Nordic Council
of Ministers

Scaling-Up Climate Action in Agriculture

IDENTIFYING SUCCESSES AND
OVERCOMING CHALLENGES

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*Bager, S. L., Dinesh, D., Olesen, A.S., Andersen, S.P.,
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Abbreviations and acronyms

AAA	Adaptation of African Agriculture
ADB	Asian Development Bank
AfDB	African Development Bank
ASEAN	Association of Southeast Asian Nations
ASEAN-CRN	ASEAN – Climate Resilience Network
AU	African Union
BAU	Business as usual
CCAFS	CGIAR Research Program on Climate Change, Agriculture and Food Security
CDKN	Climate and Development Knowledge Network
CGIAR	Consortium Group of International Agricultural Research
CbA	Community-based Adaptation
CChAM	SEARCA Climate Change Adaptation and Mitigation for Southeast Asia (Umbrella Program)
COP	Conference of Parties (to the UNFCCC)
CSA	Climate Smart Agriculture
CSL	Climate Smart Landscapes
CST	Climate Smart Territories
DES	Dietary Energy Supply
EbA	Ecosystem-based Adaptation
ECOWAS	Economic Community of West African States
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GCF	Green Climate Fund
GEF	Global Environment Facility
GGWSSI	Great Green Wall for the Sahara and the Sahel Initiative
GHG	Greenhouse gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German Association for International Co-operation)
GRA	Global Research Alliance on Agricultural GHG
IFAD	International Fund for Agricultural Development
INDC	Intended Nationally Determined Contributions
IPCC	Intergovernmental Panel on Climate Change
LA	Latin America
LDC	Least Developed Countries
LDCF	Least Developed Countries Fund
M&E	Monitoring and evaluation
MRV	Measurement, reporting and verification

NAMA	National Appropriate Mitigation Action
NAP	National Adaptation Plans
NAPA	National Adaptation Programme of Action
NDC	Nationally Determined Contributions
NOAK	Nordic Working Group for Global Climate Negotiation
NWP	Nairobi Work Programme
ODA	Official Development Assistance
PA	Paris Agreement
REDD+	Reducing Emissions from Deforestation and Forest Degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks
SBSTA	Subsidiary Body for Scientific and Technological Advice
SCCF	Special Climate Change Fund
SDGs	Sustainable Development Goals
SEARCA	Southeast Asian Regional Center for Graduate Study and Research in Agriculture
SIDS	Small Island Developing States
SMART	Simple, Measurable, Accurate, Reliable and Time-bound
SA	South Asia
SEA	Southeast Asia
SSA	Sub-Saharan Africa
SWOT	Strengths, weaknesses, opportunities and threats
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WACSAA	West African CSA Alliance
WFP	World Food Programme

Foreword

The impacts of climate change are very apparent in agriculture, with increasing droughts, floods and extreme weather events causing crop losses and putting pressure on rural communities all over the world. At the same time, agriculture and land use activities contribute a significant share of global greenhouse gas emissions.

Simultaneously agriculture faces demands on rising productivity with significant population growth, changing dietary patterns and rising demands on land use. Therefore, initiatives addressing the challenge of agriculture and climate change are needed to further build resilience, adaptive capacity and mitigate emissions within the agriculture sector.

This project sought to identify agriculture initiatives, primarily focused on developing countries, and to analyse strengths, weaknesses, opportunities, and threats across these initiatives. Further, it suggests ways for further development and implementation and searched for ways to replicate the successful examples in other countries and areas. Finally, these initiatives were placed in the context of the agriculture related components of the Intended Nationally Determined Contributions (INDCs) submitted by Parties under the United Nations Framework Convention on Climate Change as part of the Paris Agreement.

It is our hope that global, regional and national policy makers, financial institutions and climate change negotiators, among others, will learn from these findings when designing and implementing agriculture initiatives and activities in relation to climate change.

COWI A/S in collaboration with COWI AB and the CGIAR Research Program on Climate Change, Agriculture, and Food Security, has carried out this study for NOAK, a working group under the Nordic Council of Ministers. The aim of NOAK is to contribute to an ambitious and effective implementation of the UNFCCC and its Paris Agreement, with a Nordic perspective. To this end, the group prepares studies and reports, conducts meetings and organizes conferences supporting Nordic and international negotiators in the UN climate negotiations.

April 2017, Oslo

Peer Stiansen

Chair of the Nordic Working Group for
Global Climate Negotiations

Executive Summary

The global agricultural sector must increase food production to meet demand from a growing population with increasing economic capacity, while at the same time adapting to a changing climate and reducing the greenhouse gas emissions generated by the sector. Climate change is expected to seriously affect agriculture and the national and local economy in many developing regions, affecting the livelihoods and food security level of millions of people. With these challenges in mind, several agriculture initiatives linked to climate change have been launched by different stakeholders in the past decade.

In this regard, the objectives of this study were to:

- Take stock of regional and global initiatives related to agriculture and climate change, which have been launched since 2005, maintaining a focus on developing countries, particularly Sub-Saharan Africa.
- Assess the objectives and impacts of these initiatives and identify the most successful ones.
- Evaluate the extent to which agriculture climate change initiatives could be further developed or replicated.
- Place the initiatives in the context of the agriculture related components of the Intended Nationally Determined Contributions (INDCs) of Sub-Saharan African countries submitted by Parties under the United Nations Framework Convention on Climate Change (UNFCCC).
- Identify barriers and opportunities for implementation of agriculture climate change initiatives and ways to address these.

The study begins with a review of recently launched agriculture climate change initiatives to identify the most relevant agricultural initiatives and provide examples of such. This is followed by an analysis of the initiatives using a SWOT (strengths, weaknesses, opportunities, and threats) framework, which identified such elements within the initiatives. Building on this, it is determined which of the initiatives that were most successful or interesting. In combination, these two assessments helped identify how new and existing initiatives could be improved, replicated or scaled up.

Following this, success factors, best practices, and areas for improvement were identified across initiatives. Building on the knowledge of regional experts and literature on the subject, opportunities and barriers for further improvement of the initiatives were identified and presented.

Finally, in the context of INDCs submitted by Parties under the UNFCCC in the lead-up to the Paris Agreement (PA) in 2015 and the subsequent re-submission of NDCs

upon ratification of the PA, the needs for adaptation and mitigation actions within agriculture in developing countries were identified. This include needs for capacity building, technological transfer, and financial assistance. Building on this, initiatives were linked to INDCs to help understand how the former could help meet the targets expressed by countries in the INDCs.

Ultimately, the analysis found that no agriculture climate change initiative alone included only best practices and opportunities. Some initiatives included several of the identified success elements with opportunities to be scaled up, while other initiatives had several areas for improvements. Further, a number of initiatives covered elements, which was explicitly expressed as needs in (I)NDCs submitted by countries. This related to capacity building in particular, but also concerned implementation of specific agricultural practices to help increase mitigation and adaptation actions within agriculture.

Based on the analysis of agriculture climate change initiatives and the assessment of needs within the (I)NDCs, the following recommendations on how to implement best practice agriculture initiatives, successfully overcome barriers and challenges, learn from existing initiatives and help achieve the targets set out in (I)NDCs in developing countries are made:

- Focus on key competencies rather than spreading and diluting efforts.
- Achieve synergies between adaptation and mitigation and ensure that projects are undertaken with such focus where possible.
- Build and ensure capacity building and ownership.
- Ensure an inclusive and participatory approach with mobilisation of multiple stakeholders, including local stakeholders.
- Include farmers and farmers' organizations in the development of agriculture climate change initiatives.
- Make sure that technical solutions are supported by solid project management and stakeholder engagement.
- Develop a sound business plan including funding.
- Ensure progress for monitoring and evaluation (M&E).
- Alignment of agriculture initiatives to needs identified in INDCs.
- Empower African institutions and build African capacity.
- Develop South-South cooperation.
- Support agriculture climate change initiatives in local and domestic policies and review current efforts to ensure alignment with needs.
- Ensure mainstreaming of climate change policies into (existing) national, regional and sectoral policies.
- Ensure that all agriculture investments take climate change into account.

Introduction

Overall scope and objective

This project took stock of key global, regional and national initiatives related to agriculture and climate change launched between 2005 and 2016. We identified strengths, weaknesses, opportunities, and threats across these initiatives, as well as highlighting success factors, best practices, areas for improvement, and opportunities and barriers for further development of these.

The analysis is undertaken in the context of the agriculture-related components of the Intended Nationally Determined Contributions (INDCs) submitted by Parties under the Climate Convention as part of the lead-up to the Paris Agreement (PA) in 2015 and re-submitted as Nationally Determined Contributions (NDCs) upon ratification of the PA.

The focus of the report is on developing country regions, notably Sub-Saharan Africa (SSA). Throughout the report, three other regions, South Asia (SA), Southeast Asia (SEA) and Latin America (LA), are also analysed. These regions are selected, as they, like SSA, are home to a number of low-income, developing countries, which share some of the challenges faced by SSA within agriculture and climate change.

Methodology

The development of this project and the methods used are described in detail at the beginning of each section. Throughout the project, we have relied on several sources, including literature analysis, interviews with stakeholders and experts, and a questionnaire survey, as well as a roundtable meeting with experts and policy makers to gather feedback. Information on agriculture initiatives have been gleaned from various websites and publications, including repositories on climate change activities.

Agriculture and the UNFCCC process

Agriculture was a key topic at the 22nd Conference of the Parties to the climate convention (United Nations Framework Convention for Climate Change (UNFCCC)) (COP22), which was held in Marrakesh, Morocco, in November 2016. A five-year process of discussion of “issues related to agriculture” reached a milestone at COP22, in the meetings of the Subsidiary Body on Scientific and Technical Advice (SBSTA). Although a decision was not reached as a result of this process, the INDCs prioritise agriculture as a sector for climate action, both adaptation and mitigation, paving the

way for further action within the sector under the UNFCCC processes, including through the mechanisms for finance, capacity building and technology transfer.

Agriculture and the NDCs

As the national climate plans (Nationally Determined Contributions) will guide country-level climate action in the coming years, the action taken on agriculture within these will help determine whether national and international targets to combat climate change can be met. Therefore, it is vital that successful initiatives on how this can be achieved are identified and scaled up to.

Ministerial Roundtable held at COP22

In addition to a mapping and assessment of agriculture and climate change initiatives, the report also incorporates the outcomes of a Ministerial Roundtable held at COP22, which discussed the initial findings of the project.

The content of this report

The report is structured as follows: Chapter 1 presents the background. The SWOT assessment and identification of initiatives is presented in chapter 2. In chapter 3, the learnings from COP22 are presented, while chapter 4 presents best practices and areas for improvements. Opportunities and barriers are presented in chapter 5, while integration of initiatives, INDCs and climate policy is analysed in chapter 6. Chapter 7 offers conclusions and recommendations.

1. Background

This chapter discusses the link between climate change and agriculture; a two-way street, where agriculture is not only affected by climate change, but has significant effect on it in return. Following this brief introduction, the United Nations Framework Convention on Climate Change (UNFCCC) process on climate change, and the role of agriculture within this, is discussed. Finally, the focus region of this report, Sub-Saharan Africa (SSA), is presented.

1.1 Methodology

This chapter was developed relying on existing literature, mostly reports and academic articles, and complemented with the insights from experts. This included searching for academic, peer-reviewed literature, as well as recent reports by international organizations, such as the United Nations Food and Agriculture Organization (FAO) and research organizations, such as the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Experts affiliated with the latter were also consulted, and their insights are also used in latter parts of the report.

1.2 Agriculture and climate change

Against the backdrop of population increase expected to lead to a global population of 9.7 billion by 2050 and changing dietary patterns, agricultural production is expected to have to increase by 50–70% towards 2050 to meet the rising demand for food (see e.g. FAO, 2017c; Alexandratos and Bruinsma, 2012; Campbell *et al.*, 2011; Godfray *et al.*, 2010). In addition, increased affluence and rising demands on land for the generation of fuel means that agricultural productivity is required to increase significantly. This increase must take place in a context of constrained or scarce resources in many places, and rising global temperatures and changing weather patterns, due to climate change. These challenges highlight the importance of sustainably increasing agricultural productivity to meet the increased demand, and to ensure a sustainable use of natural resources (FAO, 2017c).

Agriculture is affected by climate change in several ways. Firstly, food production is directly affected through changes to the conditions of production (e.g. climate, water availability, pests). For instance, changes in temperature and precipitation associated with climate change will affect the suitability of land for production of goods and the resulting yields (see e.g. Schmidhuber and Tubiello, 2007; Ray *et al.*, 2013). Secondly, climate change can affect growth and income generating activities, which can decrease

resilience and adaptive capacity (Schmidhuber and Tubiello, 2007; Campbell *et al.*, 2011). Recent reports from the Intergovernmental Panel on Climate Change (IPCC) (Porter *et al.*, 2014), indicates that climate change pose a challenge in achieving 50–70% increase in food production, since impacts of climate change include changes in temperature, water availability, increased intensity and frequency of extreme weather events, and expansion of pests and diseases, which will have profound impacts on the food system.

Large agricultural areas are expected to suffer the negative consequences of climate change, especially in SSA and Asia, where 56% and 21% of crops, respectively, are expected be negatively affected (Campbell *et al.*, 2011). This will have great consequences on the national and local economy, especially in SSA, South Asia (SA), and Southeast Asia (SEA), where agriculture constitute the backbone of the economy, thus not only affecting the livelihoods and food security level of millions of people, but also economic security and development. These challenges necessitate urgent adaptation actions in the agricultural sector to meet future demand and changed conditions. Meanwhile, agriculture is not only impacted by climate change, but is also an important driver of climate change.

1.2.1 Agricultural GHG emissions

Agricultural activities are contributing significantly to climate change, with agricultural production and the agricultural supply chain being responsible for up to a third of total anthropogenic greenhouse gas (GHG) emissions. When land use change, deforestation, transport, cooling, retail and other aspects of the agricultural supply chain is considered, this figure rises to 74% in the case of Least Developed Countries (LDCs)

(Funder *et al.*, 2009; Vermeulen *et al.*, 2012; Campbell *et al.*, 2011; Smith *et al.*, 2014). The agricultural sector is responsible for approximately 47% of the world's methane (CH₄) and 58% of its nitrous oxide (N₂O) emissions (Vermeulen *et al.*, 2012; Campbell *et al.*, 2011).

If agricultural emissions are not reduced, agriculture will account for 70% of the total GHG emissions that can be released if temperature increases are to be limited to 2°C (WRI, 2014). This necessitates a transition within the agricultural sector, which not only meets increased productivity, and meets poverty alleviation and adaptation goals, but also delivers mitigation benefits. On a global scale, the agricultural sector carries a significant potential to mitigate climate change, e.g. by reducing emissions and increasing productivity throughout the supply chain and by increasing sequestration through changing land use practices (Campbell *et al.*, 2011; Vermeulen *et al.*, 2012; Gerber *et al.*, 2013).

Many low-income countries see adaptation as more important than mitigation, while the opposite might be true in high-income countries. Positive synergies can be achieved between agricultural adaptation and the needs of low-income countries, including food security, mitigation and poverty reduction, if these are considered in unison (Tennigkeit *et al.*, 2013; Leonard *et al.*, 2016).

1.2.2 Climate change and food security

Improving agricultural practices to become more sustainable is much needed in the 21st century. Agriculture is a major source of GHGs, and with further increases to GHG emissions being expected due to increasing demands for food and feed (Alexandratos and Bruinsma, 2012; Tilmann *et al.*, 2011), changing agricultural practices to take into account climate change and food demand will be needed. Further, food security problems exist in several regions, with 793 million people being undernourished (c.f. FAO, IFAD, and WFP, 2015), which requires increased production, particularly in countries and regions, where actual productivity falls far short of potential productivity, i.e. a significant yield gap exist (Campbell *et al.*, 2011; Ray *et al.*, 2013). Adding to these problems, some agricultural practices lead to negative environmental impacts and loss of natural areas (c.f. Campbell *et al.*, 2011; Smith *et al.*, 2014), especially of natural forests (FAO, 2015). To add to these challenges, increased resilience and adaptation will also be needed in many areas, as climate change leads to changing conditions for food production (Schmidhuber and Tubiello, 2007).

1.3 Agriculture and the UNFCCC process

Historically, agriculture has had a difficult time as a subject at UNFCCC negotiations. Agriculture has been treated under different headings and in shifting tracks and working groups. One of the main points of controversy has been the debate over whether agriculture should be about mitigation or adaptation (Kalfagianni and Duyck 2015; Richards *et al.*, 2015). However, a breakthrough occurred in Durban at COP17,

when agriculture was referred to the Subsidiary Body for Scientific and Technological Advice (SBSTA) for an eventual decision on agriculture (Richards *et al.*, 2015). Agriculture was the main topic for discussion in 2016 and one of the main themes for the COP22 in Marrakesh, as this COP coincided with an agreement among Parties to reflect on how to frame future work on the SBSTA agriculture agenda item.

1.3.1 The Paris Agreement

The UNFCCC states in article 4.1 that all parties should promote a range of activities that control, reduce or prevent GHG emissions in all relevant sectors, including agriculture (UNFCCC, 1992). The “purpose and long-term goals” mentioned in the Paris Agreement (PA) are to address climate change, specifically by limiting the increase in the global average temperature to well below 2°C above pre-industrial levels and to strive for 1.5°C above pre-industrial levels, increase climate resilience and switch over to low-carbon development. The Convention makes no further reference to specific initiatives or actions to be taken, in accordance with its framework nature (UN, 1992). The action, and hence initiatives to ensure the fulfilment of the objectives of the Convention has always been the discrete responsibility of the Parties to the Convention, individually or in cooperation. This distinction between domestic or cooperative action is further illustrated by the Kyoto Protocol, where the Protocol promotes cooperative action in the form of technology transfer and flexible mechanisms. However, the Protocol is mostly sector-neutral in that it leaves the Party or Parties with the choice of where to act and how.

PA also leaves the choice of action to parties, now even more so with the paradigm shift to a collaborative bottom-up process of setting targets and implementing Measuring, Reporting and Verification (MRV). The PA does not mention agriculture explicitly (see Box 1) or indeed agriculture related initiatives at all, nor sets out if and how agriculture should be treated in to process going forward. However, in the preamble of the PA, Parties recognize the fundamental priority of safeguarding food security and ending hunger, both of which are inevitably linked to agriculture. They further highlight the vulnerabilities of food production systems to climate change impacts. The PA also acknowledge the particular vulnerabilities of agriculture and food production systems to the adverse impacts of climate change. Furthermore, in article 6 of the PA, GHG sinks, reservoirs and forests are mentioned and a number of mechanisms are named including REDD+¹ and the Joint Mitigation and Adaptation Approaches. As represented by the “plus” in REDD, this mechanism has increasingly been scoped to cover agricultural drivers of deforestation, and thus agriculture and sustainable development as such.

¹ REDD+ is an acronym referring to reducing emissions from deforestation and forest degradation, and the role of conservation, sustainable management of forests, and enhancement of forest carbon stocks.

Box 1. Accounting for agriculture and land use within the UNFCCC

Agriculture in the UNFCCC merely covers non-CO₂ emissions from activities relating to animals, manure management, fertilisation and liming among other. The land management part of agricultural activity, such as tilling, soil management, and land cover is covered under the category land use, land use change and forestry, in short LULUCF. This means there is and have never been one all-inclusive negotiation track or sector-specific target, measure or rulebook on accounting. Agriculture and its activities remain split into two domains. Despite this, in this paper agriculture refers to all agricultural activities, e.g. all livestock and all land management, and hence encompass two UNFCCC reporting categories.

1.3.2 *The bottom-up approach of the Paris Agreement*

As opposed to previous climate agreements, such as the Kyoto Protocol, the architecture of the PA is a “hybrid,” containing elements which facilitate both bottom-up and top-down approaches. A noteworthy top-down mechanism is the Global Stocktake (GST) mentioned in Article 14 of the PA, “which serves as a crucial review exercise to periodically assess collective progress toward the Agreement’s long-term goals, enhance implementation of the Agreement and scale ambition” (Bushan and Rattani, 2017). However, the PA is largely bottom-up in its ambition to allow Parties to choose their own country-specific climate action plans and targets, as set out in the INDCs in the lead-up to COP21 and confirmed in the Nationally Determined Contributions (NDCs) submitted after the ratification of the PA. These also contain the means by which Parties seek to achieve the targets presented in the NDCs, including relevant policies, frameworks, initiatives, and other political levers applied to achieve the goals within the stated timeframe.

1.3.3 *Agriculture and the Paris Agreement*

The (I)NDCs, which are the building blocks of the agreement, overwhelmingly prioritise actions in the sector. Any action taken that would lead to reduced emissions (e.g. reducing fertilizer use) or increased carbon reservoirs (e.g. planting of trees), would have to be identified and incorporated in the system for transparency of action, i.e. the reporting and accounting setup defined in the PA (cf. art. 13). In that sense, the PA facilitates transparency on mitigation ambitions of domestic agricultural initiatives. The PA is clearer than its predecessor in promoting cooperative action: The flexible mechanisms based on the voluntary cooperation (cf. art. 6), as well as the means of finance (cf. art. 9) and the technology transfer (cf. art. 10) could all be used to promote agricultural initiatives if scoped for that purpose or targeted at the agriculture sector. In all these mechanisms, the basic concept is two or more parties cooperating on transfer of mitigation outcomes, finance or technology. Further, capacity building (cf. art. 11) and training (cf. art. 12) could be used to promote agricultural initiatives.

The adaptation elements of the PA do not differentiate between domestic and cooperative action as do the other mentioned elements. Article 7 on adaptation

mentions all dimensions from local to international, and iterates the importance of “people, livelihoods and ecosystems,” which in most developing country contexts involve agriculture. The text on adaptation is rather conceptual and sets out principles for adaptation action, but it gives no mechanism for action. Adaptation in the frame provide by the PA appears as an opportunity for agricultural action, but the agreed wording of the PA does not facilitate or support concrete action.

Using one or more of the abovementioned opportunities to promote action in the agricultural sector is in principle merely a question of two or more parties agreeing to do so. If no decision is taken to use any of the opportunities, all climate action taken by all parties in order to deliver on the NDC can be targeted at other sectors, such as energy or transport. On the other hand, since it is solely a question of scope, the PA arguably provides opportunities for cooperative initiatives in the agricultural sector, but does not promote it specifically.

As for the domestic action by parties, outcomes of cooperative action between parties will be recorded and reported in the new transparency framework for either action or support. The transparency system set out by the PA and its decision does not as such point to agriculture, but does mention that the National Inventory Reports shall provide information on emissions by sources and removals by sinks, which essentially consists of soils and trees. This is a continuation of current practice. The new part is that progress on implementing and achieving the NDCs needs to be documented and be subject to plenary assessment under the Global Stocktake. The process and content for providing such information is to be negotiated in the years to come, and in this work any specific mention or omission of outcomes of agricultural initiatives could be indicative of the level of action to be expected after 2020. In other words, the process promotes transparency of action in agriculture, which is an opportunity for ensuring promotion of agricultural initiatives.

1.3.4 INDCs and the Paris Agreement

The INDCs served as the basis for negotiations at COP21 in Paris in 2016, and thus helped produce the PA on climate change (FAO, 2016). As the INDCs will guide country-level climate action in the coming years, the action taken on agriculture within these will help determine whether national and international targets to combat climate change can be met. Despite lacking progress at the COP and in the UNFCCC arena in general, agriculture features prominently in the INDCs, which have been submitted by Parties to the UNFCCC (see e.g. Richards *et al.*, 2015; 2016, for further analysis of the role of agriculture in INDCs).

1.3.5 Current status on INDCs and NDCs

In the years following the PA, Parties will transpose their INDCs into the first version of their NDCs. The submission of NDCs is the main national policy framework, which Parties will use to report on their climate commitments under the PA, including progress made towards meeting the targets specified in the NDCs. A Party may revise

its INDC before submitting an NDC. Such a revision could be necessary to increase a target, or to provide additional information on sectoral targets and policies and initiatives necessary to achieve these. However, “unless a Party specifies otherwise, its INDC will become its first NDC upon submitting its instrument of ratification for the Paris Agreement” (FAO, 2016b).²

1.3.6 The Paris Agreement and the NDC process in the coming years

The PA entered into force on 4 November 2016.³ As of 7 April 2017, 19 Parties to the UNFCCC have signed the PA, while 142 Parties have ratified their national contributions in accordance with the PA (UNFCCC, 2017a) (see Figure 1). Globally, 127 first NDCs have been submitted by March 2007 (Table 1). Of the 49 SSA countries, all have submitted an INDC, as well as signed the PA. 17 Parties have signed the PA, but not ratified the PA, while 32 Parties have signed as well as ratified the PA. 29 SSA Parties had submitted a first NDC by March 2017 (see Table 1) (IGES, 2017).

Figure 1: Status of Ratification of the PA

Status of Ratification of the Paris Agreement

Source: UNFCCC (as of 7 April 2017).

² As stipulated in Decision 1/CP.21, paragraph 22, “if a Party has communicated an intended nationally determined contribution prior to joining the Agreement, that Party shall be considered to have satisfied the NDC submission requirement upon submitting its instrument of ratification unless it specifies otherwise”.

³ The ratification threshold of the PA was set at ratification by 55 countries representing at least 55% of global GHG emissions; this was crossed on 5 October 2016. Article 21 of the PA stipulates that the Agreement will enter into force 30 days after crossing this threshold.

Table 1: INDCs, ratification of the PA and NDCs

	Signed PA	Submitted INDC	Ratified PA	Submitted NDC
Global	191	190	142	127
Sub-Saharan Africa	49	49	32	29

Source: IGES INDC and NDC database, March 2017, and UNFCCC 2017a.

In accordance with the PA, Parties must communicate their first NDCs upon ratification of the Agreement, and update their NDCs every five years thereafter, with increasing ambition in terms of GHG emission reductions. The Parties will meet every five years with the first meeting in 2018, to take stock of the collective efforts and to assess progress on the NDCs and towards achieving the goal of the PA (Obergassel *et al.*, 2017).

The majority of the submitted INDCs/NDCs propose either relative emissions reductions (79 countries) or absolute emissions reduction (72 countries) mitigation reductions, compared to business as usual (BAU) (79 countries) or the baseline year 1990 (43 countries). In SSA, the structure of mitigation targets varies a lot, however, the most common type is either relative emissions reduction targets (28 countries) or use of a conditional mitigation scenario (16 countries) with the majority using the business as usual baseline (31 countries) and the target year of 2030 (IGES, 2016). In addition, all of the SSA countries mention adaptation measures in their INDC/NDC, and 41 of these have quantified their financial needs, especially finance for mitigation actions. A total of 28 SSA countries mention the need of specific technology transfer in order to enhance and ensure mitigation and adaptation actions (IGES, 2017).

1.4 Focus region: Sub-Saharan Africa

The study focuses on developing countries, though it maintains a specific focus on Sub-Saharan African (SSA). This is done for three reasons: i) The most recent Conference of the Parties (COP) to the UNFCCC was held in an African country; ii) agriculture, particularly as concerns the relation between developing and developed countries, was front and centre at the COP; and iii) SSA is expected to be disproportionately affected by climate change, and faces tremendous challenges of poverty, food insecurity and political instability. As such, this region is especially in need of initiatives to address the impacts of climate change.

1.4.1 *Agriculture and Food Security in Sub-Saharan Africa*

In SSA, according to FAO (2017), about one in four people experience hunger, a total of 153 million individuals, or about 26% of the population above 15 years. Further, SSA suffers from what FAO (2017) terms the “triple burden of malnutrition, undernutrition, and overweight and obesity,” further exacerbated by “rising levels of non-communicable diseases and micronutrient (vitamins and minerals) deficiencies.” This happens at a time when SSA achieved adequate food availability (in the 2014–2016 period), having a Dietary Energy Supply (DES) index of 110 percent. However, many countries or regions within these are highly dependent on food imports to achieve food security, with some regions importing up to a third of their total cereal consumption (FAO, 2017a). In its “Regional Overview of Food Security and Nutrition in Africa 2016,” FAO (2017a) notes that at least some of the challenges to food security are caused by climate change and natural disasters, including severe droughts and floods, which are leading to crop failure, insufficient feed on pastures, and lack of water for livestock. This underscores the need for initiatives that focus on agriculture and climate change in combination.

1.4.2 *Climate change impacts in Sub-Saharan Africa*

Climate change is expected to hit the African agricultural sector especially hard (WB, 2013), with Africa being the region most vulnerable to current and future climate change. Without increasing adaptation and resilience, this is expected to reduce food production and cause losses to economic growth, livelihoods and well-being and make fulfilment of the SDGs especially difficult. The exposure and vulnerability of the African agricultural communities to climate change and natural disasters is exacerbated by

marginalisation, poverty, “and lack of access to social services, information and technologies which makes their adaptation to climate change challenging” (Chirambo, 2016). Further, the Adaptation of African Agriculture (AAA) Initiative, which focus on adaptation of African agriculture, has identified the following challenges and opportunities faced by African agriculture in relation to climate change:⁴

- 6 of the 10 countries most threatened by climate change are located in Africa.
- Africa is only responsible for 4% of GHG emissions.
- 65% of the world’s arable land is in Africa.
- By 2050, agricultural yields in Africa could decrease by 20% if agriculture does not adapt to climate change.
- Africa only attracts 5% of the climate funds (4% of these funds are allocated to agriculture and of this, only 20% to adaptation projects).

These conditions should be kept in mind when analysing how agriculture climate change initiatives can contribute to meeting some of the needs and challenges experienced by countries across SSA.

⁴ Information extracted from: <http://www.aaainitiative.org/initiative>

2. Identification and assessment of initiatives

In the following section a number of agriculture and climate change initiatives are presented and analysed. The first section presents the initiatives, including areas they cover and how they work. In the second section, a SWOT-analysis of the initiatives are undertaken, allowing us to identify strengths (S), weaknesses (W), opportunities (O), and threats (T) across initiatives. Finally, in the third section of this chapter, examples of best practices from various initiatives are provided.

2.1 Methodology for selecting initiatives

Initiatives were identified using websites, literature, and expert recommendations. Information on the initiatives were extracted and placed in the two appendices. Appendix A presents all initiatives that were part of the initial screening, including the name, responsible authority and the period the initiative is/was active. In Appendix B, those initiatives included for consideration in this report are found. Here, the following information on each initiative is found:

- Name.
- Location (country or region).
- Objectives.
- Type and focus area.
- Agricultural approaches used.

To compile information on the initiatives, affiliated experts were asked to submit information on initiatives in their respective country or region of expertise. For initiatives where web and literature searches yielded insufficient results, organizations and experts responsible for the initiative were asked for supplementary information.

2.2 Agriculture climate change initiatives

With the challenges faced by agriculture in the coming decades in mind, a number of agriculture initiatives considering climate change adaptation and/or mitigation have been launched by funds, universities, research groups, private companies, governments, and international agencies in the past decade. Some of these are

analysed in the following section. As mentioned in the introduction to this report, the focus is on developing country regions, notably Sub-Saharan Africa (SSA). Throughout the report, three other regions, South Asia (SA), South East Asia (SEA) and Latin America (LA), are also analysed. These regions are selected, as they, like SSA, are home to a number of low-income, developing countries, which share some of the challenges faced by SSA within agriculture and climate change. Therefore, regional initiatives from these four regions are analysed in detail, whereas agriculture climate change initiatives from developed regions are not included for thorough analysis. Further, national initiatives from SSA are included for analysis, whereas other national initiatives are excluded. An exception is made for countries, whose size lead to national initiatives being larger than many regional initiatives. Specifically, this exception is made for India and Brazil. The purpose of including regional initiatives from these regions is to identify how promising initiatives and best practices can be shared and learned from across countries facing similar economic, environmental and social challenges.

2.2.1 Overview of initiatives

In this report, a total of 69 global, regional and national agricultural and climate change initiatives launched between 2005 and 2016 have been screened (see Appendix A). Of these, 15 global, 32 regional and 11 national initiatives have been included in the analysis. A list of these initiatives can be found in Appendix B. The initiatives chosen for analysis share a common focus on agriculture and climate change, and the interaction between these areas. Thus, initiatives have been excluded from analysis if their scope and objectives are not focused on agriculture and climate change. For example, initiatives related exclusively to food security or poverty reduction are excluded. Further, some initiatives have been excluded due to limited information availability. Due to the focus on developing countries, especially SSA, initiatives from these regions have been prioritized.

The initiatives undertake different types of activities, most commonly information-related activities such as providing collaborative platforms that collect and share information on projects or other initiatives, conducting research and development on agriculture in relation to climate change, or establishing knowledge repositories that collect and distributes research on agriculture and climate change. Some also provide concrete recommendations and advice to farmers, e.g. on practices and tools, establishes pilot projects on the ground, or distributes materials, seeds, or other goods to farmers. Less prevalent are those initiatives that finance research, provide insurance, or finance projects on the ground with farmers (Bager *et al.*, 2016) (Appendix B).

The initiatives cover a vast range of topics, including breeding of drought tolerant crop varieties, crop insurance, implementing novel or successful agricultural practices, providing information and knowledge, and financing sustainable management practices. The majority of the initiatives include both adaptation and mitigation elements (26 initiatives) although many of them focus more on one of them, for example adaptation, but identifies potential mitigation co-benefits. Significantly fewer focus only on adaptation (4 initiatives) or mitigation (1 initiative) (see Appendix B).

2.2.2 Agricultural practices and approaches

Several initiatives also refer to novel or successful agricultural approaches and practices such as Climate Smart Agriculture (CSA), agroforestry, ecosystem-based adaptation (EbA) and agroecology. Several of these approaches have been found to contain various benefits in relation to climate change and agriculture, e.g. increased mitigation of emissions or larger adaptive capacity. These benefits are identified in peer-reviewed literature, and based on local experiences, on-the-ground tests, and various evaluations of such agricultural approaches and practices⁵.

For example, CSA and Climate Smart Landscapes (CSL) (Box2) have shown to provide multiple adaptation and mitigation co-benefits, such as e.g. building carbon content in soil, while conserving ecosystems and natural resources (Scherr *et al.* 2012; FAO, 2017b; FAO, 2016; Minang *et al.* 2015; Cooper *et al.* 2013). Success stories of CSA include water harvesting in the Sahel and Drought-Tolerant Maize for African farmers, the purpose of which is to make crops more climate change resilience and mitigate the GHG emissions related to agricultural production (Neate, 2013; FAO, 2017b). Further, agroforestry systems, including tree-based adaptation, are an important means of sustainably producing food, while conserving ecosystems (FAO, 2017b).

Including such agricultural approaches or practices could improve the performance of the agriculture climate change initiative by increasing impact or success. As an example, both the Great Green Wall for the Sahara, the Sahel Initiative, and the Climate Smart Territories (CST) take a CSA approach, while the Lake Chad Sustainable Development Support Program (PRODEBALT) focus on agroforestry and EbA. The Association of Southeast Asian Nations Climate Resilience Network (ASEAN-CRN) promotes the CSA approach in order to ensure that member states of the ASEAN are in better position to adapt their agricultural sector to the impacts of climate change, while at the same time increasing mitigation of GHG emissions (Appendix B). Other examples of inclusion of some of these agricultural approaches and practices are integrated in the sections below in order to illustrate how these are related to success elements of agriculture climate change initiatives.

Box 2. Climate Smart Agriculture

Climate-Smart Agriculture (CSA) is developed to address the interlinked issues facing food security and climate change in order to achieve sustainable agricultural development and consists of three main objectives (CCAFS and FAO, 2014):

- Sustainably increasing agricultural productivity and incomes (Food Security).
- Adapting and building resilience of agriculture and food security to climate change (Adaptation).
- Reducing and removing GHG emissions from agriculture (including crops, livestock and fisheries) (Mitigation).

⁵ For a list of initiatives and the objective of these, including the focus area and the various agricultural approaches employed by these, see Appendix B.

The CSA approach aims at developing the technical, policy, and investment conditions for mainstreaming climate change challenges into agricultural sectors. Production technologies and practices under CSA needs to be determined in relation to the country and capacity context, and based on site-specific considerations, as well as the specific social, environmental, and economic situation. Thus, CSA does not suggest practices, which can be universally applied (FAO, 2013). Actions under CSA are both on-farm and beyond and include:

- Management of farms, crops, livestock etc. to better manage resources, produce more with less, while increasing resilience.
- Ecosystem and landscape management to conserve ecosystem services, which are important for increasing resource efficiency and resilience.
- Services that enable farmers and land managers to implement necessary agricultural changes.

The CSA concept is widely incorporated into initiatives, e.g. the Climate-Smart Agriculture Booster (Girvetz and Armitage, 2015), and supported by governments, regional and international agencies, civil society and private sector. For example, the Costa Rican Minister of Agriculture, H.E. Arauz-Cavallini, noted at COP22 that *"world leaders should work towards implementation of climate-smart agriculture."*

Climate-smart landscapes (CSL) refer to the concept of climate-smart agriculture beyond field and farm scale by taking an integrated landscape management approach aiming at achieving multiple economic, social and environmental objectives (multi-functionality). In doing so, the climate-smart landscape approach allows for generation and coordination of synergies (and potential trade-offs). This could include a focus on integrating agricultural production, climate change adaptation and mitigation, and other livelihoods and environmental objectives on farm and landscape scales (Minang *et al.* 2015).

Three features characterise climate-smart landscapes (Scherr *et al.*, 2012):

- Climate-smart practices at field and farm scale: e.g. no-tillage, building soil organic matter, agroforestry, and nutrient, water and livestock management.
- Diversity of land use across the landscape: Diversity has several climate adaptation and mitigation functions, which include reducing risks, providing strategic food and feed reserves, and sustain perennial habitats as carbon stocks.
- Management of land use interactions to enhance adaptation and mitigation: this include monitoring and management of land use interactions in order to generate synergies and help sustain stakeholder engagement.

The main benefits of landscape interactions are:

- to enhance field-level benefits of climate-smart practices
- to secure ecosystem functions
- to enhance the effectiveness of climate change efforts (Scherr *et al.*, 2012).

In order to achieve a successful climate-smart landscape multi-stakeholder engagement and governance, planning and knowledge sharing is required. Further, there must be supportive landscape governance and resource tenure, as well as financing for integrated landscape investments. Lastly, in order for stakeholders to invest in climate-smart landscapes, there is a need to track multiple dimensions of change (Scherr *et al.* 2012).

2.3 Analysis of agricultural and climate change initiatives using SWOT

The identified initiatives (Appendix B) were analysed using a SWOT-framework (Strengths, Weaknesses, Opportunities, Threats). The purpose of the SWOT-analysis was to identify success factors (strengths), areas for improvements (weaknesses), areas for increased impact and success (opportunities) and external factors that should be mitigated (threats) for devising agriculture initiatives. The SWOT analysis is conducted for regional and national initiatives only. Global initiatives were not included as these initiatives cannot be replicated in other regions. However, best practices are identified, as these can be taken forward to other initiatives when identifying potential for replication and scaling up of initiatives.

2.3.1 Methodology for SWOT analysis

The SWOT-analysis was undertaken by identifying elements internal and external to each initiative, and assessing whether these are contributing positively or negatively to the impact and success of the initiatives. Strengths and weaknesses relate to the internal factors of the initiative, while opportunities and threats relate to the external factors of the initiative (see Figure 2).

Figure 2: SWOT-assessment framework containing the distinction between internal and external aspects, as well as positive and negative elements

For each element of the SWOT, the analysis was conducted across four areas, which cover how initiatives operate, the themes covered, and the financial means to do so. The four areas are found throughout the report, and have been selected to maintain consistency in reporting on initiatives. The four areas are:

- *Knowledge sharing and capacity building*: This area focus on how initiatives gather and share information and knowledge. This include the information gathered by internal parties (e.g. project managers) as well as external stakeholders (e.g. researchers, beneficiaries, and local officials). Further, the way in which this information or knowledge is shared is analysed here (e.g. through informal networks, using newsletters, by word of mouth, etc.). Finally, the capacity (technical/agricultural, financial, and political) held by the involved stakeholders (internal and external) is analysed.
- *Initiative design*: This area focus on how the initiative operate. This include setting objectives, goals, and targets, as well as measuring progress. It also focus on whether initiatives report on these achievements, and how. Further, it focuses on whether initiatives reach objectives set and the impact that initiatives have on target areas (e.g. research, policy, on-the-ground, etc.).
- *Financial backing*: This area focus on how initiatives are funded, including the amount of funding, the type of funding (e.g. loan, grant, insurance, in-kind contributions, etc.), and who provides this funding. The latter includes assessing whether local/national or external/international funding is the source of financial backing for the initiative, and the temporal period that this funding has been secured for.
- *Synergies*: This area is the most difficult to define, as synergies are difficult to define, given they can be found within various areas (e.g. research, initiative design, financial backing, agricultural practices, climate change mitigation and adaptation, etc.). The focus of this area is thus on identifying whether initiatives have identified any synergies (or failed to do so) or whether opportunities for this exist. It also focus on identifying whether any initiatives work with or include successful agricultural practices, such as CSA, agroforestry, Community-based Adaptation (CbA), or sustainable agriculture. Finally, it focus on assessing the mitigation and adaptation components of the various agriculture climate change initiatives in light of the objectives and targets of those.

2.3.2 *Strengths*

Knowledge sharing and capacity building

A key strength among initiatives is when knowledge is shared between various stakeholders affiliated with the initiative. Knowledge sharing has multiple benefits. Sharing knowledge is vital in order to transfers technology and build capacity. For example, knowledge sharing is critical for sustainable development, where better agricultural practices and advisory services can be shared that allows for more effective

adaptation and mitigation actions (FAO, 2016). A number of initiatives collaborate with research institutions, while others collaborate with national or international institutions that are experts in the given field, thus fostering knowledge sharing. For example, the Capacity Building System on Resilience for Central America initiative is being led by and involves a number of international agriculture organizations and affiliated experts. Similarly, the Global Climate Change Alliance Programme on Climate Change Adaptation and Mitigation collaborate with international research institutions, such as ICRAF and CIFOR.

Other initiatives put special emphasis on sharing information within the initiative or with various stakeholders. For example, the ASEAN-CRN promotes climate resiliency through exchange of information, expertise, and experiences on CSA amongst countries participating in the initiative. The Drought Tolerant Maize for Africa Initiative (DTMA) (Box 13) designs and coordinate events focusing on knowledge-sharing, capacity building and technical and advisory support. Another example is the “Adaptive Management to meet Food, Fibre, Energy and Environmental Goals” initiative, where collaboration with farmers, ranchers, foresters, industry values chain, academia, government and NGO partners in sharing new adaptation practices, tools and management systems is in focus.

Ensuring capacity building also seems to be crucial, as such efforts enable improved decision-making and implementation. The FoodAfrica initiative collaborates with research institutions in educating the local agricultural sector in East and West Africa about agricultural production, market performance, and other necessary skills in order to enhance food security and reduce poverty.

The last element of knowledge sharing concerns how knowledge is disseminated to project beneficiaries. A great example of how this can be done is shown by the initiative on “Communicating seasonal forecasts to farmers in West Africa for better agricultural management”, which develop good practise guidelines and training materials for communication with local farmers, and combine scientific forecasting with traditional knowledge.

Initiative design

In order to achieve results, the way the initiative is designed and operated is crucial. The first finding from the SWOT analysis is that initiatives have a much larger likelihood of being successful if they have well defined objectives, strategies and guidelines, and clear, reasonably ambitious and quantitative goals. For example, the Climate Smart Territories (CST) initiative (Box 7) have clear objectives related to climate change, focusing on production capacity, GHG emissions reduction and increasing the adaptive capacity of the territory. Brazil’s Low-Carbon Agriculture Plan is another example of an initiative with clear, ambitious and quantitative goals, which include rehabilitating 15 million hectares of degraded pastures, and a specific target to reduce GHG emissions by 160 MtCO₂e annually by 2020. Another example is the Global Climate Change Alliance Programme on Climate Change Adaptation and Mitigation, where well defined programme objectives with a clear stepping stone approach for each of the objectives and expected results exist.

This leads to the second observation within initiative design, namely that publication of progress reports and monitoring of tasks enable initiatives to identify whether goals and objectives have been reached. For example, the R4 Rural Resilience Initiative (R4) publishes quarterly reports on the status and progress of the R4 activities. This is also seen in the "Climate Resilient Post-Harvest Agribusiness Support Project (PASP) in Rwanda", where detailed information about the objectives, project activities, actors involved, and the amount of funding allocated for each of components have been established.

Finally, it is important how initiatives link to existing policies and other projects in the country or region. Many initiatives do not explicitly evaluate this, but the Great Green Wall for the Sahara and the Sahel Initiative (GGWSSI) (Box 6) project is an example of an initiative that aims to integrate the project into existing national, regional and local programmes for rural development. Thus, ensuring coherent policy frameworks for climate action in the agriculture sector may lead to opportunities and more effective initiatives (FAO, 2016).

Other examples of interesting, novel, or beneficial initiative design elements is the bottom-up approach of the CST initiative (Box 7), where all people, who have an influence on the way in which the environmental, social and productive resources of the territory are managed, are involved in the process. The communicating seasonal forecasts to farmers in West Africa for better agricultural management also has an interesting approach, where partners facilitates communication workshops with information, training and guidance for beneficiaries.

Financial Backing

Financial backing is a key element of initiatives. In general, it is best to have long-term funding secured from several international agencies, as it reduce the risk that a single funder will cut the flow of money to the initiative. Examples of important institutions in this context are the International Fund for Agricultural Development (IFAD), the Asian Development Bank (ADB), the African Development Bank (AfDB), the World Bank (WB) as well as various national development cooperation institutes such as GIZ, DANIDA, NORAD, SIDA and FINIDA. Of importance is also the climate finance available through funds, such as the Green Climate Fund (GCF), the Least Developed Countries Fund (LDCF), the Special Climate Change Fund (SCCF), the Global Environmental Facility (GEF), the Climate Investment Funds (CIF), and the Clean Technology Fund (CTF), among others.

Most initiatives are funded by one or several of these institutions, although some are also funded by national governments, e.g. Brazil's Low-Carbon Agriculture Plan, or by private companies. A good example of an initiative with funding from several international institutions and private companies is the R4 Rural Resilience Initiative (Box 12), which has been launched by Oxfam and the World Food Programme (WFP) with multiple financing partners (USAID, Swiss RE, Rockefeller Foundation), who works with local R4 partners and institutions. Another example is the DTMA (Box 13), which is funded by the US Agency for International Development and the UK Department for International Development and two private funds.

An interesting approach to funding is taken by the Adaptation of AAA Initiative, which has a rather pragmatic approach that focuses on securing funding for projects within the initiative, which can achieve results. This is further explained in the opportunities section.

Synergies

While most of the initiatives include both elements of adaptation and mitigation, a majority does so through a focus on only one of them. For example, if an initiative focus on mitigation, this focus might result in co-benefits for adaptation, and vice versa. However, a few initiatives have identified actual adaptation and mitigation synergies, where actions are undertaken with a view to increase both aspects. This can increase the impact of such actions, an element noted also by the IPCC in their fourth assessment report (see Klein *et al.*, 2007).⁶

Another perspective on synergies is taken by the Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA). Their Umbrella Program on Climate Change Adaptation and Mitigation Program for Agriculture and Natural Resource Management in Southeast Asia (CChAM) find that “synergies can be created across other research agendas/programs in terms of knowledge, technologies, capacities, processes and inputs to policies at the national and regional level.” As such, the focus here is not on the initiative’s activities, but on synergies between the initiative and other existing initiatives or policies. Similar activities is undertaken by the Joint Programming on Agriculture, Food Security and Climate Change (FACCCE-JPI) initiative, which seek to identify synergies and trade-offs through employing a “transdisciplinary research base, encompassing economic and social aspects in addition to scientific ones, and with a creative approach towards the alignment of national programmes and the input of multiple actors and stakeholders.”

The presence of initiatives that focus on novel practices, which research has found to be effective in increasing mitigation or adaptation of agriculture is also notable. For instance, agroforestry (see Box 3), understood as practices, where trees are grown in interacting combinations with agricultural production on the same land (FAO, 2016: Maathai, 2012) is promoted by several initiatives. For example, the National Mission for Sustainable Agriculture (NMSA) aims to promote agroforestry in India in order achieve adaptation, such as increased resilience of agricultural production and livelihoods, as well as mitigation goals, such as enhanced carbon sequestration and enriched soil organic matter, while at the same realising economic gains (NMSA, 2016)(see Box 9).

Box 3. Agroforestry

Agroforestry refers to agricultural practices, where trees are grown in interacting combinations with agricultural production on the same land. Agroforestry can be implemented in both crop and livestock production systems, depending on landscape and production features. Agroforestry protects

⁶ An assessment of mitigation and adaptation synergies was conducted for NOAK in 2016. For further information, see COWI (2017).

biodiversity and enhances the provision of ecosystem services, such as carbon storage, soil fertility, reduced erosion, pollination and pest control, as well as nutrient retention, by maintaining plant and tree species, which facilitate provision of such services. The positive effects of agroforestry are most evident on a landscape or regional scale compared to farm scale, as some ecosystem services, such as pollination or erosion control only become effective at larger scales; a factor, which should be considered in rural planning policy (Torralba *et al.*, 2016). Unsustainable agricultural systems are the most vulnerable to climate change, and can benefit in particular from agroforestry approaches. Trees, and thus agroforestry, play a key role in climate change mitigation and adaptation, but also in reducing agricultures' vulnerability to climate-risks (Maathai, 2012).

2.3.3 Weaknesses

Knowledge sharing and capacity building

Almost all of the identified initiatives have strengths in knowledge sharing and capacity building, and the weaknesses that can be identified relate to initiatives that lack internal technical and other capacity, and rely on outside institutions for knowledge generation and capacity building. Network initiatives that solely facilitate information sharing are especially prone to this. Lack of knowledge sharing and capacity building may inhibit countries from identifying viable adaptation and mitigation options within the agricultural sector. It can also make it difficult to conduct the research and assessments on e.g. vulnerabilities, adaptive capacity, and agriculture climate change solutions, which are necessary to meet some of the challenges posed by climate change (FAO, 2016). Further, lack of knowledge and the presence of information asymmetries may lead to market and policy failures if policymakers and institutions fail to consider appropriate agricultural approaches in relation to climate change adaptation and mitigation. Further, if lacking knowledge, the stakeholders involved, from policymakers to researchers to farmers could miss out on opportunities for adaptation and mitigation synergies, or overlook potential threats and trade-offs (FAO, 2016).

Another weakness relate to managing the relations between the different stakeholders, e.g. farmers, researchers, and government officials, involved in the initiative. An example of this is when one stakeholder has been engaged, while others are not involved to the extent that is required for the initiative to successfully function. For example, a R4 progress report found that resilience at the community-level remains weak, thus identifying needs for both enhancing the mobilisation of local stakeholders and building capacity (WFP, 2015). Further, lack of technical capacity and information about the technical and financial performance has led to difficulties and caused a slow implementation process of Brazil's ABC Plan (Low Carbon Agriculture Plan), which has constrained the initiative in meeting its objectives (GCF, 2012). As such, lack of knowledge sharing and capacity building, for example through lack of coordination among stakeholders, can inhibit countries and regions from designing and implementing successful agricultural practices and initiatives, as well as from scaling up support for climate action in the agricultural sector (FAO, 2016).

Initiative Design

The most prevalent weakness concerning initiative design relates to initiatives not realising the goals or objectives set, often due to lack of control mechanisms and evaluations of impacts. For example, the Global Climate Change Alliance Programme on Climate Change Adaptation and Mitigation reached less beneficiaries and achieved less adopters of CSA than planned. While Brazil's Low-Carbon Agriculture Plan approved over 2,000 projects with a total value of USD 251 million, it still fell short of the USD 1.6 billion target. Very few contingency plans were identified, meaning that initiatives had no plan for what to do when goals or targets are not reached. In similar fashion, the success of the DTMA initiative (Box 13), and hence the realisation of the increase in maize yields, depended on farmer's uptake of seeds provided by the initiative. Thus, the design of DTMA needed to ensure adequate supply of drought tolerant maize seed in the local market.

Another example is the R4 initiative (Box 12), where evaluations reports showed that the speed of the progress of getting farmers insured was significantly slower than the initiative aimed for. For example, the initiative strives to ensure 500,000 farmers in 2020, but have only managed to increase from 1,300 to 40,000 from 2010 to 2016 (WFP, 2015). This highlights the need to evaluate and develop the initiative, and to identify potential barriers in order to enhance the impacts and effectiveness of the initiative.

Financial Backing

As concerns financing, the main weaknesses are lack of financing or limited temporal guarantee of finance. For example, the ASEAN-CRN has only managed to secure finding until 2017, while other initiatives are forced to scale down activities due to lack of/uncertainty of funding.

It can also be a problem that the initiative lacks a focus on financing, including securing this or making sure that activities and projects can actually be undertaken with the available resources.

Synergies

When multiple projects are undertaken within an initiative, but these are being undertaken independently of each other or without thought of how they could complement each other, it weakens the impact of the initiative. In the Asia Pacific Adaptation Network (APAN), for example, multiple international initiatives to help countries build their national capacity is being created, but these initiatives are being undertaken independently of each other. Another example is DTMA (Box 13), which primarily focuses on adaptation without integrating potential mitigation benefits and synergies, such as for example combining the use of the drought-tolerant maize with practices such as no-till agriculture.

Another weakness is when initiatives seek or claim to use an approach, which facilitates synergies, but do not clearly specify how these synergies are being realised. For example, in the CST initiative (Box 7), it is unclear exactly what the systemic approach entails and which benefits it brings, which weakens the overall initiative compared to a situation where this had been clarified.

2.3.4 Opportunities

Knowledge sharing and capacity building

Elements related to knowledge sharing and capacity building are among those areas where most opportunities for initiative impact and development have been identified. Among several initiatives, various platforms for sharing information within the initiative or with affiliated stakeholders have been identified, which in various ways increase the possibility of success by facilitating sharing of knowledge and best practices through both online and offline means. For instance, the GGWSSI (Box 6) has developed a platform for sharing knowledge in order to upscale best practices and stimulate dialogue on how to combat climate change and desertification and boost investment in the region. The platform serves as a collaborative tool, an editorial space, and as an umbrella platform, which can be accessed by stakeholders to gain insights on these practices. In a similar fashion, the North America Climate-Smart Agriculture Alliance (NASAA) facilitate knowledge-sharing through roundtables, web and social media, enabling participants to gain insights into ideas and best practices. A means of sharing knowledge, which should be increasingly used as the technologies mature and can also be taken up in lower income regions.

The Promotion of Smart-Agriculture Towards Climate Change initiative seeks to further the exchange of information between scientific and technical organisations and has developed a platform, which is open to non-state actors. Further, the initiative supports spaces for dialogue for non-State actors at the national and regional levels to facilitate their access to data and available technologies, which can further the success of actions by these actors. Along the same lines, the AAA initiative promotes South-South cooperation, which provides an avenue for sharing knowledge and tools with projects within regions and countries facing similar challenges on agriculture and climate change.

Finally, some initiatives seek to increase participatory development and increase bottom-up development of practices and knowledge sharing. For instance, the Capacity Building System on Resilience for Central America initiative seeks to develop tools and knowledge in a participatory manner with regional and national stakeholders. This means that expertise can be built locally, enabling local stakeholders to use the knowledge and information gathered in their daily practices. Further to this, the Capacity Building System on Resilience for Central America initiative also seeks to increase the training of local professionals. They have developed a program, which builds capacity through training of local professionals. This enables the local stakeholders to translate the tools and knowledge developed throughout the program into actions within the country and thus increase the scale and reach of the program.

Initiative design

Design of initiatives are mostly related to internal elements (i.e. strengths and weaknesses), but external factors can naturally affect the way in which initiatives function. Involving and getting the support of local stakeholders can increase the

project impact by fostering empowerment and ownership. Further, involving farmers and rooting initiatives in local realities also provide new opportunities.

Along these lines, participatory and bottom-up approaches can help build ownership and combine local knowledge with outside technical and other professional expertise, as is the case in the initiative on “Communicating seasonal forecasts to farmers in Senegal for better agricultural management”. Further, collaboration between multiple partners and stakeholders, e.g. research, government, farmers’ organizations, and religious groups, provide new opportunities for engaging stakeholders.

Finally, technical and professional capacity within the initiative can increase the dissemination of knowledge to local stakeholders and increase the capacity of the stakeholders involved in the project. Further, having such capacity within the initiative provide opportunities for new projects and activities and various forms of collaboration.

Financial backing

As concerns financial backing, opportunities exist where initiatives have managed to develop solid business and financial plans. This includes managing money to ensure that spending on projects and activities is aligned to the funding available, raising funds from multiple sources (local as well as national or international) and delivering the best results using the available funds. That is, making sure that the money is spent the most efficient and effective way.

Somewhat disappointing, however, an often-identified opportunity concern the presence of financial means, which have not been fully utilized. For instance, Brazil’s Low-Carbon Agriculture Plan had not managed to reach the amount of beneficiaries intended. While this in itself is disappointing, it also means that there is scope for expansion of initiative activities, as more funds are available.

Other opportunities are found in initiatives, which disburse funds in a novel way or use various forms of funding across spatial scales. For instance, the AAA Initiative seeks to strengthen the financing capacities of African farmers, via the micro-credit generalization to small farmers, meso-credit development to medium-sized farms and mobile banking solutions deployment. Such examples can be seen as novel solutions for using and disbursing funds. A similar approach is taken by the R4 initiative, which seek to contribute to the creation of rural financial markets by building and increasing the capacity of the farmers, local insurance companies, and micro-finance institutions to participate in crop insurance and risk management (Box 12).

In addition, identifying significant opportunities for adaptation and mitigation synergies, as well as economic, environmental and social co-benefits, may help attracting increased levels of climate finance (including for the agricultural sector) (FAO, 2016b).

Synergies

Within the area of synergies, a number of opportunities exist within those initiatives where the objectives and activities cover both mitigation and adaptation areas, but where synergies have not been identified. For example, the National Innovations on

Climate Resilient Agriculture (NICRA), conduct research on adaptation and mitigation, which covers both crops, livestock, fisheries and natural resource management, and thus provides an avenue for using an integrated approach that seek to build synergies across the two.

Along the same lines, opportunities to align initiatives with local, national or regional policies often exist, but have not always, at least explicitly, been sought identified. For example, several INDCs mention national policies to promote CSA, agroforestry and similar practices, which is a key element within several of the initiatives analysed here (see Appendix B).

A recent initiative, yet to be fully developed and implemented throughout 2017, is the International Panel of Experts on Sustainable Food Systems (IPES-Food), which aims to support and stimulate agricultural development in West Africa towards the adoption of diversified agro-ecological systems (see Box 4). Through dialogue, consultations and collaborative research, IPES-Food will work with local partners to explore how agroecology is understood and can be applied in a West African context. This include identifying its performance in the region, as well as the opportunities and potential barriers for such activities. The main objectives are to consolidate the knowledge base on agro-ecological practices, to bring these practices into light, and to reflect on and discuss such practices and a way forwards (Globalnyt, 2017; IPES-Food, 2017). Other examples of initiatives focusing on agroecological practices are the Promotion of Smart Agriculture Towards Climate Change initiative, which aims to support the transition towards agroecology in West Africa in order to increase the resilience of vulnerable populations and the “4 per 1000” initiative (see Appendix B).

Box 4. Agroecology

Agroecology is concerned with designing and managing sustainable agroecosystems through the application of ecological concepts and principles. Ecological concepts are applied to manage the interactions between agroecosystem components such as plants, crops, livestock, soils, climate, and humans.

The aim of agroecology is to improve the ecological and socioeconomic impact from agriculture (Francis *et al.*, 2003; Gorton *et al.*, 2015) by applying principles, which decrease the impact of agriculture on the surrounding landscape. For example, the Promotion of Smart Agriculture Towards Climate Change initiative has as its objective to support the transition towards agroecology in West Africa to reinforce the resilience of vulnerable populations. The initiative aims at the adoption of practices by 25 million households by 2025.

Some of the initiatives use CSL approaches (see Box 2) and include considerations of ecosystem-based adaptation. Examples of such initiatives are the CST initiative (Box 7), the Lake Chad Sustainable Development Support Program (PRODEBALT) (Appendix B), and the GGWSSI (Box 6). The CST initiative includes management of ecosystems and ecosystem services, as well as equitable use of natural resources and agrobiodiversity, while PRODEBALT aims to restore the productivity of the Lake Chad’s ecosystems (CATIE, n.d.; AFDB, 2017). Using a landscape approach creates opportunities for working across agriculture and forestry, and allows for generation of synergies and identification

of potential trade-offs (Scherr *et al.* 2012) (additional information on this in Box 2). Working across forestry and agriculture ensures that ecosystem functions are taken into account and that practices related to protection, restoration, and management of biodiversity and ecosystem services and processes are taken into account (Munang *et al.* 2013) (additional information on this in Box 5).

Box 5. Ecosystem-based Adaptation

Ecosystem-based Adaptation (EbA) is not a sectoral approach and is not exclusive to agriculture. However, in relation to agriculture, EbA is the implementation of agricultural management practices that use biodiversity, ecosystem services or ecological processes (at field, farm or landscape level) to build robust food systems and reduce and adapt to the impacts of climate change and climate variability (Vignola *et al.*, 2015; Munang *et al.* 2013).

EbA builds on practices, which conserve, restore and manages biodiversity and ecosystem services and processes, such as water retention or soil fertility. Overall, actions for better managing ecosystems include improved soil management and agro-biodiversity, as well as relying on agricultural science and traditional knowledge and improving farmers' capacity to invest, access new technology and payments for ecosystem service provision (Munang *et al.* 2013).

Examples of agricultural practices at the field or farm level under EbA are agroforestry or silvo-pastoral systems (Torralba *et al.*, 2016), the use of mulching or local species as cover crops, conservation of riparian vegetation in farms, diversification of crop varieties or inclusion of wild relatives, integrated pest-management strategies, and planting of windbreaks. As such, EbA promotes agricultural systems, which are more ecologically and socially sustainable (Vignola *et al.*, 2015), as the practices do not simplify the farmers' productions systems, but rather seek to integrate them into the landscape. At the landscape level, practices include ensuring tree cover or natural vegetation in key hydrological hotspots and enhancing the structural complexity of the agricultural landscapes through diverse cropping systems, or inclusion of natural vegetation and on-farm tree cover to promote pest regulation (Vignola *et al.*, 2015).

Adopting EbA in agriculture can reduce the vulnerability of the agricultural sector to climate change impacts, while providing environmental and productivity benefits (Chirambo, 2016). Thus, it has the potential to facilitate smallholder farmers' adaptation to climate change and their becoming more resilient to the increase in climate extremes, while potentially reducing GHG emissions. An example of the use of the EbA approach is in Uganda, where various projects implemented agroforestry, conservation agriculture, integrated nutrient management and the establishment of woodlots. The result of these projects were an increase in productivity by conserving soil and water, as well as the use of leguminous cover crops. Further, planting costs were reduced by 75% because of conservation techniques. This has given the farmers an opportunity to seek additional income possibilities and thus reduce rural poverty. Also, the EbA approach resulted in benefits for biodiversity and the environment as fewer chemicals were used, restoration of the hydrological cycle because of revegetation and reforestation and better nutrition.

2.3.5 Threats

Knowledge sharing and capacity building

A number of factors threaten the knowledge sharing and capacity building of initiatives; chief among these is of course the opportunity to share information and knowledge within and between initiatives and stakeholders, such as universities, farmers,

government representatives, and financial backers. Information flows can be hindered by lack of communication means or channels, or can be hindered by excessive bureaucracy that prevents ease of sharing and distribution. Further, lack of technical or other capacity increase the risk of information, tools, or knowledge not reaching the intended beneficiaries.

Another important inhibitor of project impact is political opposition or lack of support for initiatives. As initiatives often seek to enact some kind of change, either on the ground, within policy, or among other stakeholders, it is important that they have the opportunity to inform policy or research based on the results achieved in the program, as well as to have the political support to carry out activities or projects. Not having this also increase the risk of becoming subject to political winds of change.

Initiative design

Design of initiatives are mostly related to internal elements (i.e. strengths and weaknesses). However, it is worth noting that if an initiative is solely driven and operated by external partners and experts, it risks losing support by local stakeholders, including organizations in the region, local governments, and, more importantly, farmers themselves. It is therefore vital that initiatives are rooted in local operations and have the backing of local stakeholders.

An external threat that should be mitigated is limited initiative integration with existing local, regional or national policies, which proves to be vital to ensure long-term sustainability of the initiative activities. For example, despite the aim of the GGWSSI (Box 6) to integrate actions in national policies, progress reports have showed that this remains a difficulty. However, this issue has been mentioned by the initiative itself, thus recognizing areas for improvement.

Besides local support, local knowledge is also of importance to the initiative. If technical, financial and other professional capacity resides mainly with external partners, the initiative is vulnerable to lacking such capacity if external partners lose their affiliation with the initiative or become preoccupied with other projects. Further, local expertise can increase the dissemination of knowledge to local stakeholders and increase the capacity of the stakeholders involved in the project.

Financial Backing

External elements that can increase the threat of losing financial backing are often related to initiatives being funded by a sole financial backer or by external partners only, that is, the initiative lack support of the local stakeholders. For example, the GGWSSI (Box 6) is primarily financed by international partners, and although this is not currently a problem (in which case it would be a threat), this increase the risk that backers without local commitment relinquish their support for the initiative. An example of an effort, which can somewhat reduce or mitigate such a threat is seen by the R4 Rural Resilience Initiative (Box 12), which is driven by external and international organisations, and thus subject to similar threats, but who make an effort to work with local partners on various project elements.

As concerns financial backing and project funding, some initiatives rely solely on grants, while others rely on funding that is a combination of a loan and a grant. This type of funding means there is pressure on the initiative to enact activities that generate income, in order to repay the loan.

Synergies

While identifying synergies are vital to increase project impact, there is also such a thing as too much of a good thing. Focusing on too many projects can risk spreading the effort too thinly and reducing the chance of having an impact in each of these. For instance, the Asia Pacific Adaptation Network (APAN) run activities and projects under eight different themes, one of which is agriculture and climate change, thereby running the risk of having less impact in these than if the work was more focused.

Projects with multiple main and minor focus areas, e.g. agricultural productivity and food security within a context of climate change, risk misaligning the resources (financial, technical, professional) dedicated to each area and project(s) within this area. For example, a project might dedicate substantial financial and technical resources to an area, while under-prioritizing another, although this might be of more importance given the local circumstances. Therefore, it is vital that initiatives balance the resources allocated to projects within the themes/areas that the initiatives focus on. Along these lines, it is worth noting that significantly more funds are dedicated to agricultural mitigation than to adaptation, although in the case of Africa, for instance, adaptation is just as important, if not more important.

2.3.6 SWOT summary

The findings of the SWOT analysis have been summarized below, the wording has been modified to show generic examples of various best practices (e.g. solid financial backing) and areas for improvements (e.g. lack of technical capacity) as opposed to specific examples, as this is more useful when providing recommendations on how to design and execute initiatives. However, in section 2.4, the SWOT analysis is complemented with specific examples of some initiatives, which have incorporated various best practices.

In the table seen below (Table 2), each of the SWOT elements that have been extracted from across the identified initiatives have been listed. Note that no initiative contains all of the elements contained in the table; the table is an aggregation of SWOTs across various initiatives. The elements are not listed in any specific order, meaning that those written at the top of the list are not necessarily found more often than those below.

The SWOT analysis of the agricultural initiatives reveal that several of the initiatives contain elements that strengthen the initiative or provide new opportunities. Overall, more strengths and opportunities were identified than weaknesses and threats. However, no initiative show only strengths and opportunities, but include elements, which can be characterised as a weakness or potential threat.

Table 2: Identified SWOT elements in the agricultural initiatives

Strengths	Weaknesses	Opportunities	Threats
<ul style="list-style-type: none"> - Solid financial backing. - Well-defined objectives for programme/initiative. - Clear (political and financial) mandate. - Support from national government and relevant regional and international organizations. - Clear, ambitious and quantitative goals. - Involvement of international research organizations. - Focuses on existing, workable solutions. - Measures progress and publishes progress reports. - Facilitates communication workshops with information, training and guidance. - Scale up and replicate workable solutions. - Develops good practice guidelines and training materials. 	<ul style="list-style-type: none"> - Multiple projects undertaken without focus on synergies and co-benefits. - Less beneficiaries and/or adopters reached than planned - Lack of contingency plan when goals are not met. - Has managed to mobilize one stakeholder (e.g. scientific community), but needs to establish ties to the rest (e.g. governments, international institutions, the private sector, and NGOs.). - Shortage of technical, financial or institutional capacity. - Focus on too many areas (e.g. food security, resilience, job creation, gender, climate change) dilutes potential for impact. 	<ul style="list-style-type: none"> - Focusing on both adaptation and mitigation to provide opportunities for synergies. - Working across agriculture and forestry for landscape-wide/ecosystem benefits. - Involving local stakeholders. - Capacity building, e.g. through training of local professionals. - Integrating project activities with existing local, regional or national policies and actions. - Conducting projects on-the-ground to meet local needs and challenges. - Developing tools and knowledge in a participatory manner with regional and national stakeholders. - Adopting a bottom-up approach helps ensure local ownership and empowerment. - Collaboration between multiple partners/stakeholders (e.g. technical experts, representatives of farmers community, the civil society, woman and youth organisations, government, the private sector). - Innovative funding mechanisms. 	<ul style="list-style-type: none"> - Limited and/or unpredictable funding. - Strict external criteria on how to spend financial means. - Shortage of financial and professional capacity. - Excessive bureaucracy. - Mainly external driven and funded and not in touch with local stakeholder needs and expectations. - Cannot set the policy or research agenda in country/region; subject to political winds of change. - Limited integration with existing local, regional or national policies.

2.4 Examples of successful agriculture and climate change initiatives

2.4.1 *Successful agriculture initiatives*

Based on the identification on SWOT elements and the examples of promising agricultural practices, an initiative is considered successful if it include multiple Strengths and Opportunities elements, with limited Weaknesses and Threats. The analysis reveals that sharing knowledge and building capacity, having a design with clear objectives and quantifiable goals and progress reports, robust and continuous financial backing, and an integrated approach to addressing climate change and agriculture challenges are key criteria to successful agricultural initiatives. Furthermore, initiatives focusing on both adaptation and mitigation actions provide opportunities for synergies and co-benefits, which some of the successful initiatives explore. This opportunity was highlighted at the Roundtable at COP22 by the Costa Rican Minister of Agriculture, H.E. Arauz-Cavallini, who expressed the importance of a whole-system approach in order to understand the interactions in the agricultural systems. In addition, agricultural initiatives working with multiple local stakeholders and farmers taking a bottom-up approach helps foster support for the initiative at the local level and on the ground, where agricultural practices are undertaken. Finally, a clear political and mandate, including sufficient financial and technical support, builds the foundation for the activities of the initiative.

Based on the findings of the SWOT analysis, case examples featuring description of some of those agricultural initiatives, which have implemented elements of successes (S) and opportunities (O) are presented in boxes below (Box 6 to Box 12). Some of these identify potential pitfalls by highlighting areas of improvement. The examples below are not a complete identification of the most successful initiatives, but

serves as a means to inform and share knowledge on best agricultural practices and policies in the climate change context as identified in agriculture climate change initiatives analysed for this project.

2.4.2 Great Green Wall for the Sahara and the Sahel

An example of a successful regional agriculture climate change initiative is the GGWSSI with several strengths and opportunity elements, such as an integrated landscape approach, development of a platform for knowledge sharing on best practices and dialogues, synergic opportunities, as well as aims to integrate the initiative into existing national, regional and local programmes for rural development. A more detailed description of the initiative and its potential strengths and opportunities is found in Box 6.

Box 6. Great Green Wall for the Sahara and the Sahel Initiative (GGWSSI)

The GGWSSI initiative is a pan-African program adopted in 2006 by the AU, which aims to address food security, reverse land degradation and desertification, and to support local adaptation to climate change in a sustainable land and water management manner (SLWM). By now, the initiative includes four sub-projects: (i) the Action Against Desertification, (ii) the Building Resilience through Innovative Communication and Knowledge Services (BRICKS), (iii) FLEUVE which aims to strengthen the capacities of actors and to inspire South-South learning, partnership and cooperation, and (iv) the Sahel and West Africa Program (SAWAP) aiming at developing solutions to ensure environmental security and sustainability through a region hub. Many of the initiative's activities support a climate-smart landscape approach (see Box 2 on CSA), including a mosaic of partners with both regional South-South cooperation (African countries) and international cooperation.

By recognizing the benefits of regional efforts to address the challenges, the initiative plans to be more effective and with larger positive impacts beyond smaller scale projects (Scherr *et al.*, 2012). Further, the initiative includes a web-based platform to support the community of partners to implement the initiative through knowledge-sharing on good practices and monitoring reports, enhance collaboration and dialogue, and create partnerships (GGWSSI, 2013). The initiative has led the African countries involved in the initiative to develop national actions plans, regional programmes of capacity building and communication plans, while at the same time receiving additional financial funding from international donors. (NEPAD, 2016; GGWSSI, 2013; terrafrica, 2017; PRI, 2016; APGMV, n.d; Scherr *et al.*, 2012). Several INDCs of countries based in the focus region of GGWSSI, such as Chad, Eritrea and Mali, mention the GGWSSI as an important initiative, thus highlighting the importance of such initiatives in realising their national contributions.

2.4.3 Climate Smart Territories

The CST initiative takes an integrated approach to food security, ecosystem services and climate change. The initiative has a beneficial initiative design, with multiple strengths. For example, the integrated approach works with multi-stakeholders platforms that facilitates meeting local societal needs, by including a bottom-up approach, while at the same time contributing to implementation of international

agreements. Further, the initiative sets clear objectives for its actions and activities related to climate change (Box 7).

Box 7. Climate Smart Territories Initiative

In 2011, CATIE launched the Climate Smart Territories (CST) initiative, which is designed to address climate change, food security, poverty, and the environmental degradation taking place in LA using an integrated approach (CATIE, 2011). The initiative builds on four systems approaches to achieve sustainable development in rural areas; sustainable livelihoods, aligned policies, institutions and incentives; territorial management; and the ecosystem approach (Minang *et al.* 2015). The initiative is thus identified as a good example of application of CSL approach identified as an opportunity in the SWOT-analysis. CST are defined as “geographical and social spaces where ecosystem services are maintained or restored, improving wellbeing of local people while continuously optimizing mitigation and adaptation to global change” (CSA, 2015). The initiative sets clear objectives for those of its actions and activities related to climate change, including aspects focusing on production capacity, GHG emissions reductions, local realities, and increasing the adaptive capacity of the territory. Further, the CSL approach presents opportunities for adaptation and mitigation synergies. The initiative takes a bottom-up approach, working through multiple-stakeholder platforms that facilitates the engagement of local people in the process of deciding how the environmental, social, and productive resources of the territory are managed. In addition, the initiative focus on building capacity through sharing both technical and local knowledge and through multi-stakeholder platforms fostering collective action. This leaves the stakeholders with a feeling of ownership and empowerment over territorial resources. The process of building and strengthening capacity is a vital in addressing critical issues at different geographical scales as well as increasing climate smart practices. Examples on CSTs are the Trifinio territory in the upper watershed of the Lempa River (Guatemala, El Salvador, and Honduras), and the NicaCentral territory in Nicaragua (CATIE, n.d; ASB, n.d; Minang *et al.* 2015).

2.4.4 Rural Initiative for Participatory Agricultural Transformation

Another example of an initiative designed in a participatory manner is the Rural Initiative for Participatory Agricultural Transformation (RIPAT) (Box 8), which combines top-down and bottom-up approaches, and include the principle of help to self-help in developing and implementing agricultural technology practices. This participatory approach furthermore leaves the farmers with a sense of project ownership, thus enhancing opportunities for stakeholder participation and scaling up the initiative.

Box 8. Rural Initiative for Participatory Agricultural Transformation (RIPAT)

The RIPAT was launched by the Danish ROCKWOOL Fund in partnership with the Tanzanian NGO RECODA in 2006. The RIPAT is an economic development initiative, which aims to improve agricultural practices, animal husbandry and livelihoods among smallholder farmers, in a sustainable manner, by closing the agricultural technology gap. The initiatives take a one-size-does-not-fit-all approach, where technological solutions are a mix of top-down and bottom-up participatory approaches. This is done through the principle of help to self-help, where farmers are introduced to a variety of crops and agricultural technologies. This is done through participant-oriented demonstrations and training programs conducted in a community, thus leaving farmers with genuine

possibilities to choose the actions and practices most suitable to their individual situation. The principle of help to self-help, and the mobilisation of farmers to take charge of their own agricultural development promote a sense of project ownership, which has showed to enhance participation and stakeholder involvement. The participating farmers establish farmer groups, which enable transfer of knowledge on best practices and agricultural technologies. In addition, collaboration with local governments, village leaders, and agricultural experts ensure project development and facilitates opportunities to scale-up projects within the initiative. The initiative has published a manual for sharing knowledge on how to best organise and implement group-based agricultural development projects. Evaluations of RIPAT projects have shown an increase in food security among the farmers participating in the initiative, as well as larger farmer dependency. It has recently been decided that World Vision Tanzania is to take over the ownership of the RIPAT model in order to integrate it into their existing development programmes (Globalnyt, 2017; RIPAT, n.d.; Rockwoolfonden, n.d.).

2.4.5 *National Mission for Sustainable Agriculture, India*

While the initiatives shown hitherto are successful examples of stakeholder engagement and clear and well-defined actions and objectives, other initiatives are successful examples of how to implement agricultural practices identified as contributing to development of agriculture and climate change mitigation and/or adaptation (see section 3.3.1). For example, the National Mission for Sustainable Agriculture (NMSA) in India (Box 9) focuses on integrated farming practices and agroforestry. Such practices are explained in operational guidelines and monitored through progress reports in order to ensure implementation and knowledge sharing of the best of the most promising agricultural practices.

Box 9. National Mission for Sustainable Agriculture (NMSA)

With the aim to promote adaptation and mitigation to climate change in Indian agriculture through sustainable strategies and development goals, the National Mission for Sustainable Agriculture focus on developing integrated farming programmes. These include: (i) the Rainfed Area Development (RAD) project aiming at promotion of integrated farming with adaptation and mitigation practices; (ii) the On Farm Water Management (ODWM) project, which focus on enhancing water use efficiency. Further, the (iii) the Soil Health Management (SHM) project aiming at promoting location and crop specific sustainable soil health management; and (iv) Climate Change and Sustainable Agriculture: Monitoring, Modelling and Networking (CCSAMMN) project, which will provide creation and bidirectional dissemination of climate change related information and knowledge. This is done by piloting climate change adaptation and mitigation research projects in the domain of climate smart sustainable management practices and integrated farming system suitable to local agro-climatic conditions.

These programmes include very specific objectives, strategies, and good practice guidelines to enhance sustainable agriculture, taking into account both adaptation and mitigation efforts in the agricultural sector, thus providing opportunities for synergies across efforts. The sub-mission on agroforestry especially provides such opportunities, as it focus on developing a practice, which at its core seeks to generate synergies by working in a landscape approach. The initiative has a strong focus on generating awareness and stakeholder involvement through training workshops and demonstrations for farming communities in order to share knowledge and enhance capacity building. Further, the

initiative collaborate with research institutions aiming at developing climate change adaptation and mitigation practices, including different agro-climate conditions. The NMSA will be operational throughout the country with some local-specific components. The initiative includes a monitoring and feedback system, the purpose of which is to evaluate mission activities and publish maps and progress reports to ensure transparency in the programme implementation; another key aspect identified as a strength in the SWOT-analysis (GoI, 2014; IFMR, 2015).

2.4.6 Sustainable Agriculture

Implementing Sustainable Agricultural practices is imperative to address the meet the objective of increased production while reducing GHG emissions and adapting to a changing climate. Therefore, with the aim to promote and ensure the transition to a more sustainable agriculture, FAO has defined five principles of sustainable food and agriculture (Box 10).

Box 10. The FAO Principles of Sustainable Food and Agriculture

According to FAO (2014), five principles underscore sustainable food and agriculture.

Improving efficiency in the use of resources is crucial to sustainable agriculture:

- Some key practices related here to are genetically divers varieties of crops and breeds, conservation agriculture, careful use of fertilizer, precision irrigation, improved water productivity and integrated pest management (IPM) (FAO, 2014).

Sustainability requires direct action to conserve, protect and enhance natural resources:

- Key practices for this principle are better practices for biodiversity, soil and water such as IPM, land rehabilitation, appropriate cropping systems, deficit irrigation, preventing water pollution, payments for using and providing ecosystem services, use grasslands for biodiversity, carbon storage and actions to reduce emission intensity (FAO, 2014).

Agricultural practices that fails to protect and improve rural livelihoods, equity, and social well-being is unsustainable:

- Key practices for achieving this principle are increasing farmers access to resources and markets through equitable land and water tenure systems, capacity-building, credit and infrastructure, increasing rural job opportunities and improving rural nutrition by producing more and affordable diverse food (FAO, 2014).

Enhanced resilience of people, communities, and ecosystems is key to sustainable agriculture:

- Practices under this principle include risk assessment, management and communication, adaptation to climate change, planning for droughts, floods and pest outbreaks, social safety nets, respond to market volatility through flexible production systems and savings (FAO, 2014).

Sustainable food and agriculture requires responsible and effective governance mechanisms:

- Some key practices for this principle are increasing effective participation, consultation among stakeholders and formation of associations as well as development of decentralized capacity (FAO, 2014).

2.4.7 West African Alliance for Climate Smart Agriculture

Climate-Smart Agriculture is another successful approach (see box 2) that is promoted by several of the analysed initiatives. For example, the West African Alliance for Climate-Smart Agriculture initiative aims to make agricultural practices in the region more sustainable and resilient, while at the same time increasing agricultural productivity and income. Similar to the GGWSSI initiative, the West African Climate Smart Agriculture Alliance (WACSAA) works to be integrated in existing national programmes and plans (Box 11).

Box 11. West African Climate Smart Agriculture Alliance (WACSAA).

The West African Alliance for Climate Smart Agriculture was launched in 2014 (Toure and Fane, 2015). The objective of the Alliance is to include CSA in the Economic Community of West African States' (ECOWAS) Agricultural Policy by providing a consultation, coordination, convergence, funding, and monitoring framework for initiatives (Toure and Fane, 2015). The framework aims to transform and reorient agricultural systems and their value chains towards sustainable and equitable increases in agricultural productivity and incomes, to increase adaptation and resilience to climate variability and change, and to increase carbon sequestration and/or mitigation of GHG emissions, when possible and appropriate. The Alliance is a voluntary and multi-stakeholder partnerships including Government agencies, Non-Governmental Organizations, farmer organizations, private sector, international organizations and other agencies.

The implementation of the initiative by WACSAA involve creation of a knowledge-sharing platform and capitalization of technologies, practices and data, promotion and up-scaling of best practices through agro-meteorological support, use of agroforestry and carbon sequestration, storm water management, soil regeneration and fertilization, reinforcement of national and regional capacity building in policies and strategies, training, mobilizing financial and technical resources and creation of expert pools. How the regional initiative of the West African Alliance for Climate-Smart Agriculture is implemented in coming years will determine whether the initiative will become truly successful, as it appears promising, or whether too many threats and weaknesses persists (Toure and Fane, 2014; Zougmore *et al.*, 2013).

2.4.8 The R4 Rural Resilience Initiative

Besides stakeholder engagement and agricultural practices, some initiatives focus on the financial mechanisms used to deliver results. An example of this is the R4 Rural Resilience Initiative (R4) (Box 12) and the Drought Tolerant Maize for Africa Initiative (DTMA) (Box 13). The R4 initiative includes innovative funding mechanisms by creating new rural financial markets through building and increasing the capacity of the farmers, local insurance companies, and micro-finance institutions to participate in crop insurance and risk management. This enables farmers to pay for crop insurance with their own labour and involves a set of integrated tools, insurance, credit, savings, and disaster risk reduction activities, the goal of which is to increase overall initiative effectiveness and thus increase resilience of farmers and communities to climate change.

Box 12. The R4 Rural Resilience Initiative (R4)

The R4 initiative was launched by the World Food Programme (WFP) and Oxfam America in 2011. The overall objective is to enhance community resilience to climate variability and shocks through a risk management approach. Currently the initiative reaches more than 40,000 farmers and is active in Senegal, Ethiopia, Malawi and Zambia. The initiative combines four risk management strategies: (i) to improve resource management; (ii) to provide insurance (risk transfer); (iii) livelihood diversification and microcredit activities; and (iv) generating savings (WFP, 2017). The initiative enables farmers to pay for crop insurance with their own labour, thus providing farmers with resiliency towards weather and climate impacts. Rural financial markets, including capacity building of farmers, local insurance companies, and micro-finance institutions are to ensure long-term sustainability of the R4 initiative. Such elements are identified as clear opportunities for increasing the impact and scale of initiatives, as R4 is a great example of how to apply such mechanisms.

Several reports monitor and evaluate the impacts of the initiative (WFP, 2017). For example, in Ethiopia, an impact evaluation report shows that insured farmers save more than twice the money of those without any insurance, and invest more in seeds, fertilisers and improved tools for planting, allowing for increased agricultural productivity and greater resilience to threats and climate variability (WFP, 2017). The 2015 R4 Senegal Evaluation Report found that despite adverse climate conditions, farmers involved in R4 did not experience increased food insecurity, and that rice production increased ten times more for R4 farmers compared to farmers not being involved in R4. Increasing the capacity of those on the ground is a clear strength, while following up and providing progress reports ensure that an initiative reaches the goals that have been set; another element identified as a strength.

2.4.9 Drought Tolerant Maize for Africa

The Drought Tolerant Maize for Africa (DTMA) Initiative aims to address and mitigate the negative impacts of drought on the maize production by developing and disseminating drought tolerant, high-yielding, locally adapted maize varieties. The aim was to reach 30–40 million people in the SSA region (Uiane *et al.* 2011). The Initiative was funded by several funding resources, which ensures a continuous flow of money. Further, the initiative aims to involve national governments, thus fostering opportunities for competitive seeds markets (Box 13).

Box 13. Drought Tolerance Maize for Africa Initiative (DTMA)

The DTMA was launched in 2006 (and finished in 2015) and covers 13 African countries. The aim of the initiative was to introduce new maize crop varieties with high drought tolerance in order to reduce the yield gap and improve food security in the region. Between 2007 and 2013, the DTMA released 160 drought-tolerant maize varieties suitable for local conditions SSA region. In order to ensure farmer's access to these new seed varieties, the DTMA coordinated capacity building events and activities for maize breeders, technicians, seed producers, non-governmental organisations, private companies, and farmer groups. This strengthened the knowledge sharing and opportunities for capacity building and advisory support; two clear strengths. Further, the involvement of governments in the region fostered opportunities for more competitive seed markets and widespread access to affordable seeds for farmers in the region. Not providing these for free, but rather developing a functioning market of cheap, locally suitable seed varieties is a novel way to provide assistance, providing opportunities for greater involvement, as less financial burdens are put on governments. Accountability was ensured by the DTMA partners through publication of progress reports with the aim to quantify the impact of research outcome. This enabled that the initiative to be scaled up. By 2013, more than three million smallholder farmers had benefitted from the initiative, for example by a harvest increase of 20–30% compared to their usual maize yields (Ellul, 2013). Furthermore, it was found that the seeds were not only drought-resistant, but also provided other benefits, such as a higher resistance to some pests (SciDevNet, 2015).

3. Findings from COP22

The purpose of this task is to report on the outcome of the roundtable discussion, which was held at COP22 in Marrakech, in order to gather insights on how the experts present at the event view the future of agriculture and food security within the frame of climate change and the UNFCCC process. An additional purpose was to report on any general findings from COP22 and the UNFCCC process in general, of relevance to the subject of this report.

3.1 Agriculture within the UNFCCC process

At the COP22, agriculture became a key topic. While a number of other issues have been addressed or further developed in recent COPs, agriculture remains an agenda item of much contention and frustration. For years, agriculture has been a “nomadic” item, moving from one work stream to another, often being side-lined by other pressing negotiation topics. This side-lining has caused much concern in part due to agriculture’s largely unrealized potential GHG reduction, in part due to its strategic importance to many countries, given the need to maintain sovereign food production, food safety, and food security.

In the run up to the COP, Parties had agreed to reflect on how to frame the work of the Subsidiary Body for Scientific and Technological Advice (SBSTA) agriculture agenda item. Also in preparing for the conference, the Consortium Group of International Agricultural Research (CGIAR) published a report, in which they noted that: “SBSTA 45 in Marrakech represents a unique opportunity for Parties to decide on the future of agriculture within the UNFCCC. The process of discussions on issues related to agriculture initiated at COP17 in Durban 2011 culminates at COP22 in Marrakech 2016.” The hope among international observers and Parties was therefore that Marrakech would mark the conclusion of the process, where “a decision would deliver the much-needed support to the sector, including elements of finance, technology, knowledge sharing, and capacity building” (Meadu *et al.*, 2016). Regrettably, Parties were unable to reach a decision in Marrakesh, mainly due to unsolved issues between developed and developing countries, on e.g. mitigation in agriculture and trade in agricultural commodities. Talks on adaptation in agriculture ended more successful, and the PA now stipulates that the Adaptation Committee and the LDC Expert Group should seek to develop methodologies to be used for assessing the adaptation needs of countries. Discussions at COP22 further produced guidance on “the character and minimum information for the adaptation component of Nationally Determined Contributions” (Bhushan and Rattani, 2017).

Many of the actors involved in the process, especially NGOs and researchers, hope that a conclusion on agriculture can be reached at SBSTA in Bonn in May 2017. In the absence of a decision, agriculture as a sector within UNFCCC will be dealt with under different areas, including the Nairobi Work Programme (NWP), the Cancun Adaptation Framework, finance mechanism, gender, and the technology mechanism.

However, the disagreement on how to deal with agriculture within the UNFCCC process need not affect the work on agriculture climate change initiatives greatly. While the current discussion points on level of ambition, e.g. how to report and account for agriculture and land use change, the need for mitigation in agriculture, and how to deal with trade in agricultural commodities, several channels for financial and technical support to the agricultural sector already exists. It is therefore vital that national policy makers use these channels to further the work on agriculture domestically and on the ground, in the absence of a decision within the UNFCCC process.

3.1.1 *Agriculture initiatives at COP22 in Marrakech*

The Marrakesh “COP of Action” had a focus on agriculture and a number of relevant newer initiatives on agriculture was discussed. Specifically, the “quatre pour mil” or “4 per 1000” (Box 14), which was launched by the French government at COP21, drew large support from several Parties. As did the AAA initiative, which was officially launched at COP22.

The AAA initiative aims to reduce the vulnerability of Africa and its agriculture to climate change. Specifically it will do so by directing funding, resources and attention to the need for adaptation in African agriculture. AAA is built around two themes (AAA Initiative, 2016):

- Advocacy to secure financing for projects of agricultural adaptation in African countries.
- Promotion of innovative solutions to respond to Africa's top priority needs.

The AAA initiative seeks to implement specific projects the goal of which are to improve soil management, agricultural water control, and climate risk management, increase capacity building and identify funding solutions. To date, the initiative is actively supported by 25 African countries, the UNFCCC, and the FAO.⁷

The "4 per 1000" addresses the importance of carbon sinks, the four referring to the need to increase soil carbon by four per mille (or 0.4 percent) to increase carbon sequestration and reduce the risk of climate change. The need to increase carbon sequestration (in soil, biomass, and elsewhere) is directly referred to in the PA. The text states the need "to undertake rapid reduction thereafter in accordance with best available science, so as to achieve a balance between anthropogenic emissions by sources and removals by sinks in the second half of this century" (PA, 2015; Article 4; para 1). Given the focus on the "4 per 1000" initiative at COP22, the initiative is presented in more detail in Box 14, and the strengths and opportunities in this recent initiative are highlighted.

Box 14. 4 per 1000 Initiative

The "4 per 1000" initiative was launched by France at COP21 (in Paris) and aims to demonstrate how agriculture, and soils in particular, can play a crucial role in mitigation climate change through carbon sequestration, as well to adapt and improve productivity and nutrient intake (ClimateAction, 2016). The "4 per 1000" means a "4‰ annual growth rate of the soil carbon stock would make it possible to stop the present increase in atmospheric CO₂" (4 per 1000, 2017). "This means to increase the amount of CO₂ captured by the soil by four gram per kilo in the soil" (euractiv, 2015). The purpose is to engage different stakeholders in a transition towards sustainable agricultural production and development, where stakeholder voluntarily commits with action plans that maintain and enhance soil carbon stock and sustainable development. It is the course of action that stakeholders should implement training programmes for farmers and agricultural advisors that aim to enhance carbon in agricultural soils, to give financial support to carbon sequestration development projects, and to develop policies that promote sustainable management of soils. Actions committed by the initiative's partners are shared on the NAZCA portal – an online platform available for the public, and makes it possible to share knowledge, practices and experiences (UNFCCC, 2017b). Finland is an example of a country that has signed the initiative, and has already showcased pilot testing projects on ground, such as a network of nutrient and energy-effective colleges and school farms, including biogas, composting and organic fertilisers (ClimateAction, 2016).

⁷ For more information, see <http://www.aaainitiative.org/>

3.2 Roundtable discussion

As part of the preparation of this report, a high-level roundtable on agriculture and climate change was hosted by NOAK at COP22 in Marrakech. The roundtable included two Ministers, H.E. Luis Felipe Arauz-Cavallini, Minister of Agriculture and Livestock, Costa Rica, and H.E. Kimmo Tiilikainen, Minister for Agriculture and the Environment, Finland. Also three senior experts participated; Ms Anette Friis, Head of Program Coordination at CCAFS, Mrs Margarita Astralaga, Director of the Environment and Climate Division at the International Fund for Agricultural Development, and Ms Fhumulani Mashau, Projects Officer at the Southern African Confederation of Agricultural Unions (SACAU). The event was moderated by Dr Tony Simons, Director General of the World Agroforestry Centre (ICRAF). The roundtable was live streamed (see also Minchew, 2016 for a summary of the event).

The Roundtable debate centred on the agricultural sector and initiatives linked to agriculture and climate change. This included the role of INDCs, and the role of multilateral and bilateral donors, as well as the role financial institutions will play in mainstreaming climate change into agriculture investments. Especially these institutions' support to agricultural initiatives that can help address climate change mitigation and adaptation needs, in particular smallholder farmers, was seen as crucial. In this regard, the understanding and importance of the (I)NDCs to farmers on-ground was highlighted as a means to explore the role of local stakeholders in realising agricultural initiatives.

The main findings from the Roundtable were that:

- *The INDCs have become like a roadmap for steering the investments in the right direction:* All donors and financial institutions investing in achieving activities found in (I)NDCs have a responsibility to ensure – together with the INDC country in question – that those (I)NDC commitments are in fact implementable, and that the money is being distributed down to local communities.
- *Investments should account for climate change:* While a great amount of financial institutions are present in the developing world and are making important investments in for example in development issues and agriculture, it is vital that such investments take into consideration climate change. Such investments that considers climate change and its impacts make good business sense in order to design a sustainable business strategy. IFAD have made a commitment that by December 2018 all its new lending will take account for climate change impacts. A suggestion was provided that all multilateral and bilateral institutions make this a requirement.
- *Inclusion of local stakeholders in designing and carrying out agriculture and climate change initiatives:* Farmers are no strangers to the challenges of climate change. Therefore, including them as stakeholders in the design of initiatives will ensure that activities are in the best interest of those who will ultimately have to carry out the activities. In order for this to succeed, it is necessary that there is a common

understanding of the challenges of climate change and agriculture. Further, experts and non-local stakeholders need to speak in a language that farmers can readily identify with.

- *Investment in climate-smart agriculture and sustainability practices should be seen as an opportunity, not an obstacle:* Leaders should work towards designing and implementing climate-smart agriculture, and include a whole system approach in order to understand the interactions in the agricultural systems, including potential synergies and trade-offs and make actions more effective. By now, only about 3% of global climate funds are allocated towards agriculture (as found in WB, 2013). Therefore, it is important that leaders and institutions work to make climate-smart agriculture a good investment for banks and investing agencies, so that investments in sustainability is a business opportunity and not an obstacle to development.
- *Learning from on-the-ground projects:* It is important to learn and share knowledge on best agricultural practices (and areas for improvements) on-the-ground, and to ensure that such learnings are fed into research again. In that way, learnings about successes can be scaled up and risks reduced, thus enhancing farmer's adaptive capacity and agricultural production.
- *Monitoring progress and alignment with NDCs:* This is especially important since verification is challenging in the PA, as there is no binding or streamlined requirements or guidance for countries on how to do this. However, the transparency framework aims to ensure that this actually take place. Nonetheless, initiatives, INDCs, and finance should be aligned with each other to ensure that money is spent where the INDC indicate the challenges are and using initiatives that actually have an impact on the ground.⁸

The above findings and the COP22 agricultural context have been taken forward and contribute to the analysis of best practices.

⁸ This was explored in section 4.3 and illustrated in the Venn-diagram showed in this section.

4. Best practices and areas for improvements

To break down the results of the SWOT-analysis and align this with the various initiatives identified, best practices (S and O) and areas for improvements (W and T) were identified. The purpose of this task is to analyse how best practice elements within promising agriculture climate change initiatives (as identified in the previous section) can be further developed to address climate action overall and replicated in other regions of the world. Following an initial assessment of best practices and areas of improvements across four regions (SEA, SA, LA, and SSA), including identification of local best practices not identified in the SWOT-analysis above, opportunities and barriers for implementing best practices are identified. Building on this analysis, an assessment of how these initiatives can be utilized to meet national objectives for agriculture and climate change and contribute to goals and objectives set out in the INDCs is presented.

Best practices are understood as design elements of the initiatives, which contribute positively to the success and impact of the initiative, or external factors, which positively affect the initiative. This could be features related to stakeholder engagement, capacity building, governance and management structure, monitoring and verification set-up, funding schemes (both for the initiative as such and for eventual recipients benefiting from the initiative, if any), assessment of impacts, and other elements affecting how initiative operate.

Areas for improvements are here understood as design elements of the initiatives, which contribute negatively to the success and impact of the initiative, or external factors, which negatively affect the initiative. The features resemble those mentioned for best practices above.

4.1 Identification of best practices and areas of improvement by regional experts

4.1.1 *Regional analysis*

Following identification of best practices and areas for improvements in the SWOT-analysis, regional representatives of the CGIAR network, which work with various agricultural initiatives in their region of expertise, were asked to identify three aspects related to the SWOT for their respective region. CGIAR is a global research partnership on agricultural topics, dedicated to reducing poverty, enhancing food and nutrition security, and improving natural resources and ecosystem services. Its research is carried

out by 15 CGIAR centres in close collaboration with hundreds of partners, including national and regional research institutes, civil society organizations, academia, development organizations and the private sector. The following items were identified by the experts:

- The three most common best practices and areas for improvements in their region, as identified in the SWOT.
- The presence of any best practices in their region not identified by the SWOT.
- The three most common opportunities and barriers for implementation of the best practices in their region.

The results of their assessment are shown in Table 3.

Table 3: Identification of most prominent best practices (S and O) and areas for improvements (W and T) in the four regions, as well as identification of any best practices not covered by the SWOT-analysis

Region	Best Practices (S and O)	Areas for improvements (W and T)	Best practices not identified in SWOT-analysis
Southeast Asia	<ul style="list-style-type: none"> - Work across agriculture and forestry for landscape-wide/ecosystem benefits. - Capacity building, e.g. through training of local professionals. - To develop tools and knowledge in a participatory manner with regional and national stakeholders. 	<ul style="list-style-type: none"> - Multiple projects undertaken without focus on synergies and co-benefits. - Focus on too many areas (e.g. food security, resilience, job creation, gender, climate change) dilutes potential for impact. - Has managed to mobilize one stakeholder (e.g. scientific community), but needs to establish ties to the rest (e.g. governments, international institutions, the private sector, and NGOs.). 	<ul style="list-style-type: none"> - Linking climate information/risks with CSA options at scale. - Providing innovative financing for community level initiatives for climate change A&M. - Evaluating co-benefits of CSA options.
South Asia	<ul style="list-style-type: none"> - Collaboration between partners/stakeholders for scaling out CSA approach. - Communication, engagement and capacity building of key stakeholders. - Linking adaptation and mitigation options with livelihood management opportunities. 	<ul style="list-style-type: none"> - Mainly external driven and funded and not in touch with local stakeholder needs and expectations. - Focus on too many areas (e.g. food security, resilience, job creation, gender, climate change) dilutes potential for impact. - Shortage of technical capacity. 	<ul style="list-style-type: none"> - Integration with existing policies rather than too much focus on developing new policy and institutions. - Linking science to practice.
Latin America	<ul style="list-style-type: none"> - To develop tools and knowledge in a participatory manner with regional and national stakeholders. - Capacity building, e.g. through training of local professionals. - Involve local stakeholders. 	<ul style="list-style-type: none"> - Limited and unpredictable funding. - Cannot set the policy or research agenda in country/region; subject to political winds of change. - Multiple projects undertaken without focus on synergies and co-benefits. 	<ul style="list-style-type: none"> - Promote and facilitate linkages across scales.
Sub-Saharan Africa	<ul style="list-style-type: none"> - Focus on both adaptation and mitigation, provides opportunities for synergies. - To develop tools and knowledge in a participatory manner with regional and national stakeholders. - Capacity building, e.g. through training of local professionals. 	<ul style="list-style-type: none"> - Has managed to mobilize one stakeholder (e.g. scientific community), but needs to establish ties to the rest (e.g. governments, international institutions, the private sector, and NGOs.). - Multiple projects undertaken without focus on synergies and co-benefits. - Shortage of technical capacity. 	<ul style="list-style-type: none"> - In view of the many challenges faced by actors on the ground, good leadership is needed to ensure result-based management and implementation of projects.

4.1.2 Additional best practices not identified in SWOT

Although the SWOT-analysis of the various initiatives had identified a number of best practices and areas for improvements, the local experts were asked to identify whether any best practices observed in their region had not been included in the analysis. The identification of best practices not found in SWOT has been linked to the four elements contained in the SWOT-analysis (Knowledge sharing and capacity building, Initiative design, financial backing, and Synergies).

Knowledge sharing and capacity building

A best practice, which can be classified as an opportunity within the SWOT-framework, is to link science to practice, i.e. to ensure that science informs the practices that take place on the ground, and vice versa. This element was also noted by Ms Annette Friis of CCAFS at the COP22 roundtable, who pointed to the importance of learning from pilot projects (on the ground) and to ensure that results from on-ground project will be fed back into research again. Thus could for example be projects related to climate-smart villages.

Initiative design

As concerns initiative design, experts noted that initiatives should focus on integration with existing policies rather than focusing too much on developing new policies and institutions. As such, it can be seen as a strength when an initiative align with an existing policy, and can potentially also increase the political backing of the initiative.

The African experts noted that in view of the many challenges faced by actors on the ground, good leadership is needed to ensure result-based management and implementation of projects. This aligns with the strength previously identified that initiatives that had clear goals and objectives were more successful.

Financial Backing

In line with innovative funding mechanisms as an opportunity for increased project success, experts note the need to provide innovative financing for community level initiatives for climate change adaptation and mitigation. The key element here is to ensure that the funding becomes available at community level, as was showcased by e.g. the R4 initiative (Box 12).

Synergies

A number of best practices to facilitate synergies were identified by the experts. Two of these included links to CSA, with one best practice focusing on evaluating the co-benefits of CSA options, while the other was to link climate information and climate risks with CSA options at scale, i.e. to identify how CSA can contribute to large-scale provision of climate information to reduce risks. The element of scale was also highlighted by the Latin American experts who noted that promoting and facilitating linkages across scales provided opportunities for increased project success. This is the case, as most governments are challenged by linking national initiatives with actions on the ground. From national to local scale, decision makers are usually focused on their own context. Thus, with a holistic approach, this is an area where initiatives have the opportunity to contribute by linking on ground science to national decision-making processes.

4.2 Best Practices

Best practices can contribute to initiative success and ensure that it has sufficient positive impact, depending on the type of strength or opportunity present, and should be sought, improved or replicated if scaling-up or implementing elsewhere.

The best practices identified as being most prevalent across the regions vary to some extent between the regions. However, it is worth noting that all regions mention “capacity building” and SEA, LA, and SSA all mention “participatory development of tools and knowledge” among the most important best practices, making these two best practices the most often observed. The remaining best practices are mentioned only once by one of the regions.

4.2.1 *Capacity building*

Capacity building, e.g. through training of local professionals, is mentioned by SEA, LA, and SSA. The Latin American experts note that, in LA, stakeholders are usually eager to learn new things. Thus, capacity building becomes a useful tool to get partners and stakeholders involved and interested in the initiative. The more they perceive that the project is benefiting them in terms of capacity building, the more they would like to collaborate with it. Capacity building thus becomes a positive feedback circle, enabling future collaboration and growth. Capacity building can also be applied as a resource to increase the sustainability over time of the initiative. Once national or local stakeholders become experts, they feel empowered and therefore they are ready to take ownership of the initiatives, sometimes even with their own resources.

The Sub-Saharan experts add that capacity building of those who will lead the implementation of the projects or the initiative on the ground is crucial to the success of the initiative, given that most local professionals regularly lack capacity for new and emerging thematic areas, such as climate change and the mitigation and adaptation practices needed to deal with this new reality.

4.2.2 *Participatory approaches*

The development of tools and knowledge in a participatory manner with regional and national stakeholders is also mentioned by SEA, LA, and SSA. The Latin American experts note that institutions can be concerned about their mandates and thus want to make sure that nobody is “stepping on their toes”. This is why involvement with regional and national stakeholders from the very beginning of the project is key to success. The Sub-Saharan experts note that participatory development of tools and knowledge is a sound way to avoid all stakeholders doing business as usual.

Additionally, it should be added that the more involved these stakeholders are in a given initiative, the higher the chance the initiative has of having a positive impact for stakeholders. Stakeholders and partners should not perceive themselves as outsiders of the initiative, but on the contrary, they should see themselves as guiding the process. The latter includes elements such as defining research questions, discussing project

design and implementation, and making sure they are consulted throughout the phases of the initiative's projects and activities. If one can get that type of relation with regional and national stakeholders it is easier to scale initiatives happening at the local level and also it gives the initiative leader more authority to interact with local stakeholders. This means that it becomes easier to implement activities at the local level.

4.2.3 *Stakeholder engagement*

Engaging stakeholders is mentioned by both SA and LA, although in two variants: SA emphasizes the collaboration between partners to scale out the Climate Smart Village approaches, while LA highlights the need to involve local stakeholders. However, both practices showcase the need to work with the partners and stakeholders involved in the initiative to achieve better results. The Latin American experts note that, at the end, adoption of a given project or activity is made by farmers and other people working in the local reality. These people are often enabled by local stakeholders, especially in countries where national extension services are weak and NGOs and private sector are the ones engaging directly with them. Involvement with local stakeholders facilitates understanding of the specific context in terms of economic, social, political, and cultural issues and therefore makes scaling easier. Multi-stakeholder platforms can be effective mechanisms in planning and implementation of regional sustainable activities by providing space to identify issues raised by different stakeholders involved, sharing views and knowledge on such issues, and collectively come up with a solution (Manging *et al.* 2015).

4.2.4 *Synergies*

The need for thinking about synergies is mentioned by SEA, SA, and SSA, although in three different versions. Southeast Asian experts highlight working across agriculture and forestry for landscape-wide and ecosystem benefits as a key synergy, which is in line with practices such as agroforestry and agroecology, where agricultural practices are seen in a larger ecosystem or landscape perspective. This perspective was also highlighted by the Costa Rican Minister of Agriculture, H.E. Arauz-Cavallini, at COP22, where he highlighted the importance of a whole-system approach in order to understand the interactions in the agriculture system. The South Asian experts mention the option to link adaptation and mitigation options for increased livelihood management opportunities, while Sub-Saharan African experts note that a focus on adaptation and mitigation provide opportunities for synergies, adding that given that most African countries focus on adaptation, building synergies will allow including mitigation as adaptation co-benefits.

4.3 Areas for improvement

Areas for improvements can act as a barrier to success and impact, depending on the type of threat, and should be avoided if scaling-up and replicating the initiative. For example, one initiative has managed to mobilise the scientific community, but has not (yet) established ties to the government, international institutions, the private sector or NGOs. Thus, there is a risk that not all stakeholders are duly consulted and involved, meaning that project impact can be limited. Furthermore, some initiatives primarily focus on adaptation with the risk that potential adaptation and mitigation synergies are being lost. Other initiatives are being driven by external finance, which may limit work with local stakeholder needs and capacities, as mentioned by above. Such pitfalls may potentially fail to sustain a long-term sustainability of the initiative.

Areas for improvements most commonly identified across regions is the tendency to undertake multiple projects at once without focus on synergies and co-benefits. This potential pitfall is mentioned by SEA, LA, and SSA. Three other practices, one of which is related to the most common practice, namely the tendency to focus on too many areas, thus diluting project impact, is mentioned by two regions. The various areas for improvements are discussed in the following.

4.3.1 *Initiative design*

The most commonly identified area for improvement is to undertake multiple projects without focus on synergies and co-benefits. The Latin American experts note that countries tend to implement projects, which sometimes are linked to other projects thematically and even geographically, but can remain unknown for the involved stakeholders. They further note that in some of the cases, the government does not articulate actions occurring in their territory. The international cooperation and research institutes are not always coordinated either, losing golden opportunities to achieve impact and wasting resources that could have been spent in a more efficient manner if collaboration and synergies had been sought. Along the same lines, SEA and SA note that initiatives sometime focus on too many areas (e.g. food security, resilience, job creation, gender, climate change, etc.), which can dilute the potential for impact. Sub-Saharan African experts note that sometimes stakeholders implementing the initiatives disperse their energy between many projects and initiatives, meaning they cannot keep focus on the expected results of the given initiative. Further, such approaches risk losing focus on the beneficiaries, who are sometimes lost with many initiatives and projects with similar interventions and objectives being undertaken at once.

South Asian and Sub-Saharan African experts mention the shortage of technical capacity as a common challenge. The SSA experts note that the weak competency to handle technical tasks could be instrumental to implementation failure, which seems the case for various actors. That technical knowledge is critical to initiative success was also highlighted by the Costa Rican Minister of Agriculture, H.E. Arauz-Cavallini, at the COP22 roundtable where he pointed to the importance of knowledge-sharing, partly in relation to CSA, and the need to scale up successful practices.

4.3.2 Stakeholder Engagement

The most common area for improvement identified across regions is when initiatives have managed to mobilize one stakeholder (e.g. the scientific community), but needs to establish ties to the rest (e.g. governments, international institutions, the private sector, and NGOs.). This is noted by the Southeast Asian and Sub-Saharan experts, who note that the need to include all project stakeholders should be a priority requirement for all initiatives, as this can help install a spirit of interactions among stakeholders, which can foster coalescence of efforts and increase the chance of common success. Latin American experts note that the failure of not being able to set the policy or research agenda in their region is a common area for improvement, meaning they become subject to political winds of change. The LA experts furthermore note that this lack of policy agenda setting is not found in all cases, but some countries have high volatility regarding political issues, several changes in ministries staff, and priorities changing according to political perspectives. The latter can definitely pause relevant processes with national institutions as key partners. This is in some cases an outcome of not having engaged sufficiently with the relevant government stakeholders at national or regional level, and can be seen as a similar failure to engage stakeholders to the degree required, which is thus found in three out of four regions.

4.3.3 Financial Backing

Interestingly, only LA cite limited and unpredictable funding as common areas for improvement, although South Asian experts do note that externally driven and funded projects not in touch with local stakeholder needs and expectations is a common area for improvement. The Latin American experts note the peculiarity of the region finding itself in a situation, where levels of vulnerability are increasing, but funding opportunities are decreasing, in part due to the low impact potential of climate change as assessed by donors, the perception of improvements in the regional economy (although this is not necessarily the case for agriculture), and to social and environmental aspects.

5. Opportunities and barriers

5.1 Methodology and Purpose

The purpose of this section is to identify barriers and opportunities, including technical, financial or political, for implementation and replication of promising initiatives or best practice elements thereof. Further, ways to address the identified barriers and challenges are proposed. This will help in the development of recommendations to policy makers, researchers, international organizations, and other stakeholders. The analysis in the following is based on the SWOT-assessment above, needs expressed in (I)NDCs, and an identification of the most common opportunities and barriers for implementation of best practices expressed by the regional experts in the four developing regions assessed in this report (SSA, SA, SEA, and LA). Finally, the analysis is complemented with the findings from the discussions that took place at the Ministerial Roundtable meeting, as well as findings from literature.

5.2 Identification of barriers and opportunities by regional experts

In order to complement analysis of initiatives and information found in literature, regional experts were asked to identify the three most common opportunities and barriers for implementation of the best practices in their region. This assessment was based on the SWOT-analysis, and the results of this survey are expressed in the table below (Table 4).

Table 4: Opportunities and barriers for implementing best practice elements in the four regions analysed

Region	Opportunities	Barriers
Southeast Asia	<ul style="list-style-type: none"> - Presence of agriculture development investment loans or grants. - Achieving synergies with NDCs and national programs on climate change adaptation and GHG mitigation in agriculture. - Accessing finance through UNFCCC linked financing facilities (GCF, GEF, etc.). 	<ul style="list-style-type: none"> - Restrictions on the use of investment loans (e.g. can only be used for R&D, or soft components). - Too "technical" solutions (neglects social preparation and mobilization). - Upscaling challenges (failure to consider the wider requirements of upscaling).
South Asia	<ul style="list-style-type: none"> - High crop yield gap and low use of technical inputs (potential for improvement). - Addressing the large policy gaps in relation to CSA through policy support and guidance. - Growing investment in agriculture and ICT from the private sector. 	<ul style="list-style-type: none"> - Less coordination among the stakeholders (ministries, departments and other organizations) - Large number of smallholders and low investment capacity among these. - Weak linkages between policy design and implementation in the field.
Latin America	<ul style="list-style-type: none"> - Political will especially in Central America regarding CSA approach is a prominent opportunity to start implementing CSA portfolios in Central American countries. - Significant interest and empowerment of local communities participating in agriculture initiatives is a great opportunity for farmer to farmer learning and therefore to scale out e.g. the CSA approach. - Due to lack of technical capacity in identifying synergies and linkages across scales, capacity building around these processes are an opportunity. 	<ul style="list-style-type: none"> - Decreasing interest in funding initiatives in the region by traditional donors. - Cultural barriers to implement new systems (for example in the livestock sector) that are more efficient and that at the same time reduce GHG emissions. - Lack of political stability in the region which makes more difficult to engage in long term processes required to generate impact.
Sub-Saharan Africa	<ul style="list-style-type: none"> - Strong experience in project management. - Policies facilitating speedy decision making and approval of project operations/engagements. - Quick disposal of funds by implementers. 	<ul style="list-style-type: none"> - Shortage of local technical knowledge on climate change as related to agriculture leading sometime to weak contextualisation of the project. - Bureaucracy in project operations. - Overestimation of project impact vis-à-vis beneficiaries priority needs.

Across regions, a number of opportunities for further development and replication of best practice elements in agriculture and climate change initiatives were identified by experts. These revolve around financial support for initiatives, the policy environment in which the initiatives are developed, the technical knowledge held by those operating or implementing the initiatives, and the design of the initiatives and projects. Some of the opportunities are so-called "negative opportunities," i.e. opportunities caused by the current situation lacking something and thus providing room for improvement, while other are "positive opportunities," i.e. opportunities caused by strong foundations established by the current situation.

5.3 Barriers for implementation of successful agriculture climate change initiatives

Across regions, a number of barriers for further development and replication of best practice elements in agriculture climate change initiatives were identified by local experts. These barriers revolve around financial backing of initiatives, technical capacity or lack thereof, design of the initiatives, and, most prevalently, the policy support and political situation.

5.3.1 *Technical capacity*

The technical barrier identified by the SSA experts relates to shortage of technical knowledge among local stakeholders on climate change and agriculture, which can lead to difficult project implementation on the ground and weak contextualization of the project. Related to this, the SEA expert note that initiatives and projects are sometimes too technical and based on technical solutions exclusively, neglecting social aspects and mobilization of support among local stakeholders and the social and economic reality faced by these people. Examples of such limited technical capacity was explicitly mentioned by several SSA INDCs, such as Chad, The Gambia, Guinea-Bissau, Madagascar, and Zimbabwe. For example, The Gambia expresses that in order to achieve their intended contributions, such as implementing climate monitoring and forecasting systems, and development of drought tolerant crops, technology transfer and capacity building are required.

Limited capacity (technical or otherwise) to implement and manage agriculture climate change initiatives can act as a barrier to the setting up and scaling up of the initiatives, which are necessary to reduce the impact of climate change or meet the needs identified in the INDCs or NDCs. Along these lines, the INDC of Madagascar states that an “effective implementation of Madagascar’s contributions requires the reinforcement of the national capacities (technical, institutional, mobilisation and absorption of funding) and transfer of technology and research from developed countries, as well as the contributions of countries and other stakeholders that are actively involved in the fight against climate change” (UNFCCC INDC Madagascar, 2015). As such, transfer of technology and finance will be necessary to overcome the lack of capacity experienced by many (African) countries, and successfully implement or scale up agriculture climate change initiatives.

5.3.2 *Initiative design*

Although financial backing is increasing and new funding opportunities have arisen, experts point out that a large number of small-scale farmers exist across the developing countries, who have low investment capacity, and the projects might not have sufficient means to reach the amount of beneficiaries needed or intended. Along the same lines, SSA experts note that project impacts vis-à-vis beneficiaries’ priorities and

needs are sometimes overestimated meaning that the goal of the initiative is not aligned with the reality of what is needed on the ground.

An unsurprising barrier is the presence of bureaucracy in the project operation, which can slow or hinder project progress or action on the ground. A related barrier is the difficulty of scaling-up the initiative or projects within this, possibly because of failure to consider the wider requirements involved in scaling-up, which goes beyond financial means.

5.3.3 *Policy support*

Among the most important barriers is the political climate and commitment to agriculture climate change initiatives. As the African regions suffers from a number of interlinked challenges, such as poverty, food insecurity, overexploitation of natural resources, and political instability, climate change poses an additional element to enhance and ensure economic development. Such challenges limits farmers, communities and governments adaptive capacity to climate change, hence making them increasingly vulnerable to future shocks (FAO 2017a). Lack of political stability in a country or region is naturally an impediment to implementation of agriculture and climate change initiatives, as it makes it more difficult to engage in the long term processes that are often required to generate impact. In this regard, it is especially important for countries in the SSA region to clearly review and exert agricultural efforts in order to enhance economic development and fulfil their political commitments and declarations into effective programmes on ground.

Thus, to implement and scale initiatives, various stakeholders, political and non-political alike, must coordinate their efforts. As such, reduced coordination or complete lack of coordination between political stakeholders (ministries, departments, agencies) and other organizations (NGOs, farmers' representatives, cultural organizations, donors, etc.) act as a barrier to successfully implementing or scaling initiatives. For example, the INDC of the Central African Republic (CAR) identifies lack of synergy between sectoral policies and institutions as a barrier to be overcome in their INDCs (UNFCCC INDC CAR, 2015). Further, Chad mentions that limited climate change governance, as well as poor integration of climate change related policies into national and sectoral policies acts as a barrier for realising the intended contributions (UNFCCC INDC Chad, 2015). The INDC of Zimbabwe mentions that "incoherent institutional frameworks (policies) to coordinate disaster risk reduction" is a barrier for building resilience in managing climate change, such as drought and floods (UNFCCC INDC Zimbabwe, 2015). Following up on the needs expressed in INDCs, a reiteration of the request by FAO (2017) for African countries to review political efforts "to improve the translation of political commitments and declarations into effective programmes on the ground" seem poignant. Particularly in the context of the ambitious targets set in the Malabo Declaration for 2025 and the Sustainable Development Agenda for 2030.

As also mentioned in the SWOT-analysis, coordination is also necessary between research and action on the ground. The South Asian expert highlight weak linkages between policy design and implementation in the field as a key barrier. This can involve

lack of communication between stakeholders (e.g. new solutions or approaches, such as CSA, not reaching beneficiaries on the ground), or culturally created barriers, e.g. reluctance to accept new or improved systems, which are more efficient and at the same time reduce GHG emissions, but do not align with how things are traditionally done. For example, Zimbabwe states that a fragmented implementation of climate smart strategies works as a barrier for increasing the effectivity of such promising agricultural practices (UNFCCC INDC Zimbabwe, 2015).

Finally, increased collaboration between those regions experiencing the same challenges is needed. Such collaboration is necessary on various levels, from initiatives in e.g. India and Kenya working together to national governments working with and supporting efforts in regions similar to theirs. As Mrs Margarita Astralaga of IFAD noted, a key question in this regard is: “How are we to ensure the south-south cooperation, which is necessary to learn from innovations and approaches and scale up successful practices and initiatives?”

5.3.4 Financial backing

Although funds are increasing in certain areas, experts note that there seems to be a decreasing interest in funding initiatives in the region by traditional donors, at least in the case of LA. Such funding could be through Official Development Assistance (ODA), which is decreasing in some countries in LA due to the increased economic performance of countries in the region; a similar situation could likely be expected in SEA, whose countries have also experience increased economic performance in recent years.

Restrictions on how the funds should be spent can also act as a barrier to initiative implementation. For instance, donors might place restrictions on certain amounts, only allowing these to be used for research and development (R&D) and thus not allowing use of these funds for direct support to farmers to invest in new agricultural tools or practices. While not necessarily negative, it potentially restricts the operations of initiatives. Related to this, H.E. Arauz-Cavallini, the Costa Rican Minister of Agriculture, noted at the roundtable at COP22 that it is important global leaders and politicians work to make financing agriculture climate change initiatives and related approaches, such as CSA, a good investment for national banks and investing agencies. As he said: Investing in sustainability “should be seen as an opportunity as opposed to an obstacle.”

Misalignment between the available finance in the initiatives and in the INDCs seems to be a barrier. Based on the analysis presented here, some of the initiatives seem to have secured sufficient financial backing, often from multiple donors and funding institutions. However, the INDCs highlights the need for finance in order to achieve their intended contributions. For example, Guinea-Bissau explicitly states that shortage of finance, weak financial capacity by the state and research institutions, as well as weak resource mobilisation and accessing to fund programs and adaptation strategies are one of the greatest barriers in realising their climate change contributions (UNFCCC INDC Guinea-Bissau, 2015). CAR states that “the government’s insufficient capacity does not permit it to cover by itself the costs of implementing the INDCs” (UNFCCC INDC CAR, 2015). Further, Chad mention that not only is there insufficient

international funding, but that it is a failure to consider climate change in the general State budget (UNFCCC INDC Chad, 2015). Thus, it seems that while some (international) initiatives can secure sufficient funds, many national governments (and thus national initiatives) – especially in Africa – lack the financial means to implement their INDCs and the projects set out in these.

Currently, the allocation of climate change finance presents a barrier to implementing more (and more successful) agriculture climate change initiatives. Current climate change finance is heavily skewed towards mitigation, which receives around 90% of total support. Within mitigation finance, renewable energy and energy efficiency receives more than 90% of total flows, with agriculture receiving only 6 billion USD out of the total 302 billion USD allocated to mitigation (Rosenberg *et al.*, 2014). Only 25 billion USD are allocated to adaptation practices, and although a larger percentage of adaptation finance is allocated to land use and agriculture than is the case for mitigation, total flows are in the order of 2–3 billion USD (Rosenberg *et al.*, 2014). This presents a very large problem for those regions, especially SSA, which are expected to be adversely affected by climate change and unable to bear the costs of adaptation; these are estimated between 20 to 30 billion USD per year until 2030, according to the African Development Bank (Meadu, 2016). As part of the UNFCCC process, Parties have promised 20 billion USD per year to the Green Climate Fund by 2020; to date, USD 10.3 billion has been pledged and 1.2 billion committed – this is far short of the total ambition and risk creating “a serious gap for developing countries that want take action but lack the resources.” (Meadu, 2016). Therefore, it is even more vital that the evidence presented by Vermeulen and others (see e.g. Vermeulen *et al.*, 2016a; 2016b) that investments in agriculture and climate change deliver positive returns is brought to the attention of policy makers. Such evidence might help countries mobilise increased financial backing from a broader range of sources.

About 4 billion USD are allocated to both mitigation and adaptation, but no indication of allocation to land use and agriculture is made. The numbers are about two years old, but figures are unlikely to have shifted fundamentally since then, despite the importance of finance and of agriculture at COP21 and COP22. This means that agriculture, especially adaptation practices, are heavily underfunded within climate change finance flows, especially given the importance of the sector for climate change mitigation and adaptation overall. The need for investment (including various innovative sources of funding) is also highlighted by FAO (2017b). While the PA marks tremendous progress in climate action, the current political climate lends a certain amount of uncertainty to its implementation, and indeed the mobilization of committed financial resources.

5.4 Opportunities for improvement and replication of agriculture climate change initiatives

Following from the identification of barriers and opportunities by regional expert, findings from the assessment of agriculture climate change initiatives, statements from the COP22 roundtable, and literature on the topic, opportunities (section 6.3) and barriers (section 6.2) are identified in the following.

5.4.1 Financial backing

Three of the four regions, the exception being LA, mention opportunities related to finance for replication of best practice elements in agriculture climate change initiatives. Southeast Asian experts note that several opportunities for agriculture development investment loans or grants exists, further noting that a number of financing facilities, such as the Green Climate Fund⁹ and the Global Environment Facility¹⁰, are available within or linked to the UNFCCC process. The need to disburse financial means was also emphasized in the PA, where it was highlighted that “developed country Parties shall provide financial resources to assist developing country Parties with respect to both mitigation and adaptation in continuation of their existing obligations under the Convention” (Art. 9, sub. 1). This means that it can be assumed that if Parties keep their pledges within the PA, increased financial means will be made available in the coming years.

Adding to the public finance provided through UNFCCC channels and as part of ODA, South Asian experts also note that growing investments in agriculture and ICT are mobilised by the private sector, providing opportunities for new initiatives and further development of existing ones. The Sub-Saharan African experts note that, adding to the increased availability of funds, implementers are quick to dispose of these, meaning that the time from plan to action on the ground can be shortened.

It must also be mentioned that investments in agriculture climate change projects and activities is not only socially and environmentally a good investment, it also makes sense from a financial perspective. Sonja Vermeulen, Head of Research at CCAFS, makes the case that “globally there is a strong economic case to invest in agriculture for future food security and rural livelihoods under climate change” (Meadu, 2016). Further, “at the farm level, positive economic returns can be demonstrated for practices that build adaptive capacity and reduce emissions intensity across several of the priority sub-sectors highlighted in the NDCs” (Vermeulen *et al.*, 2016). Such positive returns highlight the need to invest in agriculture and the huge opportunity that this provides.

Further, various innovative sources of funding should be explored. For example, in order to scale-up agriculture and food security programmes in SSA, FAO (2017) recommend development of innovative resource mobilization from a broad set of

⁹ The GCF was established as part of the 2010 Cancun Agreements. For more information, see <http://www.greenclimate.fund/home>

¹⁰ See <https://www.thegef.org/>

public and private sector actors. Specifically, this could be cash transfer to farmers, as has been explored by FAO,¹¹ which was, among other things, found to increase the use of seeds, fertilizers and hired labour.

5.4.2 Policy support

Policy support for agriculture and climate change is also a prominent opportunity mentioned by all of the regional experts. The policy gaps in relation to CSA has been highlighted by experts, meaning that ample opportunities to improve the current gaps can be identified, given that political will and finance exists. In LA, experts mention the political will, especially in Central America, regarding the CSA approach as a prominent opportunity to start implementing CSA across the region. That this topic is important is also highlighted by the fact that the Costa Rican Minister of Agriculture, H.E. Arauz-Cavallini, continuously emphasized the importance of CSA at the COP22 roundtable, noting that “world leaders should work towards implantation of climate-smart agriculture.”

On a more practical level, the presence of policies that facilitate speedy decision-making and approval of projects, activities, engagement, and other operations was noted by the Sub-Saharan African expert. This relate to the quick disbursement of funds and show that ease of work and minimizing bureaucracy is important and opportunities exists in these areas to scale best practices. The presence of a new and improved policy environment is also noted in a report by FAO on food security in Africa, who find that “an increased number of comprehensive social protection policy frameworks and institutional arrangements have been introduced in the region to integrate nutrition and agriculture.” Although not directly linked to climate change, but to the topic of food security, which is of immediate concern in Africa. However, FAO nonetheless note, in line with the SWOT-analysis in this report, that “countries are encouraged to adopt multi-sectoral and multidisciplinary approaches in integrating agriculture, nutrition, social protection and related measures by realigning, integrating and coordinating activities and accountability mechanisms to deliver evidence-based sustainable nutrition solutions and outcomes” (FAO, 2017a).

Last, but not least, and hugely important in this context, the Latin American expert noted the presence of NDCs, National Adaptation Programmes of Action (NAPAs), and National Appropriate Mitigation Actions (NAMAs) as opportunities for improving, scaling-up or creating new initiatives, as these policy documents provide directions for climate adaptation and GHG mitigation in the agricultural sector.¹²

¹¹ See FAOs infographic on cash transfers: <http://www.fao.org/resources/infographics/infographics-details/en/c/452436/>

¹² The link between NDCs and agriculture climate change initiatives is further explored in the following section.

5.4.3 *Initiative design*

Only two opportunities related to initiative design are found by local experts, the first relating to the strong experience in project management by actors in the SSA region. This could be seen as a result of several years of initiative development in the region having consolidated the project management skills of the involved stakeholders. The Latin American experts note that there is significant interest and empowerment of local communities in participating in agriculture initiatives. This is a great opportunity for farmer-to-farmer learning, as well as farmer to researcher learning, and vice versa, and provides an avenue for information dissemination and knowledge sharing. The great interest in agriculture climate change initiatives is also an opportunity to scale-up various technical approaches, such as CSA or agroforestry.

Despite positive elements within some initiatives, e.g. the progress reports published by the R4 Rural Resilience initiatives, there is room to improve the design of initiatives. Facilitating cooperation between initiatives could be an effective way to do this. In this regard, international platforms are particularly relevant as they allow for cooperation across different regional and global initiatives and thus share best practice. This could also help increase South-South cooperation.

When looking at the initiatives, it becomes clear that the successful initiatives have clear goals and objectives, and ensure monitoring and verification of progress, goals, and activities. In this regard, an opportunity exist in implementing so-called SMART goals and objectives. SMART denote the need for ensuring that objectives are Simple (S), Measurable (M), Accurate (A), Reliable (R) and Time-bound (T).

5.4.4 *Technical capacity*

A negative opportunity is mentioned by the South Asian experts who note that across many developing country regions, a large yield gap exists. Further, farmers across the region show a low use of technical inputs, such as fertilizer and pesticides. This means that potentials for improvement of agricultural production exists across many regions, which can better food security, and, if combined with CSA-approaches, increase the resilience of the sector.

Another negative opportunity is caused by the lack of technical capacity in identifying synergies and linkages across scales, which means that opportunities exists to increase capacity building around these processes to ensure that technical capacity can be generated at local levels to help identify such synergies.

Capacity building, training, continuous research and new solutions, as well as the development of tools and knowledge in participatory manner with regional and national stakeholders are opportunity elements that may increase project impacts and successes. The Costa Rican Minister of Agriculture points to the importance of knowledge-sharing and scaling up “smart” agricultural practices (e.g. CSA), as a means of doing so. In addition, initiatives reaching farmers on the ground enhances the local involvement, local knowledge and helps identify capacity needs. Ms Fhumulani Mashu, who stressed that farmers are no strangers to the challenges of climate change, highlighted this issue; thus, including them as stakeholders when designing initiatives

and programs will help ensure that policies are in the best interests of those, who will ultimately carry them out. In order to do so, it is important to ensure that the financial support is distributed widely, also reaching the communities. Mrs Astralaga of IFAD also expressed the need to ensure that the money given to initiatives and other actions “are really being distributed down to communities – that is, it must be ensured that this money goes to the smaller association of farmers and farmers working in remote areas.” Further, on-the-ground projects can help highlight workable solutions with opportunities to expand, scale up, and replicate pilot projects.

Along these lines, further access to technology is needed. As was demonstrated by the “Communicating seasonal forecasts to farmers in Senegal for better agricultural management” initiative, there is ample opportunity to increase and develop professional extension systems and the use of mobile phone and smart phone technology, and Internet-of-Things approaches to get access to data on soils, real-time weather forecasts, research information, crop information, financial transactions, and many other areas. Such information would increase productivity and could help accelerate progress in regions currently lacking such technological solutions (SDSN, 2013).

While not explicitly the focus of this report, the need to focus on gender issues is also a huge, currently untapped, opportunity. Female smallholders comprise about half the smallholders in SSA, but have access to fewer resources than men, and often face more challenges than their male counterparts (SDSN, 2013). Empowerment of women cuts across the entire agricultural supply chain, from equal access to land and input material to opportunities for small business development in the food sector. Empowering these women is a currently underutilized potential and an opportunity not to be missed.

Finally, an opportunity exists in building on the considerable experience in agriculture and climate change initiatives that exists across the regions. The initiatives analysed cover several topics, use a host of approaches, and focus on adaptation, mitigation or both. The experiences gained by these initiatives can be used to scale up the effort on agriculture and climate change, building on the best practices identified here.

5.4.5 Synergies

Generating synergies in agricultural activities, and specifically linking climate change adaptation and mitigation activities is an area of opportunity. Synergy opportunities were mentioned by the Southeast Asian experts, who mentioned NDCs and national programs on climate adaptation and GHG mitigation in agriculture, thus hinting to the fact that INDCs and agriculture initiatives can be linked to each other – a topic which is explored in the coming chapters. Furthermore, the Latin American experts noted that political will regarding the CSA approach is a prominent opportunity to start implementing CSA portfolios in especially Central American Countries. CSA approaches are mentioned in several of the SSA INDCs, such as Botswana, the Central African Republic (CAR), Kenya, Madagascar, Namibia, Nigeria, Zimbabwe and Zambia. Several of these identified opportunities for synergies and co-benefits. For example, the INDC of Zambia identifies potential mitigation and adaptation synergies in their

priority actions, and the use of promising agricultural practices, such as CSA and agroforestry (UNFCCC INDC Zambia, 2015). Similarly, CAR mentions agroecology practices, the aim of which is to improve the ecological and socioeconomic impact from agriculture (UNFCCC INDC CAR, 2015).

It also needs to be understood that “not every adaptation to climate change is a good one.” Adaptation to climate change must take into consideration the local needs and challenges, in order to ensure that “mal-adaptation” practices does not occur (Eriksen *et al.*, 2011). In line with the need to consider the local situation and needs, as stressed in this report, it must be recognized that adaptation strategies and measures need to be analysed and implemented at the appropriate scale and level, which must be duly identified. This is the case, as strategies or policies that seem successful or useful from one point of view, or for one set of stakeholders, may at the same time cause harm or decrease resource access to other stakeholders (Eriksen *et al.*, 2011; Chirambo, 2016). This could for instance be done by adhering to the principles of Sustainable Adaptation (Box 15) or by working to implement Community-based Adaptation (Box 16), which draws specifically on the knowledge and experiences with climate variability and change that are held by local communities, ensuring that adaptation is beneficial to them and meets their needs.

Box 15. Sustainable Adaptation Practices

The principles of sustainable adaptation practices, which should be considered when designing local adaptation practices are (Eriksen *et al.*, 2011):

- Recognize the context for vulnerability, including multiple stressors.
- Acknowledge that differing values and interests affect adaptation outcomes.
- Integrate local knowledge into adaptation responses.
- Consider potential feedbacks between local and global processes.

Box 16. Community-based Adaptation

Community-based Adaptation (CbA), like EbA, is not a sectoral approach or exclusively for agriculture. CbA can contribute to tackling climate change by drawing on knowledge and experiences of communities with climate viability and change. CbA is led by communities based on the communities’ priorities, needs, knowledge and capacities. This should empower them to plan for and cope with the impacts of climate change and adapt to living in a riskier and less predictable climate (Reid, 2015; Ayers & Forsyth, 2009). Thus, CbA operates at the local level with communities that are vulnerable to the impacts of climate change and builds on participation by the local community and stakeholders. It is a place-based and context specific approach. CbA has had success in attracting the interest of donors e.g. the World Bank, United Nations Development Programme (UNDP), UK Department for International Development, and Swedish International Development Cooperation Agency, which recognizes CbAs potential for building resilience and adaptive capacity. One issue with CbA is that the outcome can be difficult to assess, as the impact of its implementation should be measured in outcomes that did not happen e.g. crops not lost. Another challenge with CbA is the unclear distinction between CbA and community-based development, which is relevant for practitioners and funding bodies. A further important challenge with the CbA is that currently many projects only include

existing climate change and not projections of changes to come. IPCC scientists have stressed the importance of including climate models in CbA. In relation hereto, CbA can be criticised for not being able to sufficiently prevent some impacts from climate change on communities e.g. if atmospheric warming is not kept under two degrees Celsius, then some villages might have to be relocated. Thus, if CbA does not include detailed climate change information and communicate likely scenarios it might prevent necessary measures for adaptation. This can lead to a situation where strategic adaptation on a larger scale are further alienated from local communities which they impact because there is a lack of knowledge on the need for these programs, which in turn will make the cooperation with local communities problematic. This issue is referred to as the maladaptation, where there is a mismatch between expectations (Ayers & Forsyth, 2009). One example of the use of the CbA approach is in the Gaibandha district in northern Bangladesh, which floods every monsoon season. Practical Action, an international NGO, has worked with farmers in the district to identify ways for the farmers to produce food on the flooded land. They used community-led identification and prioritization of natural resource management options and technologies and action plans based on consultations, assessments of local needs, skills, assets and capacity. This led to the implementation of floating gardens in the community, which are used to grow vegetables. These provide food in periods of food shortage, an additional income or help for people who have lost their house or land to flooding.

6. Integration of initiatives, INDCs and climate policy

Analysing INDCs and expressions about agriculture helps identify what actions are needed in realising adaptation and mitigation opportunities and challenges in the developing countries, notably SSA, which is the region in focus of the analysis of INDCs in this report. Identifying such needs can help understand which agricultural initiatives and elements thereof that can be utilized when countries are to fulfil their commitments of the INDCs and the PA. As expressed by Mrs Margarita Astralaga from IFAD at the COP22 roundtable: “The INDCs have become like a roadmap for steering the [agriculture and climate change] investments in the right direction”. As such, INDCs can help guide agriculture climate change initiatives, while these initiatives can help meet the (political) goals and objectives that are set out in the INDCs.

6.1 Methodology for INDC assessment and analysis

Relying on databases developed by CCAFS, IGES and COWI, respectively, as well as all of the INDCs submitted by Parties, INDCs were assessed for links to agriculture, as well as agriculture and climate change initiatives, finance, mitigation, and adaptation related to the agricultural sector. The purpose of the exercise was two-fold: firstly, to understand how agriculture features within the INDCs. The results of this assessment was reported in a Factsheet in November 2016 (see Bager *et al.*, 2016) and is also reported below. Secondly, INDCs were screened for links to agriculture climate change initiatives, agricultural approaches relating to adaptation or mitigation, as well as promising opportunities and any existing barriers. These are identified in order to understand how INDCs and agriculture climate change initiatives can complement each other. Further, the findings here will be used to identify whether those of the barriers and opportunities identified in the SWOT-analysis and related assessments align with those identified by Parties in their INDCs.

INDCs and NDCs are national climate action plans submitted in accordance with the PA and subsequent development within the UNFCCC process (see section 2.2). The PA does not directly promote national action on agricultural emissions, since the agreement covers all of the UNFCCC sectors.³³ However, agriculture and related sectors (crops, livestock, forestry, fisheries and aquaculture) feature prominently in INDCs.

³³ However, it should be noted that the flexible mechanisms based on the voluntary cooperation (cf. art. 6), as well as the means of finance (cf. art. 9) and the technology transfer (cf. art. 10) could all be used to promote agricultural initiatives if scoped for that purpose or targeted at the agriculture sector.

Thus, analysing INDCs and the elements within these concerning agriculture helps identify what actions that are needed in realising adaptation and mitigation opportunities and challenges.

6.2 Agriculture in African (I)NDCs

In African countries, agriculture is given priority as a crucial sector for climate action, with parallel economic development and poverty reduction. Of the submitted African INDCs, 98% specified adaptation in the agricultural sector compared to 64% globally (Richards *et al.* 2015; 2016). Priority sectors for adaptation measures include: livestock (43 countries), crops (35 countries) and fisheries and aquaculture (33 countries). For example, Malawi lists detailed agricultural adaptation actions and highlights major adaptation challenges, for example their heavy reliance on rain-fed agriculture, which is highly climate-sensitive. Further, the INDC mention that climate change requires farmers to adapt to new agronomic practices, such as conservation agriculture and growing of drought tolerant crops in order to improve the agricultural productivity. Developing of a financial mechanism to support crop insurance targeting smallholder farmers was further mentioned as an important adaptation action. In addition, the INDC includes actions such as implementing conservation agriculture, CSA, and agroforestry practices, as well as increasing irrigation on smallholder farms; practices that could contribute to mitigation activities, increased resilience and adaptation to a changing climate.

6.2.1 Adaptation in (I)NDCs

Many of such adaptation actions are found in most of the African INDCs. For example, developing a financial insurance mechanism was mentioned by Tanzania with the aim to protect smallholder farmers against climate related shocks (UNFCCC INDC Tanzania, 2015), and by Zimbabwe that intends to promote climate indexed insurance solutions and enabling market framework in order to build resilience in managing climate related disaster risks, such as drought (UNFCCC INDC Zimbabwe, 2015). In addition, improving drought resistant crops is mentioned in several African INDCs, such as Burundi, Guinea-Bissau and Nigeria aiming at making agriculture more resilient.

Agricultural practices related to FAO's (2014) five principles of sustainable food and agriculture (see section 3.3) are found in several INDCs. For example, CSA and agroforestry are mentioned by Zambia, which prioritise such practices in order to ensure food security and promote conservation and more effective management. This is further mentioned by Ethiopia, Nigeria, Sudan and Togo among others (Bager *et al.*, 2016; update of INDC analysis in COWI, 2017). All in all, more than 30 countries in the SSA explicitly referred to CSA in their INDCs (FAO, 2016b; Bager *et al.*, 2016).

Figure 3: Specific cost for adaptation of agriculture provided in INDC

6.2.2 Mitigation in (I)NDCs

In addition to adaptation measures in the agricultural sector, the majority of the African countries recognize the role of the agricultural sector in mitigating GHG emissions. 61% of the African INDCs have specifically included agricultural in mitigation targets, which is similar to the global figure of 64% (Richards *et al.* 2016). The priority sectors for mitigation are livestock (19 countries), agro-forestry (5 countries) and croplands (14 countries), out of the 34 countries, whose INDCs include mitigation targets for INDCs. For example, Togo's INDC include mitigation actions such as livestock fodder improvement and extensive farming. Furthermore, the INDC promote land use planning practices that boost carbon sequestration through agroforestry and supporting research into organic and synthetic enriching agents that release less GHG. Rice cultivation is a particular concern for Togo and the INDC outlines how they will target identification and promotion of varieties of rain-fed rice and support better use of organic matter on rice paddy fields.

Figure 4: Specific cost for mitigation of agriculture provided in INDC

6.3 Synergies identified in (I)NDCs

Action like the ones presented above may create adaptation and mitigation synergies, with larger combined effects than their individual ones. Several of the African INDCs mention synergies or co-benefits between their adaptation and mitigation actions. For example, Ethiopia directly states that they “seek to maximise the synergies between adaptation and mitigation, especially involving agriculture and forests” (INDC, Ethiopia, 2015; 11). In Zambia’s INDC it is states that the “all adaptation actions have strong synergies with mitigation actions” (INDC, Zambia, 2015; 6). The INDC of the Central Africa Republic refers to their National Programme for Investment in Agriculture, Food Security and Nutrition (PNIASAN) which is multiple co-benefits of adaptation and mitigation measures (INDC, CAR, 2015; 11).

6.4 Agriculture climate change initiatives mentioned in (I)NDCs

A total of 26 of the 53 African INDCs reference existing agriculture climate change initiatives on a national scale (Bager *et al.*, 2016). Chad, for example, mentions the GGWSSI in the country's INDC in relation to the planting of trees as a way to protect the environment, while increasing mitigation and adapting to climate change. Also, the Lake Chad Sustainable Development Support Programme (PRODEBALT) is mentioned as a regional program aiming at reducing vulnerability and risks. This initiative is further mentioned in CAR's INDCs as an adaptation measure, given its ability to enhance agro-ecological systems in the Chad Lake basin. Many African INDCs refer to national agricultural policies, however, some have more specific policies tailored to deal with the intersection of climate change and agriculture. Examples of this include Uganda's 10-year CSA Program, Togo's national programme Adapting Agriculture in Togo to Climate change (ADAPT) (see also Bager *et al.*, 2016) and Malawi's National Climate Change Management Policy (GoM, 2016) and Madagascar's Resilient Agriculture Integrated Models (UNFCCC, INDC, Madagascar, 2015).

6.5 Aligning NDCs and agriculture climate change initiatives

As the PA has been ratified, Parties are now in the process of implementing policies necessary to meet their targets and commitments. This involves defining which specific policies, initiatives, and actions are required to transform the national and sectoral targets defined in the NDC to concrete results. This will require extensive planning and inter-governmental, inter-ministerial, and inter-sectoral coordination (FAO, 2016b). It will also require increased financial investments to implement initiatives and other projects that has an impact – in the agricultural sector and on the ground.

As highlighted in the introduction to this section, INDCs (and subsequently NDCs, once these have all been submitted or transposed), can be seen as roadmaps for steering investments in agriculture – and thus also agriculture and climate change initiatives – in the direction that Parties see as needed to meet the challenges that climate change will bring. Given that existing initiatives already target some of the areas also identified in NDCs, e.g. adaptation of the agricultural sector to higher temperatures and less precipitation, aligning existing initiatives with NDCs provide an opportunity for increased synergies.

Another important area of future work is assess whether potential trade-offs in the agriculture sector exist in relation to the goals set out in the NDC, particularly between mitigation and economic growth. An example of this is the Colombian NDC, where the different agricultural development options are assessed on how they perform in relation to both GHG emissions reductions and the generation of profits by the sector (Vermeulen *et al.*, 2016).

In NDCs, (some of) the following elements of relevance to agriculture and climate change can be found, though the extent to which this has been specified varies from NDC to NDC:

- The need for adaptation and mitigation in agriculture, and how the sector needs to evolve in the coming years in order to meet challenges caused by climate change.
- Specifications – and to some extent – quantifications of the financial support needed for adaptation and mitigation in agriculture.
- Existing policy support and policy development needed in order to implement initiatives and other support elements to achieve such adaptation and mitigation.

Further, when reporting on the progress under NDC implementation, developed countries must provide information on finance, technology transfer and capacity building support provided to developing countries. Developing countries, on the other hand, are requested to report on the support they have received and any additional needs they have in these areas (FAO, 2016b). LDCs and Small Island Developing States (SIDS) are exempt from these obligations. Further, Art. 7 of the PA encourages Parties to submit an adaptation communication outlining climate change impacts and adaptation progress within the country. These communications will likely also provide guidance (for use in initiatives) on where countries need further assistance on agriculture climate change aspects.

As NDCs submitted by countries are, by and large, a reflection of each country's political and economic priorities, such INDCs can to a large extent provide guidance for agriculture climate change initiatives in terms of which adaptation and mitigation needs exist, how much these costs, and which policies and projects could be utilized to meet these. Thus, NDCs can be used to identify opportunities for new agriculture climate change initiatives.

6.5.1 *Identifying needs for technology transfer and capacity building*

Within NDCs, needs for technology transfer and capacity building identified by Parties as necessary to meet targets can also be identified. For example, all of the African countries expressed needs for technology and financial support in their INDCs (Mbeve *et al.* 2015). Technology transfer refers to technologies such as tools for climate monitoring and weather forecasting or irrigation and water management systems. The measurement, reporting and verification (MRV) requirement within UNFCCC also leads to some Parties requesting technology and capacity building among local professionals to meet these requirements, including for example reporting on emissions from the land use, land use change and forestry (LULUCF) sector. This could involve using geographical information systems (GIS) and remote sensing, and working with international experts to develop such reports.

While most Parties mention technology transfer needs in general (FAO, 2016b), e.g. Rwanda, Nigeria and Kenya, some INDCs request specific technology transfers necessary to increase mitigation and adaptation actions, or general agricultural performance. For example, the Central African Republic (CAR) identified technological needs in production, inspection and certification of high quality seeds, soil analysis and climatological and meteorological observations systems. Gambia, among other needs, identified technology needs in systems of rice intensification, and Zambia in water management and irrigations systems and storage facilities for agricultural products. Beyond agricultural production and supply chain elements, countries also request technologies to help utilize an untapped potential for bioenergy (see e.g. Gambia) or increase plant breeding and genetic research (see e.g. Malawi).

Capacity building focuses on enhancing the technical, institutional or economic capacity of Parties to meet their obligations under the PA and the needs identified in the NDCs. This could involve assistance in undertaking analyses and assessments, developing plans and policies, and managing projects and initiatives.

In line with elements identified in the SWOT-analysis, Parties also point to the need for engaging stakeholders (see e.g. Eritrea, the Central African Republic (CAR) and Angola), improve planning and project management (see e.g. Eritrea) and foster implementation and project uptake (see e.g. Malawi). This could also involve raising awareness and improving outreach. For example, Zimbabwe aims to promote capacity building through research and development, education and awareness, and training in climate change related issues. Further to this, there is a need to develop and implement new projects, initiatives, policies, and economic support schemes, as well as revise existing. For example, Malawi requires support to the development of market based policies and legal instruments to shifts decisions from financial to environmental decisions, and

development of financial mechanisms to support crop insurance targeting smallholder farmers. Lesotho requires capacity building and policy reform to integrate climate change in sectoral development as a priority area. As also mentioned previously, this also include mainstreaming climate change into new and existing agricultural plans, programmes, and policies, as mentioned by Malawi, Ethiopia and the Central African Republic (CAR). Finally, progress on plans and initiatives must be monitored, reported on, and evaluated, as suggested in the SWOT-assessment. For example, the Central African Republic express the need for capacity building on data identification, collection, processing and documentation of climate change in the agricultural sector.

With regards to the agricultural practices identified earlier, some countries also request support to help implement CSA (see e.g. Zambia, Swaziland, and Nigeria) or agroforestry practices (see e.g. Malawi, Côte d'Ivoire and Senegal). Some (such as Lesotho and Zambia) also request assistance in devising sustainable agricultural practices or improved forest management.

6.6 NDCs, initiatives and the role of financial backing

In order to implement the required policies, projects and initiatives, financial backing is needed. 81 countries specify their financial needs in their NDC, the total amount of which is estimated at 5,711 billion USD, 2,457 billion USD (43%) of which is expressed by African countries. The brunt of the financial needs expressed concern adaptation, while mitigation make up only a minor share. In the case of African countries, 1,661 billion USD is for adaptation, while 179 billion USD is for mitigation (IGES, 2017) (see Figure 5).

Figure 5: Adaptation, financial, and technology transfer needs, as specified in INDCs and NDCs

Source: IGES (2017).

In this regard, it is worth noting that the cost of delivering on NDCs is unknown, as “economic assessment and financial analysis of agriculture in NDCs, and in related plans, like national adaptation plans (NAPs), are weakly developed to date” (Vermeulen *et al.*, 2016). Within NDCs, a few countries provide estimates of overall costs for implementation (see also IGES, 2017). At the moment, however, detailed assessments are lacking. In order to attract large-scale public (national and international) and private financial backing and increase investments in the agricultural sector, credible, thoroughly assessed financial plans and proposals delivering return on investments should be developed by initiatives and countries alike.

6.7 Linking (I)NDCs, initiatives and climate finance

Building on the analysis of agriculture climate change initiatives conducted and the needs identified in (I)NDCs, one can identify areas where a new or existing initiative could contribute to meeting targets in the (I)NDC. Further, if including the need for climate change finance, one can identify areas, where new initiatives should be implemented. These can be financed using identified sources, will contribute to INDC targets, and will increase the likelihood of succeeded in meetings its objectives through the use of best practices (see Figure 6).

Figure 6: Opportunities for linking (I)NDCs, agriculture climate change initiatives, and climate change finance

Linking INDCs, agriculture climate change initiatives, and climate change finance flows can also help identify where a new or existing initiative falls short (e.g. lacking finance, not contributing to INDC targets, or not succeeding in having an impact).

6.7.1 Finance (grey circle)

At the COP22 Roundtable meeting, Mrs Margarita Astralaga from IFAD pointed to a strength of the INDCs being that they highlight the need for finance for the agricultural sector. As such, it is vital to acknowledge that finance has a role in supporting projects that relates to agriculture and climate change and apply best practices, while meeting the needs expressed in the INDCs/NDCs. Given that investing in agriculture climate change initiatives can be a good investment, which can help achieve food security while also reducing climate change, channelling funding to initiatives can assist in meeting some of the targets set in the INDCs and NDCs. This was also noted Vermeulen *et al.* (2016a; 2016b).

Following from this, the commitment of IFAD to, by December 2018, have all investments in agriculture take into account climate change is a huge opportunity to align initiatives and (I)NDCs, as investments in one area will support work in the other. Therefore, as suggested by Mrs Astralaga, to have all multilateral and bilateral institutions ensure this would bring the fulfilment of sufficient funding for agriculture and climate change closer to reality. This is also remarked by FAO in their assessment on the agricultural sector and NDCs: “support for the agricultural sectors should be a priority for the international community given their prominence in the INDCs and their potential to enhance adaptation and mitigation ambition” (FAO, 2016b). Further, a large amount of financial institutions are present in the developing world today, meaning that they can help channel investments where they are needed.

6.7.2 *Initiatives (orange circle)*

It follows from the illustration that initiatives should seek to align with finance flows and NDC targets, as they otherwise risk not having sufficient financial backing (in the case of the former) or will not contribute to meeting (I)NDC targets (in the case of the latter). To ensure that initiatives are relevant and have financial backing, it would thus be wise to align initiatives to the needs identified in (I)NDCs. For example, the Central African Republic (CAR) lack of expertise in climatological and meteorological observations systems, while other (I)NDCs express a need for support to implement CSA (see e.g. Zambia, Swaziland, and Nigeria) or agroforestry practices (see e.g. Malawi, Côte d’Ivoire and Senegal). Some (such as Lesotho and Zambia) also request assistance in devising sustainable agricultural practices or improved forest management. Aligning their work and objectives to such needs would help initiatives reach a greater impact and scale.

6.7.3 *(I)NDCs (yellow circle)*

The importance of agriculture in (I)NDCs and the need for adaptation and mitigation actions within the sector identified in these point to a growing recognition among countries that action in the agricultural sector is required if climate change is to be mitigated and food production increased to the levels required to feed a growing population. Further, as noted by FAO (2016b), action on agriculture (as a result of (I)NDCs identifying needs) can act as a lever for achieving the 2030 Agenda for Sustainable Development. With this in mind, donors have a responsibility to make sure that those NDC commitments are in fact implementable, i.e. that the finance is available for the INDC and the initiatives that should meet the targets set out in these. This include honouring its commitment to channel at least 100 billion USD in annual climate finance to developing regions. Similarly, countries have a responsibility to identify how and potentially which initiatives that could contribute to meeting the targets specified in NDCs. FAO (2016b) finds that steps involved in NDC implementation in developing countries are likely to include:

- developing a national NDC implementation strategy or plan
- identifying appropriate mitigation and adaptation policy measures in all relevant sectors
- mobilizing national and international financial resources and support
- implementing policy measures through legislation, regulations and expenditures
- facilitating/coordinating action with non-state actors.

To this list, it might be relevant to add the following:

- Identification of (new or existing) agriculture climate change initiatives that through actions and projects can contribute to meeting targets for the agricultural sector specified in the NDC.

7. Conclusion and recommendations

7.1 Conclusions

With increased climate change and its impacts on economic growth, agriculture and the environment, and thus also on food security and the livelihoods of the people in developing regions, it is necessary to develop and implement policies, strategies and initiatives to mitigate and adapt to these. The aim of such policies, initiatives and projects are, inter alia, to ensure that the negative impact of climate change on agriculture and economic growth is reduced. This means that the funds from international aid, loss-and-damage under the UNFCCC, and national sources should be spent in a way that ensures increased productivity and resilience of the agricultural sector, while increasing climate change mitigation and adaptation. This involves assessing trade-offs and identifying potential synergies, as increased production sometime leads to nutrient losses in soils or reduced biodiversity. Doing this will, among other things, require maintaining research and development, providing technical and financial support, and building capacity.

Agriculture's importance in reaching climate objectives (as a sector within the climate negotiations) cannot be underestimated. This is not just due to the GHG emissions generated, as well as the large potential for mitigation, but because of the jobs created and the livelihoods provided by the sector. Further, the explicit reference to food security in the preamble of the PA highlight the need to develop solutions within the agricultural sector that take into account the multiple dimensions of the sector, including not just food production, but also climate change abatement, environmental protection, economic growth and job creation, and fulfilment of the Sustainable Development Goals (SDGs). The means through which countries intend to undertake these challenges, not just for agriculture, but also energy, industry, and other sectors, is – to some extent – explained in the (I)NDCs, which act as the guiding documents for action of climate change. Given the challenges faced by agriculture and the opportunities provided by the framework of the PA and the development of NDCs, there is an increasing need to understand the link between the two. This include assessing how agriculture initiatives can support fulfilment of NDC goals and objectives, and how NDCs can support successful agriculture initiatives. This report conducted a SWOT-analysis on agriculture climate change initiatives in developing countries, focusing especially on SSA, identified best practices and areas for improvement, and went on to identify barriers and opportunities for replication and scaling up of such initiatives. This assessment was undertaken in light of the (I)NDCs and the development of agriculture within the UNFCCC negotiations. A number of key observations in this regard has been made below:

- No single agriculture climate change initiative were found to include only best practices and opportunities. Some initiatives included several of the identified success elements with the opportunities to be scaled up, while other initiatives had several areas for improvements.
- A number of initiatives covered elements, which was explicitly expressed as needs in (I)NDCs submitted by countries. This related to capacity building in particular, but also concerned implementation of specific agricultural practices to help increase mitigation and adaptation actions within agriculture.
- Given the uncertainties associated with the current political climate, it is essential for countries, donors, international organizations and other stakeholders to revitalise their support to agriculture and climate change initiatives, to sustain and indeed scale out the progress made. Action in the sector is critical to combat climate change, and secure the livelihoods of millions of smallholder farmers.
- While this study did not focus on the thematic focus of initiatives, we did not observe many (any) initiatives which focused on the transformational changes required in the sector. Most of the initiatives focused on incremental interventions, therefore there is an opportunity to focus on transformative action in the sector.
- The INDCs/NDCs can be used to guide action on agriculture and climate change. Linking INDCs, agriculture climate change initiatives, and climate change finance flows can help identify where a new or existing initiative falls short (e.g. lacking finance, not contributing to INDC targets, or not succeeding in having an impact). A strength of the INDCs is that they highlight the need for finance for the agricultural sector, which must be provided by donors in order to implement the targets defined in NDCs.

7.2 Recommendations

The last part of this report seeks to provide general recommendations on how to implement best practice agriculture initiatives, successfully overcome barriers and challenges, learn from existing initiatives, and help achieve the targets set out in (I)NDCs. The recommendations provided in this section build on the work undertaken throughout the project and is thus based on initiatives, interviews, literature, and outcomes of the roundtable alike. The first nine recommendations focus on initiatives and the design of these, while the last five deal with the policy framework surrounding agriculture climate change initiatives:

- *Focus on key competencies rather than spreading and diluting efforts.* In designing the agriculture climate change initiatives it is important that the objectives are clear with rather narrow and specific goals and strategies rather than a wide range of unspecific and general objectives.

- *Achieve synergies between adaptation and mitigation and ensure that projects are undertaken with such focus where possible*, both within the agricultural sector, economic development goals, across sectors and territories. This could increase the opportunities, the efficiency of resources and may potentially attract more funding.
- *Build and ensure capacity building and ownership*. Following the recommendation above, ensure local capacity building becomes a useful tool to get partners and stakeholders involved in the initiatives. Further, a development of knowledge-sharing platforms, especially focusing on South-South cooperation enhance the success the initiative. For example, sharing best knowledge on CSA, agroforestry and agroecology in order to increase technical capacity and best practices.
- *Ensure an inclusive and participatory approach with mobilisation of multiple stakeholders*, including local stakeholders. It is important to engage multiple stakeholders, from communities to local farmers in order to understand the needs of these through a participatory approach. This will firstly enhance the number of people willing to engage in the initiatives due to larger ownership and sustainability; secondly, ensure both local and technological knowledge and best practices; and thirdly, ensure development of tools and knowledge in a way that avoid stakeholders doing business as usual.
- *Include farmers and farmers' organizations in the development of agriculture climate change initiatives*. The millions of farmers, small-holders, and local businesses across the developing world are aggregately large investors in agriculture and landscapes. Therefore, their voice and opinion must be included when designing agriculture climate change initiatives, strategies, and plans.
- *Make sure that technical solutions are supported by solid project management and stakeholder engagement*. This recommendation, as well as the result of the SWOT, highlight the need to look beyond purely technological solutions (e.g. novel agricultural approaches). This case was made in recent research by IFAD (Vermeulen *et al.*, 2016a), who found that investments in institution- and capacity-building, in services to provide finance, information, extension and research, in policy and legal frameworks, and in programme management, particularly for M&E, was important to achieve successful agriculture initiatives. These findings reflect many of the observations made throughout this report, further stressing the need to focus on issues that build the foundation for successfully implementing technical solutions, i.e. the way in which initiatives align and communicate with stakeholders, operate and manage daily activities, monitor and follow up, and secure and spend the financial means available.
- *Develop a sound business plan including funding*. To attract increased financial backing from national and international public and private investors, it is necessary to develop sound business plans, which show how targets are achieved and what results (financial and otherwise) can be expected. In this regards, it is important to ensure that climate finance is decentralised and distributed down to

communities in order to ensure that money and innovative financial mechanisms (e.g. new insurance schemes) become available at community level.

- *Ensure progress for monitoring and evaluation (M&E).* In order to identify whether goals and objectives have been reached within the initiatives, it is important to monitor and evaluate progress. In this way, it is possible to revise the initiative to make it more successful. This process of M&E should be aligned with the updates in NDCs.
- *Alignment of agriculture initiatives to needs identified in INDCs.* The design and implementation of agriculture climate change initiatives needs to be aligned with the needs, strategies and policies expressed in the (I)NDCs. As the NDCs will guide country-level climate action in the coming years, the actions taken on agriculture within these will help determine whether national and international targets to combat climate change can be met. Therefore, it is vital that successful initiatives on how this can be achieved are identified and rolled-out across countries.
- *Empower African institutions and build African capacity.* More specifically for agriculture climate change initiatives in SSA, it is important that activities focus on empowering regional, national and local African institutions and build capacity. Initiatives driven by internal funding (combined with external funding) will perform more sustainably with involvement of local stakeholders and their needs and capacities, as well as ensure a continuing development despite the withdrawal of external funding.
- *Develop South-South cooperation.* Policies, institutions and technologies from developed countries cannot (and should not) necessarily be transferred to developing countries. Countries and regions should learn from regions that face similar challenges and opportunities, and any possibilities for South-South cooperation and knowledge sharing should be promoted.
- *Support agriculture climate change initiatives in local and domestic policies and review current efforts to ensure alignment with needs.* As also mentioned by SDSN (2013), governments should make sustainable development of agriculture a priority, especially in those countries where climate change is expected to have large impacts on production (e.g. SSA). This requires review of current policies, increased support through larger and sustained investments, and alignment with identified needs.
- *Ensure mainstreaming of climate change policies into (existing) national, regional and sectoral policies.* An important barrier for implementation of successful agricultural initiatives is lack of policy mainstreaming into existing national policies. This issue was mentioned by several INDCs, as well as identified as an area for improvement/potential pitfall. This highlights the need to enhance the integration of policies related to climate change into national and sectoral policies, rather than implement climate change related measures as individual activities. Such mainstreaming will help enhance the political prioritisation of agriculture, affect the current policy agenda, increase investments in agriculture

related to climate change, and ensure a long-term sustainability of the activities undertaken by agriculture climate change initiatives.

- *Ensure that all agriculture investments take climate change into account.* It is vital that all multilateral and bilateral institutions take into account climate change when investing in agriculture and promoting investment considering climate change as a good business strategy.

“Now, more than ever, countries must act on their Paris commitments. The emphasis on agriculture in national plans is a strong point of departure.” – Meadu (2016).

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Resumé (dansk)

Den globale landbrugssektor skal øge fødevarereproduktionen for at imødegå den stigende efterspørgsel fra en voksende befolkning med øget økonomisk købekraft. Samtidig skal sektoren tilpasse sig ændrede klimaforhold og reducere udledningen af drivhusgasser. Klimaforandringer forventes at påvirke landbrugssektoren og national og lokale økonomier i udviklende regioner ganske kraftigt, hvilket kan påvirke levestandarden og fødevareresikkerheden for millioner af mennesker. Med disse udfordringer in mente har forskellige aktører i det seneste årti lanceret forskellige landbrugsinitiativer med fokus på klimaforandringer.

I denne henseende er formålet med dette studie at:

- Identificere regionale og globale initiativer lanceret siden 2005 relateret til landbrug og klimaforandringer med et fokus på udviklingslande, specifikt landene i Afrika syd for Sahara.
- Vurdere formål og virkning af disse initiativer og identificere de mest succesfulde.
- Evaluere i hvilken grad disse landbrugsklimaforandringsinitiativer kunne videreudvikles eller implementeres i andre regioner.
- Indsætte de identificerede initiativer i en kontekst af planerne for foreslåede nationale planer for reduktion af drivhusgasser (Intended Nationally Determined Contributions) som landene i Afrika syd for Sahara har indsendt under FN's klimakonvention (United Nations Framework Convention on Climate Change (UNFCCC)).
- Identificere barrierer og muligheder for at implementere landbrugsinitiativer med fokus på klimaforandringer og adressere disse.

Analysen starter med en gennemgang af nyligt lancerede landbrugsinitiativer med fokus på klimaforandringer for at identificere de mest relevante af disse (set i konteksten af denne rapports formål). Derudover gives i løbet af rapporten detaljerede eksempler på sådanne initiativer. Gennemgangen af initiativer efterfølges af en analyse af de udvalgte initiativer ud fra en SWOT-metode (styrker, svagheder, muligheder, trusler), der identificerer disse elementer inden for de pågældende initiativer. Ud fra dette kan det identificeres hvilke initiativer, der er mest interessant eller succesfulde. Denne analyse bruges til at forstå hvorledes nye eller eksisterende initiativer kan forbedres, gentages i andre områder, eller yderligere opskaleres.

Efter denne indledende analyse udvælges succesfaktorer, god praksis, og områder, hvor initiativerne kan forbedres. Yderligere interviewes eksperter og litteratur anvendes, begge med det formål at identificere muligheder og barrierer for yderligere udvikling af initiativerne.

Afslutningsvis analyseres behovet for tilpasning og reduktion af drivhusgasser i landbrugssektoren i udviklingslande – med fokus på landene i Afrika syd for Sahara. Dette gøres i lyset af de planer for foreslåede nationale planer for reduktion af drivhusgasser (Intended Nationally Determined Contributions) som verdens lande har indsendt til FN's klimakonventions sekretariat som led i forberedelserne til det 21. klimatopmøde (COP21) afholdt i Paris i 2015, samt de efterfølgende opdaterede nationale planer for reduktion af drivhusgasser (Nationally Determined Contributions (NDC)), der blev udarbejdet efter ratificeringen af Paris-aftalen. Denne analyse inkluderer behovet for kapacitetsopbygning, teknologioverførsel og finansiel assistance til disse lande. Ud fra disse analyser linkes initiativer til INDC'er for at forstå hvordan førstnævnte kan bruges til at opfylde de reduktionsforpligtelser som landene har nævnt i deres nationale planer (INDC'er og NDC'er).

De forskellige analyser på tværs af rapporten konkluderer at ingen af de analyserede landbrugsinitiativer indeholder udelukkende god praksis elementer og muligheder for udvikling. Derimod indeholder adskillige initiativer flere af de elementer, der er blevet identificeret som bidragende til succesfulde initiativer, og har dermed mulighed for opskalering. Andre initiativer havde færre af disse og flere områder, hvor forbedring er mulig. Derudover påpegede analysen at flere initiativer arbejdede indenfor eller påvirkede elementer, der eksplicit var identificeret som krævende, udfordrende eller på anden måde påpeget i flere landes nationale reduktionsplaner (INDC'er og NDC'er). Dette relaterede sig især til kapacitetsopbygning, men gjaldt også implementering af specifikke praksisser eller aktiviteter, der kan øge tilpasning eller reducere drivhusgasudledningen inden for landbrugssektoren.

Baseret på analysen af landbrugsinitiativer med fokus på klimaforandringer og vurderingen landbrugssektor behov udtrykt i de nationale klimaplaner, følgende anbefalinger angående hvordan god praksis implementeres i landbrugsinitiativer, samt hvordan barrierer overkommes og muligheder udnyttes blev identificeret. Disse kan forhåbentlig hjælpe med at forbedre initiativerne samt med at nå de mål, som landene har udtrykt i deres klimaplaner.

- Fokusér på nøglekompetencer inden for initiativet i stedet for at sprede indsatsen.
- Skab synergi mellem tilpasning til klimaforandringer og reduktion af drivhusgasser, og sørg for at projekter foretages med et sådant fokus, når det er muligt.
- Opbyg og sikr kapacitetsopbygning og ejerskab blandt initiativets deltagere.
- Skab et inkluderende og deltagende miljø, der sikrer mobilisering af forskellige interessenter, inklusive lokal interessenter.
- Inkluder landmænd og deres respektive organisationer til at deltage i udviklingen af landbrugsinitiativerne.
- Sørg for at tekniske løsninger understøttes af god projektledelse and interessentinvolvering.
- Få udviklet en solid forretningsplan, hvilket også inkluderer finansiering.

- Etabler kanaler, der sikrer at fremdrift i projektet monitoreres og evalueres.
- Tilpas formålet og aktiviteterne i landbrugsinitiativerne med fokus på klimaforandringer til de behov for udvikling og assistance som landene udtrykker i deres nationale klimaplaner (INDC'er og NDC'er).
- Styrk Afrikanske institutioner og understøt opbygning af lokal kapacitet i Afrika.
- Understøt og assister i udviklingen af samarbejdet mellem udviklingslande.
- Støt landbrugsinitiativer med fokus på klimaforandringer i lokal og nationale politikker og revurdér nuværende projekter for at sikre at de understøtter de behov for udvikling og assistance som landene udtrykker i deres nationale klimaplaner (INDC'er og NDC'er).
- Sørg for at eksisterende nationale, regionale og sektor politikker tager klimaforandringer i betragtning.
- Sørg for at alle investeringer i landbrug tager klimaforandringer i betragtning.

Annex

List of initiatives and List of initiatives analysed.

Table 1: List of initiatives

Name	Responsible Authority	Period	Status of Assessment † excluded * included, but no SWOT
Global			
"4 per 1000" initiative	Agricultural Ministry of France	2015 –	
Adaptation for Small holder Agriculture Programme (ASAP)	International Fund for Agricultural Development (IFAD)	2012 –	
Caring for Climate	United Nations Global Compact (UNGC)	2007 –	
Climate and Clean Air Coalition (CCAC)	CCAC Secretariat is hosted by the UNDP, Division of Technology, Industry and Economics.	2014 –	*
Climate and Development Knowledge (CDKN)	Funded by the UK Department for International Development (DfID) and the Dutch Ministry of Foreign Affairs (DGIS)	2010 – 2017	
Climate Change, Agriculture and Food Security (CCAFS)	International Center for Tropical Agriculture (CIAT)	2014 – 2022	
Climate Policy initiative (CPI)	Independent non-profit organization	2009 –	
Climate Risk and Early Warning Systems (CREWS) Initiative	Global Facility for Disaster Risk Reduction from the World Bank (GFDRR), the World Meteorological Organization (WMO) and the United Nations Office for Disaster Reduction (UNISDR)	First phase: 2015 – 2023	
Cities Climate Finance Leadership Alliance (CCFLA)	UN	2014 –	*
CSA Initiative	World Business Council for Sustainable Development (WBCSD)	2015 – 2030	
Economics and Policy Innovations for Climate-Smart Agriculture (EPIC) programme	FAO		
Food Security climate Resilience Facility	World Food Programme (WFP)	2015 –	
Global Alliance for CSA	GACSA membership	2014 -	
Global Research Alliance on Agricultural Greenhouse Gases	Global Research Alliance	2009 –	
Global Resilience Partnership	Rockefeller Foundation, the United States Agency for International Development (USAID), and the Swedish International Development Cooperation Agency (Sida)	2014 –	
International Partnership on Mitigation and MRV	GIZ	2012 – 2016	*
Mitigation of Climate Change in Agriculture (MICCA) Programme	FAO	2010 –	
Sustainable Rice Platform (SRP)	Co-convened by the United Nations Environmental Programme (UNEP) and the International Rice Research Institute	2012	
The International Panel of Experts on Sustainable Food Systems (IPES-Food)	IPES-Food	2015 –	
World Economic Forum's New Vision for Agriculture	World's Economic Forum	2009 – 2050	*
Africa			
2nd generation of the Regional Agricultural Investment Plan under ECOWAP 2025 process	ECOWAS	2015 – 2025	†
Adaptation of African Agriculture Initiative (AAA Initiative)	Morocco	2016 –	*
African CSA Alliance	NEPAD (African Union) and Comprehensive Africa Agriculture Development Programme (CAADP)	2014 – 2025	
Climate & Agriculture Network for Africa (CANA)	CCAFS	2014 –	
Climate Resilient Post-Harvest Agribusiness Support Project (PASP) in Rwanda	Government of Rwanda	2014 – 2020	
Communicating seasonal forecasts to farmers in Kaffrine, Senegal for better agricultural management	CCAFS, National meteorological agency (ANACIM), the Senegal Agricultural Research Institute and the Ministry of Agricultural and Extension Services	2011 – 2012	
Drought Tolerant Maize for Africa Initiative (DTMA)	International Maize and Wheat Improvement Center (CIMMYT) and the International Institute for Tropical Agriculture (IITA)	2006 – 2015	
East Africa Climate Smart Agribusiness Investment project (CSA – I)	Climate Focus, USAID (funded)	2016 – 2018	
FoodAfrica	Finnish Ministry for Foreign Affairs (MFA), Natural Resources Institute Finland (Luke), and 4 CGIAR institutions (FPRI, ILRI, ICRAF, and HAMK)	2012 – 2016	

Name	Responsible Authority	Period	Status of Assessment † excluded * included, but no SWOT
Global Alliance for Resilience (AGIR) – Sahel and West Africa	ECOWAS, UEMOA and CILSS	2013 –	†
Great Green Wall for the Sahara and the Sahel Initiative (GGWSSI)	African Union (AU)	2007 –	
Kenya Agricultural Productivity Programme	Government of Kenya, supported by the World Bank	2004 – 2008	†
Lake Chad Sustainable Development Support Program (PRODEBALT)	African Development Bank Group (AFDB)	2009 –	
National Agricultural Resilience Framework (NARF)	Federal Ministry of Agriculture and Rural Development, Nigeria	2012 – 2015	
National Climate-Smart Agriculture and Food Security Action Plan	Ministry of Food and Agriculture of Ghana	2016 – 2020	
Niger's Community Action Project for Climate Resilience (CAPCR)	GEF and IFAD	2003 –	
Productive Safety Net Programme (PSNP)	Ethiopian Government	2008 – 2012	†
Programme on Climate Change Adaptation and Mitigation in the COMESA EAC-SADC region	The Common Market for Eastern and Southern Africa (COMESA), the East African Community (EAC) and the Southern African Development Community (SADC)	2010 – 2015	
Promotion of Smart Agriculture Towards Climate Change and agro-ecology transition in West Africa	ECOWAS	2015 –	
Rural Initiative for Participatory Agricultural Transformation (RIPAT)	ROCKWOOL Fund and the local TZ NGO Recoda		
The Agriculture and Climate Risk Enterprise (ACRE)	ACRE Africa	2009 –	
The R4 Rural Resilience Initiative	WFP and Oxfam America (OA)	2011 –	
West African CSA Alliance (WACSAA)	ECOWAS	2015 –	
Europe			
Climate-Smart Agriculture Booster	Alterra-WUR, Wageningen University, French National Institute for Agriculture Research, Institute of Biometereology of the National Research Council of Italy, South Pole Carbon, University of Reading. Funding from climate-KIC	2015	
European Agricultural Research towards greater impact on global challenges (ARCH)	European Commission	2013 –	*
European Initiative for Agricultural Research for Development (EIARD)	European Coordination Group (ECG)	1996 –	†
European Initiative for Sustainable Development in Agriculture (EISA)	EU	2001 –	
The Agricultural Research for Development (ARD)	European Commission	1997 –	†
The European Forum on Agricultural Research for Development (EFARD)	European Commission	1996 –	†
The Joint Programming Initiative on Agriculture, Food Security and Climate Change (FACCCE-JPI)	European Commission	2010 –	
Latin America			
Adapting to Markets and Climate Change Project in Nicaragua (NICADAPTA)	Government of Nicaragua	2014 – 2019	
Alliance to promote Climate Smart Agriculture in Central America	Central American Agricultural Council (CAC)	2015	*
Brazil's Low-Carbon Agriculture (ABC) Plan	Government of Brazil	2010 – 2020	
Capacity Building System on Resilience for Central America and Dominican Republic in the framework of the Central American Agricultural Council (CAC)	FAO		
Climate and the Colombian Agriculture Sector: Adaptation for a Productive Sustainability	Ministry of Agriculture and Rural Development of Colombia	2013 –	*

Name	Responsible Authority	Period	Status of Assessment † excluded * included, but no SWOT
Climate Change Regional Strategy	Central America	2010 –	*
Climate Smart Agriculture Strategy for Central America and Dominican Republic	Central American Agricultural Council (CAC)		†
Climate Smart Territories	CATIE		
Latin America Dialogues on Agriculture and Forestry in the Context of the Climate Change Negotiations	ECLAC, CCAFS, FAO, French Cooperation	2014 –	†
Sustainable Management of Natural Resources and Climate Change (DACC)	Ministry of Agriculture, Livestock, and Fisheries of Uruguay	2012 –	
Northern America			
25x25 Alliance	Solutions from the Land	2004 –	*
Adaptive Management to meet Food, Fiber, Energy and Environmental Goals	Solutions from the Land	2015 – 2017	
AgSTAR	EPA	1994 –	
Feed the Future – the U.S Government’s Global Hunger and Food Security Initiative	USAID	2010 –	†
North America Climate Smart Agriculture Alliance (NASAA)	Solutions from the Land		
North American Regional Soil Partnership	FAO	2012 –	†
The People’s Gardens Initiative	U.S. Department of Agriculture		*
South Asia			
National Innovations on Climate Resilient Agriculture (NICRA)	Indian Council of Agriculture Research, Government of India	2011 –	
National Mission for Sustainable Agriculture (NMSA)	Ministry of Agriculture, Government of India	2013 –	
Pilot Program on Climate Resilience (PPCR)	Government of Nepal, Bhutan and Bangladesh, Climate Investment Fund		†
Southeast Asia			
ASEAN Climate Resilience Network (ASEAN-CRN)	ASEAN Member States (AMS)	2015 – 2017	
	ASEAN Technical Working Group on Agricultural Research and Development (ATWGARD)		
Asia Pacific Adaptation Network (APAN)	The UNEP Regional Office for Asia and the Pacific (UNEP ROAP)	2011 –	
	APAN is supported by the Ministry of the Environment, Japan, the Asian Development Bank, USAID (funded)		
Myanmar Climate-Smart Agriculture Strategy	Ministry of Agriculture and Irrigation	2015 –	†
SEARCA’s CChAM Umbrella program	Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA)	2016 –	

Table 2: List of initiatives analysed

Initiative	Objective	Type and focus area	Agriculture approaches
Global Global Alliance for CSA	GACSA is an inclusive, voluntary and action-oriented multi-stakeholder platform on Climate-Smart Agriculture (CSA). It is the vision to improve food security, nutrition and resilience in the face of climate change and to catalyse and help create transformational partnerships to encourage actions that reflect an integrated approach to the three pillars of CSA: (i) improve farmers' agricultural productivity and incomes in a sustainable way; (ii) build farmers' resilience to extreme weather and changing climate; and (iii) reduce GHG emissions associated with agriculture. The initiative states that solutions need to be aligned with national policies and priorities.	Collaborative platforms Research and development Knowledge repository Financing farmers Financing research Test projects on the ground Mitigation and adaptation	CSA
CSA Initiative (WBCSD)	Climate-Smart Agriculture (CSA) promotes production systems that sustainably increase productivity, improve agricultural systems' resilience (adaptation), reduce GHG emissions (mitigation), and enhance achievement of national food security and development goals. It was identified by WBCSD members as a key solution that companies should collectively work on. A work program is currently being developed by a core group of companies committed to make a difference by contributing to scaling up implementation of CSA practices. Options of work currently considered include strengthening the business case for action on CSA, identifying a set of CSA indicators to measure progress, working on policy advocacy at a national level, as well as catalysing collaborative action in priority geographies and on specific crops.	Collaborative platforms Knowledge repository Mitigation and adaptation	CSA
Global Research Alliance on Agricultural Greenhouse Gases (GRA)	The Global Research Alliance on Agricultural Greenhouse Gases (GRA) was launched in December 2009 and now has 46 member countries from all regions of the world. The Alliance is focused on research, development and extension of technologies and practices that will help deliver ways to grow more food (and more climate-resilient food systems) without growing GHG emissions. The Alliance is founded on the voluntary, collaborative efforts of countries. Its membership and governance arrangements are underpinned by a Charter, signed by all participating countries. This Charter establishes the Alliance Council, which is the representative body of all member countries. Members of the Alliance aim to deepen and broaden mitigation research efforts across the agricultural sub-sectors of paddy rice, cropping and livestock, and coordinate cross-cutting activities across these areas.	Research and development Knowledge repository Mitigation and adaptation	
"4 per 1000" initiative	The aim of the Initiative is to demonstrate that agriculture, and agricultural soils in particular, can play a crucial role where food security and climate change are concerned. Based on robust scientific evidence, the initiative invites all partners to declare or to implement practical programmes for carbon sequestration in soil and the types of farming methods used to promote it (e.g. agroecology, agroforestry, conservation agriculture, landscape management).	Collaborative platforms Knowledge repository Knowledge advisory Test projects on the ground Mitigation & adaptation	Agroforestry Agroecology CSL
Mitigation of Climate Change in Agriculture (MICCA) Programme	The Mitigation of Climate Change in Agriculture (MICCA) programme strengthens FAO's longstanding work to address climate change in the agriculture, forestry and fisheries sectors and supports countries participating in the climate change negotiation processes within the United Nations Framework Convention on Climate Change. Since 2010 the Mitigation of Climate Change in Agriculture (MICCA) Programme has contributed to making agriculture more climate-smart through the generation of evidence-based knowledge and tools that recognize the synergy between mitigation and adaptation actions. These aim to support better decision-making within policy, planning, and investment processes. This in turn has an influence on securing food production and the sustainable management and utilization of natural resources at field level.	Knowledge repository Knowledge and advisory Test projects on the ground Mitigation & adaptation	Agroforestry
Economics and Policy Innovations for Climate-Smart Agriculture (EPIC) programme	The Economics and Policy Innovations for Climate-Smart Agriculture (EPIC) programme works with governments, research centres, universities and other institutional partners to support the transition to Climate-Smart Agriculture (CSA) by using sound economic and policy analysis. It is a programme of work aimed at identifying and harmonizing climate-smart agricultural policies, analysing impacts, effects, costs and benefits as well as incentives and barriers to the adoption of climate-smart agricultural practices. The ultimate objective of the programme is to support developing and in-transition countries to formulate agricultural investment proposals to increase resilience to climate change and promote CSA. EPIC seeks to bridge the gap between field research, policy making and financial investments in agriculture.	Research and development Knowledge repository Knowledge and advisory Financing farmers Financing research Mitigation & adaptation	CSA

Initiative	Objective	Type and focus area	Agriculture approaches
Climate Policy initiatives	Climate Policy initiatives work to improve the most important energy and land use policies and business practices around the world, with a particular focus on finance. Their analysts and advisors support decision makers through in-depth analysis on what works and what does not. They work in places that they believe provide the most potential for policy impact, including Brazil, China, Europe, India, Indonesia, and the United States. Their services include advisory and convening, analysis and assessments, and design and implementation of new solutions.	Knowledge repository Knowledge and advisory Financing farmers Financing research Mitigation & adaptation	Agroforestry
Climate and Development Knowledge Network (CDKN)	The Climate and Development Knowledge Network supports decision-makers in designing and delivering climate compatible development. They do this by combining research, advisory services and knowledge management in support of locally owned and managed policy processes. They work in partnership with decision-makers in the public, private and non-governmental sectors nationally, regionally and globally. CDKN holds strongly to the ideals of human development and environmental sustainability.	Collaborative platforms Knowledge repository Knowledge and advisory Financing farmers Financing research Adaptation	
Sustainable Rice Platform (SRP)	The SRP pursues public policy development and voluntary market transformation initiatives to provide private, non-profit and public actors in the global rice sector with sustainable production standards and outreach mechanisms that contribute to increasing the global supply of affordable rice, improved livelihoods for rice producers and reduced environmental impact of rice production. The SRP focuses on development and testing of sustainability guidelines, standards, tools and outreach models for sustainable rice production and processing, including decision making tools and quantitative sustainability impact indicators. The overall objective is to promote resource efficiency and sustainability in the global rice sector through an alliance that links research, production, policy making, trade and consumption.	Collaborative platforms Research and development Knowledge repository Knowledge and advisory Test projects on the ground Mitigation & adaptation	CSA
Adaptation for Small holder Agriculture Programme (ASAP)	Smallholder Agriculture Programme (ASAP) channels climate finance to smallholder farmers so they can access the information tools and technologies that help build their resilience to climate change. The objective of ASAP is to improve the climate resilience of large-scale rural development programmes and improve the capacity of at least 8 million smallholder farmers to expand their options in a rapidly changing environment.	Knowledge and advisory Financing farmers Adaptation	
Caring for Climate	Caring for Climate was launched by UN Secretary-General Ban Ki-moon in July 2007. The initiative is jointly convened by the United Nations Global Compact, the secretariat of the United Nations Framework Convention on Climate Change (UNFCCC) and the United Nations Environment Programme (UNEP). Caring for Climate endeavours to help prevent a climate change crisis by mobilizing a critical mass of business leaders to implement and recommend climate change solutions and policies. The initiative helps companies to advance practical solutions, share experiences, inform public policy as well as shape public attitudes. Chief executive officers who support the Caring for Climate Statement are prepared to set goals, develop and expand strategies and practices, and publicly disclose emissions as part of their existing disclosure commitment within the Global Compact framework, that is, the Communication on Progress.	Collaborative platforms Knowledge repository Knowledge advisory Mitigation & adaptation	
Climate Risk and Early Warning Systems Initiative (CREWS)	The Climate Risk and Early Warning Systems (CREWS) initiative aims to significantly increase the capacity for Multi-Hazard Early Warning Systems. By 2020, all relevant SIDS and LDCs are expected to have at least moderate early warning system and risk information capacities. CREWS aims to mobilize US\$ 100 million by 2020 in order to fill the gaps in the exiting bilateral and multilateral cooperation programs. These systems effectively generate and communicate impact-based early warnings, delivering risk information for hazardous hydro-meteorological and climate events. They protect lives, livelihoods, and property in more than 50 LDCs and SIDS.	Knowledge repository Financing farmers Adaptation	Climate risk management, insurance and finance
Food Security climate Resilience Facility	The Food Security Climate Resilience (FoodSECURE) Facility is a multilateral, multi-year, replenishable fund being developed by WFP to financially and programmatically support community-centred action to reinforce and build climate resilience. The goals are to i) trigger action based on climate forecasts, to reinforce community resilience before shocks occur; ii) complement early response mechanisms, and iii) provide multi-year financing to deliver high-quality resilience-building activities are undertaken during post-disaster recovery operations.	Knowledge repository Knowledge and advisory Financing farmers Adaptation	Climate risk management, insurance and finance
Global Resilience Partnership	The Global Resilience Partnership aims to help millions of vulnerable people in the Sahel, the Horn of Africa, and South and SEA better adapt to shocks and chronic stresses and invest in a more resilient future. We will strive to improve resilience at multiple scales: from families to communities, countries to regions. Activities include: Identify critical capacity gaps; Catalyse alliances across all sectors; Enable regional and global learning; Advance data-driven analytics and measurements; Design flexible financial mechanisms, such as micro-finance and risk insurance.	Knowledge repository Knowledge and advisory Financing farmers Insurance Adaptation	Climate risk management, insurance and finance

Initiative	Objective	Type and focus area	Agriculture approaches
The International Panel of Experts on Sustainable Food Systems (IPES-Food)	IPES-Food aims to support and stimulate agricultural development in West Africa towards the adoption of diversified agroecological systems. Through dialogue, consultations and collaborative research, the IPES-Food will work with local partners to explore how agroecology is understood and can be applied in a West African context, its performance, opportunities, and potential barriers for such activities. The main objectives are to consolidate the knowledge base on agroecological practices, to bring these practices into light, and to reflect on and discuss such practices and a way forwards.	Research and development Knowledge repository Knowledge and advisory Adaptation and mitigation	Agroecology
Regional The ASEAN Climate Resilience Network (ASEAN-CRN)	The ASEAN-CRN is a platform for regional exchange, particularly for sharing information, experiences, and expertise on CSA. The objective of the ASEAN-CRN is to ensure that ASEAN member states are in a better position to adapt their agricultural sector to climate change and optimize its mitigation potential. The network promotes climate resiliency through exchange of information, expertise, and experiences on CSA amongst the AMS.	Collaborative platforms Knowledge repository Mitigation & adaptation	CSA
SEARCA's CChAM Umbrella program	Knowledge Center on Climate Change Adaptation in Agriculture and Natural Resources (KC3). SEARCA's CChAM Framework is envisioned to contribute to the twin goals of food security and poverty reduction through ensuring climate change resiliency in the agricultural production and sustainable natural resources management in SEA. The objective is to identify priority areas of convergence and collaboration at the regional and sub-regional levels, where institutions can work together, pool resources, and address gaps or move in directions where their joint efforts provide a strategic advantage for climate resiliency in SEA. Specifically, the program aims to: (i) enable institutions to adapt to climate change and mitigate its impact on agriculture and natural resources through training and capacity building; (ii) provide technical assistance and advisory to government agencies in SEA through policy studies, cutting-edge research, regional and national conferences and workshops; (iii) generate body of knowledge through scientific research, thesis and dissertations; (iv) guide national and local governments to integrate climate change adaptation in national and sub-national development plans; (v) develop projects that will enhance climate change adaptation and mitigation in SEA; and (vi) manage knowledge on climate change through website, publications and public awareness campaign.	Collaborative platforms Knowledge repository Test projects on the ground Mitigation & adaptation	CSA
The Asia Pacific Adaptation Network (APAN)	The main purpose is to (1) build climate change resilient and sustainable human systems, ecosystems and economies through the mobilisation of knowledge enhanced institutional capacity and informed decision making-processes, and facilitated access to finance and technologies. Furthermore, (2) to equip key actors in Asia and the Pacific Region with adequate knowledge for designing and implementing climate change adaptation measures, building capacity to access technologies and finance in support of climate change adaptation, and integrating climate change adaptation into policies, strategies and plans. More specifically, the objectives are to: (i) Improve understanding and knowledge of adaptation to past, current and future climate conditions; (ii) Enhance capacities to apply knowledge to assess technologies, access finance, and design and implement actions on adaptation and (iii) Strengthen the ability to integrate adaptation into development policies, strategies, and plans.	Collaborative platforms Knowledge repository Adaptation and mitigation	Agroforestry
Capacity Building System on Resilience for Central America and Dominican Republic in the framework of the Central America Agricultural Council (CAC)	The initiative aims to address mainly adaptation challenges in the region. It is expected that technical personnel of ministries of agriculture, environment and risk management units is trained in order to be able to translate the tools and knowledge into actions within the country across scales. The system seeks to contribute to the improvement of family livelihoods resilience to threats of climate change in Central America and Dominican Republic through a virtual platform linked to the specialized communication network called Agro y Clima (Agriculture and Climate). The virtual platform will become an expert committee (government, civil society and cooperation organizations) that will support structure, functioning and monitoring of the system, a capacity-building program in agro-climatic risk management that involves national, sub-national and local trainers and a M&E mechanism. The capacity building system will provide tools and knowledge developed in a participatory manner with regional and national stakeholders on agro-climatic risk management to be applied by Central American Integration System countries.	Collaborative platforms Knowledge and advisory Knowledge repository Adaptation	Climate risk management, insurance and finance
Climate Smart Territories	Climate Smart Territories (CST) is an initiative led by CATIE. The climate Smart Territories model approach has several objectives: (i) Increasing the production capacity of the territory; (ii) Reducing the GHG emissions responsible for climate change and climate variability; and (iii) Increasing the capacity for adaptation of the territory and its inhabitants, production systems and ecosystems, in the face of the growing pressures caused by global changes.	Knowledge and advisory Collaborative platforms Research and development Test projects on the ground Mitigation & adaptation (synergies)	CSA and climate-smart landscapes Ecosystem-based adaptation Tree-based approach Agroforestry

Initiative	Objective	Type and focus area	Agriculture approaches
Lake Chad Sustainable Development Support Program (PRODEBALT)	The Lake Chad Basin Sustainable Development Programme (PRODEBALT) is six year jointly financed (donors such as ADF, EU and WB) programme launched in 2009. It covers part of Cameroon, Niger, Nigeria, CAR and Chad. The aim of the project was to promote sustainable conservation of Lake Chad to ensure the economic security of the fresh water ecosystem resources, an integrated and judicious management of the basin in order to achieve sustainable development and equitable use of the natural resources for each country, while preserving its ecosystems and biodiversity.	Knowledge repository Knowledge advisory Adaptation and mitigation	Ecosystem based adaptation Agroforestry
Great Green Wall for the Sahara and the Sahel Initiative (GGWSSI)	The initiative is a pan-African program launched in 2007 by the African Union (AU), and aims to address food security, reverse land degradation and desertification, and to support local adaptation to climate change in a sustainable land management manner. The initiative includes four sub-projects: (i) the Action Against Desertification, (ii) the Building Resilience through Innovative Communication and Knowledge Services (BRICKS), (iii) FLEUVE aiming to strengthening the capacities of actors and to inspire South-South learning, partnership and cooperation, and (iv) the Sahel and West Africa Program (SAWAP) aiming at developing solutions to ensure environmental security and sustainability through a region hub.	Collaborative platforms Knowledge repository Knowledge and advisory Financing farmers Test projects on the ground Mitigation & adaptation	CSA and CSL Sustainable land management (SLM) Agroforestry
West African CSA Alliance (WACSAA)	The West African Alliance for Climate-Smart Agriculture was launched in 2014 (Toure and Fane, 2015). The objective of the Alliance is to include climate-smart agriculture (CSA) in the Economic Community of West African States' (ECOWAS) Agricultural Policy by providing a consultation, coordination, convergence, funding, and monitoring framework for initiatives (Toure and Fane, 2015). The framework aims to transform and reorient agricultural systems and their value chains towards sustainable and equitable increases in agricultural productivity and incomes, to increase adaptation and resilience to climate variability and change, and to increase carbon sequestration and/or mitigation of GHG emissions, when possible and appropriate.	Knowledge and advisory Mitigation & adaptation	CSA
Rural Initiative for Participatory Agricultural Transformation (RIPAT)	The RIPAT was launched by the Danish ROCKWOOL Fund in partnership with the Tanzanian NGO RECODA in 2006. The RIPAT is an economic development initiative, which aims to improve agricultural practices, animal husbandry and livelihoods among smallholder farmers, in a sustainable manner, by closing the agricultural technology gap. This is done by the principle of help-to-self-help through participant-oriented demonstrations and training programs conducted in a community, thus leaving farmers with genuine possibilities to choose the actions and practices most suitable to their individual situation. The participating farmers establish farmer groups, which enable transfer of knowledge on best practices and agricultural technologies.	Knowledge and advisory Pilot testing on the ground Materials (incl. technologies) and seeds Mitigation and adaptation	Sustainable Agricultural Practices
East Africa Climate Smart Agribusiness Investment project	Climate Focus has joined forces with SNV and UNIQUE to implement a two year USAID-funded initiative that aims to promote climate-smart agricultural development in East Africa. The project will incubate CSA innovations on the one hand and develop scalable investments on the other, supporting these activities through analysis, training, public private dialogue, and strategic partnerships. In doing so, the project aims to identify and grow business models that are explicitly climate smart, promote the involvement of women and youth, and contribute to the reduction of poverty, creating an enabling environment for investment in CSA and creating innovative climate smart and inclusive agriculture business in Kenya, Ethiopia and Uganda that lend themselves to private investment, and lastly accelerating deployment of private capital into scalable CSA businesses.	Knowledge and advisory Financing farmers Research and development Mitigation and adaptation	CSA
Climate & Agriculture Network for Africa (CANA)	A knowledge sharing web based platform by a network of partners drawn from the region. CANA brings together researchers and practitioners within Climate Science and Agriculture who are seeking to build resilience within African agriculture. The platform fills an important niche by linking climate change and agriculture policy processes with key research and development actors from Africa. The platform will ensure timely sharing and access to information by all the partners involved. CANA promotes collaboration amongst institutions and partners online and will bring together an increasing group of players within the climate change and agriculture sectors to be involved in conversations on the establishment of best practices for African Agriculture.	Collaborative platforms Financing farmers Insurance Mitigation & adaptation	CSA
Africa CSA Alliance	The Africa CSA Alliance was formed to leverage policy, technical and financing support for grassroots national and regional-level programmes and initiatives that can drive the widespread adoption of CSA practices throughout Sub-Saharan Africa. Their goal is to support the uptake of CSA practices by at least 6 million farming households in Sub-Saharan Africa by 2021, contributing to the AU's broader goal of supporting 25 million farming households by 2025. CSA aims to build the food and nutrition security of the rural poor so that farm families have access to enough nutritious food at all times, even in the face of a changing climate.	Collaborative platforms Knowledge and advisory Materials and seeds Mitigation & adaptation	CSA

Initiative	Objective	Type and focus area	Agriculture approaches
Adaptation of African Agriculture Initiative (AAA Initiative)	<p>The Adaptation of African Agriculture ("AAA") is an ambitious new initiative launched by the Moroccan Government to transform African Agriculture by mobilizing climate finance to support sustainable management of soils, agricultural water and climate risks projects as well as innovative policies, financial mechanisms and capacity development at multiple scales.</p> <p>The AAA initiative must allow climate change mitigation as well as better access to change adaptation financing. The objective of the AAA Initiative is to transform African Agriculture by mobilizing climate finance to support sustainable management of soils, agricultural water and climate risks projects as well as innovative policies, financial mechanisms and capacity development at multiple scales.</p>	<p>Knowledge repository</p> <p>Knowledge and advisory</p> <p>Financing farmers</p> <p>Mitigation & adaptation</p>	<p>Agroforestry</p> <p>Agroecology</p>
Programme on Climate Change Adaptation and Mitigation in the COMESA EAC-SADC region	<p>The Programme on Climate Change Adaptation and Mitigation in the COMESA EAC-SADC region is a five-year initiative that started in 2010. It aims to inject Africa's Unified Position on Climate Change into the post-2012 United Nations Framework Convention on Climate Change (UNFCCC) global agreement in order to unlock resources for promoting strategic interventions that sustain productivity and livelihood improvements for millions of climate-vulnerable people in the Eastern and Southern Africa (SADC region). It seeks to address the impact of climate change through successful adaptation and mitigation actions, which build economic and social resilience for present and future generations.</p>	<p>Collaborative platform</p> <p>Knowledge and advisory</p> <p>Mitigation and adaptation</p>	<p>CSA</p> <p>Agroforestry</p>
The R4 Rural Resilience Initiative	<p>The R4 Rural Resilience Initiative (R4) is a comprehensive risk management approach to help communities be more resilient to climate variability and shocks, which was launched in 2011. R4 builds on the initial success of the Horn of Africa Risk Transfer for Adaptation (HARITA) initiative, pioneered in Ethiopia. R4 currently reaches almost 200,000 people in Ethiopia, Senegal, Malawi and Zambia (32,000 with insurance) through a combination of four risk management strategies: improved resource management through asset creation (risk reduction), insurance (risk transfer), livelihoods diversification and microcredit (prudent risk taking) and savings (risk reserves). R4 aims to help communities become more resilient in the face of increasing climate variability and shocks through risk reduction, risk transfer, risk reserves and prudent risk taking.</p>	<p>Knowledge and advisory</p> <p>Insurance</p> <p>Test projects on the ground</p> <p>Adaptation</p>	<p>Climate risk management, insurance and finance</p>
FoodAfrica	<p>FoodAfrica was launched in 2012 (until 2018) and is a research and development programme enhancing food security in West and East Africa. The objective of the programme is to provide new knowledge and tools for researchers, decision makers and local farmers to improve local food security. The Programme will be implemented in seven work packages that concentrate on certain areas and countries. Programmes include strengthening soil research, sustainable dairy production, agricultural practices in changing climate, traditional foods for nutrition, reducing risk of mycotoxins, better market access through ICT and innovative extension approaches.</p>	<p>Research and development</p> <p>Knowledge repository</p> <p>Knowledge and advisory</p> <p>Test projects on the ground</p> <p>Mitigation & adaptation</p>	<p>Sustainable Agricultural Practices</p>
Drought Tolerant Maize for Africa Initiative (DTMA)	<p>The DTMA was launched in 2006 (ended in 2015) and covers 13 African countries. The aim of the initiative was to introduce new maize crop varieties with high drought tolerance in order to reduce the yield gap, vulnerability and improve food security in the region. Between 2007 and 2013 the DTMA released 160 drought-tolerant maize varieties. Yields of the new varieties are superior to those of currently available commercial maize varieties under both stress and optimum growing conditions.</p>	<p>Research and development</p> <p>Knowledge repository</p> <p>Knowledge and advisory</p> <p>Test projects on the ground</p> <p>Materials and seeds</p> <p>Adaptation and mitigation</p>	<p>CSA</p>
The Agriculture and Climate Risk Enterprise (ACRE)	<p>The Agriculture and Climate Risk Enterprise (ACRE) is the largest index, crop and livestock insurance programme in Africa in which the farmers pay a market premium to protect them from unpredictable weather conditions. It is projected to reach 3 million farmers across 10 countries in Eastern and Southern Africa by 2018.</p>	<p>Insurance (value chain)</p> <p>Materials and seeds</p> <p>Adaptation</p>	<p>Climate risk management, insurance and finance</p>
Promotion of Smart Agriculture Towards Climate Change and agroecology transition in West Africa	<p>The Promotion of Smart Agriculture towards Climate Change and agroecology transition in West Africa (in French, "Agriculture Intelligente pour le Climat", or AIC) is a regional initiative focused on Africa. The objective is to support the transition towards agroecology in West Africa to reinforce the resilience of vulnerable populations. The initiative aims at the adoption of practices by 25 million households by 2025.</p>	<p>Collaborative platforms</p> <p>Knowledge repository</p> <p>Knowledge and advisory</p> <p>Financing research</p> <p>Mitigation & adaptation</p>	<p>CSA</p> <p>Agroecology</p> <p>Agroforestry</p>
North America Climate Smart Agriculture Alliance (NASAA)	<p>NASCAA, is a collaboration of farm and conservation leaders, value chain partners and academics who recognize that climate change is real and have come together to do something about it. The objectives of NASAA are to sustainably intensify production systems to ensure the needs of a growing world population are met, provide the tools that can build production resiliency and allow growers to adapt to the changing climate; and to offer major reductions in GHGs through methane capture, soil carbon sequestration and biofuels that burn more cleanly than fossil fuels.</p>	<p>Collaborative platforms</p> <p>Mitigation & adaptation</p>	<p>CSA</p>

Initiative	Objective	Type and focus area	Agriculture approaches
Adaptive Management to meet Food, Fiber, Energy and Environmental Goals	Through this initiative, Solutions from the Land will facilitate and support a North American Climate- Smart Agriculture Alliance where farmers, ranchers and foresters can collaborate with industry value chain, academic, government and NGO partners in sharing and discussing new adaptation practices, tools and production systems designed to improve resiliency and mitigate the current and future risks of changing climatic conditions. Specifically, the objectives are to: (i) sustainably increasing agricultural productivity and livelihoods (i.e. sustainable intensification); (ii) adapting and building more resilience; and (iii) reducing and/or removing GHG emissions.	Collaborative platforms Knowledge repository Knowledge and advisory Mitigation and adaptation	CSA Agroforestry
AgSTAR	AgSTAR is an outreach program designed to reduce methane emissions from livestock waste management operations by promoting the use of biogas recovery systems. AgSTAR provides information and tools to assist producers in the evaluation and implementation of these systems.	Knowledge and advisory Insurance Financing farmers Mitigation	
European Initiative for Sustainable Development in agriculture (EISA)	EISA was launched in 2001 with the aim of developing and promoting sustainable farming systems, which are an essential element of sustainable development. Specifically, the objectives of the initiative are to establish and promote dialogue on sustainable agriculture; to support and develop sustainable agriculture at European Level through the implementation of Integrated farming; and to bring together a broad range of organisations in Europe to support and develop sustainable agriculture as well as practical, progressive and modern farming methods.	Knowledge repository Knowledge and advisory Test projects on the ground Mitigation & adaptation	Integrated Farming Agroforestry
Climate-Smart Agriculture Booster	The Climate-Smart Agriculture Booster is a network of enterprises and organisations. It was launched by Climate-KIC in 2015, and aims to increase the development, marketing and adoption of CSA technologies in Europe. Its primary focus is to fill the gap between supply and demand of CSA technologies.	Collaborative platforms Research and development Knowledge repository Knowledge advisory Mitigation & adaptation (synergies)	CSA
The Joint Programming Initiative on Agriculture, Food Security and Climate Change (FACCE-JPI)	The FACCE-JPI initiative was launched in 2010 and brings together 22 countries that are committed to building an integrated European Research Area addressing the interconnected challenges of sustainable agriculture, food security and climate change. It aims to further develop knowledge and technologies to underpin sustainable and competitive food production systems.	Research and development Financing research Knowledge repository Collaborative platforms Mitigation & adaptation (synergies and trade-offs)	CSA
National initiatives National Mission for Sustainable Agriculture (NMSA)	NMSA derives its mandate from Sustainable Agriculture Mission, which is one of the eight Missions outlined under National Action Plan on Climate Change of the Indian government. The initiative is to promote adaptation to climate change in Indian agriculture through a variety of strategies linked to sustainable development goals and plans of the government. Climate finance is especially provided by the government to support resilient development. The mission have several objectives: (i) To make agriculture more productive, sustainable, remunerative and climate resilient by promoting location specific Integrated/Composite Farming Systems; (ii) To conserve natural resources through appropriate soil and moisture conservation measures; (iii) To adopt comprehensive soil health management practices based on soil fertility maps, soil test based application of macro & micro nutrients, judicious use of fertilizers etc.; (iv) To optimize utilization of water resources through efficient water management to expand coverage for achieving "more crop per drop"; (v) To develop capacity of farmers & stakeholders, in conjunction with other on-going Missions e.g. National Mission on Agriculture Extension & Technology, National Food Security Mission, National Initiative for Climate Resilient Agriculture (NICRA) etc., in the domain of climate change adaptation and mitigation measures; (vi) To pilot models in select blocks for improving productivity of rainfed farming by mainstreaming rainfed technologies refined through NICRA and by leveraging resources from other schemes/Missions like Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), Integrated Watershed Management Programme (IWMP), RKVY etc.; and (vii) To establish an effective inter and intra Departmental/Ministerial co-ordination for accomplishing key deliverables of National Mission for Sustainable Agriculture under the aegis of NAPCC.	Knowledge repository Knowledge and advisory Materials and seeds Mitigation & adaptation (synergies)	Agroforestry CSA

Initiative	Objective	Type and focus area	Agriculture approaches
National Innovations on Climate Resilient Agriculture (NICRA)	NICRA is a network project of the Indian Council of Agricultural Research (ICAR) launched in February 2011. The project aims to enhance resilience of Indian agriculture to climate change and climate vulnerability through strategic research and technology demonstration. (i) To enhance the resilience of Indian agriculture covering crops, livestock and fisheries to climatic variability and climate change through development and application of improved production and risk management technologies; (ii) To demonstrate site specific technology packages on farmers' fields for adapting to current climate risks; and to (iii) enhance the capacity building of scientists and other stakeholders in climate resilient agricultural research and its application.	Research and development Knowledge repository Knowledge and advisory Financing research Test projects on the ground Mitigation & adaptation	Climate risk management, insurance and finance
Brazil's Low-Carbon Agriculture (ABC) Plan	The ABC Plan (2010) is a credit initiative that provides low-interest loans to farmers who want to implement sustainable agricultural practices. The specific objective is to promote adaptation of sustainable agricultural systems and practices that at the same time reduce GHG emissions, whilst improving the efficiency and resilience of rural communities and agricultural activities. These include no-till agriculture, the restoration of degraded pasture, the planting of commercial forests, biological, treatment of animal wastes and the integration of crops, livestock and forest. The programme's ambitious goals include rehabilitating 15 million hectares of de-graded pastures and increasing the area under zero tillage from 25 million hectares to 33 million hectares by 2020. It also intends to reduce by 160 million tonnes of CO ₂ equivalent annually, before 2020. Initial uptake was slow, with only 5 projects approved in the first year, representing USD 1.7 million in loans. However in 2014/2015, uptake has increased significantly, with over 25,000 contracts being approved. These projects represented loans worth a total value of more than USD 4 billion (Angelo, 2012; Cooper <i>et al.</i> , 2013).	Knowledge and advisory Financing farmers Test projects on the ground Mitigation & adaptation	CSA Agroforestry
Kenya Agricultural Carbon (KAC) Project	The project is developed by Vi Agroforestry and several other actors, and launched in 2009. The project aims to (i) increase farmers' resilience to climate change; (ii) increase food security through increased farm productivity and diversified food sources; (iii) increase farm income through farming as a business; (iv) reduce GHG emissions; and (v) sell carbon credits for the benefit of small-holder farmers. The project takes a participatory approach with the aim to strengthening farmer groups and farmer's organisations. (Vi agroforestry, 2016; Cooper <i>et al.</i> , 2013).	Knowledge and advisory Financing farmers Test projects on the ground Mitigation and adaptation	CSL Sustainable Agricultural Practices Including Agroforestry
Niger's Community Action Project for Climate Resilience (CAPCR)	Niger's Community Action Project for Climate Resilience (CAPCR) was launched in 2003 by GEF and IFAD, with the aim to "improving the resilience of the populations and the production systems to climate change and variability, in order to increase national food security". The project aims to mainstream climate resilience into development, integrate resilient practices into agro-pastoral systems, and coordinate M&Es of progress (CIF, 2011; Cooper <i>et al.</i> 2013).	Knowledge and advisory Knowledge repository Test project on the ground Mitigation and adaptation	CSA Agroforestry
Nigerian National Agricultural Resilience Framework (NARF)	The NARF seeks to minimize climate risks associated with Nigeria's ambitions to promote rural development through export led agriculture. The NARF has the following strategic objectives: (i) Strengthening the overall policy/institutional framework for improved resilience and adaptation to climate variability and change in the agricultural sector, including planning and implementation, systems for resource mobilization, and effective project M&E; (ii) Evaluation and introduction of risk transfer and risk management strategies (e.g., improved seasonal and real time weather forecasts, insurance based risk mitigation options etc.) into the agricultural sector and widespread deployment of same through communication technologies, including mobile phones; (iii) Improving productivity through training community and grass root farmers on land and water management strategies (e.g., irrigation farming, water harvesting, soil fertility enhancement and erosion control etc.) improved farming practices and using policy instruments such as economic incentives, regulations and communication; (iv) Reinforcing existing social safety nets through support systems that reduce vulnerability and improve livelihood conditions for the vulnerable, especially women and children; (v) Improving farming systems research capacity within the National Agricultural Research System (NARS) to enable and support the implementation of climate friendly agriculture in Nigeria; and (vi). Revamping extension services, including building new capacity for evidence-based assessment and management of climate risk for resilience in the agriculture sector.		CSA Climate risk management, insurance and finance
Communicating seasonal forecasts to farmers in Senegal for better agricultural management	Since 2011, climate information services have been broadcasted to millions of farmers in Senegal, using simple to understand forecasts. By providing relevant and comprehensible climate information, farmers are more capable of coping with increasing climate uncertainty. The objective of this project is therefore to improve the resilience of smallholder farmer livelihoods in the face of climate variability, through a package of locally relevant seasonal forecast information, training and guidance.	Knowledge and advisory Test projects on the ground Adaptation	Climate risk management, insurance and finance

Initiative	Objective	Type and focus area	Agriculture approaches
Climate Resilient Post-Harvest Agribusiness Support Project (PASP) in Rwanda	The PASP is a five-year project active between 2014 and 2019. The project aims to increase resilience of rural infrastructure to climate change impacts, through design of climate-smart post-harvest and dairy infrastructure.	Knowledge and advisory Financing farmers Insurance Materials and seeds Mitigation & adaptation	CSA
Ghana National Climate-Smart Agriculture and Food Security Action Plan	The Action Plan aims to translate the national goals and objectives in CSA, into action on the ground, through sound implementation of programmes in the respective agroecological zones and in the various districts in Ghana.	Knowledge and advisory Test projects on the ground Mitigation & adaptation	CSA Agroecology Agroforestry

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Scaling-Up Climate Action in Agriculture

Increasing food production in the face of a growing population, while adapting to and mitigating climate change constitutes a main challenge for the global agricultural sector. This study identifies, analyses and contextualizes regional initiatives related to agriculture and climate change in developing countries. In order to identify needs for improvements and possibilities for replication or scale-up, a review of recently launched initiatives is combined with a SWOT analysis. Moreover, the study places initiatives in the context of INDCs of Sub-Saharan African countries submitted under the UNFCCC. As a result, recommendations on how to develop and implement best practice agriculture climate change initiatives are presented.

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