A PLATFORM FOR STAKEHOLDERS IN AFRICAN FORESTRY

STRENGTHENING CAPACITY OF AFRICAN STAKEHOLDERS TO INTEGRATE AND UPTAKE FOREST AND FARM TREE-BASED ADAPTATION AND MITIGATION OPTIONS IN FRANCOPHONE AFRICAN COUNTRIES



AFRICAN FOREST FORUM WORKING PAPER SERIES

VOLUME 5 ISSUE 2,2020

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Correct citation: Chia, E. and Fobissie, K. Strengthening capacity of forestry stakeholders to integrate and uptake forest and tree-based climate change adaptation and mitigation options in francophone African countries: African Forest Forum Working Paper, Vol (5) 2, Nairobi.

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Strengthening capacity of African stakeholders to integrate and uptake forest and farm tree-based adaptation and mitigation options in francophone African countries

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ACRONYMS AND ABBREVIATIONS

AFF	African Forest Forum
CAR	Central Africa Republic
CIFOR	Center for International Forestry Research
DRC	Democratic Republic of Congo
FAO	Food and Agriculture Organization
FCPF	Forest Carbon Partnership Facility
FLR	Forest Landscape Restoration
ICRAF	World Agroforestry Center
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
LDN	Land Degradation Neutrality
LULUCF	Land Use, Land Use Change and Forestry
NDCs	National Determined Contributions
PA	Paris Agreement
PES	Payment for Ecosystem Services
REDD+	Reducing Emissions from Deforestation and forest Degradation
UNCCD	United Nations Convention to Combat Desertification
UNEP	United Nations Environment Program
UNFCCC	

EXECUTIVE SUMMARY

Forests and trees provide huge opportunities for African countries to respond to their post-2020 climate change mitigation and adaptation commitments. The contribution of forests and/or trees to mitigation and adaptation depends on how they are incorporated in policies, strategies and actions, and the integration could depend on the choice and capacity of stakeholders. There is a gap in information and knowledge on the uptake of integrated forest and tree-based mitigation and adaptation options in addressing climate change in Africa. Generating such information and knowledge in terms of identifying challenges and opportunities is relevant for stakeholders to enhance the uptake of forest and tree-based mitigation and adaptation options into policies and actions. Thus, the necessity of this study covering francophone African countries. This study profiles promising forest-based and on farm tree-based mitigation and adaptation policies, strategies and actions, assesses the determinants of choice of strategies and actions as well as levels of successes in addressing climate change and climate variability. In addition, this study aims to evaluate the external environment, including policies, legislation, incentives, that have implications on the implementation of these promising adaptation and mitigation activities, and makes attempt to propose a framework for integrating forest and tree-based adaptation and mitigation options in francophone African countries.

This study employed qualitative and quantitative research design patterns. It is based on a combination of desktop study and field data. It covers nine African francophone countries (Burkina Faso, Cameroon, Central African Republic (CAR), Democratic Republic of Congo (DRC), Mali, Niger, Republic of Congo, Sénégal, and Togo) in terms of the in-depth content analysis of literature and documents (plans, strategies, programs and projects), and on six countries (Burkina Faso, Cameroon, DRC, Republic of Congo, Sénégal, Togo) in terms of field data. Fifty-nine stakeholders from these six countries participated in the interviews, 51 face to face and 8 through emails. In addition to information from secondary data analysis, stakeholders had the opportunity to: evaluate or assess factors that influence the choice of stakeholders to undertake forest and on farm tree-based interventions as well as levels of successes of these interventions to address climate change and climate variability; evaluate the external environment that influence the design and implementation and provide their opinions on the framework to enhance the integration of mitigation and adaptation in forest and tree-based options. The study draws on the forest-climate change conceptual background and the mainstreaming framework to carry out the analysis and the development of the framework.

Policies and strategies in these countries acknowledge the role of forests and trees in climate change mitigation and adaptation. However, the role of forests and trees in terms of delivering both mitigation and adaptation (M+A) outcomes is not well

articulated in these policies and strategies. Most of these policies are more than a decade old and out of context in relation to recent policy and research developments at the international level related to forest and climate change. Some of these countries are already planning to revise their policies and strategies, thus an opportunity to better and clearly enunciate the need to develop and implement forestry and tree-based interventions that will deliver on mitigation and adaptation simultaneously.

Across francophone countries, many current and future programs and projects developed in the context of forest and climate change have potentials to deliver both M+A. However, these potentials can be transformed into tangible M+A outcomes by explicitly integrating M+A. Explicitly integrating M+A requires that stakeholders need to define M+A in the objectives and expected results, including monitoring and evaluation indicators in their policies, strategies and programs.

The decision of stakeholders to design and implement forest and on farm tree-based practices are determined by a combination of factors that may vary from one or group of stakeholders to another. Concerning on farm tree-based practices such as agroforestry, drivers of decision making related to biophysical, climate, socioeconomic and financial factors were identified. However, the climate variable – carbon sequestration and microclimate adaptation are not among the leading drivers according to the vote-counting meta-analysis and stakeholder assessment. Concerning forest-based interventions, factors driving stakeholder's decisions are related to biophysical and socioeconomic aspects, with clear indications that stakeholders need to combine a number of these factors before deciding to design and implement a forest-based intervention in a mitigation and adaptation context.

Concerning successes, the opinion of less than 25% and 30% of stakeholders for forest and tree- based interventions respectively, indicate that these interventions have not been successful in addressing climate change. Generally, there is a huge gap concerning success stories on climate change M+A in relation to forest and on farm tree-based interventions. For the past ten years, sufficient lessons and experiences have not been documented that can act as a trigger for stakeholders to design and implement ambitious M+A forest and on farm tree-based interventions. This situation is further weakened by the unfavorable policy and institutional environment in which stakeholders operate. Concerning on farm tree-based interventions such as agroforestry, policy and institutional issues identified in these countries are similar and they relate to: land and tree tenure, the capacity of seed/germ plasm supply systems, the capacity of extension systems to propagate agroforestry technology, the articulation of agroforestry in sectoral policy and strategy documents and the opportunities of agroforestry in incentive approaches such as REDD+ and PES, and subsidies to enhance adoption of agroforestry practices. Regarding forest-based interventions, stakeholders expect to see a strong political will to improve governance, ensure sectoral coherence, enhance technical capacity building, and incentivize stakeholders and interest groups.

There is a need to improve the enabling environment for the design and implementation of forest and on farm tree-based interventions, to permit stakeholders demonstrate their capacity, which is currently weak in terms of designing bankable M+A projects.
Both M+A is a priority in the case study countries thus, jointly pursuing M+A objectives in forestry is crucial. Stakeholders generally agree that the integration of M+A in forestry should be pursued at multiple levels (policy and on-the- ground levels), using vertical and horizontal interrelated approaches that can be translated into guiding principles and criteria. At the policy level, the integration of M+A should be based on, but not limited to five principles: enhance inter- and intra-organizational integration, initiate and promote programmatic integration, enhance managerial integration, enhance the regulatory integration and the need to provide incentives and support to stakeholders that are promoting the integration of M+A in forestry.

On the ground, project promoters should follow a number of principles to plan and expect M+A outcomes in their projects. They include the need to ensure that; the health of forests ecosystems are maintained or enhanced, the adaptive capacity of forest-dependent communities are ensured, the carbon and adaptation indicators be developed, monitored and verified, forestry PPs should demonstrate the need to plan and expect both M+A outcomes.

There are opportunities for African forestry stakeholders to enhance the uptake of M+A in their operations, but weak technical capacity, unfavorable policy environment and limited financial resources act as major hurdles for action and success. Two main recommendations are necessary to be made here: (i) Governments need to accompany stakeholders by ameliorating the enabling conditions for designing and implementing tree-based and off-farm tree based as they interventions as they portray nature-based solutions to climate change through mitigation and adaptation; (ii) Integrated M+A approaches should be enhanced at the policy level in terms of strategic orientations, and at the landscape level in terms of operationalizing interventions with monitoring and reporting systems to feedback to the national level.

1. INTRODUCTION

1.1 Background and objectives

The role of forests in combatting climate change through mitigation and adaptation (referred here in as M+A) have been underscored at the global level (UNFCCC, 2015). Concerning mitigation, the management of natural systems through land use, land use change and forestry (LULUCF) activities are responsible for about 15-25 % of total anthropogenic greenhouse gases emissions (Vermeulen *et al.,* 2012). In forestry, sequestration activities are aimed at transforming low carbon stock storing capacity land to land with higher capacity for storing carbon. Conservation activities provide ways for land with high carbon stocks from being converted to land with low carbon stocks (IPCC, 2007). These interventions are underscored in articles 5.1 and 5.2 of the post 2020 Paris Agreement (PA) (UNFCC, 2015).

Regarding adaptation, forests and related ecosystem-based adaptation approaches are among the recognized because of their capacities to generate a wide range of environmental, social, economic and cultural benefits that are relevant for climate change adaptation. The PA also underscores the forest aspects of adaptation such as in articles 7.2 and 7.5, that calls for the protection of ecosystems, article 7.9(c) that highlights that any assessment of climate change impacts should also take into account vulnerable ecosystems that may have to be protected by 'nationally determined prioritized actions': and article 7.9 (e), that calls on parties to increase the resilience of ecological systems, including through economic diversification and sustainable management of natural resources (UNFCC, 2015).

In land use and forestry, mitigation and adaptation might demand and/or compete for the same type of land use activities, financial and technical resources. Planning and using the same activities, institutional arrangements and inputs for mitigation and adaptation outcomes and impacts is possible and necessary (Ravindranath, 2007; Guariguata *et al.,* 2008; Chia *et al.,* 2016). Theoretical and conceptual approaches have been put forward towards enhancing the integration of both M+A into forestry. However, little has been done to explore the operationalization of this approach to climate change response in the relevant policies and programs. Therefore, a deliberate effort is required to identify best practices that integrate both adaptation and mitigation options that addresses the impacts of climate change and variability; the aim being to enhance their uptake among stakeholders in forestry.

As underscored at the national, regional and global levels, forests and trees provide huge opportunities for African countries to respond to their post- 2020 climate change M+A commitments (Fobissie *et al.,* 2017; Mbow *et al.,* 2014). The contribution of forests and/or trees to M+A depends on how they are incorporated in policies, strategies and actions and their uptake/integration could depend on the choice and capacity of stakeholders, with possible factors of influence such as – policies, legislations, incentives. There is a need for a framework to enhance the integration of M+A into forests and/or tree-based related policies, strategies and actions in Africa. There is a gap in information and knowledge on the uptake of integrated forest and

tree-based mitigation and adaptation options in addressing climate change challenges in different forest types, tree resources outside forests, and social systems in Africa. Generating such information and knowledge in terms of identifying challenges and opportunities is relevant for stakeholders to enhance the mainstreaming and uptake of forest and tree-based M+A options into policies, plans and actions. Thus, the necessity of this study covering francophone African countries. The general objective of this study is to explore forest and on farm tree-based M+A opportunities in the rainforest and dry forest types across 9 selected francophone African countries (Burkina Faso, Cameroon, Central African Republic (CAR), Democratic Republic of Congo (DRC), Mali, Niger, Republic of Congo, Sénégal, and Togo) in the context of enhancing their uptake by relevant stakeholders in the fight against climate change in the African continent. Specifically, the study will:

- Characterize promising forest-based M+A policies, strategies and actions in case study countries, including the identification of key stakeholders implementing them;
- Characterize promising on farm tree-based M+A activities in areas around the chosen forest type through Agroforestry and other Farm-based Management of Natural resources (FMNR) approaches in case study countries, including the identification key stakeholders implementing them;
- Evaluate the determinants of choice of strategies and actions as well as levels of successes in addressing climate change and climate variability in the chosen forest and agroforest types in case study countries;
- Evaluate the external environment, including policies, legislation, incentives, that have implications on the implementation of these promising adaptation and mitigation activities in selected forest types and other land use based on trees outside forest in case study countries; and
- Propose a framework for integrating forest and tree-based adaptation and mitigation options in the chosen forest/agroforest types in francophone countries in Africa.

These countries were selected based on the fact that they are making efforts in the development of policies, strategies and programs in the context of forest and climate change response. This technical report is presented in five sections, namely: country circumstances and forest ecosystems, methodology, conceptual background and analytical framework, results, discussion, conclusion and recommendations.

1.2. Country circumstances and forest ecosystems

Francophone countries constitute about 50% of the number of Least Developed Countries (LDCs) in Africa. According to the United Nations system, these countries are characterized by: poverty, with a Gross National Income (GNI) per capita of less than US$1,025 which provides an overall level of resources available in the country; weak human assets, linked to basic indicators such as health, education, nutrition, adult literacy; economic vulnerability, based on the instability of the primary sector such as agriculture production, instability of exports of goods and services, vulnerability to natural disasters (Cortez, 2019). In the context of climate change response, the UNFCCC is paying special attention to the LDCs distinguishing them as the most vulnerable parties of the convention, requesting special attention in terms of funding, capacity building and technology transfer.

A greater proportion of francophone countries are located within two of the four sub regions of sub-Saharan Africa – West and Central Africa. The territories of the countries in West Africa are largely dominated by arid, semi-arid and dry sub-humid environments that follow each other along a north-south gradient. They are subject to human activities and climatic variations due to the influence of the Great Sahara and the Atlantic Ocean, which means that temperatures, rainfall distribution and winds vary throughout this area. Most of the economic activities in these territories are based on the exploitation of natural resources (soil, water, biodiversity) through agricultural, agropastoral, sylvo-pastoral, and production systems (OSS, 2018). The distribution of vegetation is conditioned by a climatic gradient, giving a series of parallel strips of vegetation extending from the Guinean south coast with high rainfall that is distributed throughout the year, to drier vegetated areas of the Sahelian steppes located south of the Sahara desert. Forest cover is comprised of a mixed of primary forests, natural regenerated forests, planted forests, and different types of woodlands. Forest resources in these areas are experiencing a decrease as a result of deforestation and forest degradation, leading to a decrease of about 1.1% and 1.4% of forests biomass and carbon stocks respectively for the period 1990-2015 (OSS, 2018).

Apart from Chad, the other francophone countries in Central Africa each contain part of the Congo basin, the second largest continuous block of rainforest after the Brazilian amazon. These Countries experience two broad types of climate: equatorial and tropical. The equatorial type is characterized by four seasons (two rainy and two dry seasons), with a mean annual rainfall ranging from 1500-1800 mm, and warm temperatures ranging between 22°C and 30°C. The tropical type consist of two seasons that are made up of other sub-types: the Sudanese, Sahelian and Saharan (De Wasseige, 2015).The bulk of the population of the sub-region depend on small-scale slash-and-burn shifting agriculture for subsistence - a farming practice which uses the forest as a land reserve for expansion. In addition to slash-and-burn shifting cultivation, livelihoods in the region subsist by harvesting forest products for both food and domestic energy (fuelwood and charcoal).

Forest cover is comprised of dense forest (lowland dense forest, sub-montane forest, montane forest, swamp forest, mangrove), forest-cropland mosaic, forest-savanna mosaic, dense deciduous forest (Miombo). These forest types in general store an estimated 46 billion metric tons of carbon, with the lowland forest containing about 60% of this amount (de Wassiege, 2009). While annual deforestation rates have been comparatively low (between 0 and 1%), there are strong indications that the central African forest are at a critical turning point for the future in terms of deforestation. Current and future drivers of deforestation and forest degradation in the region include agriculture, mining, infrastructure, unsustainable forest exploitation. These drivers are indirectly progressed by population growth, incoherent sectoral policies, weak governance etc. (Tchatchou *et al.,* 2015). From west to central Africa in the context of climate change response, francophone countries are characterized by social, economic and environmental challenges that require special attention. Forests and other related systems offer opportunities that can boost climate change response through M+A.

2. METHODOLOGY

This study employed qualitative and quantitative research design approaches. It is based on a combination of desktop study and fied data. It covers 9 selected francophone African countries (Burkina Faso, Cameroon, Central African Republic (CAR), Democratic Republic of Congo (DRC), Mali, Niger, Republic of Congo, Sénégal, and Togo) and focus on the in-depth content analysis of literature and documents. Field data were collected only in 6 of the 9 countries, namely Burkina Faso, Cameroon, DRC, Republic of Congo, Sénégal, Togo.

2.1. Data collection

2.1.1. Desktop study

Secondary data sources involved in this study included strategy, program and project documents and literature (both scientific and grey literature). Documents were collected from the web sites of international organizations such as: the UNFCCC, Global Environment Facility, World Bank Forest Carbon Partnership Facility, Green Climate Fund, and UNEP RISO; the websites of national forest and environment ministries and programs; the web sites of major voluntary carbon market standards such as Voluntary Carbon Standards, Climate Community and Biodiversity, Plan Vivo. Our search was limited to current and planned projects in the forest and climate change sectors in 9 countries (Burkina Faso, Cameroon, Central African Republic (CAR), Democratic Republic of Congo (DRC), Mali, Niger, Republic of Congo, Sénégal, and Togo). In addition, some projects were identified during the field visits to 6 of these countries. They are also part of the regional and international forest-climate change policy processes and initiatives. Climate change policy and strategy documents for the different countries were identified including 48 programs and projects (referred here in as PPs). The PPs comprised of validated concept notes, project and program identification documents and full project design documents.

Sources of literature include google scholar, the websites of prominent organizations working on forest and climate change, and related issues from policy to practice such as: the Food and Agriculture Organization (FAO), Center for International Forestry Research (CIFOR), International Union for Conservation of Nature (IUCN), World Agroforestry Center (ICRAF), African Forest Forum (AFF) etc. The literature search was carried out at two levels - a general literature search and a restrain literature search. The general literature search captured both grey and scientific literature on forest and climate change, first to set the context of francophone countries, second, to provide a conceptual and analytical framework for the study. The restrain literature search was focused on the literature for the simple meta-analysis where the collection was limited to (i) empirical and peer review articles (ii) articles published not more than 10 years ago (iii) at least one of the 9 case study countries. Empirical information in this context, refers to information provided by studies that are based on observation and experience at micro experimental and use household levels, and policy level. The restrain literature search generated very little forest-based intervention articles, thus limiting the meta-analysis only to on farm tree-based

interventions. The process started with 48 articles, and based on the above criteria, ended up with 22 and 21 articles for the determinants and successes respectively relating to the adoption of on farm tree-based management systems and activities.

2.1.2. Field data

Field visits and stakeholder interviews were carried out in 6 of the 9 case study countries. The six countries appeared to have actions in terms of programs and projects that can permit the monitoring of the evolution of the uptake of M+A in forestry. The perception of stakeholders was deemed important because perceptions condition the behavior, engagement and compliance of stakeholders in the design and implementation of policies, strategies, including programs and projects (Bennett, 2016; Carmenta *et al.,* 2017). Stakeholders were identified based on their involvement in forest and climate change strategies, programs, projects and activities in these countries. Interview request were sent to 105 stakeholders, however, only 51 finally participated in the face-face interview, while 8 responded through email (Table 1). The interview was based on semi-structured questionnaires containing close and open-ended questions and likert-scale assessment statements. The questions permitted the stakeholders to share their opinions and to evaluate openly the determinants of the adoption of forest and on farm tree-based management systems and activities, impacts/level of successes, enabling environment for the adoption of forest and on farm tree-based management systems and activities, and the possibilities of enhancing the uptake and integration of mitigation and adaptation in policies, programs and projects. Responses were anonymous allowing respondents to freely air their personal opinions and perspectives on sensitive matters.

Table 1: Category and the type of stakeholders that participated in the interviews

Countries	Administration	National NGO	International organizations	Forest Agencies	Research and Universities	Total
Burkina Faso	3	-	2	1	1	7
Cameroon	9	-	3	1	2	14
DRC	6		2			9
Republic of Congo	4	1	3	-	-	8
Sénégal	8	-	-	-	-	8
Togo	6	3	3	1	-	13
Total	36	4	13	3	3	59

2.2. Data analysis

Data analysis comprised of descriptive statistics and simplified meta-analysis. The content of the project and program documents were analyzed and hand coded using a questionnaire to have a profile of the 48 identified projects and programs. Both the data collected from the content of projects and programs and the perception of stakeholders were analyzed in excel using simple descriptive statistics. This made it possible to capture trends on aspects that are important in the climate change mitigation and adaptation debate in the context of forestry and on farm tree-based interventions, linked to enhancing the integration of M+A in the short and long-term.

The study also employed the meta-analysis approach to review literature on farm tree-based interventions, specifically agroforestry systems. This analytical approach gives the possibility to find out if a group of studies can provide a richer picture of a particular variable under investigation that can be developed from the qualitative comparison of individual study features and results (Pattanayak *et al.,* 2003). The variables in the case of this study include the determinants of choice and successes in the design and implementation of forest and on farm tree mitigation and adaptation interventions and practices. Meta-analysis generally comprises of several quantitative methods for synthesizing results and generalizing from a variety of research methods (Pattanayak *et al.,* 2003). This study uses the simplest approach of meta-analysis known as the vote-counting method in which the analyst counts the number of studies that found a statistically significant results, for example a positive correlation between carbon sequestration and the uptake of on farm tree-based practices.

For each variable under investigation, the number of votes can be used to identify a general relationship that is consistent across studies. Using the previous example, if 9 out 12 empirical studies indicate a positive correlation between carbon sequestration and the uptake of on farm tree- based practices, this can be fairly confident about the correlation between carbon sequestration and the uptake of on farm tree-based practices. The vote-counting meta—analysis was applied only to the determinants and successes of on farm tree-based interventions, due to the fact that the search was able to generate sufficient empirical and evidence-based literature, as compared to the forest based literature search that generated very limited empirical information.

3. CONCEPTUAL BACKGROUND AND ANALYTICAL FRAMEWORK

3.1 Conceptual background

This section defines the related concepts and practices that are relevant for analyzing the forest-based and/or on farm tree-based climate change mitigation and adaptation setting in policies, strategies, programs, projects and activities.

3.1.1. Key concepts in forest and climate change Mitigation and Adaptation

The Intergovernmental Panel on Climate Change (IPCC) defines climate change mitigation as a human intervention to enhance the sinks and to reduce the sources of greenhouse gases (IPCC, 2007a). With regards to the forest sector, enhancing sinks could be achieved by enhancing carbon sequestration and reducing sources can be achieved by conserving stocks under the threat of degradation. Sequestration activities are aimed at increasing or converting low carbon forest to high carbon forest, while forest conservation activities are aimed at preventing forest with high carbon stocks from being converted to forest with low carbon stocks (Murdiyarso *et al.,* 2005).

Forest based and/or on farm tree-based mitigation measures and interventions, are expected to have a well-defined climate change mitigation agenda (carbon mission reduction and/or absorption). These measures can be a forest sector based or an environment/climate sector based. A mitigation agenda could be explicit i.e. precise in the objectives, expected results, in addition to MRV indicators; or implicit i.e. indicating potentials in terms of activities without any clear indication if a mitigation outcome is expected (Chia *et al.,* 2016). A wide range of forestry practices that include on farm tree-based practices have potentials to deliver greenhouse gases (GHG) emission reduction and/or absorption (Table 1).

Climate change adaptation is about enhancing adaptive capacity or/ reducing vulnerability to climate change impacts, while also taking advantage of the positive opportunities resulting from climate change. Vulnerability to climate change is a function of the adaptive capacity (AC) of a system, and the Sensitivity (S) and Exposure (E) to climatic stressors. Adaptive capacity is the ability of a social or ecological system to evolve in order to accommodate environmental hazards or policy change and to expand the range of variables in which it can cope with. Sensitivity is the degree to which a system is modified or affected by perturbations. Exposure is the nature and degree to which a system experiences environmental or socio-political stress (Adger, 2006; IPCC, 2007b). Two types of adaptations are identified in the context of forest-human relationships: “adaptation of forest” and “forest for adaptation”. Adaptation of forest entails the adjustment of forest ecosystems to changes in temperature, precipitation, seasonal patterns, land use change, land fragmentation, pollution and over exploitation; and sensitive to fires, pests, diseases, soil conditions, changes in species distribution, etc, for example.

(IPCC 2007b; Locatelli *et al.,* 2008). Forest for adaptation will enable forests produce ecosystem goods and services that are important for forest communities to adapt to the changing climate -"forest for adaptation" (Locatelli *et al.,* 2008) (Table 2).

Forest-based policies, strategies and actions and/or on farm tree-based adaptation activities are expected to have a well-defined climate change adaptation agenda (enhancing adaptive capacity and/or increasing resilience, reducing vulnerability). An adaptation agenda could be explicit i.e. precise in the objectives, expected results, in addition to monitoring and evaluation indicators; or implicit i.e. indicating potentials in terms of activities, without any clear indication if an adaptation result is expected (Chia *et al.,* 2016). A wide range of forestry practices that include on farm tree-based practices have potentials to enhance the adaptive capacity, reduce the vulnerability or enhance the resilience of forest and forest dependent livelihoods (Ravindranath, 2007; Locatelli *et al.,* 2008; Verchot *et al.,* 2007).

Table 2: Forestry practices and management systems and their mitigation and adaptation potentials

Practices and management systems	Mitigation potential*	Adaptation of forest**	Forest for adaptation***
Carbon conservation			
Avoided deforestation and forest degradation	+++	+++	++
Creation and management of protected areas	+++	+++	++
Sustainable management of forests	+++	++	+++
Fire management techniques	++	++	+
Managing invasive species, insects and pests	++	+++	++
Carbon sequestration			
Afforestation (A)	++	++	++
Reforestation (R)	+++	++	+
Agroforestry	++	++	+++
Urban forestry	++	++	+++
Industrial plantations	++	+	+++
Soil and water conservation measures	++	++	++

Source: Adapted from Ravindranath, 2007; Locatelli *et al.,* 2008; Lasco *et al.,* 2014; Guariguata *et al.,* 2008.

**Carbon emission reduction or sequestration potential; **potential to enhance the adaptive capacity of forest ecosystems; ***capacity to enhance the adaptive capacity of forest dependent communities +++high positive potential, ++medium positive potential, +low positive impact*

Forest-based and/or on farm tree-based practices have potentials or could deliver both M+A outcomes (Table 2). The synergy literature indicates that to ensure M+A outcomes in forest-based and/or on farm tree-based measures, there is a need to explicitly anticipate and plan i.e. defining both M+A intentions in the objectives, expected results and monitoring and evaluation indicators (Chia *et al.,* 2016). Table 3 provides key questions that can help diagnose if M+A or both M+A are explicitly integrated in a project or program.

Table 3: Features to analyze the Mitigation an Adaptation (M+A) context of forest-based and on farm tree-based projects and programs

	Mitigation (M)	Adaptation (A)	M+A
Objectives	Is greenhouse gases emission reduction mentioned as part of the objectives?	Enhancing adaptive capacity and/or increasing resilience, reducing vulnerability mentioned as part of the objectives?	Does both M+A appear as part of the objectives?
Expected results	Are M outcomes part of the expected results?	Are A outcomes part of the expected results?	Does M+A both appear as part of the expected results?
MRV (Measurement, Reporting, Verification)	Are there clear indicators to evaluate M outcomes?	Are there clear indicators to evaluate A outcomes?	Are there clear indicators to evaluate both M+A outcomes?

Source: Chia *et al.,* 2016

3.1.2. Key forest and on farm tree-based practices in the different forest types

In this section the dominant forest and on farm tree-based practices in the dry forest of West Africa and the rainforest of Central Africa were selected. In the rainforest of Central Africa, large scale forestry practices is dominated by conservation and sustainable forest management; while on farm tree-based practices are dominated by agroforestry, precisely cocoa agroforestry. In the dry forest of West Africa, large scale forestry practices are dominated by afforestation and reforestation management systems and practices; while on farm tree-based practices are dominated by agroforestry practices of different types. For example, fertilizer tree system, modified taungya system, sahelian eco-farm, parkland/scattered tree system,

multi-storey cropping, alley cropping/hedgerows, improved fallows, legume trees etc. (Mbow *et al.,* 2014; Lasco *et al.,* 2014).

Agroforestry and related on farm tree-based systems are defined as dynamic, ecologically based natural resource management systems that through the integration of trees in agriculture landscapes, diversifies and sustains production for environmental, economic and social benefits (Msuya and Kideghesho, 2012). The ecological, economic and social impact of agroforestry systems are context specific, and they depend on biophysical and socioeconomic conditions and the knowledge of farmers on the chosen system (Lasco *et al.,* 2014). This study is not exploring the science and practices of agroforestry systems, but rather, the endogenous and exogenous factors influencing decision making on the adoption of these practices in the framework of climate change M+A.

3.1.3. Factors influencing decision to adopt forest and/or on farm tree-based practices

The decision of stakeholders to involve and implement forestry and/or on farm tree practices is determined by a combination endogenous and exogenous factor. The endogenous factors are factors that characterized the immediate decision-making environment (the activity or project level) of the stakeholder in relation to knowledge, perception and attitude towards a particular practice (Meijer *et al.,* 2015). In the context of agroforestry and other on farm tree-based related systems, knowledge and perception and attitude are influenced by a combination of biophysical (vegetation, soil fertility, farm size, topography); climatic factors (microclimate, carbon sequestration); socioeconomic (balance gender roles - security of land and tree tenure, accessibility to markets; availability of inputs - labour, planting materials; accessibility to information - demand, supply, prices; characteristics of the agroforestry system (affordable costs ,livelihoods and income benefits); financial motivation to invest (access to capital/credit, incentives -cash or noncash) (Kiyani *et al.,* 2017; Mfitumukiza *et al.,* 2017; Glover *et al.,* 2013; Meijer *et al.,* 2015; Mwase *et al.,* 2015: Sood *et al.,* 2009). Concerning afforestation and reforestation (A/R), determinants include: biophysically suitable land which could be used for placing carbon in landscapes through A/R projects (Unruh, 2008); high degree of land degradation in many African countries and the heavy dependence on wood resources (biomass) for energy is a strong asset for stakeholders to engage in A/R carbon sink projects. Furthermore, the low technology requirements to grow trees and the livelihood benefits are a strong motivation and incentive for rural communities to engage in A/R carbon activities (Desanker, 2005).

The determinants of choice to employ one or more forest based management systems and practices such as avoided deforestation and forest degradation, conservation of carbon stocks and sustainable management of forest (REDD+), is driven by a combination of factors, in which some are biophysical – high carbon stock forest ecosystems and deforestation threat (Gizachew et al., 2017; Paasgard and Mertz, 2016) ; incentive opportunities – voluntary and compliance markets, non-carbon benefit opportunities – social and economic benefits, biodiversity conservation, adaptation of forest and forest dependent communities, willingness of communities to engage; opportunity cost (Paasgard and Mertz, 2016).

3.1.4. Factors to assess the success of forest and/or on farm tree-based practices

The success of agroforestry practices can be evaluated based on how they contribute to achieving expected project results or outcomes such as; biophysical - soil and water conservation, soil fertility improvement, biodiversity conservation – maintaining forest corridors, and reduce demand for additional land; climate - buffering of microclimate and carbon sequestration; socioeconomic - income, food security, wood e.g. fuel wood, non-wood products e.g. medicinal products, increase productivity etc (Gockowski *et al.,* 2010; Mbile *et al.,* 2009; Binam *et al.,* 2017; Abdoulkadri *et al.,* 2018). The success of forest-based mitigation and adaptation practices are monitored and evaluated based on their carbon and non-carbon outcomes (Chia *et al.,* 2016). The carbon balance sheet includes avoided carbon emissions and/or carbon sequestration), while non-carbon outcomes include social and economic benefits, biodiversity conservation, adaptation of forest and forest dependent communities etc. (Katerere and Fobissie, 2015).

3.1.5. External factors influencing decisions to adopt forest and/or on farm tree-based practices

Exogenous factors refer to external factors that contribute in influencing a stakeholder's attitude and perception towards a particular practice. These factors that often take national level dimensions could hinder or facilitate the implementation and outcome of forest and/or on farm tree-based management systems and practices. For the case of agroforestry and other related on farm tree-based practices, policy and institutional issues relate to (i) land and tree tenure (ii) the capacity of seed/germ plasm supply systems (iii) the capacity of extension systems to propagate agroforestry technology (iv) the articulation of agroforestry in sectoral policy and strategy documents (v) the opportunities of agroforestry in incentive approaches such as REDD+ and PES (vi) subsidies to enhance adoption of agroforestry practices (Ajayi and Place, 2012; Place *et al.,* 2012; Foundjem-Tita *et al.,* 2012).

The national level policy and institutional frameworks could hinder or facilitate the implementation of forest-based M+A practices. The policy and institutional enabling environment is influenced by a mix of financial, economic, governance, technical factors and the political will of country governments. Governance factors include tenure and resource rights, political will to improve upon existing policies (influenced by the level of pressure or demand for forest resources (Korhonen-Kurki *et al.,* 2014), availability of information, discourse and ideas that favor forest-based programs etc. (Brockhaus and Angelsen, 2012), while technical issues are linked to the capacity of countries to develop bankable projects in general and in particular on issues related to robust monitoring, reporting and verification of carbon and non-carbon benefits (Gizachew *et al.,* 2017; Fobissie *et al.,* 2019). Economic factors relate to the availability of incentives for project proponents (Nasi *et al.,* 2011; Nasi *et al.,* 2012). The financial aspect of the enabling environment denotes the availability of sufficient and sustainable financing (both results and non-results based) to cover the opportunity and implementation cost of the chosen forest management system (Gizachew *et al.,* 2017; Karsenty *et al.,* 2014).

3.2. Analytical framework

The need to integrate both mitigation and adaptation in forest and on farm tree-based management systems are well advocated in scientific literature (Ravindranath 2007; Locatelli *et al.,* 2011; Verchot *et al.,* 2007; Chia *et al.,* 2016; Kongsager and Corbera, 2015; Guariguata *et al.,* 2008; Mbow *et al.,* 2014), The concept of integration in this context is about incorporating a new topic into planned, existing and often fixed ways of operating. It changes the rules of the game, challenges ideas, attitudes and activities that are considered normal (Wamsler, 2015). According to Wamsler (2014), integration can be operationalized at the strategy/policy and program levels. At the program level, integration, describe as programmatic integration involves the modification of the stakeholders core work (in our case - forest and on farm tree interventions) by integrating aspects related to the topic in consideration (in our case - M+A), into on-the-ground activities, operations, projects and programs (Wamsler, 2014; Roberts and O'Donoghue, 2013). At the strategy/policy level, it involves institutional, sectoral, stakeholder collaboration, modification of organizational working structures, revision and creation of policies, regulations and instruments (Wamsler, 2014; Roberts and O'Donoghue, 2013). The two levels of integration will be explored in the framework that will be proposed, where in the first place M+A considerations are captured by incorporating pre-conditions and key principles (Chia *et al.,* 2016) as a flexible practical way to integrate M+A into on-the-ground design and implementation of forest management projects and programs. In the second place, entry points to enhance uptake of M+A in policies and strategies will be explored.

4. RESULTS

4.1. Characterizing Mitigation +Adaptation in policies, programs and projects in Francophone Africa

This section presents the forests-climate context of both direct and indirect climate change response driven policies, strategies, programs and projects. In terms of programs and projects, the M+A and other related features are based on 48 programs and projects identified across 9 countries.

4.1.1. Profile of forest and climate change Mitigation +Adaptation in the policy landscape

Some francophone African countries have been involved in the development and implementation of climate change policies and strategies for more than past decades. Most of these policies and strategies capture directly and/or indirectly the forest-climate change nexus from a mitigation and/or adaptation perspective. From an adaptation perspective, these countries have elaborated key climate change adaptation policy documents such as National Adaptation Plans (NAPs), National Adaptation Program of Action (NAPA), National climate change policies and strategies etc. In the francophone countries located in the fragile semi-arid and arid

regions such as Burkina Faso, Mali, Niger and Sénégal, , these policy documents highlight the vulnerability of forest resources to the changing climatic conditions (GoSEN, 2006; GoM, 2007; GoNiger, 2007; GoBF, 2007). National orientations for adaptation in these countries underscores the importance of reinforcing the natural resource base in order to enhance the adaptive capacity of natural resource dependent communities. The different forest ecosystems in these countries play a vital role in supporting the natural resource base, thus the adaptation of communities. In the rainforest countries of Central Africa, such as Cameroon, CAR and the DRC, NAPAs stresses that the forest and related natural resource sectors are vulnerable to climate change and variability (GoDRC, 2006; GoCAR, 2008; GoC, 2015). In Cameroon for example, the NAPA underlines the need to improve the resilience of forests and forest activities to the impacts of climate change (GoC, 2015). In the CAR, the NAPA, emphasizes the need to reinforce the rational management of forest resources in order to enhance the resilience of forest and agroforestry systems to climate variability (GoCAR, 2008). It is important to note that a greater proportion of these policy documents are more than a decade old, warranting revision to take into consideration the evolution of the forest-climate change relationship both at the international and national levels.

On mitigation, the forest ecosystems of francophone countries have potentials to contribute to climate change mitigation through forest carbon emission reductions. Some countries (Burkina Faso, Cameroon, CAR, DRC, Republic of Congo, Togo) are making efforts to exploit these potentials, through the REDD+ initiative for example. Supported by the World Bank FCPF, some have developed REDD+ national strategies containing clear strategic orientations on how to reduce carbon emissions in the forestry and land use sectors. Strategic options entails actions to off-set deforestation, management of forest resources sustainably, building of carbon sinks through afforestation, reforestation, agroforestry etc. (MINEPDED, 2018; MERF, 2018).

Apart from the climate change response driven policies and strategies, these countries have also developed policies and strategies to respond to challenges in different domains such as desertification and land degradation, biodiversity loss etc. The countries facing desertification and land degradation have developed national plans and strategies, and forest and on-farm tree-based systems play a central role in the implementation of these policies and strategies (GoSEN, 2014; GoN, 2014; GoM, 2010). They have set national commitments and targets and propose orientations in the context of land degradation neutrality (LDN) and the Great Green Wall of Africa initiatives related to the United Nations Convention to Combat Desertification (UNCCD). National commitments and targets are geared towards stabilizing or increasing the quantity and quality of land resources necessary to support the provision of ecosystem goods and services. These countries are also part of the global forest landscape restoration (FLR) initiative where they have put forward targets to recover the ecological integrity and the improvement of human well-being in deforested or degraded forest landscapes that will include ecological restoration, massive plantations and the planting of trees outside forests. Through the African led AFR100 initiative to restore 100 million ha of degraded forest landscapes by 2030, actions at the national level are expected to contribute to the outcome of the “BONN CHALLENGE’ and the Aichi Target 15 of the Convention on Biodiversity.

Climate change adaptation and the conservation and enhancement of carbon sinks are among the expected results of these strategies. All national level efforts in the context of climate change response in these countries have been put forward to the international community through the National Determined Contributions (NDCs) .

The NDCs provides a critical point of departure for the implementation of the Paris Agreement i.e. post-2020 global emission reductions and adaptation commitments. NDCs links national policy frameworks i.e. governments determine their contributions in the context of their national circumstances, priorities and capabilities, with the global framework that drives the collective action towards a low-carbon, climate resilient future. In the NDCs of African countries, the Agriculture Forestry and other Land Use (AFOLU) sectors are referenced by more than 70% in terms of contribution to climate change mitigation and adaptation. Dry forest countries in West Africa referenced afforestation and reforestation as the AFOLU category that is relevant for M+A, while in NDCs of rainforest countries reference was made to forest management as important for M+A (Fobissie *et al.,* 2017).

The development of these policy and strategy documents are based on broad stakeholder consultations, indicating that the opinions of stakeholders have been instrumental in providing strategic orientations. This is important, because these same stakeholders are responsible for the operationalization and implementation of the policies and strategies through the design and implementation of programs and projects on the ground. Thus, the role of forests and on farm tree-based systems in climate change M+A will depend on how they are explicitly integrated in programs and projects.

4.1.2. Profile of promising forest and on farm tree-based mitigation programs and projects

Among all the 48 programs and projects (PPs) analyzed, 71% explicitly take into consideration climate change mitigation. This implies that mitigation aspects are defined in their objectives and/or the expected results and among monitoring and evaluation indicators. PPs are dominated by forest-based interventions, and about 16% of these projects combine forest and on-farm tree-based practices, while no stand-alone on farm tree- based mitigation project was identified. Forest based activities related to the enhancement of carbon sinks such as afforestation and reforestation dominated PPs in arid and semi-arid countries. This is as opposed to PPs in the rainforest countries, where avoided deforestation, conservation of carbon stocks, sustainable forest management dominated forest-based mitigation actions. This context is best explained by the biophysical conditions of landscapes in these two sub-regions. In the West Africa, forest landscapes are degraded thus provide suitable environments for restoration through reforestation and afforestation. While in central Africa, landscapes contain high carbon stock forests that needs to be prevented from being converted to low carbon stock landscapes.

4.1.3. Profile of promising forest and on farm tree-based adaptation programs and projects

Among all the projects analyzed 21% explicitly take into consideration climate change adaptation. This implies that adaptation features are defined in their objectives and/or the expected results and among the monitoring and evaluation indicators. However, many of these projects though not clearly defined in their objectives, have forest or/and on farm tree-based interventions that can contribute to climate change adaptation. About 10% of the interventions can contribute to both forest ecosystem adaptation and the adaptation of forest dependent communities.

4.1.4. Profile of Mitigation and Adaptations interactions in forest and on farm tree-based programs and projects

Regarding projects that explicitly consider both M+A, only about 12, 5% of PPs defined both Mitigation and and Adaptation (M+A) in their objectives and/or the expected results and monitoring and evaluation indicators (Box 1). However, about 69 % of PPs have interventions that can potentially contribute to both M+A (Box 2).

Box 1: Climate Change Support Program (PALCC) – An explicit integrated M+A program in Togo

The Republic of Togo has been making efforts to respond to the impacts of climate change through the development of mitigation and adaptation policies, strategies and programs. Among these programs is the Climate change support program. Financed by the European Union, the five years (2017-2022) program has as major objective to support Togo in the implementation of a national response to the challenges posed by climate change. Specifically, the program is expected to deliver on both emission reduction and climate resilience outcomes by increasing the resilience of populations through sustainable management, rehabilitation and preservation of soils and forest cover; implementation of more efficient techniques for the use of biomass and the wood-energy sector to support a transition to a more low-carbon economy; strengthening the capacities of the various actors in the fight against climate change and better integrate climate change into national strategies and public policies. Key activities include the creation and management of forest plantations, development of forest management plans, improve management of protected areas, support to alternative livelihood strategies, improvement of wood energy production and consumption, and the mainstreaming of climate change into sectoral strategies and plans. The program implementation approach is multisectoral involving other rural development ministries and it is expected to benefit the forestry administration and related agencies, civil society organization, universities and local communities.

Source : MEDDPN, 2019

Box 2: Emission reduction programs with adaptation potentials: case of Cameroon, DRC, Republic of Congo

The forest ecosystems of the Cameroon, DRC, Republic of Congo constitute part of the transboundary Congo Basin Forest ecosystem – the second important forest ecosystem of the world after the Amazon. The three countries have made commitments to contribute to the fight against climate change through the REDD+ initiative. The three countries have developed carbon emission reduction programs to benefit from results-based payments from the World Bank FCPF Carbon Fund. Their programs are aimed at reducing the drivers of deforestation and forest degradation. Key activities in these programs relate to the improvement of sustainable forest management practices, improvement of agriculture systems, improvement of wood energy value chain, enhancement of forest carbon stocks through reforestation and agroforestry plantations etc. Despite the fact that the major objective of these programs is carbon emission reduction, these programs are also expected to deliver non-carbon benefits related to biodiversity, livelihood improvement, climate change adaptation, governance and community rights etc. Beneficiaries of these programs include the global community, government ministries, private sector and local communities. Implementation involves sector ministries and related agencies, non-governmental organizations, development and technical partners and local communities.

Sources : MEFD, 2014 ; MECNT,2014 ; MINEPDED, 2016.

4.1.5. Institutional setting of strategies, programs and projects

In the francophone countries, the response to climate change is led by the government through competent ministerial departments. In some countries, the responsibility is shouldered by the environment ministry e.g. Cameroon), while in others by the forestry ministry (e.g. Republic of Congo). In some cases, both the forestry and the environment departments are lodge in the same ministry. In the context of forest and climate change, it is argued that integrating M+A can be effective if the climate change response plan and forest management are under the same ministry. This is because, it is assumed that collaboration and coordination will be guaranteed. For example, in Sénégal and Togo, where the forestry and environment departments are under the same ministry, it was mentioned that the people are working closely together in the climate change response process. In countries where it is separated, e.g., Cameroon, Republic of Congo, it was mentioned that the collaboration between these two ministries is insufficient. There is a permanent, unresolved conflict between senior officials of these two ministries. The officials of each ministry believe that actions fall within their competence. The ministry in charge of climate change issues, steers the policy and strategy processes in collaboration with other sectoral ministries accompanied more often by development partners, Civil Society Organizations (CSOs), universities, national agencies etc. In terms of operationalization and resource mobilization through the development of programs and projects, stakeholders are free to engage in PP development, though they have to ensure that they follow the overall national level orientations and contribute to national level objectives.

Programs and projects are being designed and implemented by diverse stakeholders. Government led PPs are generally implemented by a management unit that ensures the technical day to day running of activities. These PPs are monitored at the strategic level by steering committees, most of the time composed of a wide range of stakeholders (sectoral ministries, agencies, development partners, CSOs, etc.). Among all the PPs analyzed, about 78% mobilize their financial resources through climate finance windows at the international level with a greater proportion of the PPs having a duration of 5 years and below.

4.2. Determinants of choice and level of successes of Mitigation and Adaptation

4.2.1. Determinants of choice of on farm tree-based and forest practices in the context of Mitigation and Adaptation

On farm tree-based practices

The literature review of the determinants of on farm tree-based practices especially agroforestry, produced five general categories of determinants as follows: Biophysical; climatic; socioeconomic; characteristics of agroforestry systems and the financial motivation to invest (Table 4). Each is briefly presented below, along with the results of the vote-counting meta-analysis of determinants of agroforestry adoption. Furthermore, the opinions of stakeholders involve in the development and implementation PPs in relation to these determinants are also presented.

Table 4: Categories of determinants and their variables

Categories of determinants and their variables	Sources
Biophysical	
Vegetation	Kpadonou *et al.,* 2017 ; Sanou *et al.,* 2017
Soil condition	Kpadonou *al.,* 2017; Faye *et al.,* 2011 ; Haglund *et al.,* 2011
Farm size	Kpadonou *et al.,* 2017; Savadogo *et al.,* 2017 ; Binam *et al.,* 2017 ; Etshekape *et al.,* 2018
Topography	Kpadonou *et al.,* 2017
Climatic factors	
Microclimate adaptation	Kpadonou *et al.,* 2017 ; Djibo *et al.,* 2016
Carbon sequestration	Luedeling and Neufeldt, 2012
Socioeconomic Factors	
Balance gender roles	Elias, 2015; Kpadonou *et al.,* 2017 ; Sanou *et al.,* 2017; Gélinas *et al.,* 2015
Security of land tenure	Kpadonou *et al.,* 2017 ; Yaméogo *et al.,* 2018 ; Fenske, 2011 ; Gyau *et al.,* 2012; Alemagi *et al.,* 2015
Accessibility to markets	Basinger *et al.,* 2012 ; Haglund *et al.,* 2011; Binam *et al.,* 2017; Sonwa *et al.,* 2017
Availability of inputs - labour, planting materials	Kpadonou *et al.,* 2017; Yameogo *et al.,* 2018 ; Gyau *et al.,* 2012 ; Alemagi *et al.,* 2015 ; Haglund *et al.,*

	2011; Etshekape *et al.,* 2018
Awareness and training	Kpadonou *et al.,* 2017 ; Sanou, *et al.,* 2017; Yameogo *et al.,* 2018 ; Alemagi *et al.,* 2015 ; Degrande *et al.,* 2013 ; Basinger *et al.,* 201; Binam, *et al.,* 2017 ; Bertin *et al.,* 2014 ; Etshekape *et al.,* 2018
Accessibility to information - demand, supply, prices	
Characteristics of the agroforestry system	
Affordable cost	
Livelihood and income benefits	Kpadonou *et al.,* 2017 ; FAyE *et al.,* 2011
Financial motivation to invest	
Capital/credit	Kpadonou *et al.,* 2017 ; Yameogo *et al.,* 2018 ; Alemagi *et al.,* 2015; Pédelahore, 2014; Basinger *et al.,* 2012
Incentive –cash or non-cash	Kpadonou *et al.,* 2017; Alemagi *et al.,* 2015; Yameogo *et al.,* 2018

The results in table 5, column 4 shows that these categories and/or variables influence the adoption of agroforestry practices. Influence is indicated through the percentage of the studies that found a significant effect for a variable out of all the studies that included the variable. Looking at the direction of significance, except of the "affordable cost" variable, all the other variables scored a positive significant result of above 67%. Column 2 and 3 indicate the number and percentage of studies that included each variable as described below. Looking at the individual variables, awareness and training is the most common variable, present in approximately 50% of the empirical studies. In contrast, affordable cost, carbon sequestration, topography are the least common, being present in only 0-5% of the studies.

Biophysical

Vegetation: This variable is included in only 9% of the studies. Generally, agroforestry practices contribute in increasing vegetation cover, and a means to improve soil quality. The studies that included this variable show a significant correlation with adoption practices.

Soil fertility: This variable is included in only about 14% of the studies. Normally, poorer soils and severe threat of soil degradation are positively correlated with adoption and all the studies that include soil quality indicate positive correlation.

Farm size: Farm size has an inclusion rate of 18% with the tendency that farmers with small farm holdings are generally expected to adopt agroforestry technologies. This variable is found to be statistically correlated with adoption in all the cases.

Slope/topography: The slope of the landscape is included in only 5% of the studies and the included studies show a statistical significance of 100%. Farmers owning farmlands on steeper slopes are generally more likely to adopt agroforestry technologies on their farmlands.

Climatic factors

Microclimate adaptation: This variable measure whether the adaptation to climatic conditions experienced by farmers influences their decision to adopt agroforestry practices. About 14% of the cases included this variable, and in all the studies, the variable is found to be 100% positively correlated with adoption.

Carbon sequestration: This variable is linked to climate change mitigation, and it measures whether carbon sequestration is a driver of choice in decision making concerning agroforestry practices. Only 5% of the cases included the carbon sequestration variable and the study that included this variable showed a positive correlation between adoption and carbon sequestration.

Socioeconomic variables

Balance gender roles: This variable is included in 23% of the case studies and it is found that all the studies that included this variable show a significant correlation;

Security of land and tree tenure: Most of the studies investigated if farmers have tenure or not, and about 27% of the cases included this variable. Generally, landowners are more likely to invest in their farmlands using agroforestry technologies. When included, the tenure security variable is significant in 100% of the cases;

Accessibility to market: Accessibility to markets is included in 18% of the studies and the studies included, generate a positive correlation of 100%;

Availability of inputs - labor, planting material: This variable is included in 23% of the cases, where farmers with greater possibilities to have inputs are more likely to engage in agroforestry practices. The included cases demonstrate about 80% in positive correlation between availability of inputs and adoption;

Awareness and training: This is the most often included variable among all the variables. This variable is linked to extension and training services in which researchers report on whether stakeholders (households, farmers, communities) have receive training and/or have access to extension services. The assumption is often based on the fact that stakeholders can influence decisions to adopt practices if they are exposed to training and extension services. Measures of 'awareness and training' are included in 50% of the studies and 82% of the studies included, show a positive correlation;

Accessibility to information - demand, supply, prices: This variable measures whether farmers are informed about factors that influence the marketing of their products. This variable is included in only 9% of the cases, and all the included cases show a positive correlation between accessibility to information and the adoption of agroforestry practices.

Cost/benefit characteristics of agroforestry systems

Affordable costs: This variable is not included in any of the studies in terms of empirical findings;

Livelihoods and income benefits: Potential livelihoods and income benefits, is a variable that is generally put forward as a driving factor in rural poor communities. However, it was surprising that only 9% of the cases included this variable. In terms of the correlation, all the studies included shows a positive correlation with adoption of agroforestry practices.

Financial motivation to invest

Access to capital/credit: Availability of credits is included in 18% of the studies and when included, it has the expected positive and statistically significant influence in 100% of the cases;

Incentive - cash or non-cash: This is considered as an extrinsic motivator, and it is included in only 14% of the studies. In all the cases that include the incentive

variable, 67% show positive correlation between incentive and adoption of agroforestry practices.

Table 5: Results of vote-counting meta-analysis of determinants of agroforestry adoption in case study countries (22 studies)

Categories of determinants	Included (n)	Included (%)	Significant (n)		Positive significant (included studies) (%)
			Positive	Negative	
Biophysical		**12%**			**81%**
Vegetation	2	9%	1	1	50%
Soil condition	3	14%	3		100%
Farm size	4	18%	3	1	75%
Topography	1	5%	1		100%
Climatic factors		**10%**			**100%**
Microclimate adaptation	3	14%	3		100%
Carbon sequestration	1	5%	1		100%
Socioeconomic Factors		**25%**			**90%**
Balance gender roles	5	23%	4	1	80%
Security of land tenure	6	27%	6		100%
Accessibility to markets	4	18%	4		100%
availability of inputs - labour, planting materials	5	23%	4	1	80%
Awareness and training	11	50%	9	2	82%
accessibility to information - demand, supply, prices	2	9%	2		100%
Characteristics of the agroforestry system		**5%**			**50%**
Affordable cost	0	0%	0	0	0
Livelihood and income benefits	2	9%	2		100%
Financial motivation to invest		**16%**			**84%**
Capital/credit	4	18%	4		100%
Incentive –cash or non-cash	3	14%	2	1	67%

Stakeholder opinions

Following the vote-counting analysis and stakeholder assessment of the determinants of agroforestry adoption in the past decade, it shows that climate change response factors do not occupy an important position among the factors that influence decision making of stakeholders concerning the adoption of agroforestry practices. This is also observed in the results of the PP document analysis in which very little or no PPs are design principally on agroforestry interventions.

Forest based

Concerning the determinants of choice of forest-based practices in PPs, 9 variables are produced from the literature review (Table 6). Stakeholder opinions were sampled on whether they identify these variables as part of the variables that

influenced their decisions to adopt forest-based practices in their programs and projects. Table 6 presents the percentage of stakeholders interviewed in the different countries that identify one of more these variables as a determinant of choice in relation to the forest-based practices, they are involved in.

Generally, stakeholders' decision to adopt forest-based practices is influenced by a mix of biophysical and socioeconomic related factors. It should be noted decision making on forest-based practices depends on a combination of multiple factors. This is because the expectations from forest carbon projects go beyond carbon to include non-carbon benefits such as biodiversity conservation, climate adaptation and other socioeconomic benefits. This aspect of non-carbon benefits is also acknowledged at the international level, where the Paris agreement underscores the need for UNFCCC parties to consider incentivizing non-carbon benefits.

According to stakeholders, suitable and vast land for A/R activities and high degree of land degradation appears to be the driving factor behind the adoption of forest-based interventions. The identification of these two variables dominated the response of stakeholders from the arid and semi-arid countries. The determinants directly linked to M+A i.e. high carbon stock forest ecosystems and deforestation threat and the adaptation of forest and forest dependent communities are considered by 49% and 34% of stakeholders respectively.

Table 6: Results of stakeholders' assessment of determinant factors included in programs and projects

Determinants	Source	Frequency (N=59)
Suitable and vast land for A/R activities	Unruh, 2008	59%
High degree of land degradation	Unruh, 2008; Desanker, 2005	51%
Heavy dependence on wood resources (biomass) for energy	Desanker, 2005	34%
Low technology required to grow trees	Desanker, 2005	8%
Biophysical – high carbon stock forest ecosystems and deforestation threat	Paasgard and Mertz, 2016; Gizachew *et al.,* 2017	49%
Incentive opportunities – voluntary and compliance markets, low opportunity cost	Paasgard and Mertz, 2016;	24%
Non-carbon benefit opportunities – social and economic benefits, biodiversity conservation	Paasgard and Mertz, 2016; Katerere and Fobissie, 2015;	27%
Adaptation of forest and forest dependent communities	Katerere and Fobissie, 2015;	34%
Willingness of communities to engage	Paasgard and Mertz, 2016	24%

4.2.2. Level of successes of Mitigation and Adaptation in on farm tree-based and forest interventions

On farm tree-based practices

As concerns successes of on farm tree-based practices, variables that have been used by investigators to evaluate success or impacts were identified from empirical studies in the case study countries. The literature review produced three categories of variables – biophysical, climate and socioeconomic categories (Table 7).

Table 7: Success factors identified in the case study countries

Categories and Variables	Sources
Biophysical	
Soil and water conservation	Leenders *et al.,* 2016
Soil fertility	Marone *et al.,* 2017; Abdoulkadri *et al.,* 2019; Osman and Bayala 2011; Jagoret *et al.,* 2011; Jagoret *et al.,* 2014
Biodiversity conservation - maintaining forest corridors and reduce demand for additional land	Mbolo, *et al.,* 2016
Climate	
Buffering of microclimate	
Carbon sequestration	Marone *et al.,* 2017; Abdoulkadri *et al.,* 2019; Leenders *et al.,* 2016 ; Takimoto *et al.,* 2009
Socioeconomic	
Income	Abdoulkadri *et al.,* 2019; Osman and Bayala 2011; Asaah *et al.*, 2011; Jagoret *et al.,* 2014 ; Jiofack *et al.,* 2013 ; Mbile *et al.,*2009; Haglund *et al.,*2011; Binam *et al.,*2017; Sidibé, Sanou *et al.,* 2017; Gockowski *et al.,* 2010
Food security	Abdoulkadri *et al.,* 2019 ; Faye *et al.,* 2010 ; Asaah *et al.,* 2011 ; Mbile *et al.,* 2009 ; Haglund *et al.,* 2011 ; Binam *et al.*, 2017 ; Sidibé *et al.,* 2017 ; Gockowski *et al.,* 2010
Wood e.g. fuel wood	Robiglio *et al.,* 2013 ; Faye *et al.,* 2010
Non-wood e.g. medicinal plants	Faye *et al.,* 2010 ; Jagoret *et al.,* 2014 ; Mbile *et al.,* 2009 ; Gockowski *et al.,* 2010
Increase productivity	Abdoulkadri *et al.,* 2019; Osman and Bayala 2011; Asaah *et al.,* 2011; Jagoret *et al.,* 2011 ; Binam *et al.,* 2017

The results of the vote-counting meta-analysis of success variables of agroforestry adoption are presented in table 8. Columns 2 and 3 shows the total number of studies that included these success variables and the percentage of studies containing each variable respectively. Socioeconomic success variables are the most often included in the studies (29%), while the success variables related to climate and biophysical factors of agroforestry systems are least often included (10%). As concerns the individual variables, the income and the food security success variables are the most present in 48% and 43% of the empirical studies respectively. On the other hand, the buffering of microclimate, soil and water conservation and biodiversity conservation success variables are the least common variables being present in only about 0-5% of the empirical studies.

The results in column 4 indicates that these categories and/or variables are a measure of success following the adoption of agroforestry practices. Success is indicated through the percentage of the studies that found a significant effect for a variable out of all the studies that included the variable. Looking at the direction of significance, except of the "buffering of microclimate" variable, all the other variables scored a positive significant result of above 83%. This means that these variables were successful as regard project objectives and results.

Table 8: Results of vote-counting meta-analysis of success variables of agroforestry adoption in case study countries (21 studies)

Categories and Variables	Included (n)	Included (%)	Significant (n)		Positive significant (included studies) (%)
			Positive	Negative	
Biophysical		10%			100%
Soil and water conservation	1	5%	1		100%
Soil fertility	4	19%	4		100%
Biodiversity conservation - maintaining forest corridors and reduce demand for additional land	1	5%	1		100%
Climate		10%			42%
Buffering of microclimate	0	0	0	0	0
Carbon sequestration	6	29%	5	1	83%
Socioeconomic		29%			100%
Income	10	48%	10		100%
Food security	9	43%	9		100%
Wood e.g. fuel wood	2	10%	2		100%
Non-wood e.g. medicinal plants	4	19%	4		100%
Increase productivity	5	24%	5		100%

As regards stakeholder assessment of successes of agroforestry to address climate change, the views of the stakeholders indicate that 7% and 20% are respectively very successful and successful for the case of climate change adaptation i.e. buffering of microclimate. Regarding mitigation, i.e. carbon sequestration, 14% of stakeholders had the opinion that agroforestry is successful in curbing climate change through carbon sequestration (Table 9).

Table 9: Stakeholders' assessment of success factors in agroforestry programs and projects

Variables	Very successful	successful	neutral	not successful	not very successful
Biophysical - soil and water conservation, soil fertility improvement	8%	27%	65%	0%	0%
Biodiversity conservation – maintaining forest corridors, and reduce demand for additional land	2%	20%	78%	0%	0%
Climate - buffering of microclimate	7%	20%	73%	0%	0%
Carbon sequestration	0%	14%	86%	0%	0%
Socioeconomic - income, food security, wood e.g. fuel wood, non-wood products e.g. medicinal products, increase productivity	10%	19%	71%	0%	0%

Forest based

As regards stakeholder assessment of successes of forest-based practices to address climate change, 3% and 12% of stakeholders had the opinion that forest interventions are very successful and successful respectively, in mitigating climate change i.e. avoided carbon emissions. Regarding carbon sequestration, 7% and 17% of stakeholders had the opinion that forest interventions are very successful and successful respectively in curbing climate change through carbon sequestration. On adaptation, 20% of stakeholders indicated that forest-based interventions are successful addressing climate change in terms of the adaptation of forest and forest dependent communities (table 10).

Table 10: Stakeholders assessment of success factors in forest based programs and projects

Success variables	Sources	Very successful	Successful	Neutral	Not successful	Not very successful
Carbon benefits						
Avoided carbon emission	Chia *et al.,* 2016	3%	12%	85%	0%	0%
Carbon sequestration	Chia *et al.,* 2016	7%	17%	78%	0%	0%
Non-carbon benefits						
Social and economic benefits	Katerere and Fobissie, 2015; Chia *et al.,* 2016	3%	32%	65%	0%	0%
Biodiversity conservation	Katerere and Fobissie, 2015;	2%	12%	86%	0%	0%
Adaptation of forest and adaptation of forest communities	Katerere and Fobissie, 2015; Chia *et al.,* 2016	0%	22%	78%	0%	0%

4.3. Enabling environment for the design and implementation of forest and on farm tree-based (agroforestry) interventions

4.3.1. Agroforestry based interventions

The literature review identified a number of factors at the policy level that can hinder or enhance the adoption of agroforestry practices in the context of climate change mitigation and adaptation. The factors are briefly described below including the opinion of stakeholders regarding their level of satisfaction of the current situation of these factors in terms of sufficiency in their respective countries. Generally, across Africa, widespread adoption of agroforestry is determined by the policy and institutional context within which agroforestry is disseminated, thus the adoption of agroforestry practices by stakeholders should be accompanied with favorable policy, institutional and economic incentives (Ajayi and Place, 2012).

Land and tree tenure security: Land tenure insecurity, discourages long-term investments such as agroforestry (Fenske, 2011; Gyau *et al.,* 2012). Land tenure insecurity is an issue that was identified decades ago as a stumbling block for agroforestry investments as compared to other agriculture enterprises in many African countries. Most of the francophone countries have ambiguous land laws

where customary property right systems come into conflict with statutory laws and this is often manifested through conflicts between state and land users. In the past, planting of trees were used by farmers to secure their lands, but this option is disappearing because the purchasing and inheritance of land is becoming more common as compared to the land allocation system by traditional rulers (Place *et al.,* 2012).

As concerns tree tenure, the francophone countries in West and Central Africa, have forest policies that have implications on tree growing on farms. Their policies, though well intentioned to protect forest, at times when applied to on farm tree-based systems discourages farmers from planting trees, because they regulate the harvesting, cutting and sale of tree products and certain tree species. In Niger for example, the relaxation of the rigid enforcement of restrictive policies resulted to the planting of millions of young trees in parklands (Place *et al.,* 2012).

Generally, the land and tree tenure situation has not evolved up-to-date as indicated by stakeholders interviewed in the case study countries. About 51% of these stakeholders indicated that they are unsatisfied with the current state of affairs regarding land and tree tenure, especially in the context where much is expected from trees as far as the fight against climate change is concerned. About 36% were unable to assess whether the enabling environment with regard to land and tree tenure has experienced some improvement (Figure 1).

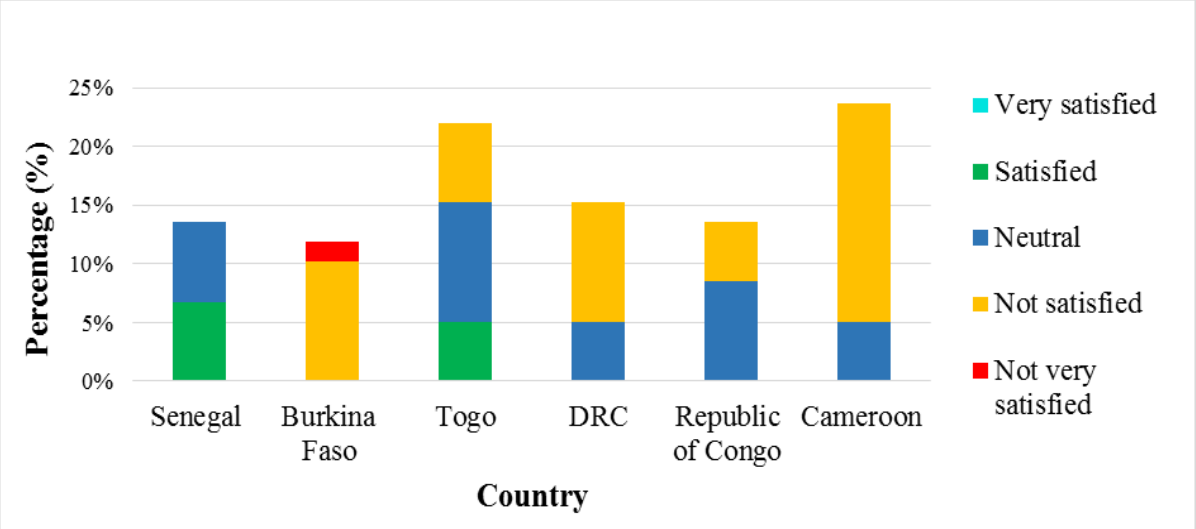

Figure 1: Percentages of stakeholders expressing level of satisfaction regarding land and tree tenure security

Support from extension systems propagating agroforestry technology: At the farm and community levels, the adoption of agroforestry practices is influenced by the level of awareness and training that farmers and stakeholders receive through extension systems (Yameogo *et al.,* 2018; Degrande *et al.,* 2013; Alemagi *et al.,* 2015; Etshekape *et al.,* 2018). The effectiveness and efficiency of extension and training systems depends on government policies. The extension systems are often dominated by agriculture extension messages characterized by limited staff in terms

of quality and quantity. About 59% of stakeholders interviewed were indecisive concerning the assessment regarding the extension and training system related to agroforestry farming methods. Stakeholders have diverse views concerning the support that farmers receive from extension services (Figure 2). About 27% and 14% of stakeholders were unsatisfied and satisfied respectively on the capacity of existing extension systems to support agroforestry technology propagation.

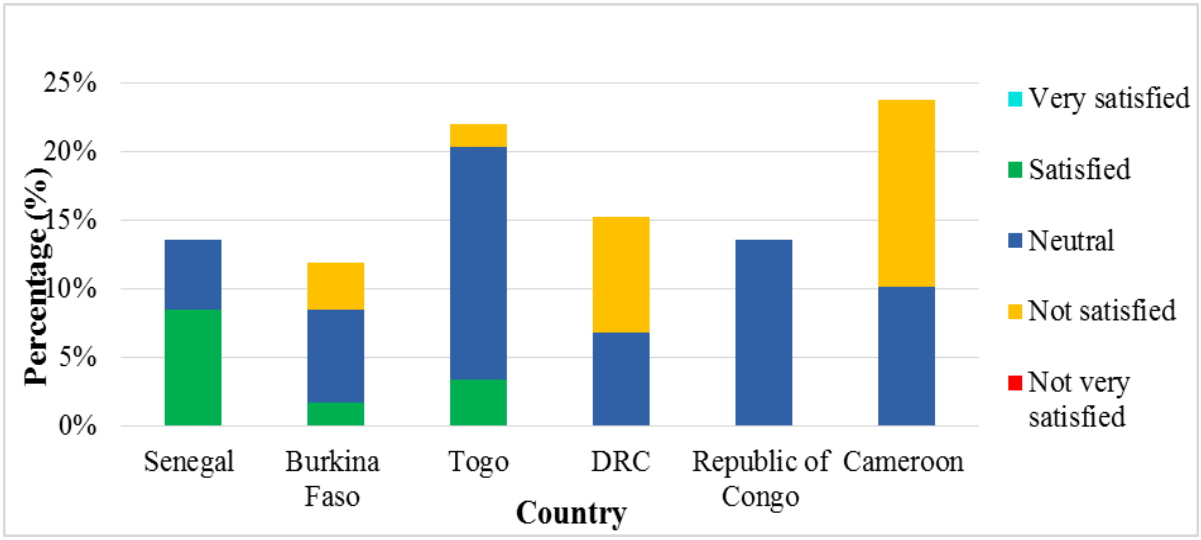

Figure 2: Percentages of stakeholders expressing level of satisfaction regarding extension systems propagating agroforestry technology

Unclear sectoral policy articulation for agroforestry: Despite the fact that agroforestry is being mentioned in climate change response and other land use and agriculture strategies and plans in these countries, it is still very difficult to clearly link agroforestry to any of those sectors. More often, legal and regulatory frameworks are more conservation oriented and do not provide distinction between tree products gathered from the wild and from farmers' fields (Foundjem-Tita *et al.,* 2013). This policy gap inhibits both public and private sector investments in relation to research and extension, human and financial resources allocation. In climate change response in most of these countries, for example, agroforestry is given a strong attention in the REDD+ and climate change adaptation, managed by the ministries of the environment. The environment ministries do not often have the capacity to support agroforestry at the project level, hence, must rely on other ministries, notably the forestry and/or agriculture. The weak collaboration between these ministries in some of these countries can put such expectations in jeopardy. For example, in Cameroon, it is not clear whether trees on farms is under the control of the forest or agricultural legislation or both (Foundjem-Tita *et al.,* 2013). In Burkina Faso, it was mentioned that there is no clear policy and institutional framework for agroforestry, thus it is surviving only through programs and projects on the ground. About 58% of stakeholders were unable to assess the articulation of agroforestry in national policy frameworks. Meanwhile 29% and 12% of stakeholders were satisfied and unsatisfied respectively regarding the consideration of agroforestry in national level policy and institutional level frameworks (Figure 3).

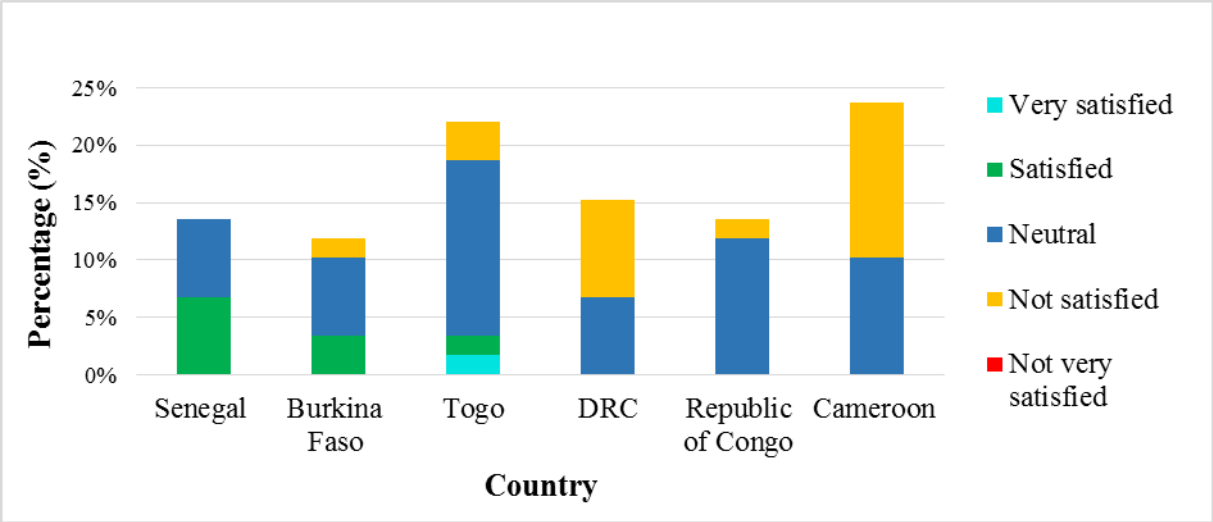

Figure 3: Percentages of stakeholders expressing level of satisfaction regarding the sectoral policy articulation for agroforestry

Opportunities to valorize/incentivize agroforestry environmental services e.g. PES, REDD+: Agroforestry is increasing being recognized as an important land use practice for the provision of ecosystem goods and services that are relevant for climate change mitigation and adaptation (Verchot *et al.,* 2007; Lasco *et al.,* 2014; Mbow *et al.,* 2014). However, for agroforestry systems to yield these services at the optimum, there is need to put forward economic or market instruments to reward the efforts and investment of stakeholders involve in these practices. Currently, there are opportunities where carbon services can be rewarded for example through the voluntary and other market mechanisms and approaches e.g. REDD+ (Ajayi and Place, 2012). Notwithstanding, national governments should play a key role to facilitate systems and mechanisms (e.g. provide guarantees and to reduce transaction cost) that can link buyers of ecosystem services to project proponents who are willing to supplier these services (Place *et al.,* 2012). Stakeholder viewpoints indicate that the enabling environment to valorize environmental services emanating from trees on farms, is yet to be satisfactory. However, stakeholders have different views concerning this variable as shown in Figure 4.

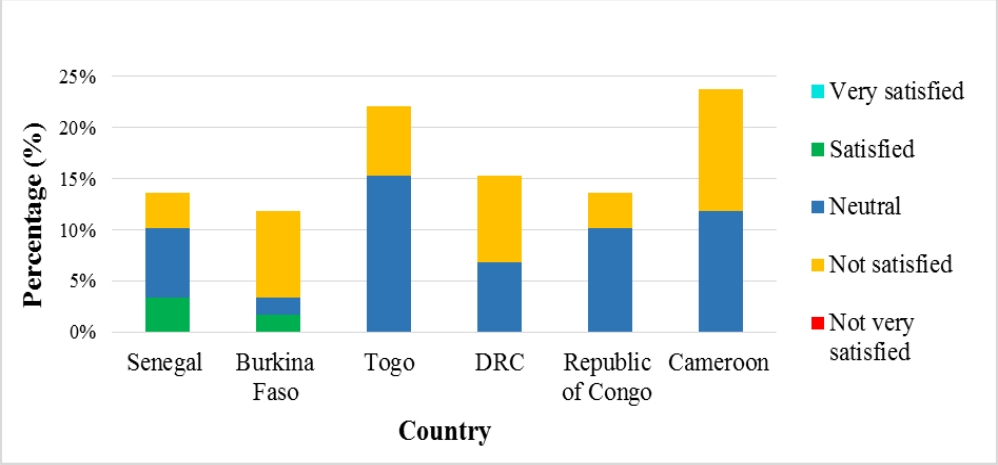

Figure 4: Percentages of stakeholders expressing level of satisfaction regarding opportunities to valorize/incentivize agroforestry environmental services

Seed/germplasm supply systems: A number of common problems in the agroforestry germplasm sector have been identified across Africa. The sector is characterized by: narrow base of tree germ plasm with little multiplication; low quality and quantity of germplasm; little investment in germplasm improvement (Place *et al.,* 2012; Marunda *et al.,* 2017). In some of the francophone countries, the sector appears neglected, it is sometimes difficult to distinguish between the forestry seed system and agroforestry seed system, since forest agencies or departments, have the mandate for all tree supply systems. In these cases, more effort is put on forest and plantation species as compared to agroforestry species, and seed supply structures are often dominated by forestry staff who are less aware of the problems of farmers. This is as opposed to agriculture extension staff that have a better understanding of farming systems and the importance of integrating trees on farms (Place *et al.,* 2012). In some of these countries e.g. Burkina Faso, efforts have been made (Marunda *et al.,* 2017); but the scale might not be sufficient to respond to the current expectations of tree planting on farms in the context of climate change M+A. Stakeholders have diverse viewpoints within and between the countries concerning the seed/germ plasm support systems (Figure 5).

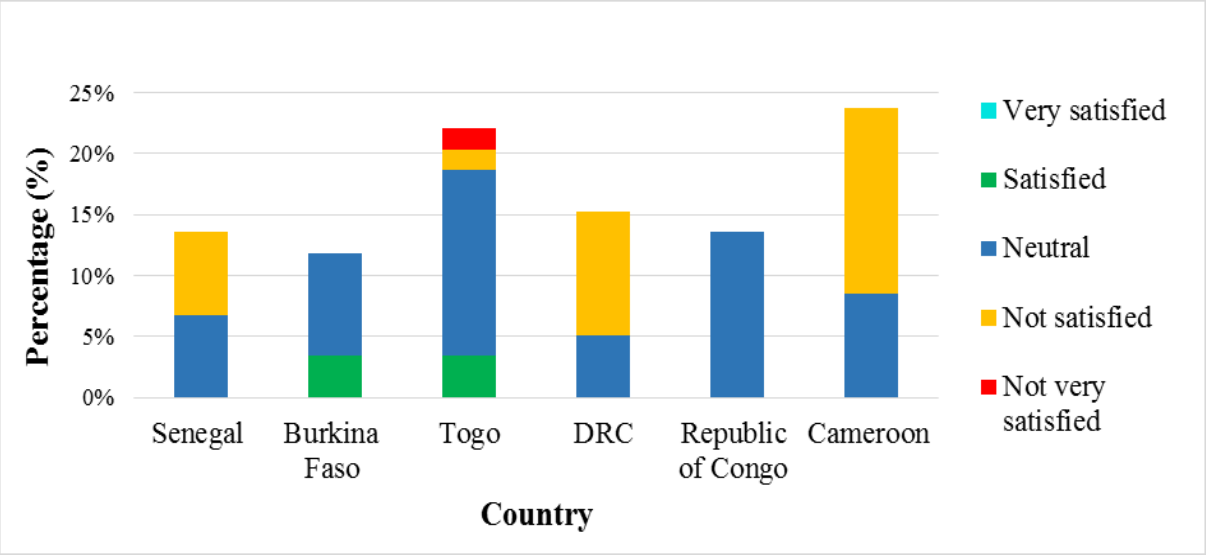

Figure 5: Percentages of stakeholders expressing level of satisfaction regarding seed/germplasm supply systems

Subsidies to enhance adoption of agroforestry practices: There are few or no government policies to specifically improve agroforestry in these countries (Foundjem-Tita *et al.,* 2013). Generally, in Africa, most governments provide support to agriculture, but agroforestry is not always included as an agricultural enterprise for support (Place *et al.,* 2012; Ajayi and Place 2012). In the countries visited, stakeholders interviewed generally express dissatisfaction with the situation of subsidies as far as agroforestry enterprises are concerned. Some respondents further mentioned that it is difficult to pin-point agroforestry government support within the broader support to the agriculture or forestry sector. Figure 6 show trends in stakeholder opinions within and between the six countries regarding the issue of subsidies in the context of agroforestry adoption.

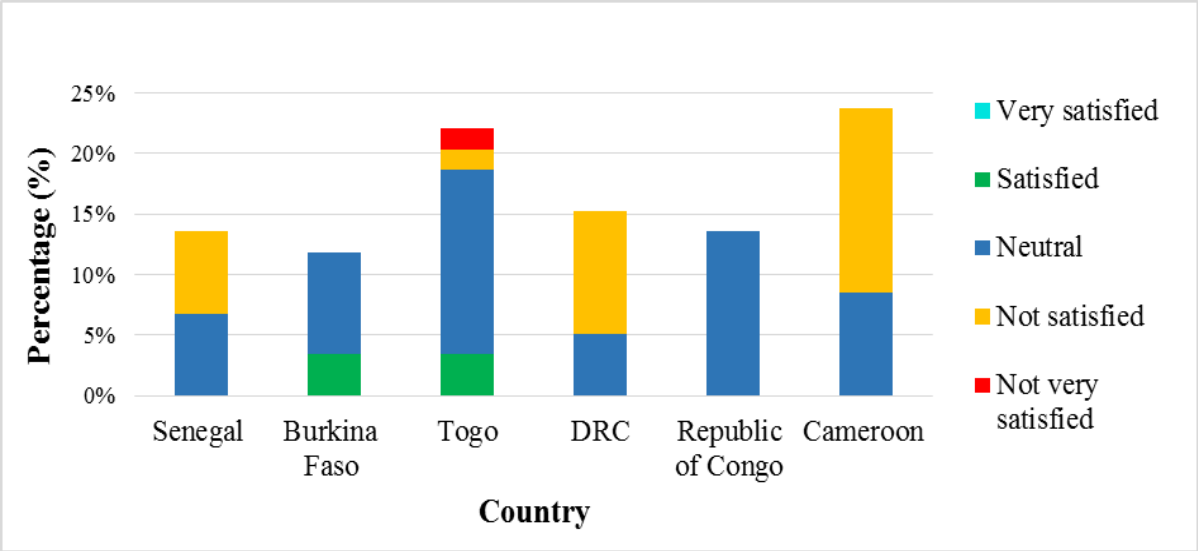

Figure 6: Percentages of stakeholders expressing level of satisfaction regarding subsidies to enhance adoption of agroforestry practices

4.3.2. Forest based

The literature review identified a number of factors at the policy level that can hinder or enhance the adoption of forest-based practices in the context of climate change mitigation and adaptation. The factors are briefly described below including the opinion of stakeholders vis-à-vis their level of satisfaction with the current situation of these factors in terms of sufficiency. Forest based programs and projects in the context of climate change can involve one or more activities as indicated table 2. In francophone countries in Africa, PPs are dominated by avoided deforestation and forest degradation, A/R, sustainable forest management etc. These activities require direct investments in order to achieve climate change M+A outcomes in the long term. Country level policy factors can, on the one hand discourage such investments, and on the other hand enhance investment on these activities.

Governance - tenure and resource rights, political will etc.: Francophone African countries have a long history of weak governance in the design and implementation of public policies. This has had impacts on the effective implementation of sectoral policies and strategies in different ways. The forestry sector is one of the sectors that has suffered most from the impacts of weak governance in these countries, where corruption, poor transparency and accountability has contributed to weak law enforcement, hence the unsustainable management of forest resources. In Cameroon, for example, unsustainable practices in the forestry sector have been linked to the drivers of deforestation and forest degradation (Tegegne et al., 2016). These are also the same challenges that were highlighted by stakeholders in the Republic of Congo and DRC.

Tenure security is crucial for the design and implementation of forest based PPs. Without clear and defendable rights to land and forests and/or carbon rights, service providers cannot make any trustworthy long-term engagement to supply carbon credits (Jindal *et al.,* 2008). On the demand side investors may have little or no confidence to invest in project activities with unclear tenure arrangements. In many francophone countries, land tenure is complex, characterized by: (i) prevalent

disconnect and conflict between customary and statutory land rights, (ii) legal pluralism i.e. lack of uniform set of statutory laws regarding tenure, (iii) tree tenure i.e. contested position over using tree planting as a mechanism to claim rights over land, (iv) and the challenge in using abandoned land (Unruh, 2008). Most of these countries are part of the REDD+ initiative, and they are expected through the readiness phase of REDD+ to transform or provide an enabling environment that will improve governance, clarify tenure rights, and ensure sectoral policy coherence and collaboration. Efforts are ongoing in some of these countries towards improving cross-sectoral coordination especially through cross-cutting aspects such as land use planning. This will contribute to attract investments, results-based payments and permit stakeholders to make strategic decisions in the design and implementation of forest-based programs and projects.

The six countries visited are involved in the REDD+ initiative and have scored substantial progress in the readiness and implementation phases of REDD+. Despite the progress, there are indications that the enabling environment has not evolved as expected, for example in Cameroon, land and forest and carbon tenure issues are still to be clarified (Chia *et al.,* 2019). Stakeholders in the different countries expressed dissatisfaction with the enabling environment in relation to governance and political will to move the forest-climate change response agenda forward (Figure 7).

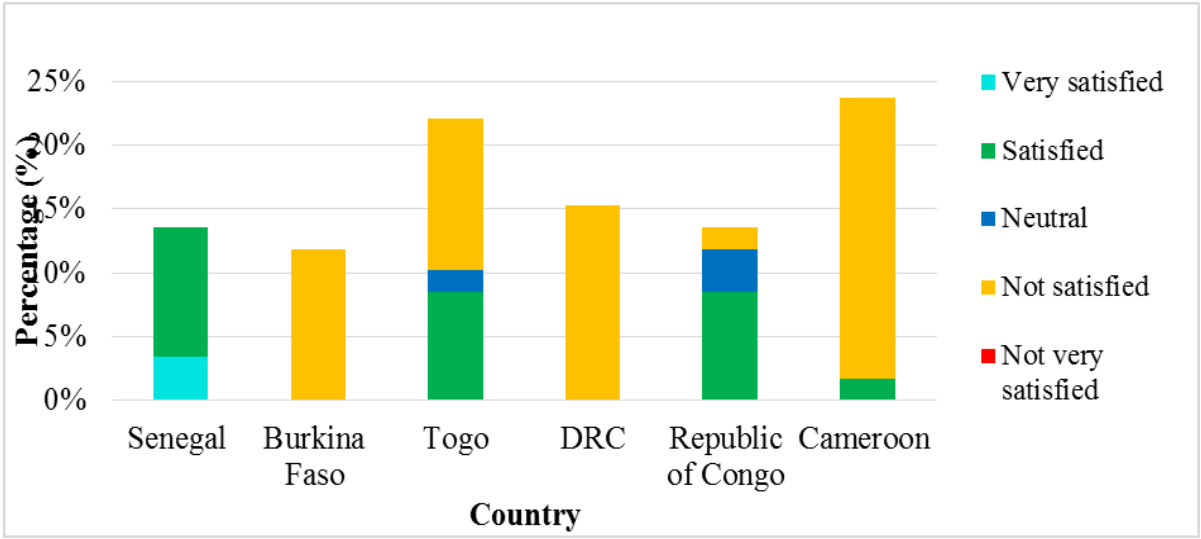

Figure 7: . Percentages of stakeholder opinions on the level of satisfaction regarding Governance - tenure and resource rights, political will

Technical capacity to develop bankable projects and robust Measurement, Reporting, Verification (MRV) system: Governments are expected to lead facilitation in the mobilization of resources to implement forest-based carbon emission reduction PPs. Financial resources are most often mobilized through bankable PPs, but currently, there is wide gap in the technical capacity concerning the development of bankable projects. Stakeholders stressed that the requirements and templates for conceptualizing PPs in relation to the different funding opportunities are always presented in English to the detriment of French speaking

experts. Most of these countries are depending on external technical expertise regarding the development of concept notes and project documents.

There is also a huge gap in baseline forest data that is relevant for the development of projects and programs and a robust MRV system. In addition, these countries are struggling to cope with the complex technology requirements concerning the monitoring of forest cover and land use change overtime. Notwithstanding, the forest administration of some of these countries have benefited from technical trainings, but the impacts of these trainings are hardly felt due to rapid staff rotation within forestry departments and the lack of PPs to test and apply technical skills.

There are opportunities for technical support for forestry stakeholders, however, this will depend on the will of various governments to galvanize and orientate these opportunities, to ensure that they effectively contribute in ameliorating the capacity of forestry stakeholders. The stakeholders' opinion across francophone countries show that the technical level of stakeholders is not satisfactory regarding the development of bankable projects (Figure 8).

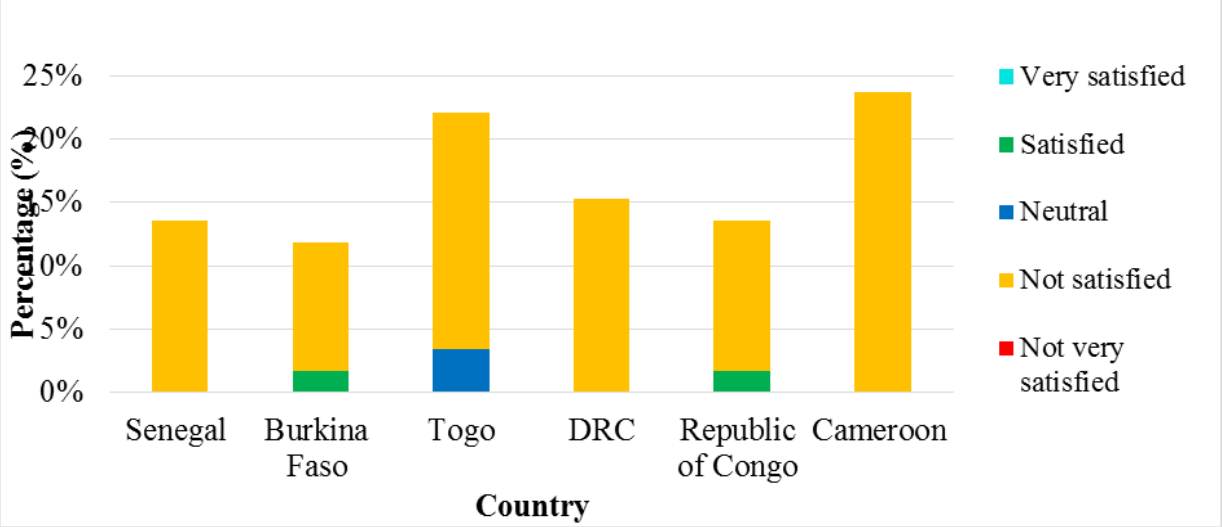

Figure 8: . Percentages of stakeholder opinions on the level of satisfaction regarding country level technical capacity

Economic incentives for project proponents: Forest based activities are demanding in terms of investments. In the current forest-climate change response policy landscape in francophone countries, little or no instruments exist to motivate investments. Stakeholders are not satisfied with the current situation regarding economic incentives for enhancing forest-based climate change projects (Figure 9). The private sector stakeholders, for example are strongly identified in the REDD+ strategy documents of some of these countries as relevant for forest carbon emission reduction investments. However, the efforts made this far in terms of reforms do not contain instruments that can drive the economic interest of stakeholders that are linked to the drivers of deforestation and forest degradation. In Cameroon deforestation and forest degradation is linked to multiple land use interests (mining, agriculture, infrastructure, forestry etc.) (Tegegne et al. 2016); thus tailored incentive

mechanisms are needed to enable these sectors achieve their sectoral objectives with low impact on forest carbon emissions (Chia *et al.,* 2019).

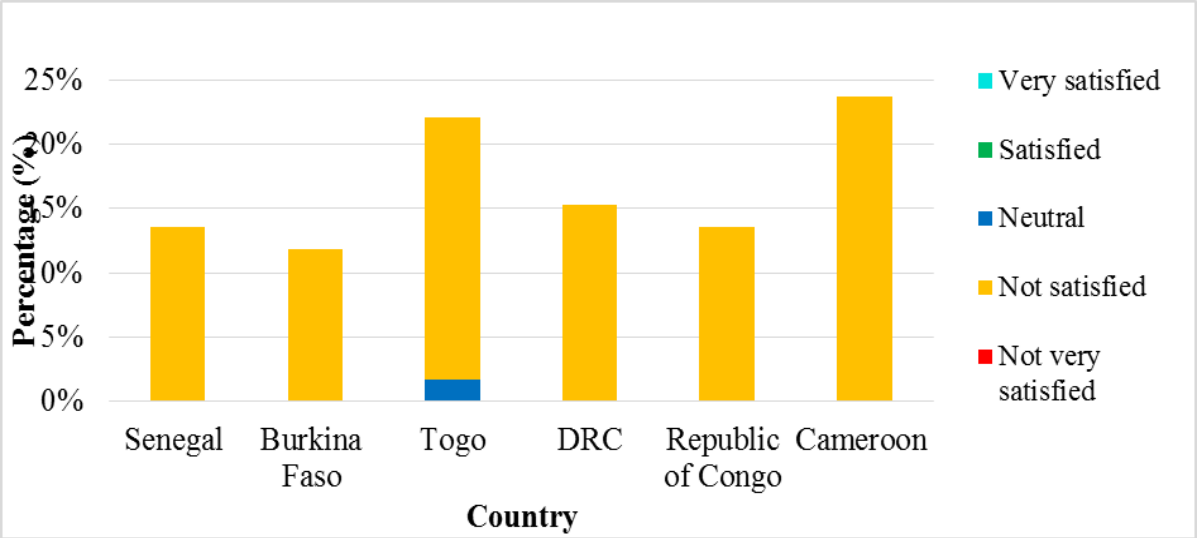

Figure 9: Percentages of stakeholder opinions on the level of satisfaction regarding economic incentives for project proponents

Availability of sufficient and sustainable financing: Forest based carbon emission reduction investments are long term engagements that require a certain level of guarantee for stakeholders to be encouraged to get involved. Huge upfront investment is required to cover opportunity, transaction and implementation costs that most project proponents in Africa do not have. A wide range of financial options exist for forestry PPs in Africa, but there is lack of clarity in the medium and long term on the size and sustainability of the different financing options. Stakeholders expressed worries and doubts on the availability of international financial resources that will enable forest PPs in Africa contribute to long-term emission reduction. Domestic financial resources are also expected to play a key role in the implementation of forest-based initiatives such as REDD+ in the long run. Unfortunately, in these countries, the public investment budget allocated for the fight against climate change is very small to produce meaningful impacts. The private sector has not yet had a meaningful role in climate financing in francophone countries, though it is the responsibility of governments to propose policy instruments that will entice private sector stakeholders. At the moment, none of the governments of the case study countries have taken an influential role in the mobilization of climate finance, for example by providing guarantee and facilitation that can reduce transaction costs. This is clearly shown by the high level of dissatisfaction indicated by stakeholders across the different countries (Figure 10).

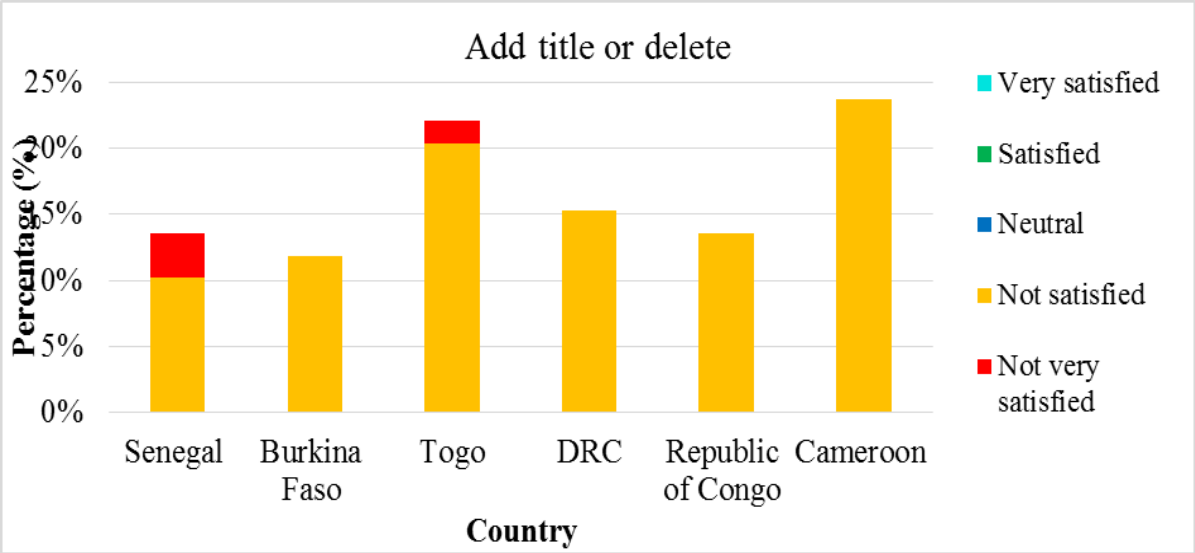

Figure 10: Percentages of stakeholder opinions on the level of satisfaction regarding the availability of sufficient and sustainable financing

Adequate policies and strategies addressing climate change

The francophone countries in Africa, have developed a wide range of policies and strategies to address climate change in the context of M+A. As concerns mitigation, some, for example Burkina Faso, Cameroon, DRC, Republic of Congo, and Togo, have developed REDD+ strategies and forest or national investment programs. All these policies and strategies will be translated to projects to be implemented by a wide range of stakeholders on the ground, through international funding support or mechanisms. In this context, the vision, ambition, the objectives and expected outcomes of these policies ad strategies should be satisfactory enough to attract international climate finance. This is also the case with adaptation policies, where impact driven adaptation actions are expected by international funding. Stakeholders encountered across the countries visited, have diverse opinions concerning the capacity of policy and strategy documents to attract the necessary international support and funding (Figure 11).

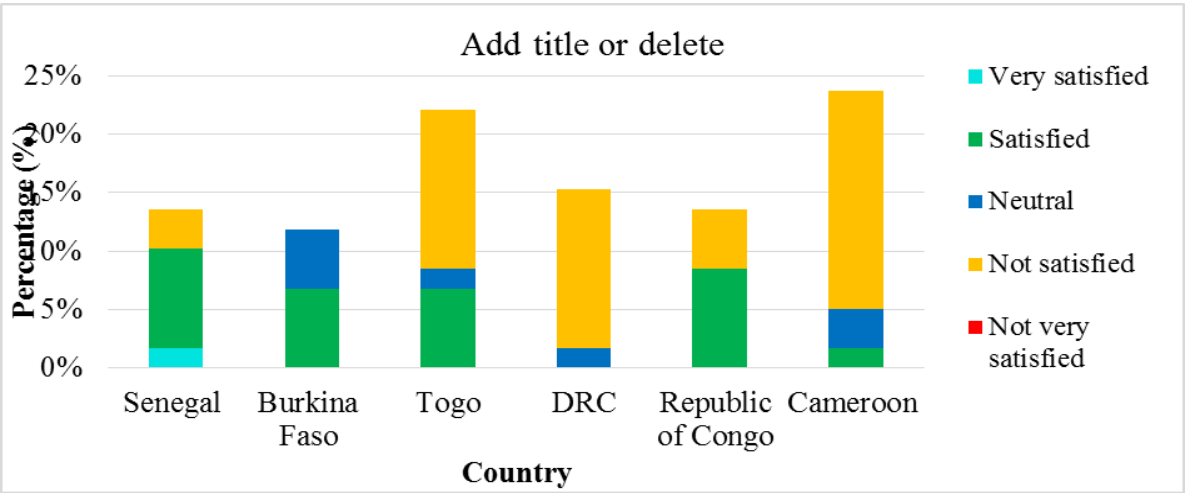

Figure 11: Percentages of stakeholder opinions on the level of satisfaction regarding the capacity of policies and strategies to attract donor interest

4.4. Propositions for enhancing the uptake/ integration of Mitigation and Adaptation in forestry

4.4.1. Trends in stakeholder opinions regarding Mitigation and Adaptation integration in forestry

Based on the fact that decisions to mainstream M+A in policies, strategies and PPs depend on stakeholders, stakeholder's views were captured concerning the importance and feasibility to operationalize the integration of M+A in forestry. First stakeholder views on national level priority between M+A from a general policy and forest sector specific perspectives are presented. Second, the views of stakeholders regarding the five identified stances around the strategies to operationalize M+A integration in forestry are presented.

Concerning climate change policy response across these countries in general, adaptation appears to be a priority, especially for the countries in the semi-arid and arid areas. For the countries in the Congo basin rainforest, both M+A appears to have the same priority (Figure 12)

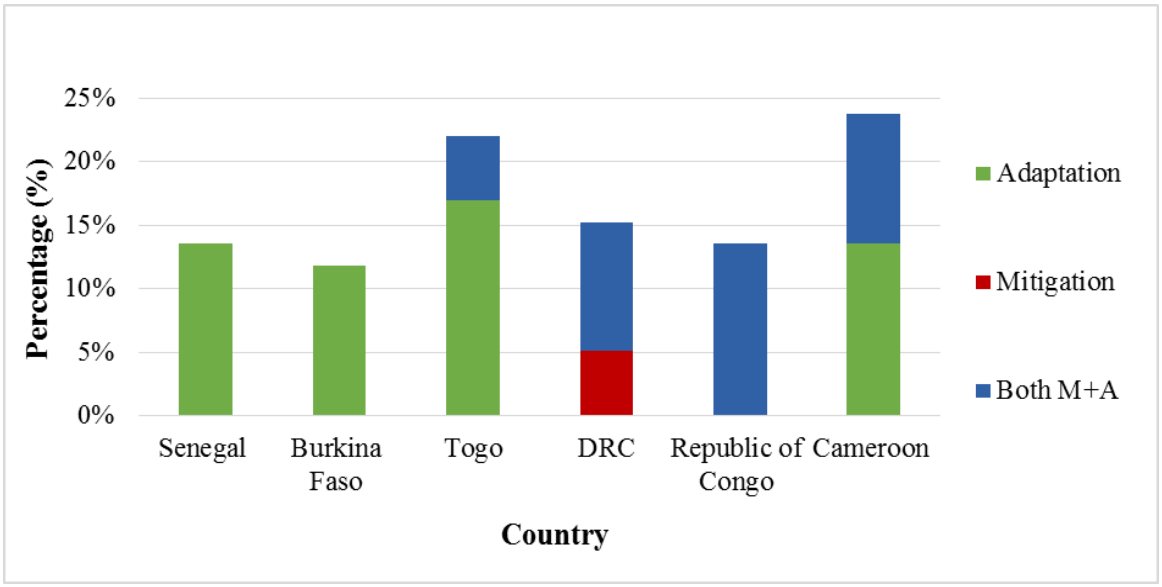

Figure 12: Stakeholder viewpoints regarding Mitigation, Adaptation, Mitigation and Adaptation priority in the climate change response process in general

Specifically, in the forest sector, stakeholder's opinions across these countries points to the fact that both M+A are a priority (Figure 13), indicating a need to jointly pursue their objectives and outcomes in forestry and on farm tree based PPs. However, despite being a priority, stakeholders indicate that this potential in the forest sector is yet to be exploited to the maximum. This situation is different in the DRC were all stakeholders indicated that only mitigation is a priority in the forestry sector. However, across the countries, stakeholders express worry over the capacity of stakeholders to develop and implement projects and programs that will explicitly take into consideration both M+A.

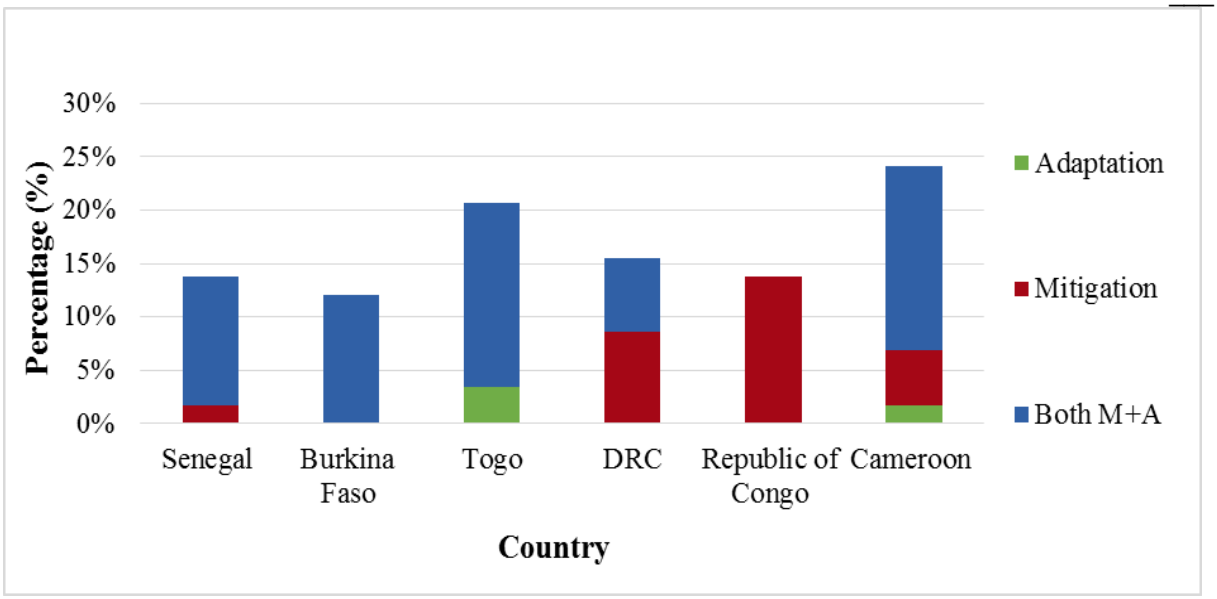

Figure 13: . Stakeholder viewpoints regarding Mitigation, Adaptation, Mitigation and Adaptation priority in the climate change response in the forestry sector

The prominent views regarding five stances on how to operationalize M+A integration are presented below (figure 14-18). The stances are developed from mainstreaming strategies in relation to programmatic integration, inter- and intra-organizational collaboration, managerial integration, regulatory integration and instruments - incentives and support to stakeholders. Concerning the stance that calls for the modification of a department's/organizations core work by integrating aspects related to M+A into on-the-ground forestry operations, projects or programs, stakeholders have divergent viewpoints within and between countries (Figure 14). Generally, only few stakeholders strongly disagree with this stance, with all of them from the DRC. Stakeholders from Senegal and Burkina Faso all agree with this stance. On the stance regarding the premise that M+A can be better integrated if there is inter- and intra-organizational collaboration, about 20% and 68% of stakeholders strongly agree and agree respectively, that collaboration between individual sections or departments and other stakeholders should be promoted e.g., between departments, committees, organizations, governmental bodies and civil society, to generate shared knowledge, develop competence, and take joint actions to advance M+A (Figure 15). About 12% and 64% strongly agree and agree respectively on the need to adjust management systems such as the modification of managerial and working structures, including internal formal and informal norms and job descriptions as well as the configuration of sections or departments to better address and institutionalize aspects related to the integration of M+A (figure 16). Stakeholders expressed different views concerning the need to adjust national regulatory frameworks (Figure 17), such as the modification of planning procedures and related activities, including formal and informal plans, policies, regulations, and legislations that lead to the integration of M+A. Lastly, stakeholders opinion also (strongly) agree on the need to create an incentive or support system to redirect stakeholders focus onto aspects related to integrating M+A by e.g. providing tailored funding, promote new projects, support capacity building of staff etc. (Figure 18).

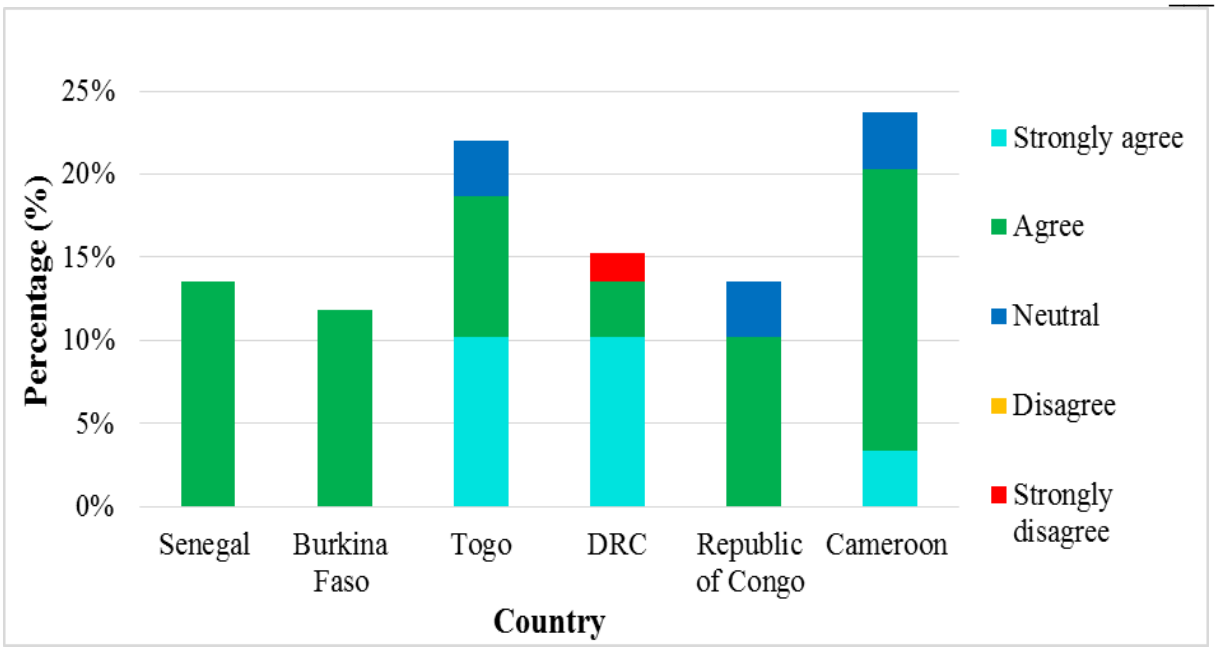

Figure 14: Percentages of stakeholders dis (agreeing) with the stance "The department's/organizations core work should be modified by integrating aspects related to Mitigation and Adaptation into on-the-ground forestry operations, projects or programs".

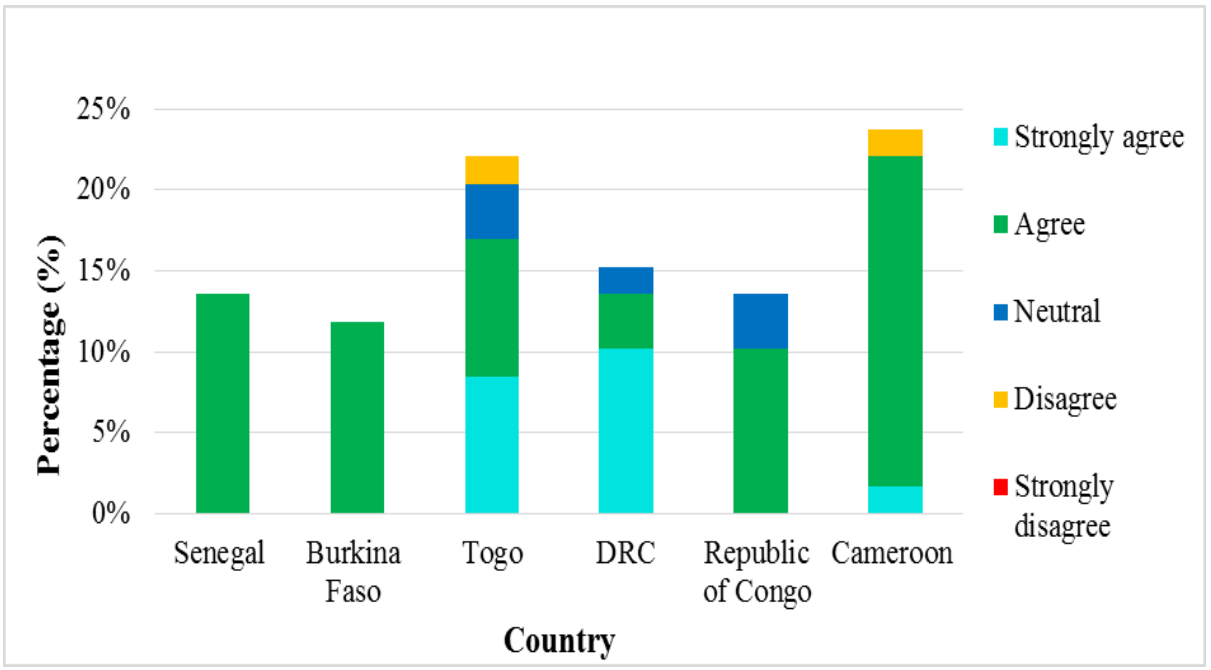

Figure 15: Percentages of stakeholders dis (agreeing) with the stance " Collaboration between individual sections or departments and other stakeholders should be promoted e.g., between departments, committees, organizations, governmental bodies and civil society, to generate shared knowledge, develop competence, and take joint actions to advance Mitigation and Adaptation".

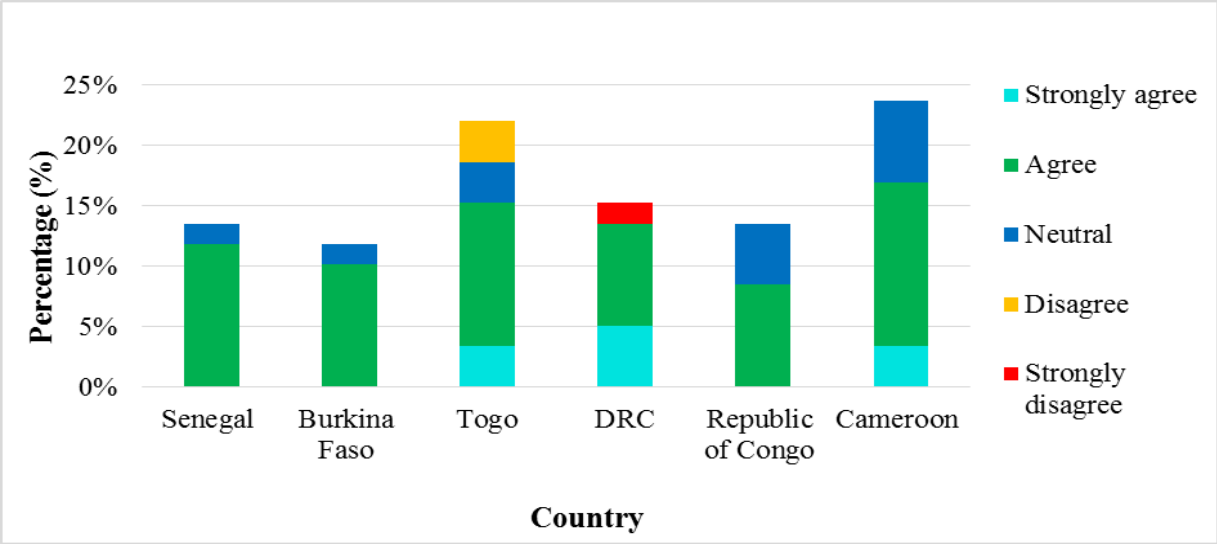

Figure 16: Percentages of stakeholders dis (agreeing) with the stance "The managerial and working structures should be adjusted, including internal formal and informal norms and job descriptions as well as the configuration of sections or departments to better address and institutionalize aspects related to the integration of Mitigation and Adaptation".

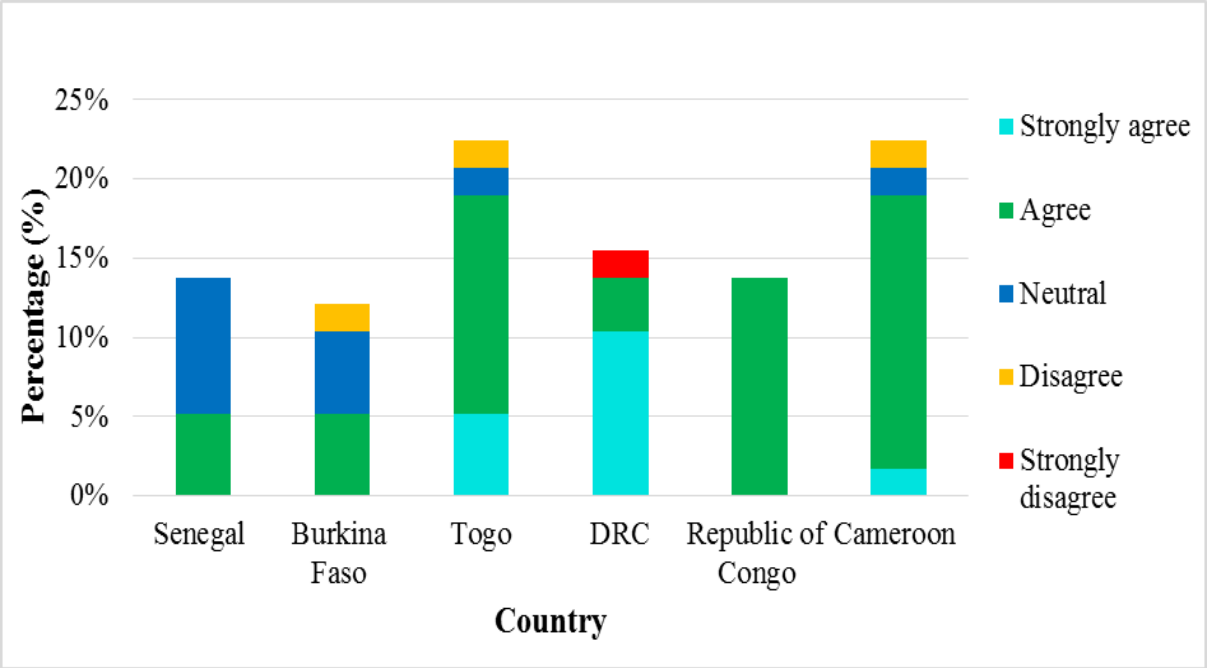

Figure 17: Percentages of stakeholders dis (agreeing) with the stance "The planning procedures and related activities should be modified, including formal and informal plans, policies, regulations, and legislations that lead to the integration of Mitigation and Adaptation".

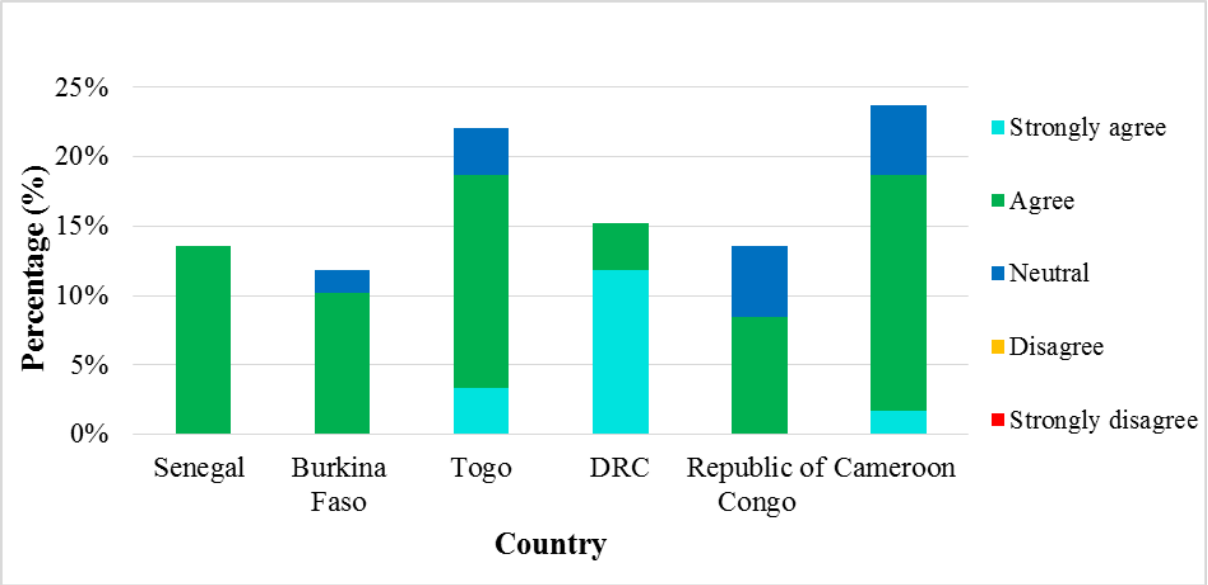

Figure 18: Percentages of stakeholders dis (agreeing) with the stance "Support should be provided or redirect the focus onto aspects related to integrating Mitigation and Adaptation by e.g. providing tailored funding, promoting new projects, capacity building of staff, or directing responsibilities".

4.4.2. Framework

The framework is developed from stakeholder views as indicated in the analysis in the previous section regarding the different integration strategies. In addition, it should be noted that the views of the stakeholders consulted strongly point to the fact that the integration of M+A should be pursued both at the policy (national) level and on-the ground i.e. program and project levels (Figure 19).

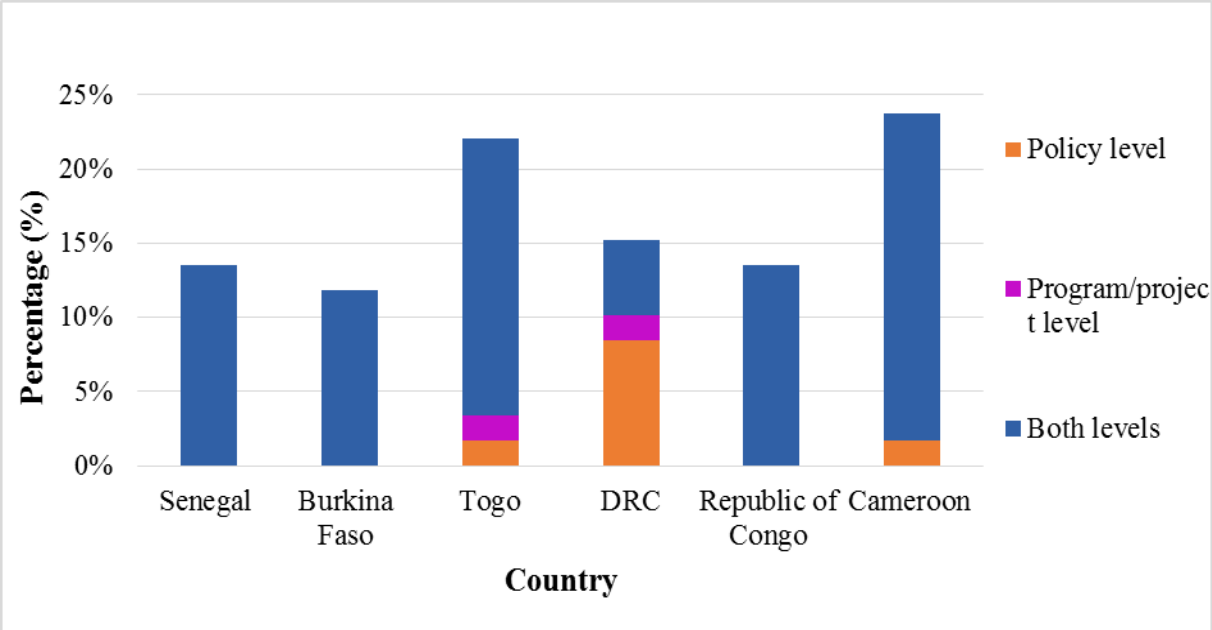

Figure 19: Stakeholder views regarding the appropriate level to pursue the integration of Mitigation and Adaptation

The integration strategies at the policy level are based on the analysis in the previous section. It combines a number of key measures and criteria and assessment questions that are linked to programmatic, regulatory, managerial, and incentive based, inter- and intra-organizational collaboration condition (Table 11). These are broad orientations, that provide possibilities to capture the integration of both M+A in national climate and forestry related processes and can be fine-tuned to fit into context specific country situations.

Table 11: Key policy and institutional measures to enhance the uptake of integrated Mitigation and Adaptation forestry interventions

Key measures	Criteria	Key assessment questions
Promote inter- and intra-organizational collaboration and coordination	- Collaboration and joint actions between the forestry and the environment ministries are promoted to advance integrated M+A interventions - Forestry and environment departments within a ministry collaborate and undertake joint actions, generate shared knowledge and develop capabilities that advance integrated M+A interventions - - Integrated M+A interventions is promoted between and across agencies, Civil Society Organizations etc.	- Does the forestry and environment ministries meet regularly to share ideas on emerging climate change response opportunities such as the integrated M+A? - Do they jointly put together project ideas? - Does the forest and environment departments engage and undertake joint actions to promote M+A integration? - -Are there multi-stakeholder platforms that share information and knowledge on the development of integrated M+A actions?
Institutionalize integrated M+A interventions and promote them in current and future programs	- Core activities of forestry departments is modified to integrate M+A in on-the-ground operations, projects and programs - - The managerial and working structures e.g. services, departments, agencies etc., is modified to better address and institutionalize M+A integration,	- Have departments introduce both M+A as expected results in their forestry operations? - - Have departments explicitly institutionalized integrated M+A options in their traditional service arrangements?
Enhance regulatory	- Existing plans, policies, strategies are revised to explicitly capture integrated M+A option - - Relevant instruments that can foster the integration of M+A are created	- Does integrated M+A explicitly referred to in revised policy and strategic documentation? - - Are there instruments created to foster integrated M+A options in forestry?

Key measures	Criteria	Key assessment questions
Develop financial and stakeholder's awareness of and technical capacities on integrated M+A interventions	- Targeted funding support to actions that integrate M+A in forestry is provided - Staff and other relevant stakeholders are trained on the integration of M+A in forestry - Access to incentive mechanisms e.g. PES, voluntary markets, is facilitated - Pilot programs to create an evidence base of the successes of integrated M+A interventions are developed - - Forest science-policy dialogue improved to create more awareness on integrated M+A interventions	- Is there a special financial support for integrated M+A interventions? - Are stakeholders aware of the existence of the fund? - Are stakeholders trained on the development of integrated M+A options in forestry? - Have sufficient evidence been documented on lessons learned from integrated M+A projects? - - Is there a knowledge sharing platform on integrated M+A approaches?

Source: developed from Wamsler, 2015 and stakeholder opinions

At the program and project level the integration of climate change response into forestry could be handled from an adaptation or mitigation direction only, of from both the two approaches. In a program or project, planning to achieve mitigation and/or adaptation outcomes should be based on a number of measures. These measures are accompanied by criteria from both the adaptation and mitigation sides as shown in table 12. The framework is a modified framework proposed by Chia *et al.,* 2016 that was limited only to the integration of adaptation into forest carbon projects. Thus, the present framework is expanded to take into consideration the context on how mitigation (i.e. carbon outcomes) and adaptation can both be integrated into forestry programs and projects. The measures are briefly described below, followed by the criteria to operationalize these principles from the mitigation and adaptation perspectives, including key guidance questions.

Table 12: Measures to be considered when designing and implementing forestry interventions that integrate both Mitigation and Adaptation

Key measures	Criteria	Key assessment questions
The health of forests ecosystems should be maintained or enhanced	- Assess the vulnerability and impacts of climate change on forest ecosystems - Assess the carbon value of forest ecosystems and the drivers of deforestation and forest degradation - Propose forest management and other related activities relevant	- Does the project proponent have robust findings on the vulnerability of forest ecosystems, carbon values, drivers of deforestation? - Has the environmental impacts of interventions been analyzed, and safeguard measures proposed?

	for conserving or enhancing forest carbon stocks and adaptation of forests and other related systems - Assess the environmental impact assessment of project activities - Put forward strategies to reduce impacts or enhance biodiversity and ecosystem services	
The adaptive capacity of forest-dependent communities should be ensured	- Assess the livelihood resources/assets in project and program areas - Evaluate the impacts of projects and programs on livelihood resources and assets - Design and implement strategies to enhance the livelihood assets of communities (A) - Enhance community participation in the identification and design of livelihood activities	- Are there adequate information on livelihood resources and livelihood impacts of interventions? - Have alternative livelihood strategies introduced in communities? - - Where communities involve in the identification of both forestry and livelihood activities?
Robust carbon and adaptation indicators should be developed, monitored and verified	- Develop indicators to monitor and report carbon values - - Develop indicators to monitor and report adaptation values	Is there a robust approach to monitor and report on carbon and non-carbon benefits?
Forestry and tree-based interventions should demonstrate the need to plan and expect both M+A outcomes	- The population or social groups vulnerable to climate change and willing to carry out forest carbon activities should overlap - The location vulnerable to climate change and suitable for forest carbon activities should overlap - - Forestry and on farm tree-based activities implemented should potentially contribute to both M+A outcomes	- Does the need for mitigation, overlap with the need for adaptation of communities and forest ecosystems? - - Does the chosen forestry activities show potentials to deliver both M+A?

Source: developed from Chia *et al.,* 2016, and stakeholder opinions

Principle 1: The health condition of forest ecosystems should be maintained or enhanced

Forest ecosystem health is a condition wherein a forest has the capacity for renewal, for recovery from a wide range of disturbances, and for retention of its ecological resilience, while meeting the current and future needs of people for desired levels of values, uses, products, and services (Twery and Gottschalk, 1996). Pramova and Locatelli (2013) state that to reduce the risks of climate change on forest ecosystems, it is important to assess vulnerability (exposure + sensitivity + adaptive capacity) and plan for adaptation measures. Given such risks, and without management strategies to enhance adaptation, the potential of planted and natural forests to sequester and store carbon will be diminished, thus feeding a positive feedback of carbon emissions (Chenost *et al.,* 2010). Furthermore, the enhancement of the adaptive capacity of planted and natural forest may contribute in reducing the vulnerability of peoples who depend on forest ecosystem services (Pramova and Locatelli 2013). Information on climate scenarios provide an opportunity for joint planning of adaptation and carbon conservation and reforestation projects (Matocha *et al.,* 2012). Addressing and providing safeguards related to the enhancement of environmental integrity through biodiversity and ecosystem services conservation provide opportunities to enhance synergy outcomes in forest carbon initiatives (Locatelli, 2014). In this context, environmental impacts should be assessed, accompanied by strategies to reduce impacts. This will ensure the continuous flow of forest ecosystem goods and services relevant for the adaptation of forest and other related natural and production systems (Locatelli *et al.,* 2008)

Principle 2: The adaptive capacity of forest-dependent communities should be ensured

The determinants of adaptive capacity are linked to the livelihood assets/resources in project areas. They include physical assets (infrastructure and technology e.g., irrigation, weather stations), natural assets (productive land, forest resources); social assets (collective action, property rights, access and use of resources; social networks, equity, and participation); financial assets (income diversification); and human assets (knowledge, skills, education, information) (Pramova and Locatelli, 2013); Munroe and Mant, 2014). The determinants of adaptive capacity provide the bases for evaluating context-specific adaptation needs across individuals, communities, and locations (Brooks and Adger 2005). Based on the assessment of livelihood assets/resources and the potential impacts of project activities on these assets, strategies for enhancing livelihood resources in project or program areas should be designed.

Principle 3: Carbon and adaptation benefits should both be monitored and verified

Guidelines for forest carbon initiatives should consider a comprehensive monitoring and verification of both carbon and non-carbon values (biodiversity, ecosystem services, and social benefits that relate to adaptive capacity) to ensure that both M + A objectives are achieved in forest carbon initiatives (Locatelli *et al.,* 2008; Yohe, 2001). Monitoring and verifying the performance of social and environmental indicators is important as it ensures that the adaptive capacity of communities are monitored and enhanced throughout the project cycle.

Principle 4: Initiatives Should Demonstrate the Need to Plan and Expect Adaptation Outcomes

Not all forest carbon projects and programs have the potentials to plan and expect adaptation outcomes. Murdiyarso et al. (2005) proposed three parameters (Who, Where, Which) that can help forest carbon or adaptation project developers detect potentials for promoting synergy and minimizing trade-offs before making attempts to promote and expect M+A outcomes. First, the parameter of "who", requires that the population or social group vulnerable to climate change and that suitable to carry out forest carbon activities overlap. Second, the parameter of "where" requires that the location vulnerable to climate change and that suitable for forest carbon activities overlap. Third, the parameter of "which", requires that activities to be implemented should have the potential to reduce carbon emissions or enhance sequestration, on one hand, and on the other hand provide opportunities for social and ecological systems to increase their adaptive capacities or resilience. The location of projects and programs, the communities to be involved, and the type of activities to be implemented are very important in determining the need for adaptation and the effectiveness of mitigation activities (Murdiyarso *et al.,* 2005).

5. DISCUSSION

5.1. Mitigation and Adaptation in forestry related climate change strategies and programs and projects: perspectives for francophone African countries

Francophone African countries for the past two decades have developed policies and strategies to combat climate change through mitigation and adaptation. Forest resources are always part of the climate change response agenda in these countries. The development of most of these policies have been driven by the international donor community, with little or no national level motivation. Thus, very limited national level resources have been injected into the implementation of these plans. Most of the countries expected to implement policies based on donor financing but are not able to mobilize the financial resources due to stringent donor requirements or conditions.

To operationalized policies and strategies, these countries have developed many climate change response programs and projects. Some have been implemented, others on going, while some are still in the pipelines of the different funding opportunities. For the PPs implemented, lessons learned have not been well documented to guide the implementation of future projects. Furthermore, most of the M+A PPs implemented have a life cycle below five years. This is difficult because trees and related resources need many years to demonstrate their contribution to M+A through the provision of ecosystems goods and services. African forestry stakeholders and climate change practitioners in general need to understand this long-term specificity of forestry M+A PPs, as they developed forestry and on farm tree-based PPs. The NDCs of these countries highlight the necessity to link M+A

through forestry (Fobissie *et al.,* 2019). PPs integrating M+A needs to be skillfully developed together with strategic orientations at the policy level and on-the-ground elements that will incentivize stakeholders to developed PPs having such dimensions.

5.2. Making decisions on forestry and on farm tree-based programs and projects interventions: role of Mitigation and Adaptation drivers

Many forestry PPs have been designed and implemented across francophone Africa, from the semi-arid countries in West Africa, to the rainforest countries in Central Africa. Very few of the PPs had climate change mitigation and/or adaptation as a principal determinant. Decisions to design and implement interventions have been influenced by factors that drive climate change response indirectly. The determinants are a combination of biophysical and socioeconomic measures that can make immense contribution to drive M+A outcomes. Furthermore, the analysis of ongoing and future PPs indicates a need to increase the profile of M+A in forestry PPs. The integration of M+A require stakeholders to have the technical capacity to maneuver and demonstrate certain aspects as proposed in the framework. The more they are technically comfortable, the more they will be willing to define M+A objectives clearly in their PPs. Thus, building the capacity of stakeholders towards integrating M+A is crucial, especially at a moment where resources to develop and implement separate M+A PPs are becoming scarce.

5.3. Success stories to spur uptake of climate change in forestry programs and projects: Are they sufficient?

Lessons and experiences are very important to drive the decision of stakeholders towards the adoption of forestry and on farm tree-based interventions. Evidence on successes for the past ten years have not shown enough successes that can spur stakeholders. In the semi-arid and arid countries, hundreds of millions of dollars have been invested in many isolated projects especially in the fight against land degradation and droughts through reforestation and afforestation, agroforestry etc. However, most of these projects ended prematurely, following the end of external funding support that is always provided below a five-year period. Some of these projects had positive results but are not strong enough to inform and guide large scale interventions. This aspect of evidence is critical for the case of climate change. For the past ten years, very little evidence exists on successes of forest carbon emission reduction projects. Taking the case of the voluntary carbon market where efforts have been made, projects have not generated carbon credits as expected and many of them ended prematurely due to limited financial and technical capacity. This is shown by the large percentage of stakeholders that were unable to assess the successes of forest-based interventions, despite the efforts that have been made this far. The current and future forestry and on farm tree-based carbon emission reduction interventions are being developed on the premise of results-based payments, where long term financial and technical investments are needed. In this

context, the challenge will be enormous because stakeholders have little or no past group of experience to build on.

5.4. Enabling conditions for uptake of forestry and on farm tree-based interventions in M+A context: Are they evolving towards expectations?

Across francophone countries in Africa, the policy level factors that can hinder the uptake of forestry and on farm tree-based interventions in the context of M+A are similar. One of the major routes for PPs to achieve effective emission reductions is through performance-based payments and the outcome of actual emissions and other benefits will depend on how policy and institutional frameworks act as enablers. Concerning on farm tree-based interventions such as agroforestry, policy and institutional issues identified in these countries relate to: land and tree tenure, the capacity of seed/germ plasm supply systems, the capacity of extension systems to propagate agroforestry technology, the articulation of agroforestry in sectoral policy and strategy documents and the opportunities of agroforestry in incentive approaches such as REDD+ and PES, subsidies to enhance adoption of agroforestry practices. These are factors that were identified more than a decade ago (Ajayi and Place, 2012; Place *et al.,* 2012; Foundjem-Tita *et al.,* 2012) and since then they have not evolve towards being effective enablers as expected by practitioners. Efforts have been made, but not sufficient to guarantee the transformation of these factors into key enablers. This is crucial, for trees on farms to make the necessary contribution to climate change mitigation and adaptation, as described in climate change policy and program documents at the country levels.

Concerning forest-based interventions, the successful implementation of PPs in francophone countries in Africa is complex because of the links between the implementation of other sectoral policies (mining, agriculture, infrastructure etc.). In this context, there is a need for a strong political will to improve governance, ensure sectoral coherence, enhance technical capacity building, and incentivize stakeholders and interest groups. In Cameroon, a recent study on the adoption of sustainable forest management practices in the context of emission reductions, found 15 barriers, in which insufficient “political will of policy makers” was ranked the most important barrier that needs to be addressed, for sustainable management to make a meaningful contribution to climate change mitigation (Chia et al 2019b).

6. CONCLUSION AND RECOMMENDATIONS

6.1 Conclusions

This study had as objective to explore the M+A potentials in forest and on farm tree-based strategies and practices in francophone countries in Africa. This is geared towards enhancing their uptake or integration by forestry stakeholders. Policies and strategies in these countries acknowledge the role of forests and trees in climate change mitigation and adaptation. However, the role of forests and trees in terms of delivering both M+A outcomes is not well articulated in these policies and strategies. Most of these policies are more than a decade old and out of context in relation to recent policy and research developments at the international level in the context of forest and climate change. Some of these countries are already planning to revise these old policies and strategies, thus an opportunity to better and clearly enunciate the need to develop and implement forestry and tree-based interventions that will deliver on M+A simultaneously.

Across francophone countries, many current and future PPs developed in the context of forest and climate change have potentials to deliver both M+A. However, these potentials can be transformed into tangible M+A outcomes by explicitly integrating M+A. Explicitly integrating M+A entails defining M+A in the objectives and expected results, including the design of M+A monitoring and evaluation indicators.

The decision of stakeholders to design and implement forest and on farm tree-based practices are determined by a combination of factors that may vary from one or group of stakeholders to another. Concerning on farm tree-based practices such as agroforestry, drivers of decision making related to biophysical, climate, socioeconomic, financial factors were identified. However, the climate variable – carbon sequestration and microclimate adaptation was not among the leading drivers according to the vote-counting meta-analysis and stakeholder assessment. Concerning forest-based interventions, factors driving stakeholder's decisions are biophysical and socioeconomic in nature, with clear indications that stakeholders need to combine a number of these factors before deciding to design and implement a forest-based intervention in an M+A context.

Generally, there is a huge gap concerning success stories on climate change M+A in relation to forest and on farm tree-based interventions. For the past ten years, sufficient lessons and experiences have not been documented that can act as a trigger for stakeholders to design and implement ambitious M+A forest and on farm tree-based interventions. This situation is further weakened by the unfavorable policy and institutional environment in which stakeholders operate. There is a need to improve the enabling environment for the design and implementation of forest and on farm tree-based interventions, to permit stakeholders demonstrate their capacity, which is currently weak in terms of designing bankable M+A projects.

Both M+A is a priority in most of these francophone countries thus, jointly pursuing M+A objectives in forestry is crucial. Stakeholders generally agreed that the integration of M+A in forestry should be pursued at multiple levels (policy and on-the-ground levels), using vertical and horizontal interrelated approaches that can be translated into guiding principles and criteria. At the policy level, the integration of M+A should be based on, but not limited to five principles: enhance inter- and intra-organizational integration, initiate and promote programmatic integration, enhance managerial integration, enhance the regulatory integration and the need to provide incentives and support to stakeholders that are promoting the integration of M+A in forestry.

On the ground, project promoters should follow a number of principles to plan and expect M+A outcomes in their projects. They include the need to ensure that; the health of forests ecosystems are maintained or enhanced, the adaptive capacity of forest-dependent communities are ensured, the carbon and adaptation indicators be developed, monitored and verified, forestry PPs should demonstrate the need to plan and expect both M+A outcomes.

Forest and on farm tree-based interventions are relevant for mitigation and adaptation in the African continent. However, operationalizing this role through the development of viable strategies, programs and projects is a big challenge. There are opportunities for African forestry stakeholders to enhance the uptake of M+A in their operations, but weak technical capacity, unfavorable policy environment and limited financial resources act as major hurdles for action and success.

6.2. Recommendations

- There is a need to generate, document and share lessons learned and experiences from integrated M+A forest-based and on-farm tree-based interventions in different forest types across francophone African countries;
- The multiple drivers and expectations (climatic and non-climatic) of stakeholders at the farm level needs to be taken into consideration when designing interventions that will involve farm level stakeholders;
- Governments need to accompany stakeholders by ameliorating the enabling conditions for designing and implementing tree-based and off-farm tree based as they interventions as they portray nature-based solutions to climate change through mitigation and adaptation;
- Integrated M+A approaches should be enhanced at the policy level in terms of strategic orientations, and at the landscape level in terms of operationalizing interventions with monitoring and reporting systems to feedback to the national level;
- Tailored funding opportunities should be created at the national and international level towards enhancing the uptake of integrated M+A approaches in programs and projects;
- Technical capacity building for project and policy level stakeholders is required for the design, implementation, monitoring and reporting of integrated M+A forest-based and on-farm tree-based interventions.

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ANNEXES

Annex 1. List of projects and programs

Projects and programs implementing forest-based and on-farm tree-based Mitigation and Adaptation related activities in francophone Africa

No	Program/project	Country	Key stakeholders involve	Type of Adaptation and Mitigation activities
1	Integrated and Sustainable Management of PONASI Protected Area Landscape	Burkina Faso	MEEVCC	- Protected area management - Livelihood support - Ecosystems services management
2	Integrated Development for increased Rural Climate Resilience in the Niger Basin	Burkina Faso	MEEVCC	- Avoided deforestation - Sustainable land management - Enhance adaptive capacity
3	Reducing vulnerability of natural resource dependent livelihoods in two landscapes at risk of the effects of climate change in Burkina Faso	Burkina Faso	MEEVCC	- Reduce vulnerability in local communities - Reduce vulnerability in development sectors
4	Community Forest Management Project Cassou	Burkina Faso	Community CAF Cassou (3C).	- Reforestation, regeneration, agroforestry - Livelihood support
5	Participatory Forest Management for REDD+	Burkina Faso	MEEVCC	- Sustainable forest management - Reforestation, agroforestry
6	Decentralized Forest and Woodland Management Project (PGDFEB)	Burkina Faso	MEEVCC	- Sustainable forest management - Reforestation, agroforestry
7	REDD + Cashew Development Support Project	Burkina Faso	MEEVCC, WOUOL -	- Reforestation

	in the Comoé Basin		NGO	- Agroforestry - Livelihood support
8	Supporting Landscapes Restoration and Sustainable Use of Local Plant Species and Tree Products (Bambusa ssp, irvingia spp, etc) for Biodiversity Conservation, Sustainable Livelihoods and Emissions Reduction in Cameroon	Cameroon	IUCN	- Improve forest management - Restoration
9	Sustainable management of forest by Cameroonian councils	Cameroon	Ministry of Environment, Protection of Nature and Sustainable Development (MINEPDED), Ministry of Forestry and Wildlife (MINFOF), Technical Center for Council forest (CTFC)	- Enhancement of forest carbon stocks through restoration - Sustainable forest management
10	Removing barriers to biodiversity conservation, land restoration and sustainable forest management through Community-Based Landscape Management – COBALAM	Cameroon	MINEPDED Rainforest Alliance	- Forest Protection - Landscape management
11	Integrated and Transboundary Conservation of Biodiversity in the Basins of the Republic of Cameroon	Cameroon	Ministry of Forestry and Wildlife	- Conservation of old carbon stocks through protected area management
12	Sustainable farming and critical habitat conservation to achieve biodiversity mainstreaming and protected areas management effectiveness in Western Cameroon	Cameroon	MINEPDED University of Dschang	- Protected area management
13	Participatory Integrated Ecosystem Management	Cameroon	MINEPDED	- Land use planning - Forest conservation
14	Project for the reduction of deforestation and forest degradation in the Bangangte-Bana-	Cameroon	Bangangte-Bana-Bangou Councils	- Conservation - Reforestation

	Bangou intercommunal massif forest			
15	Project for the conservation of the Ouro Doukoudje massif forest and the reforestation of the west bank of lake Lagdo	Cameroon	Lagdo Council	- Reforestation
16	Project to reduce the degradation and restoration of vegetation cover in the agro-sylvo-pastoral area	Cameroon	Pitoa Council	- Reforestation
17	Project for the Reduction of mangrove deforestation and degradation through integrated sustainable mangrove and associated coastal forest management	Cameroon	Tiko Council, Limbe Council	- Mangrove restoration
18	Project for the protection of the council forest through the implementation of agro-sylvo-pastoral activities	Cameroon	Yoko council	- Conservation
19	Project for the Protection of the lokoti woodland area through the adoption of alternative activities in peripheral areas	Cameroon	Meiganga Council	- Reforestation
20	Enhancing agro-ecological systems in northern prefectures of the Central African Republic	Central Africa Republic (CAR)	Lake Chad Basin Commission (LCBC)	- Sustainable forest and land management - Improve agriculture systems
21	Forest and Landscape Restoration supporting landscape and livelihood resilience	Central Africa Republic (CAR)	Ministry of Environment	- Restoration - Sustainable forest management - Livelihood support and resilience
22	GLOBE Legislators Advancing REDD+ and Natural Capital Governance Towards the Delivery of the 2030 Agenda	Democratic Republic of Congo	GLOBE	- Improvement of the enabling environment
23	Climate resilient growth and adaptation in Democratic Republic of Congo	Democratic Republic of Congo	Ministry of Environment and Sustainable Development	- Mainstreaming adaptation in plans, strategies - Reduction of vulnerability of local communities
24	The Restoration Initiative (TRI) – Fostering innovation and integration in support of the Bonn	Democratic Republic of Congo	IUCN	- Restoration of degraded forest

	Challenge			
25	Isangi REDD+ Project	Democratic Republic of Congo	Jadora LLC	- Avoided deforestation - Sustainable agriculture - Community livelihood support
26	The Mai Ndombe Redd+ Project	Democratic Republic of Congo	Wildlife Works	- Avoided deforestation - Sustainable forest management
27	DRC Improved Forested Landscape Management Project	Democratic Republic of Congo	Ministry of Environment and Sustainable Development	- Avoided deforestation
28	Strengthening the resilience of women producer group's and vulnerable communities in Mali	Mali	AEDD	- Livelihood support, support to the adaptive capacity of communities - Adaptation technology transfer and capacity building
29	Scaling up and replicating successful sustainable land management (SLM) and agroforestry practices in the Koulikoro region of Mali.	Mali	AEDD	- Biodiversity conservation - Agroforestry - Improve agriculture systems
30	Mali Jatropha Curcas Plantation Project	Mali	Jatropha Mali Initiative (JMI), Eco-Carbone	- Reforestation - Agroforestry
31	Strengthening resilience to Climate Change	Mali	AEDD	- Adaptation measures at the local and national levels
32	Integrated Management of Oasis Ecosystems of Northern Niger (IMOE -NN)	Niger	Ministry of Environment	- Sustainable forest management - Capacity building - Improving the enabling environment
33	Improving sustainable management of natural resources in Niger's Diffa region	Niger	Lake Chad Basin Commission (LCBC)	- Reforestation, conservation - Renewable energy
34	Planning and financing adaptation in Niger	Niger	National Council on Environment for Sustainable	- Vulnerability reduction - Capacity building - Mainstreaming adaptation in

			Development (CNEDD)	development plans and strategies
35	Scaling up Community-Based Adaptation (CBA) in Niger	Niger	CNEDD	- Livelihood support, support to the adaptive capacity of communities - Adaptation technology transfer and capacity building
36	Niger Acacia Senegal Plantation Project	Niger	Government of Niger	- Reforestation and afforestation
37	Integrated and Transboundary Conservation of Biodiversity in the Basins of the Republic of Congo	Republic of Congo	Ministry of Forest Economy, Sustainable Development (MFEDD)	- Protected area management - Sustainable Livelihood support
38	NORTH PIKOUNDA REDD+ PROJECT	Republic of Congo	Congolaise Industrielle des Bois	- Avoided deforestation - Sustainable forest management
39	Republic of Congo Emission Reduction Program	Republic of Congo	MFEDD	- Avoided deforestation - Sustainable forest management
40	GLOBE Legislators Advancing REDD+ and Natural Capital Governance Towards the Delivery of the 2030 Agenda	Sénégal	GLOBE	- Improving Enabling conditions - Capacity building
41	Promoting innovative finance and community-based adaptation in communes surrounding community natural reserves	Sénégal	Ministry of Environment & Sustainable development (MEDD)	- Improving Enabling conditions - Facilitating access to sustainable financing for adaptation
42	Promoting SLM practices to restore and enhance carbon stocks through adoption of Green Rural Habitat initiatives	Sénégal	MEDD*	- Land use planning - Conservation of carbon stocks - Community livelihood support
43	Strengthening land & ecosystem management under conditions of climate change in the Niayes and Casamance regions- Republic of Senegal	Sénégal	MEDD	- Mangrove Reforestation - Agroforestry - Support the resilience of communities
44	Mainstreaming ecosystem approaches to climate resilient livelihoods in vulnerable areas	Sénégal	MEDD, Ministry of agriculture, Ecological	- Climate services - Capacity building of

	through the Farmer Field School methodology		monitoring Center	communities on adaptation
45	Senegal River Basin Climate Change Resilience Development Project	Sénégal	OMVS	- Strengthening resilience and adaptive capacity
46	Jatropha Agroforestry Senegal	Sénégal	African National Oil Corporation s.a.r.l. (ANOC)	- Agroforestry - Soil and land management - - Local livelihood support
47	Livelihoods' mangrove restoration grouped project in Senegal	Sénégal	Oceanium	- Mangrove restoration - Livelihood support
48	Senegal National Adaptation Plan	Sénégal	MEDD	- Improving the enabling environment
49	Climate Change Support Program (PALCC)	Togo	MEDDPN	- Avoided deforestation - Reforestation - Agroforestry - Livelihood support and resilience

MEEVCC - Ministry of the Environment, Green Economy and Climate Change
AEDD - Environment and Sustainable Development Agency
MINEPDED - Ministry of Environment, Nature Protection and Sustainable Development of Cameroon
MEDDPN - Ministry of The Environment, Sustainable Development and Nature Protection.

Annex 2 Questionnaire

The African Forest Forum (AFF) is a pan-African non-governmental organization with its headquarters in Nairobi, Kenya. The purpose of AFF is to provide a platform and create an enabling environment for independent and objective analysis, advocacy and advice on relevant policy and technical issues pertaining to achieving sustainable management, use and conservation of Africa's forest and tree resources as part of efforts to eradicate poverty, promote gender equality, and economic and social development. The aim of this survey is to contribute to the AFF study on "Strengthening capacity of African forestry stakeholders to integrate and uptake adaptation and mitigation options in response to climate change in francophone African countries. The studies are expected to generate knowledge that could also guide targeting forestry sector inputs into Nationally Determined Contributions (NDCs) in line with Article 6 of Paris Agreement. You have been identified as one of the respondents to provide responses as guided by this tool. The data collected from this study will be primarily be used for only intended purpose and will be treated with utmost confidentiality.

Questionnaire no:		
Section 1 Identification		
S1Q1	Country: ( ) Senegal ( ) Burkina Faso ( ) Togo ( ) Rep Congo ( ) Cameroon ( ) DRC	
S1Q2	Name of respondent: Sex :	
S1Q3	Name of organization:	
S1Q4	Type of organization: ( ) Administration ( ) Forestry Service/Agency ( ) National research institution ( ) international organization ( ) Academia ( ) National NGO	
S1Q5	What type of forest and/or on farm trees-based management system/practice do you undertake in your program and project? ( ) Forest based – A/R, conservation ( ) On farm tree based/agroforestry ( ) Both	
S1Q6	Project duration (yrs.): ( ) 0-5 ( ) 5-10 ( ) 10 above	
Section 2 Determinants of choice of forest based actions and programs		
S2Q1	Which of the following factors motivated your choice of forest practice and/or activity in your program/project? *1= Yes 2=No*	
	Suitable and vast land for A/R activities	
	High degree of land degradation	
	Heavy dependence on wood resources (biomass) for energy	

	Low technology required to grow trees		
	Biophysical – high carbon stock forest ecosystems and deforestation threat		
	Incentive opportunities – voluntary and compliance markets, low opportunity cost		
	Non-carbon benefit opportunities – social and economic benefits, biodiversity conservation		
	Adaptation of forest and forest dependent communities		
	Willingness of communities to engage		
S2Q2	Which are the 3 most important determinants in S2Q1 above?		
S2Q3	Which of the following factors motivated the adoption of agroforestry activities in your project/program? *1= Yes 2=No*		
	Biophysical (vegetation, soil fertility, farm size, topography),		
	Climatic – microclimate conditions		
	Climatic - carbon sequestration		
	Socioeconomic (balance gender roles security of land and tree tenure, accessibility to markets, availability of inputs - labour, planting materials,)		
	Accessibility to information - demand, supply, prices;		
	Characteristics of the agroforestry system (affordable costs ,livelihoods and income benefits);		
	Financial motivation to invest (access to capital/credit, incentives -cash or noncash)		
S2Q4	Which are the 3 most important factors in the list in S2Q2 above?		
Section 3 Levels of success of project interventions			
S3Q1	How do you evaluate the success factors of agroforestry interventions on a scale of 1 – 5? *With 1=very successful,2=successful, 3=neutral, 4=not successful, 5=not very successful*		
	Biophysical - soil and water conservation, soil fertility improvement		
	Biodiversity conservation – maintaining forest corridors, and reduce demand for additional land		
	Climate - buffering of microclimate		
	Carbon sequestration;		
	Socioeconomic - income, food security, wood e.g. fuel wood, non-wood products e.g. medicinal products, increase productivity		
S3Q2	Which are the 3 most important success factors in the list in S3Q1 above?		
S3Q3	How do you evaluate the success factors of forest based interventions on a scale of 1 – 5? *With 1=very successful, 2=successful, 3=neutral, 4=not successful, 5=not very successful*.		
	Avoided carbon emissions		

	Carbon sequestration,	
	Social and economic benefits	
	Biodiversity conservation	
	Adaptation of forest and forest dependent communities	
S3Q4	Which are the 3 most important factors that recorded high levels of successes in the list in S3Q3 above?	
Section 4 Enabling environment for design and implementation of forest and agroforestry interventions		
S4Q1	Among the following policy level factors, what is your level of satisfaction in relation to enhancing the design and implementation of agroforestry M+A interventions? 1=Very satisfied, 2=Satisfied, 3=Neutral, 4=Not satisfied, 5= Not very satisfied	
	Land and tree tenure security	
	Seed/germ plasm supply systems	
	Support from extension systems propagating agroforestry technology	
	Clear sectoral policy articulation for agroforestry	
	Opportunities to valorize/incentivize agroforestry environmental services e.g. PES, REDD+	
	Subsidies to enhance adoption of agroforestry practices	
S4Q2	Which are the 3 most important policy level factors in S4Q1 above?	
S4Q3	With respect to the factors in S4Q1 what is being done in your country to enhance the enabling environment for the adoption of climate sensitive agroforestry technology by stakeholders?	
S4Q4	Among the following policy level factors, what is your level of satisfaction in relation to enhancing the design and implementation of forest based M+A interventions? 1=Very satisfied, 2=Satisfied, 3=Neutral, 4=Not satisfied, 5= Not very satisfied	
	Governance - tenure and resource rights, political will etc.	
	Technical capacity to develop bankable projects and robust MRV system	
	Economic incentives for project proponents	
	Availability of sufficient and sustainable financing	
	Adequate policies and strategies addressing climate change	
S4Q5	With respect to the factors in S2Q4, what is being done in your country to enhance the enabling environment for the adoption of forest based M+A practices by stakeholders?	
Section 5 Integrating mitigation and adaptation in forest and agroforestry practices and activities		
S5Q1	In Climate change response in your country, which response option is a priority?	

	( ) Adaptation ( ) Mitigation ( ) Both mitigation and adaptation	
S5Q2	In Climate change response in your country, which response option is a priority for the forest sector? ( ) Adaptation ( ) Mitigation ( ) Both mitigation and adaptation	
S5Q3	Evaluate the following statement: The role of forests in climate change mitigation and adaptation is sufficiently exploited in your country ( ) Strongly agree ( ) Agree ( ) Neutral ( ) Disagree ( ) Strongly Disagree	
S5Q4	How do you assess the technical capacity of stakeholders to develop and implement forestry/agroforestry M+A programs and projects; ( ) Very sufficient ( ) sufficient ( ) Neutral ( ) Not sufficient ( ) Not very sufficient	
S5Q5	Assess the level of importance of the following strategies toward enhancing the uptake and integration of M+A in forests and/or agroforestry actions, practices and activities in your : 1=Very important 2= Important 3= Neutral 4=Not important 5= Not very important	
	The modification of department's/organizations core work by integrating aspects related to M+A into on-the-ground forestry operations, projects or programs.	
	Promote collaboration between individual sections or departments and other stakeholders, e.g., other departments, committees, organizations, governmental bodies and civil society, to generate shared knowledge, develop competence, and take joint actions to advance M+A	
	The modification of managerial and working structures, including internal formal and informal norms and job descriptions as well as the configuration of sections or departments to better address and institutionalize aspects related to the integration of M+A	
	The modification of planning procedures and related activities, including formal and informal plans, policies, regulations, and legislations that lead to the integration of M+A	
	Support or redirect the focus onto aspects related to integrating M+A by e.g. providing tailored funding, promoting new projects, supporting the education of staff, or directing responsibilities	
S5Q6	At what institutional level should the integration of M+A be emphasized in the forestry sector: ( ) Policy level ( ) Program/project level ( ) Both levels	
S5Q7	Which areas/aspects need technical capacity building for stakeholders to efficiently and effectively develop and implement forestry/agroforestry M+A programs and projects?	



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