptation			

	Emerging Cooking Solutions	Adaptation	1	5	1
Zimbabwe	Community capacity building initiative center for Africa	Mitigation	3	2	1

ANNEX 17: CARBON POLICIES SUPPORTING / CONSTRAINING DEVELOPMENT OF INITIATIVES ON CARBON

Country	Carbon policies at national level	Areas of support to initiatives on carbon development
Ethiopia	National Policy on Biodiversity Conservation	Conservation of biodiversity
	Climate Resilient Green Economy (CRGE) Strategy	becoming a low carbon; middle income economy by 2025
	Agriculture policy	Low tillage
Tanzania	National forest policy	Enhancing and conservation of carbon stocks.
	National Environment Policy	Conservation of natural resources
	Agriculture Climate Resilience Plan	Conservation
Kenya	National Climate Change Action Plan (NCCAP)	Low carbon climate resilience development
	Forest policy/ The Kenya Forestry Master Plan	sustainable management of forest and enhancement of forest carbon stocks
Ghana	Forestry sector	Forest enrichment
	Ghana's Forest & Wildlife Policy	Conservation of wildlife

Nigeria	The National Forestry Development policy;	Afforestation, agro forestry and forest protection.
	Environment policy	Natural resource management
Zambia	forestry policy	Agroforestry/farm forestry
	National Policy on Environment	Cross-cutting with that of agriculture and forestry
Zimbabwe	National Environmental Policy	Protection and conservation of natural resources
	National Land Policy	Land use plane and zonation

ANNEX 18: CARBON POLICIES SUPPORTING / CONSTRAINING DEVELOPMENT OF INITIATIVES ON CARBON

Country	Activities	Areas of support to initiatives on carbon development
Ethiopia	Conservation agriculture	increasing carbon stocks
	Afforestation and re-forestation	reducing greenhouse emissions; protecting and re-establishing forests
	REDD+	Enhancement of carbon stock and SFM
Tanzania	Afforestation and re-forestation	Forest enrichments
	REDD+	Sustainable management of forest
	Climate Change, Impacts, Adaptation and Mitigation in Tanzania (CCIAM)	Research
	Tanzania economics of climate change	Explore opportunity for carbon
Kenya	Tree planting for forest enrichment	Forest enrichment enhances carbon sequestration
	REDD+	Enhancement of carbon stock and SFM

Ghana	Agroforestry	Sequestration of carbon
Nigeria	Agroforestry and conservation agriculture	Enhancement of carbon stock
	sustainable land management (SLM)	Land use plan
	Afforestation/ Reforestation	Protection of forest
	REDD+	Enhancement of carbon stock and SFM
Zambia	protection and maintenance of biodiversity for the benefit	sustainable forest management
	Cross-cutting with that of agriculture and forestry	avoids environmental degradation
	REDD+	Conservation of carbon stock
Zimbabwe	In line with the goals of the forestry sector	natural resources protection,
	Expand sinks by protecting and practicing agro-forestry and restoring degraded lands	Regulate change in land use

ANNEX 19: CARBON POLICIES SUPPORTING / CONSTRAINING DEVELOPMENT OF INITIATIVES ON CARBON

Country	Activities	Areas of support to initiatives on carbon development
Ethiopia	Conservation agriculture	increasing carbon stocks
	Afforestation and re-forestation	reducing greenhouse emissions; protecting and re-establishing forests
	REDD+	Enhancement of carbon stock and SFM
Tanzania	Afforestation and re-forestation	Forest enrichments
	REDD+	Sustainable management of forest
	Climate Change, Impacts, Adaptation and Mitigation in Tanzania (CCIAM)	Research
	Tanzania economics of climate change	Explore opportunity for carbon
Kenya	Tree planting for forest enrichment	Forest enrichment enhances carbon sequestration
	REDD+	Enhancement of carbon stock and SFM
Ghana	Agroforestry	Sequestration of carbon
Nigeria	Agroforestry and conservation agriculture	Enhancement of carbon stock
	sustainable land management (SLM)	Land use plan
	Afforestation/ Reforestation	Protection of forest
	REDD+	Enhancement of carbon stock and SFM
Zambia	protection and maintenance of biodiversity for the benefit	sustainable forest management

	Cross-cutting with that of agriculture and forestry	avoids environmental degradation
	REDD+	Conservation of carbon stock
Zimbabwe	In line with the goals of the forestry sector	natural resources protection,
	Expand sinks by protecting and practicing agro-forestry and restoring degraded lands	Regulate change in land use

ANNEX 20: ASSESSMENT OF KEY AFRICAN INSTITUTIONS WITH POTENTIAL TO EFFECTIVELY ADDRESS GOVERNANCE OF CLIMATE CHANGE IN FORESTRY

S/N	Institutions	CC Mandate	CB for Adaptation interventions	CB for Mitigation intervention	Collaboration with other stakeholders	Funding of CC intervention	Information sharing/CC communication	Total Score
1	Ministry of Environment	x	x	x	X		x	5
2	Ministry of Agriculture	x	x	x			x	4
3	Forestry commission	x	x	x	X			4
4	Department of climate change	x	x	x	X			4
6	NCF	x	x	x		X		4
	Federal Ministry of	X	x					2

S/N	Institutions	CC Mandate	CB for Adaptation interventions	CB for Mitigation intervention	Collaboration with other stakeholders	Funding of CC intervention	Information sharing/CC communication	Total Score
	Science and Technology							
	Federal Ministry of Water Resources	X	x	x			x	4
	Great green Wall Agecy	X	x	x				4
	River Basin Authority	x	x				x	3
	National Fadama Project	x	x			X		3
	National Space Research and Development Agency (NASRDA)	x			x			2
	Zimbabwe							
	Ministry of Environment, Water and Climate	x	x	x	X		x	5
	Environmental Management Agency	x	x	x	X			4
	Forestry Commission	x	x	x			x	4

S/N	Institutions	CC Mandate	CB for Adaptation interventions	CB for Mitigation intervention	Collaboration with other stakeholders	Funding of CC intervention	Information sharing/CC communication	Total Score
	Ministry of Agriculture, Mechanisation and Irrigation Development	x	x	x			x	4
	Ministry of Energy and Power Development	x					x	
	Zimbabwe National Water Authority	x	x					
	Tanzania							
	Ministry of Agriculture Food Security and Cooperatives	x	x	x	X		X	5
	Ministry of Water	x	x		X			3
	Tanzania Meteorological Agency	x		X				2
	Ministry of Energy and Minerals	x		X				2
	Ministry of Natural Resources and Tourism	x	x	X			X	4
	Ministry of Water	x	x				X	3

S/N	Institutions	CC Mandate	CB for Adaptation interventions	CB for Mitigation intervention	Collaboration with other stakeholders	Funding of CC intervention	Information sharing/CC communication	Total Score
	and Irrigation							
	Ministry of Community Development, Gender and Children	x	x				X	2
	Kenya							
	Kenya Forestry Research Institute (KEFRI)	x	x	x	X			4
	Ministry of Agriculture (MoA)	x	x	x			x	4
	Ministry of Environment and Mineral Resources (MEMR)	x	x	x	X		x	5
	Ministry of Energy							
	Ministry of State for Development of Northern Kenya and Other Arid Lands (MSDNKOAL)	x	x	x	X		X	5
	Ghana							
	Council for Scientific and Industrial	x	x	x			x	

S/N	Institutions	CC Mandate	CB for Adaptation interventions	CB for Mitigation intervention	Collaboration with other stakeholders	Funding of CC intervention	Information sharing/CC communication	Total Score
	Research (CSIR)							
	Ministry of Lands and Natural Resources (MOLNR)	x	x	x			x	
	Savanna Agricultural Research Institute (SARI)	x	x	x				
	Environmental Protection Agency (EPA)	x	x	x				
	Forestry Commission	x	x	x	X			X
	Zambia							
	Zambia Meteorological Department	x	x	x	X			
	Zambia Forest and Forestry Industry Corporation	x		x	X			
	Ministry of Agriculture and Cooperatives	x	x		X		x	

S/N	Institutions	CC Mandate	CB for Adaptation interventions	CB for Mitigation intervention	Collaboration with other stakeholders	Funding of CC intervention	Information sharing/CC communication	Total Score
	MTENR Ministry of Tourism, Environment, and Natural Resources	x	x	x			x	
	MMMD Ministry of Mines and Mineral Development							
	Centre for Energy Environment and Engineering Zambia (CEEEZ)	x	x	x			X	

ANNEX 21: KEY NATIONAL INSTITUTIONS WITH POTENTIAL TO EFFECTIVELY ADDRESS GOVERNANCE OF CLIMATE CHANGE

NIGERIA	Key National institutions with potential to effectively address governance of Climate change	Effectiveness
	Federal ministry of environment, agriculture, lands, NASRDA , CBN and the presidency	Political will, statutory responsibility, manpower capability and Research.
	Ministry of Environment, Federal Department of Forestry, Nigerian airspace Development Agency and Nigerian Meteorological Agency and the Universities.	Commitment to duty, better funding.
	The Department of Climate Change at the Federal Ministry of Environment and the Federal Department of Forestry.	The factors responsible for the effectiveness of the institutions are capacity development of the institutions, capacity development of human resource, provision of

		financial and material resources - vehicles, equipment, participatory governance involving communities, NGOs, academia, private sector, effective monitoring and evaluation
	Federal Department of Climate Change and REDD++ project in Forestry Department	Funding through the following: Food and Agricultural Organization (FAO) and Nigerian Government 2. Availability of Technical Know-How 3. Man power development.
	Forestry Research Institute of Nigeria. Universities and higher institutions offering Forestry/Environmental courses.	Good funding and high level commitment.
	Federal Ministry of Environment; Energy Commission of Nigeria	Political and technical commitments
	Federal Ministry of Environment	Adequate Policy back-up Access to funds Improve human capacity
	Federal Ministry of Environment	Adequate funds; supportive laws
	Federal Ministry of Environment(Federal Department of Forestry/National REDD Unit, Climate Change Unuit, Drought & Desertification Amelioration Dept., Great Green Wall Agency); National Space Research and Development Agency; Federal Ministry of Agriculture; Universities of Ibadan, Lagos and Calabar; Federal University of Technology, Akure and others; Centre for Ecological & Community Development; etc.	Availability of trained personnel and infrastructure; statutory mandates; political will; institutional arrangement; existence of national and international cooperation.
	Federal Ministry of Environment	Legal mandate to act and establishment of departments responsible for such issues. Links and collaboration with a wide range stakeholders for technical support also responsible.
	Ministry of environment (Department of climate change)	1. The assign responsibility of the ministry 2. long time engagement in environmental issues

		3. involvement in natural resource management
	Environment, Forestry Research Institute, Agriculture	Enabling Acts or Policies that created them
	The federal Ministry of environment	It has the political will and capacity
GHANA	Civil Society Organisations/ Non-Governmental Organisations, Forestry Service, Judiciary, Law enforcement agencies (provided they understand the underlying concepts)	Commitment to ensuring equity and effectiveness
	Ministry of Environment, Science and Technology; Environmental Protection Agency, Ministry of Food Agriculture and Forestry Commission, Ministry of Lands and Natural Resources	law enforcement across the different sectors, institutional coordination and synergy building, efficient programme funding mechanisms, efficient Monitoring and Evaluation systems, etc.
	Forestry Commission, Environmental Agency, Ministry of Environment Science, Technology and Innovation	
	Forestry Commission, MLNR, MESTI, EPA, CSIR, Universities	Enabling policies
	The Ministry of Lands and Natural Resources; Forestry Commission; Ministry of Environment, Science, Technology and Innovation; Ministry of Agriculture and the Environmental Protection Agency.	Their mandates are clearly defined in all relevant policies
	Environmental Protection Agency, Council for Scientific and Industrial Research (Forestry Research Institute), Forestry Commission, Environmental NGOs, Government	Collaboration, quality relevant human resource, strict adherence to policies
KENYA	National environment management authority, Kenya forest service, Ethics and anti-corruption commission, National Treasury	Supportive policies and legislation, public goodwill
	Ministry of Environment, National Environment Management Authority, Climate Change secretariat	Strong institutional capacity, government goodwill
TANZANIA	Tanzania Forestry Research Institute (TAFORI) Universities - University of Dar es salaam - Institute of resource assessment, Sokoine University of Agriculture, Ardhi University NGOs- Tanzania Forest Conservation Group	Human resource capacity Experience High level of expertise

ZAMBIA	Climate change secretariat, Ministry of agriculture and livestock and Forest Department	Resource availability, effective planning and implementation of programmes
	decentralisation process and community based initiatives	Bottom-up approach and community involvement
	Led by Ministry of Finance, Agriculture, Ministry of Land Environment and natural Protection, Energy and grass root linked CSO	Innovation, delivery as well as efficacy in contributing to policy landscape both at national and international level
	I do not know	Clear mandate which defines roles and responsibilities
	Ministry of Water, Ministry of Agriculture, Ministry of Energy	Adequate funding and availability of technical capacity to develop appropriate approaches
ZIMBABWE	Higher tertiary institutions, Forestry commission, Environmental Management Agency	Conducting researches, Building effective networks, Resource mobilization strategies
	Forestry Commission, Ministry of Environment	Capacity building, resources,

ANNEX: 22 SUB-REGIONAL AFRICAN INSTITUTIONS

	Sub-Region African Institutions	Effectiveness
NIGERIA	UNDP ,FAO, UNEP AFRICAN FOREST FORUM, WORLD BANK	Research purposes, passion for conservation/ subject matter etc.
	State ministry of Environment and state Forestry Commission in Cross river state.	Strong Political will, commitment to duty by staff
	The institutions at the sub-regional level (Cross River State) that have demonstrated the capacity and have the potential to address governance of climate change in forestry are the Ministry of Climate Change and Forestry, Forestry Commission and Ministry of Environment	The factors responsible for the effectiveness of the institutions are capacity development of the institutions, capacity development of human resource, provision of financial and material resources - vehicles, equipment, participatory governance involving communities, NGOs, academia, private sector, effective monitoring and evaluation

	Departments of Climate Change and Environment across all the 36 states	Training of man power at the state levels and collaboration with research institutes.
	ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE)	Good funding and high level commitment.
	ECOWAS Commission	Political buy-ins
	State Ministry of Environment Other State Agencies Federal Ministry of Environment Regional Offices National Park Services	Enabling Policies Funds availability Community ownership and support
	Regional Centre for Training in Aerospace Survey, OAU, Ile-Ife	Availability of trained personnel and modern infrastructure; adequate funding; sub- regional cooperation.
	Ministry of climate change and forestry	1. The assign responsibility of the ministry 2. long time engagement in environmental issues 3. involvement in natural resource management 4. engagement with forest bearing communities
	Forestry Commissions, Ministries of Environments/ Climate Change	Acts/ Laws of Creation, Political will and funding
	Cross River State ministry of climate change and forestry	Built enough capacity and political will
GHANA	Civil Society Organisations/ Non-Governmental Organisations, Local Authority, etc	
	Forest Services Division of the Forestry Commission at the regional and district offices, District Assembly, Traditional Authorities, Landowners, etc.	see question 33 + consultations at all levels
	District offices of the Forestry Commission and other decentralised offices of the national level bodies listed in 32 above.	1. They have clear contacts with the grassroots 2. Clear mandates outlined in relevant national policies and strategies 3. Good track record in implementing similar initiatives in the past.

	ITTO, IFS etc	Determination
KENYA	EAC, IGAD, AU	strong political support from governments
	EAC and LVBC	Strong coordination
	East African Community, IGAD; COMESA	Political goodwill; financial resources; community participation; synergy among actors
TANZANIA	WWF ICRAF - world agroforestry centre	Experience High level of expertise
ZAMBIA	FAO, UNPD, CIFOR, ICRAF, USAID, Finnish Embassy	Resource availability, effective planning and implementation of programmes
	FAO	Community based
	PACJA	capacity to mobilise continental constituency and consensus
	I am not sure	same as in 33
	Zambezi River Basin Commission	policies by partner governments to support adaptation frameworks
ZIMBABWE	COMESA, SADC protocol on environment	Co ordination and collaboration
	Forestry Commission, Committees on shared water resources	capacity building on MRV, Project development

ANNEX 23

CORPORATE QUESTIONNAIRE FOR POLICY MAKER (INSTRUMENT 1)

Strengthening Adaptation Policies and AFOLU based Climate Change Mitigation Interventions Relevant to African Forestry and People

INTRODUCTION

Dear Respondents,

The African Forest Forum is conducting a study on forest based climate change adaptation and mitigation interventions. This questionnaire is divided into 6 sections and will take between 5 to 20 minutes to complete each section.

The questionnaire seeks your opinion on climate adaptation/ mitigation interventions, as well as climate policy issues. I kindly solicit your time to respond to the questions as they relate to your organization and/or experience.

Your prompt response to this instrument will be deeply appreciated and will be of invaluable help to the study.

Cheers.

IDENTIFICATION AND INFORMATION

1. Country

_____

2. Date

Example: December 15, 2012

_____

3. Organization

_____

4. Unit

_____

5. Contact Address

_____

6. Email

_____

7. Phone Contact

_____

CLIMATE CHANGE IMPACTS

8. 1. What are the likely climate impacts in your country?

Check all that apply.

- Drought
- Flood
- Bush Fire
- Crop Failure
- Storms
- Other:

9. 2. What are the common socioeconomic and ecological problems traceable to the above Impacts identified?

_____

10. 3. Who are those mostly affected (individuals, gender and social groups, resource user groups, farmers, NTFP collectors, livestock grazers, hunters, loggers etc.)?

11. 4. How do they cope with these impacts (Please respond to identified impacts e.g. drought, flood)?

_____
_

12. 5. How does climate change affect the sector (e.g. Agriculture, Forestry, Energy etc.) that your agency or organization is involved in (please specify sector)?

_____

CLIMATE ADAPTATION INTERVENTION MEASURES

13. 6. List to a maximum of 5 most critical adaptation intervention measures that your

organization provides for coping with climate change (Please indicate project area/ ecozone)

_____

Rate the success of each listed Adaptation Intervention measure as well as its effect on Food (Crops and Livestock), Fuel (Fuel wood, charcoal, industrial wood residues, biomass energy) Fiber (Cotton, Flask, helm, Jute, sisal, hide and skin etc.) and Timber/

NTFPs (hard wood, Bamboos, Rattans and other NTFPs)

Space is provided for 5 measures

14. 7. Enter 1st Adaptation Measure

_____

15. 7a. Rate the success of the above adaptation intervention measure (Question #7) on livelihood improvement

Mark only one oval.

0 1 2 3 4 5

low high

16. 7b. Rate the success of the above adaptation intervention measure (Question #7) on solution

to climate change problem

Mark only one oval.

0 1 2 3 4 5

low high

17. 7c. Rate the success of the above adaptation intervention measure (Question #7) on number of target beneficiaries reached

Mark only one oval.

0 1 2 3 4 5

low high

18. 7d. Rate the success of the above adaptation intervention measure (Question #7) on level of adoption/utilization

Mark only one oval.

0 1 2 3 4 5

low high

19. 7e. Rate the success of the above adaptation intervention measure (Question #7) on extent of

participation of women

Mark only one oval.

0 1 2 3 4 5

Low high

20. 7f. Rate the impact of the above adaptation intervention measure (Question #7) on food

availability

Mark only one oval.

0 1 2 3 4 5

low high

21. 7g. Rate the impact of the above adaptation intervention measure (Question #7) on fuel

availability

Mark only one oval.

0 1 2 3 4 5

low high

22. 7h. Rate the impact of the above adaptation intervention measure (Question #7) on fiber availability

Mark only one oval.

0 1 2 3 4 5

low high

23. 7i. Rate the impact of the above adaptation intervention measure (Question #7) on

Timber/NTFP availability

Mark only one oval.

0 1 2 3 4 5

Low high

24. 8. Enter 2nd Adaptation Measure

_____

25. 8a. Rate the success of the above adaptation intervention measure (Question #8) on livelihood improvement

Mark only one oval.

0 1 2 3 4 5

low high

26. 8b. Rate the success of the above adaptation intervention measure (Question #8) on solution to climate change problem

Mark only one oval.

0 1 2 3 4 5

low high

27. 8c. Rate the success of the above adaptation intervention measure (Question #8) on number of target beneficiaries reached

Mark only one oval.

0 1 2 3 4 5

low high

28. 8d. Rate the success of the above adaptation intervention measure (Question #8) on level of adoption/utilization

Mark only one oval.

0 1 2 3 4 5

low high

29. 8e. Rate the success of the above adaptation intervention measure (Question #8) on extent of participation of women.

Mark only one oval.

0 1 2 3 4 5

low high

30. 8f. Rate the impact of the above adaptation intervention measure (Question #8) on food availability

Mark only one oval.

0 1 2 3 4 5

low high

31. 8g. Rate the impact of the above adaptation intervention measure (Question #8) on fuel availability

Mark only one oval.

0 1 2 3 4 5

low high

32. 8h. Rate the impact of the above adaptation intervention measure (Question #8) on fiber availability

Mark only one oval.

0 1 2 3 4 5

low high

33. 8i. Rate the impact of the above adaptation intervention measure (Question #8) on

Timber/NTFP availability

Mark only one oval.

0 1 2 3 4 5

low high

34. 9. Enter 3rd Adaptation Measure

_____

35. 9a. Rate the success of the above adaptation intervention measure (Question #9) on livelihood improvement

Mark only one oval.

0 1 2 3 4 5

low high

36. 9b. Rate the success of the above adaptation intervention measure (Question #9) on solution

to climate change problem

Mark only one oval.

0 1 2 3 4 5

low high

37. 9c. Rate the success of the above adaptation intervention measure (Question #9) on number of target beneficiaries reached

Mark only one oval.

0 1 2 3 4 5

low high

38. 9d. Rate the success of the above adaptation intervention measure (Question #9) on level of adoption/utilization

Mark only one oval.

0 1 2 3 4 5

low high

39. 9e. Rate the success of the above adaptation intervention measure (Question #9) on extent of

participation of women

Mark only one oval.

0 1 2 3 4 5

low high

40. 9f. Rate the impact of the above adaptation intervention measure (Question #9) on food

availability

Mark only one oval.

0 1 2 3 4 5

low high

41. 9g. Rate the impact of the above adaptation intervention measure (Question #9) on fuel

availability

Mark only one oval.

0 1 2 3 4 5

low high

42. 9h. Rate the impact of the above adaptation intervention measure (Question #9) on fiber

availability

Mark only one oval.

0 1 2 3 4 5

low high

43. 9i. Rate the impact of the above adaptation intervention measure (Question #9) on Timber/NTFP availability

Mark only one oval.

0 1 2 3 4 5

low high

44. 10. Enter 4th Adaptation Measure

_____

45. 10a. Rate the success of the above adaptation intervention measure (Question #10) on livelihood improvement

Mark only one oval.

0 1 2 3 4 5

low high

46. 10b. Rate the success of the above adaptation intervention measure (Question #10) on solution to climate change problem

Mark only one oval.

0 1 2 3 4 5

low high

47. 10c. Rate the success of the above adaptation intervention measure (Question #10) on number of target beneficiaries reached

Mark only one oval.

0 1 2 3 4 5

low high

48. 10d. Rate the success of the above adaptation intervention measure (Question #10) on level of adoption/utilization

Mark only one oval.

0 1 2 3 4 5

low high

49. 10e. Rate the success of the above adaptation intervention measure (Question #10) on extent

of participation of women

Mark only one oval.

0 1 2 3 4 5

low high

50. 10f. Rate the impact of the above adaptation intervention measure (Question #10) on food

availability

Mark only one oval.

0 1 2 3 4 5

Low high

51. 10g. Rate the impact of the above adaptation intervention measure (Question #10) on fuel

availability

Mark only one oval.

0 1 2 3 4 5

low high

52. 10h. Rate the impact of the above adaptation intervention measure (Question #10) on fiber

availability

Mark only one oval.

0 1 2 3 4 5

low high

53. 10i. Rate the impact of the above adaptation intervention measure (Question #10) on Timber/NTFP availability

Mark only one oval.

0 1 2 3 4 5

low high

54. 11. Other adaptation measure, (if any)

_____

55. 11a. Rate the success of the above adaptation intervention measure (Question #11) on livelihood improvement

Mark only one oval.

0 1 2 3 4 5

Low high

56. 11b. Rate the success of the above adaptation intervention measure (Question #11) on solution to climate change problem

Mark only one oval.

0 1 2 3 4 5

low high

57. 11c. Rate the success of the above adaptation intervention measure (Question #11) on number of target beneficiaries reached

Mark only one oval.

0 1 2 3 4 5

low high

58. 11d. Rate the success of the above adaptation intervention measure (Question #11) on level of adoption/utilization

Mark only one oval.

0 1 2 3 4 5

low high

59. 11e. Rate the success of the above adaptation intervention measure (Question #11) on extent

of participation of women

Mark only one oval.

0 1 2 3 4 5

Low high

60. 11f. Rate the impact of the above adaptation intervention measure (Question #11) on food

availability

Mark only one oval.

0 1 2 3 4 5

low high

61. 11g. Rate the impact of the above adaptation intervention measure (Question #11) on fuel

availability

Mark only one oval.

0 1 2 3 4 5

low high

62. 11h. Rate the impact of the above adaptation intervention measure (Question #11) on fiber

availability

Mark only one oval.

0 1 2 3 4 5

low high

63. 11i. Rate the impact of the above adaptation intervention measure (Question #11) on

Timber/NTFP availability

Mark only one oval.

0 1 2 3 4 5

low high

64. 12. Where success is high: what factors enhanced the successful adoption of adaptation intervention measures?

_____

65. 13. Where success is low: what factors inhibit the adoption of adaptation intervention measures?

_____

CLIMATE MITIGATION INTERVENTION MEASURES

66. 14. What mitigation intervention measures of coping with climate change is driven by your

Organization or agency? (Please indicate project area/ ecozone) Rate the success of each listed Mitigation Intervention measure as well as its effect on Food (Crops and Livestock), Fuel (Fuel wood, charcoal, industrial wood residues, biomass energy) Fiber (Cotton, Flask, helm, Jute, sisal, hide and skin etc.) and Timber/ NTFPs (hard wood, Bamboos, Rattans and other NTFPs) Space is provided for 5 measures

67. 15. Enter 1st Mitigation Measure

_____

68. 15a. Rate the success of the above mitigation intervention measure (Question #15) on livelihood improvement

Mark only one oval.

0 1 2 3 4 5

low high

69. 15b. Rate the success of the above mitigation intervention measure (Question #15) on solution to climate change problem

Mark only one oval.

0 1 2 3 4 5

Low high

70. 15c. Rate the success of the above mitigation intervention measure (Question #15) on number of target beneficiaries reached

Mark only one oval.

0 1 2 3 4 5

Low high

71. 15d. Rate the success of the above mitigation intervention measure (Question #15) on level of adoption/utilization

Mark only one oval.

0 1 2 3 4 5

Low high

72. 15e. Rate the success of the above mitigation intervention measure (Question #15) on extent of participation of women

Mark only one oval.

0 1 2 3 4 5

Low high

73. 15f. Rate the impact of the above mitigation intervention measure (Question #15) on food

availability

Mark only one oval.

0 1 2 3 4 5

low high

74. 15g. Rate the impact of the above mitigation intervention measure (Question #15) on fuel

availability

Mark only one oval.

0 1 2 3 4 5

low high

75. 15h. Rate the impact of the above mitigation intervention measure (Question #15) on fiber

availability

Mark only one oval.

0 1 2 3 4 5

Low high

76. 15i. Rate the impact of the above mitigation intervention measure (Question #15) on

Timber/NTFP availability

Mark only one oval.

0 1 2 3 4 5

low high

77. 16. Enter 2nd Mitigation Measure

_____

78. 16a. Rate the success of the above mitigation intervention measure (Question #16) on

livelihood improvement

Mark only one oval.

0 1 2 3 4 5

low high

79. 16b. Rate the success of the above mitigation intervention measure (Question #16) on solution to climate change problem

Mark only one oval.

0 1 2 3 4 5

Low high

80. 16c. Rate the success of the above mitigation intervention measure (Question #16) on number of target beneficiaries reached

Mark only one oval.

0 1 2 3 4 5

Low high

81. 16d. Rate the success of the above mitigation intervention measure (Question #16) on level of adoption/utilization

Mark only one oval.

0 1 2 3 4 5

low high

82. 16e. Rate the success of the above mitigation intervention measure (Question #16) on extent

of participation of women

Mark only one oval.

0 1 2 3 4 5

low high

83. 16f. Rate the impact of the above mitigation intervention measure (Question #16) on food

availability

Mark only one oval.

0 1 2 3 4 5

Low high

84. 16g. Rate the impact of the above mitigation intervention measure (Question #16) on fuel

availability

Mark only one oval.

0 1 2 3 4 5

low high

85. 16h. Rate the impact of the above mitigation intervention measure (Question #16) on fiber

availability

Mark only one oval.

0 1 2 3 4 5

low high

86. 16i. Rate the impact of the above mitigation intervention measure (Question #16) on

Timber/NTFP availability

Mark only one oval.

0 1 2 3 4 5

low high

87. 17. Enter 3rd Mitigation Measure

_____

88. 17a. Rate the success of the above mitigation intervention measure (Question #17) on

livelihood improvement

Mark only one oval.

0 1 2 3 4 5

low high

89. 17b. Rate the success of the above mitigation intervention measure (Question #17) on solution to climate change problem

Mark only one oval.

0 1 2 3 4 5

low high

90. 17c. Rate the success of the above mitigation intervention measure (Question #17) on number of target beneficiaries reached

Mark only one oval.

0 1 2 3 4 5

low high

91. 17d. Rate the success of the above mitigation intervention measure (Question #17) on level of adoption/utilization

Mark only one oval.

0 1 2 3 4 5

low high

92. 17e. Rate the success of the above mitigation intervention measure (Question #17) on extent

of participation of women

Mark only one oval.

0 1 2 3 4 5

low high

93. 17f. Rate the impact of the above mitigation intervention measure (Question #17) on food

availability

Mark only one oval.

0 1 2 3 4 5

Low high

94. 17g. Rate the impact of the above mitigation intervention measure (Question #17) on fuel

availability

Mark only one oval.

0 1 2 3 4 5

low high

95. 17h. Rate the impact of the above mitigation intervention measure (Question #17) on fiber

availability

Mark only one oval.

0 1 2 3 4 5

low high

96. 17i. Rate the impact of the above mitigation intervention measure (Question #17) on

Timber/NTFP availability

Mark only one oval.

0 1 2 3 4 5

low high

97. 18. Enter 4th Mitigation Measure

_____

98. 18a. Rate the success of the above mitigation intervention measure (Question #18) on

livelihood improvement

Mark only one oval.

0 1 2 3 4 5

low high

99. 18b. Rate the success of the above mitigation intervention measure (Question #18) on solution to climate change problem

Mark only one oval.

0 1 2 3 4 5

low high

100. 18c. Rate the success of the above mitigation intervention measure (Question #18) on number of target beneficiaries reached

Mark only one oval.

0 1 2 3 4 5

low high

101. 18d. Rate the success of the above mitigation intervention measure (Question #18) on level of

adoption/utilization

Mark only one oval.

0 1 2 3 4 5

low high

102. 18e. Rate the success of the above mitigation intervention measure (Question #18) on extent

of participation of women

Mark only one oval.

0 1 2 3 4 5

low high

103. 18f. Rate the impact of the above mitigation intervention measure (Question #18) on food availability

Mark only one oval.

0 1 2 3 4 5

low high

104. 18g. Rate the impact of the above mitigation intervention measure (Question #18) on fuel

availability

Mark only one oval.

0 1 2 3 4 5

low high

105. 18h. Rate the impact of the above mitigation intervention measure (Question #18) on fiber availability

Mark only one oval.

0 1 2 3 4 5

low high

106. 18i. Rate the impact of the above mitigation intervention measure (Question #18) on

Timber/NTFP availability

Mark only one oval.

0 1 2 3 4 5

low high

107. 19. Other mitigation measure, (if any)

_____

108. 19a. Rate the success of the above mitigation intervention measure (Question #19) on

livelihood improvement

Mark only one oval.

0 1 2 3 4 5

low high

109. 19b. Rate the success of the above mitigation intervention measure (Question #19) on solution to climate change problem

Mark only one oval.

0 1 2 3 4 5

low high

110. 19c. Rate the success of the above mitigation intervention measure (Question #19) on number of target beneficiaries reached

Mark only one oval.

0 1 2 3 4 5

low high

111. 19d. Rate the success of the above mitigation intervention measure (Question #19) on level of adoption/utilization

Mark only one oval.

0 1 2 3 4 5

low high

112. 19e. Rate the success of the above mitigation intervention measure (Question #19) on extent of participation of women

Mark only one oval.

0 1 2 3 4 5

low high

113. 19f. Rate the impact of the above mitigation intervention measure (Question #19) on food availability

Mark only one oval.

0 1 2 3 4 5

low high

114. 19g. Rate the impact of the above mitigation intervention measure (Question #19) on fuel

availability

Mark only one oval.

0 1 2 3 4 5

low high

115. 19h. Rate the impact of the above mitigation intervention measure (Question #19) on fiber

availability

Mark only one oval.

0 1 2 3 4 5

low high

116. 19i. Rate the impact of the above mitigation intervention measure (Question #19) on

Timber/NTFP availability

Mark only one oval.

0 1 2 3 4 5

low high

Adoption of mitigation intervention measures

_____

117. 20. Where success is high: what factors enhanced the successful adoption of mitigation intervention measures?

_____

118. 21. Where success is low: what factors inhibit the adoption of mitigation intervention

measures?

_____
__

BENEFITS OF THE ADAPTATION AND/OR MITIGATION PROGRAMME/PROJECTS

119. 22. Provide the number of resource user groups (e.g. farmers, forest product collectors, livestock rearers) in the different zones or region adopting the strategies. [For each group, please indicate the number of males and females]

_____

120. 23. Outline the various benefits of the adaptation and/or mitigation programme/projects to farmers and other resource users (please specify)

_____

121. 24. What are the indigenous adaptation and mitigation measures with prospects for efficient food, fuel and fiber production in your country.

_____

122. 25. What interventions does your agency carry out that apply to both climate change adaptation and mitigation?

_____

ADAPTATION/ MITIGATION POLICIES

123. 26. What specific policies for adaptation in your country is being implemented by your agency?

_____

124. 27. What are the criteria for implementation of these policies?

_____

125. 28. How does your organization support policies on mitigation?

_____

126. 29. How can the different project complement longterm national goals to support adaptation and sustainable development?

_____

127. 30. What are the major carbon related policies that encourage the development of carbon initiatives in the country?

_____

128. 31. What are the policies that have hampered the success of initiatives on carbon in the country?

129. 32. What are the institutions at the national level that have demonstrated the capacity and have the potential to address governance of Climate Change in forestry?

_____

130. 33. What are the factors responsible for the effectiveness of the institutions?

_____

131. 34. What are the institutions at the sub regional level that have demonstrated the capacity and have the potential to address governance of Climate Change in forestry? For instance those involving your country and others

_____

132. 35. What are the factors responsible for the effectiveness of the institutions?

_____

133. 36. What can be done to improve the governance of Climate Change in forestry in the country?

_____

134. 37. What other possible solutions or suggestions do you propose for enabling the basic

population to cope with climate changes?

_____

ANNEX 24

CORPORATE QUESTIONNAIRE FOR PROJECT MANAGERS (INSTRUMENT 2)

Strengthening Adaptation Policies and AFOLU based Climate Change Mitigation Interventions Relevant to African Forestry and People

PROJECT SPECIFIC QUESTIONNAIRE

INTRODUCTION

Dear Respondents,

The African Forest Forum is conducting a study on forest based climate change adaptation and mitigation interventions. This questionnaire is divided into 4 sections and will take between 5 to 20 minutes to complete each section.

The questionnaire seeks your opinion on climate adaptation/ mitigation interventions, as well as climate policy issues. I kindly solicit your time to respond to the questions as they relate to your organization and/or experience.

Your prompt response to this instrument will be deeply appreciated and will be of invaluable help to the study.

Cheers.

Project Objectives/ Monitoring

1.1 Name of Organization

_____

2. 2. Country

_____

3. 3. Provide the following information: Project type, project name, project location, ecological zone and target group Provide the details in order for each named project

4. 4. State briefly the main objectives of the project?

_____

5. 5. Which of the objectives have been achieved?

_____

6. 6. What are the CC problems solved by this project?

_____

7. 7. Who are the target beneficiaries of the project?

_____

8. 8. What proportion have been reached/aware of the projects? Indicate target group and proportion reached

_____

Project Effectiveness/ Livelihood Groups

9. 9. What are the monitoring mechanisms to ensure effectiveness of the project?

_____

10. 10. What livelihood activities are supported by the projects?

_____

11. 11. Assess the effectiveness of the project on Food (crops & livestock) production

Mark only one oval.

1 2 3 4 5

Low high

12. 11b. Provide reasons for your assessment of #11

_____

13. 12. Assess the effectiveness of the project on Fuel (fuelwood, charcoal, industrial wood residues, or biomass energy)

Mark only one oval.

1 2 3 4 5

low high

14. 12b. Provide reasons for your assessment of #12

_____

15. 13. Assess the effectiveness of the project on Fiber (cotton, flask, helm, jute, sisal, hide & skin, etc.)

Mark only one oval.

1 2 3 4 5

low high

16. 13b. Provide reasons for your assessment of #13

_____

17. 14. Assess the effectiveness of the project on Timber/NTFP (hardwood, bamboos, rattans & other NTFPs)

Mark only one oval.

1 2 3 4 5

low high

18. 14b. Provide reasons for your assessment of #14

_____

19. 15. Assess the effectiveness of the project on Employment

Mark only one oval.

1 2 3 4 5

low high

20. 15b. Provide reasons for your assessment of #15

_____

21. 16. Which livelihood group e.g. crop farmers, livestock farmers, forest product gatherers, etc.benefits from the projects? (List benefits to the various groups identified)

_____

22. 17. What proportion of the identified livelihood groups utilize the project? Project Adoption

_____

23. 18. What are the factors that enable the adoption of the project benefits?

_____

24. 19. What are the challenges militating against the adoption of the benefits from the project? Climate Adaptation/ Project Policies

_____

25. 20. What other opportunities exist in the project for climate adaptation and/or mitigation and livelihood enhancement?

_____

26. 21. What other adaptation/ mitigation projects do you have in your country?

_____

27. 22. What are the policies that establish the projects?

_____

28. 23. How does the project relate to existing policies on Adaptation and/or mitigation?

_____

29. 24. How can the project complement long term national goals to support sustainable development?

_____

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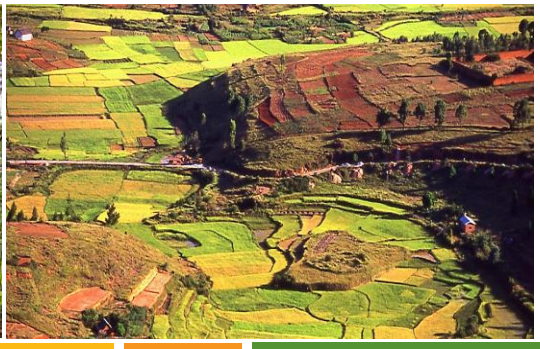


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