Food and Agriculture Organization of the United Nations

Operational guidelines for the design, implementation and harmonization of monitoring and evaluation systems for climate-smart agriculture

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Operational guidelines for the design, implementation and harmonization of national-level monitoring and evaluation systems with a focus on alignment with the Paris Agreement, 2030 Agenda for Sustainable Development, and Sendai Framework for Disaster Risk Reduction.

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Foreword

Climate-smart agriculture (CSA), a concept developed by FAO in 2010, aims to address three main objectives, or pillars: 1) sustainably increase agricultural productivity; 2) build adaptation and resilience to climate change, and 3) reduce greenhouse gas (GHG) emissions, where possible. An increasing portion of international funding for climate change in the agriculture sector is being channeled through CSA investment programmes financed by multilateral development banks (MDBs). In parallel, a majority of countries have recently committed to three international agreements: 1) the 2030 Agenda for Sustainable Development; 2) the Sendai Framework for Disaster Risk Reduction (2015-2030); and 3) the Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC). Countries have recognized the significant role of agriculture in mitigation and adaptation to climate change in their Nationally Determined Contributions (NDCs) to meet the Paris Agreement commitments. This is evidenced by the nearly 80 percent of NDCs containing mitigation and 90 percent of NDCs containing adaptation activities in the agriculture sector. CSA projects contribute to countries' fulfilment of commitments to the Paris agreement and to the Sustainable Development Goals (SDGs).

Monitoring and evaluation (M&E) is recognized as critically important for tracking progress, whether it serves the purpose of accountability to donors, informs future improvements to CSA practices, or contributes to the aggregate global progress toward meeting the SDGs or the global stocktake under the Paris Agreement. There has been a growing chorus acknowledging the need to align the indicators and M&E frameworks of major donors with those of the three global agreements. Monitoring and reporting has begun on the SDGs, although the development of methodologies for various indicators is an evolving process. The development of specific indicators for the agriculture sector is also well underway for the Sendai Framework. The organizations conducting this work have recognized the need to streamline these processes. For example, they have already attempted to align several of the indicators between the SDGs and the Sendai Framework.

The Global Alliance for Climate Smart Agriculture (GACSA), the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) and the World Business Council for Sustainable Development (WBCSD) have hosted several meetings and dialogues addressing the harmonization of M&E systems and indicators for CSA in recent years. To date, however, there has been insufficient guidance on concrete steps to utilize CSA M&E as a mechanism to achieve M&E harmonization that facilitates for countries the process of effectively and efficiently reporting on the three global agreements in tandem with their CSA reporting.

These operational guidelines aim to address the core constraints and needs of FAO Member States on both the design and implementation of M&E systems that can simultaneously address CSA and sector reporting requirements for the 2030 Agenda, the Sendai Framework and the UNFCCC Paris Agreement. First and foremost, the guidelines acknowledge the principal need expressed by Member States that M&E systems and indicators be simple and not onerous.

The challenges that have always existed with regard to M&E for CSA are still present, and are particularly pronounced for pillar 2, adaptation and resilience. These challenges to the development of indicators for pillar 2 have exhibited the greatest need for attention and discussion. To this end, the Italian Ministry of Environment, Land and Sea (IMELS) generously funded the *Workshop on Monitoring and Evaluation (M&E) for climate-smart agriculture (CSA)*, held at FAO headquarters in March 2019. This workshop convened experts from the public and private sectors, non-governmental organizations (NGOs) and academia for three days of discussions addressing these challenges and endeavoring to devise feasible solutions. The workshop discussions and results serve as the basis for these guidelines, which have also been generously funded by IMELS.

FAO and IMELS are pleased to present these guidelines. Although they are not the "silver bullet" and are not intended to enable perfect alignment on M&E for all reporting requirements, they represent a step forward in supporting this alignment and recommend actions to overcome key challenges with regard to institutional arrangements, indicator selection and data.

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Abbreviations and acronyms

AfDB	African Development Bank
ASAP	Adaptation for Smallholder Agriculture Programme
BUR	biennial update report
CCAFS	Climate Change, Agriculture and Food Security programme
CIAT	International Center for Tropical Agriculture
CISP	Climate Smart Investment Plan
CSA	climate-smart agriculture
DFID	Department for International Development (UK)
EBRD	European Bank for Reconstruction and Development
FAO	Food and Agriculture Organization of the United Nations
GACSA	Global Alliance for Climate-Smart Agriculture
GCF	Green Climate Fund
GEF	Global Environment Facility
GHG	greenhouse gas
IFAD	International Fund For Agricultural Development
IMELS	Italian Ministry for the Environment, Land and Sea
IPCC	Intergovernmental Panel on Climate Change
M&E	monitoring and evaluation
MDB	multilateral development bank
MRV	monitoring, reporting and verification
NAP	national adaptation plan
NAPA	national adaptation plan of action
NC	national communication
NCSD	National Council for Sustainable Development
NDC	nationally determined contribution
NGO	non-governmental organization
SADC	Southern African Development Community
SDG	Sustainable Development Goal
ToC	theory of change
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
WBCSD	World Business Council for Sustainable Development

Executive summary

Climate-smart agriculture (CSA) was developed as a framework to tackle three main objectives, or pillars: sustainably increasing agricultural productivity and incomes; building resilience and adaptation to the impacts of climate change; and contributing to climate change mitigation, where possible. It is a three-tiered approach that promotes the adoption of climate-smart practices, supports existing production systems in adapting to the impacts of climate change, and fosters an enabling environment for conducive policies, institutions and finance. Implementation of CSA requires a well-defined and effective approach to monitoring and evaluation (M&E) and the development of indicators.

Several billion dollars of international funding for climate change in the agriculture sector has been channeled through CSA investment programmes financed by multilateral development banks (MDBs). The private sector is also actively engaged in implementing CSA programmes. The World Business Council for Sustainable Development (WBSCD) is leading CSA projects in five priority regions around the world: Southeast Asia, Brazil, India, North America and West Africa (WBCSD, 2019). Since donors require countries to meet certain conditions in order to obtain and justify funding, climate finance mechanisms such as the Global Environment Facility (GEF), Green Climate Fund (GCF) and Adaptation Fund (UNFCCC) have developed M&E frameworks to assess the contributions of projects to decreased vulnerability and increased resilience. Therefore, guidance is increasingly needed to track this influx of climate finance.

Importantly, in 2015 countries committed to three global agreements: 1) the 2030 Agenda for Sustainable Development; 2) the Sendai Framework for Disaster Risk Reduction (2015-2030); and 3) the Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC). CSA projects contribute to countries' fulfilment of commitments to the Paris Agreement and the Sustainable Development Goals (SDGs). The Paris Agreement in particular calls for countries to report on progress made toward their mitigation and adaptation targets and plans, and inform the upcoming global stocktake on collective progress toward fulfilling the Paris Agreement.

It would greatly benefit countries in their domestic and international reporting if frameworks for M&E were harmonized to alleviate the reporting burden and avoid duplication of efforts. However, it remains a challenge to track and measure the finance channelled into CSA projects while simultaneously alleviating the onerous reporting burden on countries under multiple agreements, given the complexity of monitoring CSA's three pillars, and in particular monitoring for pillar 2 on adaptation and resilience.

These guidelines focus on finding common indicators from the three global agreements that can be used for CSA. These indicators can serve as the "common denominators' and are the minimum requirements for indicators that can serve reporting needs under all frameworks. The guidelines outline the steps for designing and implementing an M&E system for CSA and achieving harmonization among M&E processes and systems. They do not advocate a new or separate national CSA M&E system, but rather serve as a tool to facilitate the design and implementation of a more efficient and harmonized framework. They focus on alignment with monitoring under donor frameworks and international agreements, and on overcoming the challenges that typically hinder the M&E process for both national project developers and governments.

The primary audience for the guidelines is project developers of national CSA projects covering the entire country or specific locations (i.e. subnational projects). The audience may also include government agencies responsible for monitoring contributions and commitments under the global agreements. This would also include M&E experts and officers in agriculture or environment ministries, and staff from the government, non-governmental organizations (NGOs) and research institutes who are collecting M&E data. Lastly, these guidelines may also be useful for national climate finance coordination institutions and platforms, as they often play a role in setting up frameworks for accessing and managing climate finance. This group includes climate finance centre staff, national designated authorities (NDAs), and focal points for climate change coordination platforms.

The guidelines describe four main phases and their associated steps. The final sections outline recommendations for both project developers and governments to address CSA-specific challenges related to each phase.

Phase 1: Framing and context

Step 1. Determine whether national targets, commitments and indicators have been established in national climate change reports, pledges and communications, including for the SDGs

Step 2. Develop a theory of change

Step 3. Identify and map CSA policies, programmes and projects in the country

Step 4. List and assess all M&E systems directly associated with projects or related to national climate change commitments, the national development plan, sectoral systems, or other national M&E systems

Step 5. Determine and map the institutions involved in project and programme M&E

Step 6. Make a list of all CSA stakeholders

Step 7. Take stock of stakeholder information needs and define the purpose and goals of M&E for the project(s) in conjunction with the stakeholders

Phase 2: Defining the approach, selecting indicators and gathering data

Step 1. Identify contributions to sustainable agricultural production, adaptation and resilience, and mitigation (pillars 1, 2 and 3)

Step 2. Develop a results-based management framework

Step 3. Identify and prioritize existing indicators

Step 4. Select/refine indicators and develop baselines

Indicator selection by CSA Pillar

(i) **Pillar 1,** consider the 11 sub-indicators of SDG 2.4.1 as a first step in the selection of indicators.

(ii) **Pillar 2**, choose from the following outcome indicators that can be aggregated:

To measure adaptive capacity and adaptation outcomes:

- Number and types of adopted CSA practices

and/or

- Number or percentage of farmers adopting CSA practices

To measure loss and damage:

- Loss and damage, avoided loss and damage or economic losses associated with CSA practices

(iii) **Pillar 3**, choose an indicator related to the reduction and/or removal of GHG emissions

Step 5. Map indicators to data sources and determine data collection protocols

Phase 3: Operationalization and ensuring the sustainability of the system

Step 1. Assign roles and responsibilities for M&E tasks

Step 2. Develop a monitoring plan: set up a schedule for data collection and monitoring of indicators

Step 3. Begin the process of continuous data collection and monitoring of indicators

Phase 4: Reporting and communication

Step 1. Develop a reporting and communication plan

Step 2. Keep track of reporting timeframes and frequencies for reporting mechanisms corresponding to indicators related to pillars 1, 2 and 3, and align reporting, where possible

Introduction

Why develop guidelines for climate-smart agriculture and monitoring and evaluation?

Climate-smart agriculture (CSA) was developed as a framework to tackle three main objectives, or pillars: sustainably increasing agricultural productivity and incomes; building resilience and adaptation to the impacts of climate change; and contributing to climate change mitigation, where possible. It is a three-tiered approach that promotes the adoption of climate-smart practices, supports existing production systems in adapting to the impacts of climate change, and fosters an enabling environment for conducive policies, institutions and finance. The implementation of CSA requires a well-defined and effective approach to monitoring and evaluation (M&E) and the development of indicators.

Several billion dollars of international funding for climate change in the agriculture sector has been channeled through CSA investment programmes financed by multilateral development banks (MDBs). Some examples are the African Development Bank's (AfDB) flagship programme, the "Africa Climate-Smart Agriculture (ACSA) Programme for Food Security, Adaptation and Mitigation in Africa (2018-2025)", which aims to achieve the goals of the Feed Africa strategy and contribute to the implementation of the AfDB's Second Climate Change Action Plan (CCAP2) by promoting and scaling-up CSA across the continent (AfDB, 2016). The World Bank Group (WBG) has also committed to working with countries to implement and advance CSA. The WBG portfolio plans to focus on impact at scale and place increased emphasis on adaptation and resilience (World Bank, 2019). Other regional MDBs are also investing in climate change programmes in the agriculture sector.

The private sector is also actively engaged in implementing CSA programmes. The World Business Council for Sustainable Development (WBSCD) is leading CSA projects in five priority regions around the world: Southeast Asia, Brazil, India, North America and West Africa (WBCSD, 2019). WBSCD has convened a group of multinational companies from the food and agriculture sector to address the challenges posed by climate change and the need to satisfy the nutritional requirements of a growing global population.

Therefore, guidance is increasingly needed to track this influx of climate finance. Since donors require countries to meet certain conditions in order to obtain and justify funding, climate finance mechanisms such as the Global Environment Facility (GEF), Green Climate Fund (GCF) and Adaptation Fund (UNFCCC) have developed M&E frameworks to assess the contributions of projects to decreased vulnerability and increased resilience. Government requests for guidance have also increased since 2015, when countries committed to three global agreements: 1) the 2030 Agenda for Sustainable Development; 2) the Sendai Framework for Disaster Risk Reduction (2015-2030); and 3) the Paris Agreement under the UNFCCC. The Paris Agreement in particular calls for countries to report on progress made toward their mitigation and adaptation targets[1] and plans, and inform the upcoming global stocktake on collective progress toward fulfilling the Paris Agreement.

CSA projects contribute to countries' fulfilment of commitments to the Paris agreement and the Sustainable Development Goals (SDGs). There is a great need to align the indicators and M&E frameworks of major donors with those of the three global agreements. It would greatly benefit countries in their domestic and international reporting if frameworks for M&E were harmonized to alleviate the reporting burden and avoid duplication of efforts. However, it remains a challenge to track and measure the finance channelled into CSA projects while simultaneously alleviating the onerous reporting burden on countries under multiple agreements, given the complexity of monitoring CSA's three pillars, and in particular monitoring for pillar two on adaptation and resilience.

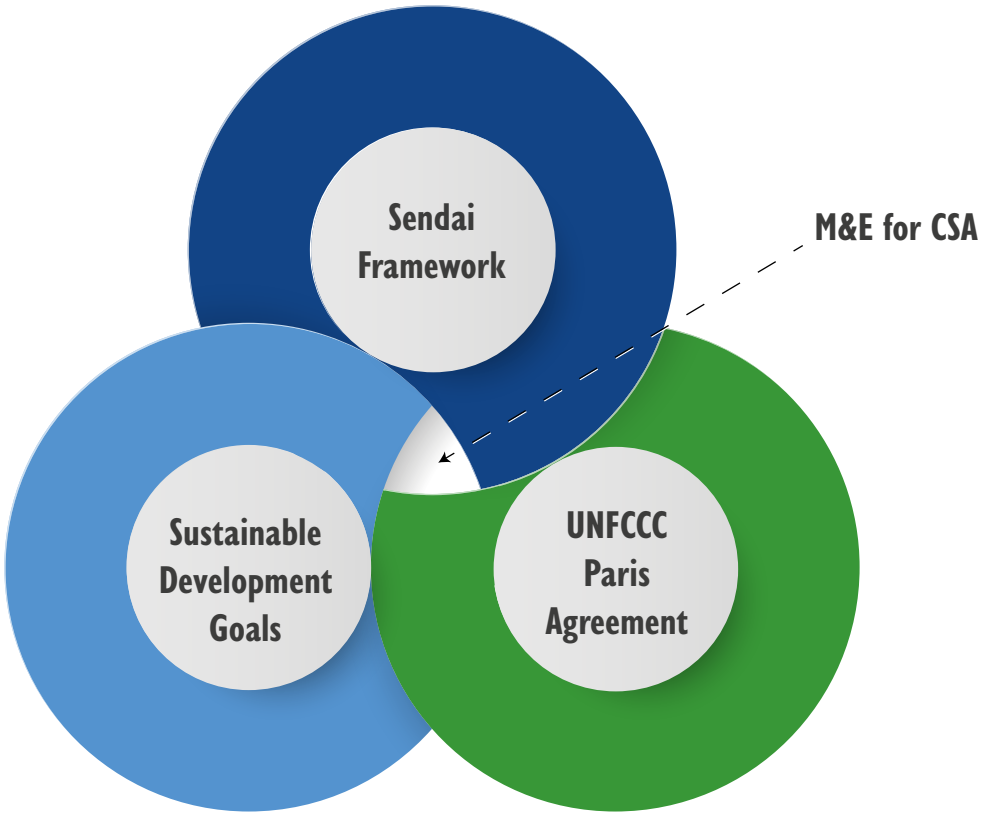
1 Under Article 13 of the Paris Agreement, all Parties *shall* report on their national GHG inventory (Article 13.7(a)) and progress made in implementing and achieving NDCs (Article 13.7 (b)), whereas all Parties *should, as appropriate* report on climate change impacts and adaptation (Article 13.8). (UNFCCC, 2016)

The origin of these guidelines can be traced back to 2017/2018 meetings and discussions hosted by WBCSD, the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) and the Global Alliance for Climate-Smart Agriculture (GACSA), which focused on the harmonization of metrics for CSA. The key recommendations emerging from these discussions were prioritizing the harmonization of approaches to measuring CSA progress across companies and sectors, reducing the number of indicators and addressing data challenges to foster this harmonization. A March 2019 workshop at FAO headquarters resumed these discussions and engaged experts in working groups to address the challenges presented by developing M&E systems and indicators that can serve the purposes of reporting at aggregated levels and harmonize CSA monitoring and reporting with donor accountability and obligations under the global agreements. The guidelines were developed using the expertise and input provided by workshop participants.

These guidelines do not advocate a new or separate national CSA M&E system, but rather serve as a tool to facilitate the design and implementation of a more efficient and harmonized framework. Monitoring and reporting is a key objective in the three agreements, and M&E obligations to donors should align with these agreements. Where possible, donor-funded mechanisms should aim to harmonize indicators with those already established as critical to M&E for CSA projects, and link to national reporting obligations under the three global agreements. Thus, the guidelines focus on finding common indicators from the three global agreements that can be used for CSA, as exemplified in figure 1. This figure shows that indicators chosen for M&E for CSA can serve as the "common denominators" and are the minimum requirements for indicators that can serve reporting needs under all frameworks.

For the purposes of these guidelines, the term monitoring and evaluation (M&E) is used to encompass the process for CSA as a whole with its three pillars. This is clarified here because it is commonly understood that M&E is usually used for pillars 1 and 2, while under the UNFCCC, the equivalent term for M&E under pillar 3 is monitoring, reporting and verification (MRV). M&E is used interchangeably in these guidelines.

Figure 1. CSA M&E indicators and the three global agreements



Target audience

The primary audience for these guidelines is project developers of national CSA projects covering the entire country or specific locations (i.e. subnational projects).[2] The audience may also include government agencies responsible for monitoring contributions and commitments under the global agreements; thus, this would also include M&E experts and officers in agriculture or environment ministries, and staff from the government, NGOs and research institutes who are collecting M&E data. Lastly, these guidelines may also be useful for national climate finance coordination institutions and platforms, as they often play a role in setting up frameworks for accessing and managing climate finance. This group includes climate finance centre staff, national designated authorities (NDAs) and focal points for climate change coordination platforms.

Monitoring, evaluation and reporting are connected and need to be linked to understand causes and effects but are separate processes. Specifically, monitoring entails the systematic and routine collection of data and information to track progress and inform indicators. Evaluation is the periodic assessment of the design, implementation, outcomes, impact and sustainability of an intervention. Reporting is the documentation and communication to stakeholders of the results for the purposes of transparency, accountability and decision-making. The target audience may indeed be involved in monitoring, evaluation and reporting. However, for the purpose of these guidelines, the monitoring and (to a certain extent) reporting processes are emphasized rather than the evaluation process.

Structure of guidelines

These guidelines outline the steps for designing and implementing an M&E system for CSA, and achieving harmonization among M&E processes and systems. They focus on alignment with monitoring under donor-funded frameworks and international agreements, and overcoming the challenges that typically hinder the process for both national project developers and governments. The guidelines describe four main phases and their associated steps. Although there is an implied order to the phases, it is possible that some steps in each phase may be implemented at different times during the process. The final sections outline recommendations for both project developers and governments to address CSA-specific challenges related to each phase. Figure 2 illustrates the four main phases to set up an M&E system for CSA.

Four phases of design and implementation of the monitoring and evaluation system

1. Framing and context
2. Defining the approach, selecting indicators and gathering data
3. Operationalization and ensuring sustainability of the system
4. Reporting and communication

2 The word "national" for the purpose of these guidelines denotes projects within one country. This includes projects that cover the whole country or one area of the country (subnational level).

Figure 2. Four phases of the design, implementation and harmonization of M&E for CSA

Phase 1
Framing and context

Figure 3. Steps in phase 1 of the design and implementation of the M&E system

The first phase of the design of M&E for CSA is a framing of the current situation or context; in other words, a situational analysis. This phase begins with defining the national policy context for SDG and Paris Agreement targets and commitments, a mapping of CSA policies, programmes and projects and the institutions involved, and an articulation of the purpose and objective of the M&E system.

1. Determine whether national targets, commitments and indicators have been established

The first step is to determine whether national targets, commitments and indicators have been established in national climate change reports, pledges and communications, including for the SDGs. Practitioners should build upon the information that is available. National mitigation and adaptation commitments, targets and indicators can be found in Nationally Determined Contributions (NDCs), Adaptation Communications[3], national adaptation plans (NAPs), national adaptation programmes of action (NAPAs), national communications (NCs), biennial reports and biennial update reports (BURs). It is also necessary to consult national commitments to the SDGs. Practitioners should review these national reports and documents to identify these targets, and to help them consider the desired outcomes, as well as the indicators

3 The specific information to be submitted on adaptation is the Adaptation Communication: Paris Agreement Art 7.10 states: Each Party should, as appropriate, submit and update periodically an Adaptation Communication, which may include its priorities, implementation and support needs, plans and actions, without creating any additional burden for developing country Parties. 7.11: The Adaptation Communication referred to in paragraph 10 of this Article shall be, as appropriate, submitted and updated periodically, as a component of or in conjunction with other communications or documents, including a national adaptation plan, a nationally determined contribution as referred to in Article 4, paragraph 2, and/or a national communication.

necessary to measure progress toward these outcomes. This review is intended to serve as the anchor for a minimum standard indicator tracking system.

An interim step is to review whether the contributions can be quantified and thus meaningfully measured and monitored. It is often the case that countries have not quantified their contributions. For example, 94 percent of agriculture adaptation contributions in NDCs from Asia are not quantified (Beau Damen, FAO, personal communication, 2019). Therefore, these guidelines set out a recommendation in the final section for governments to set clear targets and quantify them so they can be measured and tracked.

2. Develop a theory of change

A theory of change (ToC) can be defined as "the description of a sequence of events that is expected to lead to a particular desired outcome" (Davies, 2012). ToCs are the ideas and hypotheses people and organizations have about how change happens. It is important to be explicit about the priorities within the objectives for the CSA intervention to identify how to track changes (Vincent and Ofwona, 2018). Developing sound theories of change can help practitioners determine attribution[4], which is especially challenging for CSA pillar 2, covering adaptation and resilience.

According to van Es *et al.* (2015), the steps for developing a ToC are:

1. Identify the purpose of the ToC
2. Develop the vision and define desired change
3. Identify domains of change
4. Identify strategic priorities
5. Develop pathways of change
6. Review and adapt ToC

There are some key points to keep in mind when developing a ToC: 1) change is not linear; 2) the ToC will have to be revised over time; and 3) key stakeholders should be involved in its development (Kusters *et al.,* 2017).

The identification of national targets, commitments and contributions under the global agreements in step 1 ideally provides the foundation for the ToC for the M&E system. The broader goals outlined in the national commitments provide a framework for the intermediate outcomes and outputs that the M&E system should be tracking. The national commitments provided in a communication (e.g. NDC) should theoretically constitute the ToC, embodying the ways in which the country plans to execute climate change policy.

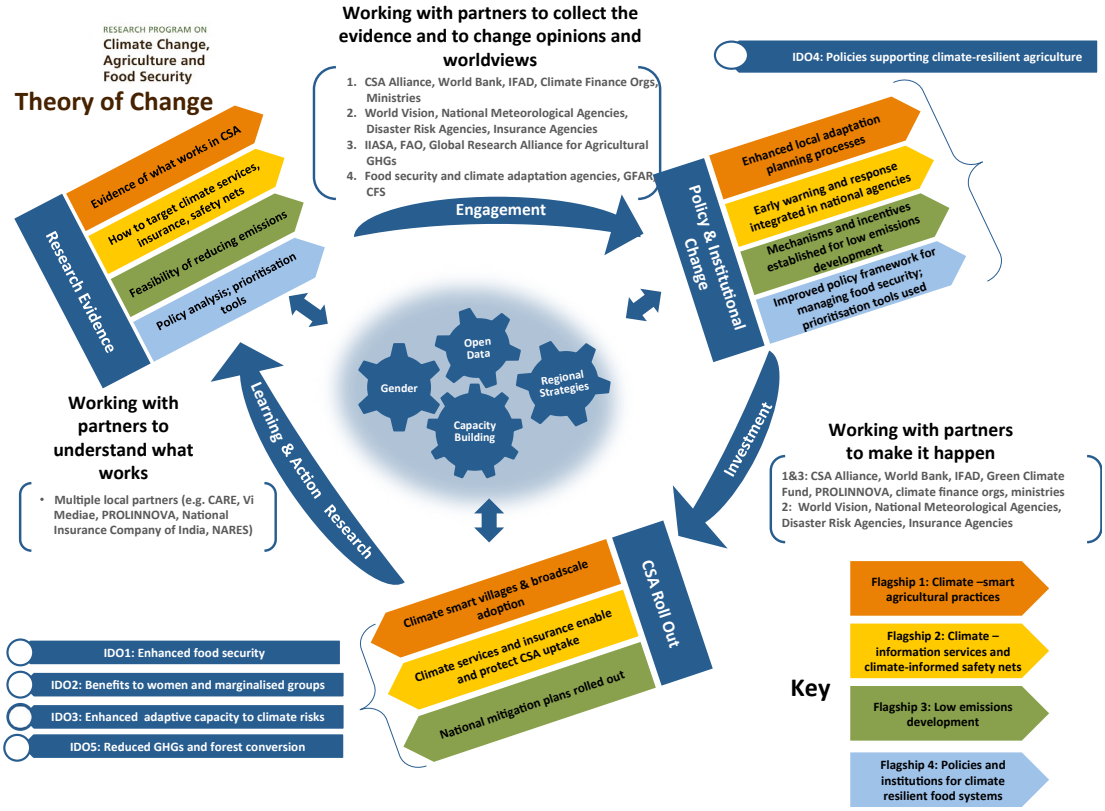
Specifically, the ToC for CSA is based on four broad areas of action: 1) the creation of an evidence base to motivate, support and monitor change; 2) continuous dialogue with stakeholders; 3) formulation of tools to enable change; and 4) innovative approaches to create and sustain change in food and agricultural systems (FAO, 2013).

As CCAFS points out, the ToC is a fundamental part of programme planning, decision-making and evaluation (Neufeldt *et al.,* 2015). The CCAFS ToC is depicted in Figure 4. It shows the flagship projects, activities, key strategies for impact (e.g. social learning approaches, partnerships) and the key roles of partners. The emphasis of the ToC is on partnerships,

4 Attribution is the process of evaluating the relative contributions of multiple causal factors to a change or event with an assignment of statistical confidence (Hegerl *et al.*, 2010). Attribution presents challenges because, due to the limited knowledge about the interactions between climate and human systems it is often not possible to establish a direct causal link confirming that an outcome was successful due to one specific action rather than other external factors.

as CCAFS collaborated with development partners in developing the ToC, including the major organizations that set the agenda for rural development globally and nationally.

Figure 4. CCAFS Theory of Change



Source: CCAFS, 2013.

From an MDB perspective, the International Fund for Agricultural (IFAD) ToC for the second phase of the Adaptation for Smallholder Agriculture Programme (ASAP2) is:

> *To strengthen the environmental sustainability and climate resilience of poor rural people's economic activities, IFAD needs to continue integrating technical assistance activities for climate change adaptation in its investment programmes. Without this supplementary support, IFAD will not be able to sustain climate-informed programming, leverage resources from the public and private sector to address the additional costs of climate change for rural development, or achieve its objective of 100 per cent climate mainstreaming.*

The IFAD example is important because it has linked the ToC directly with corresponding strategic objectives and indicators, as well as data sources for the indicators, 2025 targets, and corresponding contributions to the SDG targets, as shown in Table 1.

Table 1. The ASAP2 theory of change, objectives, outcomes and contributions to the SDGs

ASAP2 theory of change, objectives, outcomes and contribution to SDGs

ASAP2 theory of Change:

To strengthen the environmental sustainability and climate resilience of poor rural people's economic activities, IFAD needs to continue integrating technical assistance activities for climate change adaptation in its investment programmes. Without this supplementary support, IFAD will not be able to sustain climate-informed programming, leverage resources from the public and private sector to address the additional costs of climate change for rural development, or achieve its objective of 100 per cent climate mainstreaming.

Strategic objective*	Indicator	Data source	2025 target**	SDG target
To strengthen the environmental sustainability and climate resilience of poor rural people's economic activities	No. of poor smallholder household members supported in coping with the effects of climate change	Results and Impact Management System (RIMS); IFAD10 Results Measurement Framework indicator	10 million individuals	1.5 2.4
Portfolio-level outcomes	**Indicator**	**Data source**	**2025 target**	**SDG target**
1. Climate-informed investment planning: IFAD country programmes and investment programmes incorporate climate risk and vulnerability information	Percent of COSOPs and IFAD project designs that integrate climate risk and opportunity information	COSOPs, country strategy notes, SECAP review notes	100 percent	13.3
2. **Mobilization of resources to address the additional costs of climate change:** Public and private sector resources mobilized to address the additional costs of climate change for smallholder agriculture	Total in USD mobilized from non-IFAD sources to co-finance climate-related investments (adaptation and mitigation) in IFAD investment programmes.	Environment and Climate Division portfolio review, GEF and GCF pipelines	USD 300 million	7.2 17.3
3. **Climate risk management investments:** IFAD investment programmes target and budget actions to reduce climate-related risks	No. of IFAD investment programmes that make investments to reduce, mitigate or transfer climate-related risks	Portfolio review	100 projects	2.4
Project-level outcomes (financed by ASAP2)	**Indicator**	**Data source**	**2025 target**	**SDG target**
4. Climate risk awareness: Increased use of climate risk information by IFAD project teams, agriculture sector institutions and smallholder farmers	No. of individuals provided with climate information services	RIMS SO3 indicator	1 000 000 individuals	13.1 13.3
5. Policy engagement: Strengthened institutional relationships in IFAD Member States to realize international climate commitments and national adaptation plans	No. of IFAD Member States in which agricultural institutions receive capacity support and engage in climate policy dialogue	Portfolio review	50 countries	13.2
6. Women's empowerment: Increased participation of women in climate change adaptation activities	No. of women reporting adoption of environmentally sustainable and climate-resilient technologies and practices	RIMS SO3 indicator	3 000 000 women	5.5

Strategic objective*	Indicator	Data source	2025 target**	SDG target
7. Private sector engagement: Strengthened participation of private sector entities and farmers' groups in climate adaptation and mitigation actions	Total in USD leveraged from private sector entities to support climate change adaptation and mitigation actions	External review	USD 100 million	17.3 17.17
8. Nutrition security: Adoption of climate adaptation measures that increase nutrition co-benefits for smallholder farmers and their families	No. of individuals/households provided with targeted support to improve their nutrition	RIMS SO1 indicator	1 000 000 individuals	2.1
9. Natural resource management capacity: Improved participation and ownership of smallholder farmers in decision processes and technologies that relate to governance and management of climate-sensitive resources	No. of groups supported to sustainably manage natural resources and climate-related risks	RIMS SO3 indicator	10 000 groups	1.4 8.6 12.2 13.1 14.2 15.1
10. Knowledge management: Increased knowledge on climate-resilient agriculture approaches and practices available at national, regional and global level	No. of national, regional or global dialogues on climate issues where IFAD-supported projects or partners contribute actively	Tracking of climate-related knowledge products/activities	100 dialogues	2.4 13.2 12.1

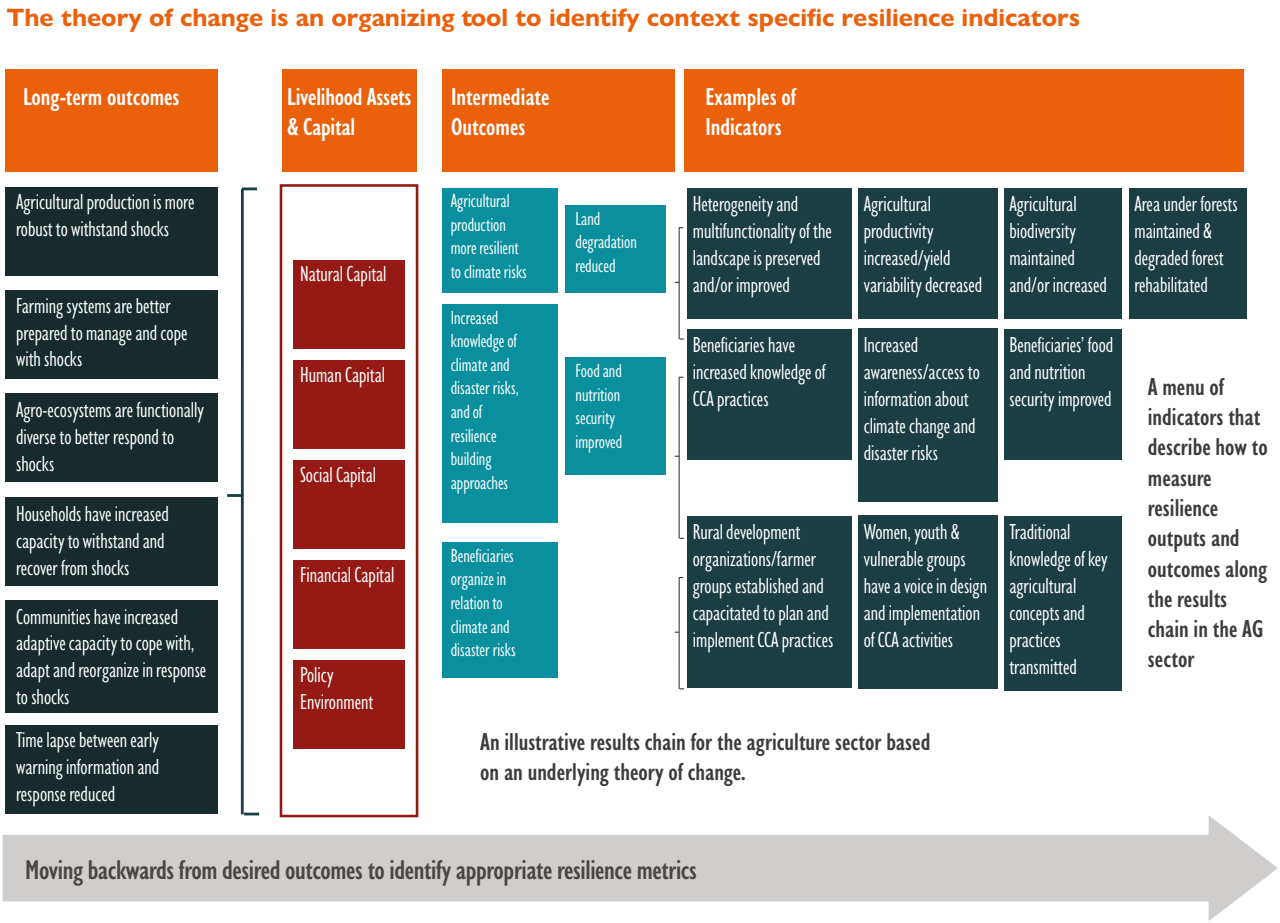
* Strategic Objective formulated in the IFAD Strategic Framework 2016-2025: Enabling inclusive and sustainable rural transformation. See www.ifad.org/documents/10180/edb9b9d4-664e-42dc-a31e-db096e6a71b5.

** Assumes contributions to the ASAP2 Trust Fund of at least USD 100 million. If contributions are of a different scale, targets need to be revised accordingly.

Source: IFAD, 2017

The World Bank Integrated M&E Framework for its Kenya Climate Smart Agriculture Project uses a resilience index underpinned by its ToC, which is informed by the vulnerability context (van Nieuwkoop, 2019). The World Bank describes the ToC for CSA as an "organizing tool to identify context-specific resilience indicators", and recognizes the value of using it to move backwards from outcomes in order to identify the appropriate resilience indicators (van Nieuwkoop, 2019). Figure 5 depicts the ToC for the agriculture sector.

Figure 5. World Bank ToC for the agriculture sector resilience indicators



Source: van Nieuwkoop, 2019

ToCs might explicitly list the assumptions inherent to each transition from outputs to short-term outcomes, short-term outcomes to intermediate outcomes, and intermediate outcomes to long-term outcomes. One additional example from FAO provided here comes from the final evaluation of the GCCA in Uganda Agricultural Adaptation to Climate Change project. Figure 6 provides the ToC for one results area of the project (improved resilience of agricultural production systems in the cattle corridor). The ToC assesses the contribution of the project to the main goals of mitigating the adverse impacts of climate change and improving farmers' food security, nutrition and livelihoods. The assumptions underlying each transition are listed.

Figure 6. ToC for GCCA in Uganda agricultural adaptation to climate change project results area: improved resilience of agricultural production systems in the cattle corridor

Source: FAO, 2017a

Developing a ToC can be a complex process and deserves its own set of guidelines. For further guidance, see the FAO CSA Sourcebook Module 10, which articulates a ToC for CSA (FAO, 2013).

3. Identify and map climate-smart agriculture policies, programmes and projects in the country

M&E is conducted to measure progress and identify the successes and setbacks of CSA interventions (FAO, 2013). In order to understand how to plan and implement M&E, it is important to understand the context and activities involved in the CSA interventions. This may include current projects and projects in the pipeline (future projects).

Ideally, planning for M&E is initiated during the project preparation stage. The frameworks and M&E systems are designed after the assessment of climate change impacts have been completed and detailed project plans are being formulated (FAO, 2013). However, if M&E set-up occurs after the projects themselves have already been planned or initiated, it should be done as soon as possible to avoid possible managerial complications during the project and missed opportunities to monitor as effectively as possible.

Box 1 describes CSA country profiles, which provide a resource for the identification of CSA projects in several countries and serve as an important reference for subsequent steps in the M&E process. It should be noted, however, that the consultation of these profiles may not be sufficient. It may be necessary to conduct additional consultations with development partners and NGOs to collect information on existing projects and local initiatives.

BOX 1

CSA country profiles

The climate-smart agriculture (CSA) country profiles were developed by the International Center for Tropical Agriculture (CIAT) and the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), in partnership with the World Bank, the Centro Agronómico Tropical de Investigación y Enseñanza (CATIE), the United Kingdom's Department for International Development (DFID), the Food and Agriculture Organization of the United Nations (FAO) and The United States Agency for International Development (USAID) Bureau for Food Security, as well as the national governments and local partner organizations in the respective countries.* These profiles outline the status of several aspects of CSA in the country, provide an overview of the agricultural challenges and describe the ways in which CSA can help the country adapt to and mitigate climate change. The key elements of the profile are: the national agricultural context, projected impacts of climate change on agriculture, CSA practices and technologies (including a list of CSA interventions), and a description of the enabling environment for CSA. One prominent feature of the profiles is the identification of trade-offs and synergies between the three pillars. The profiles have contributed to building political will and strong CSA advocacy groups.

Source: Sova *et al.,* 2018

* To date, CSA profiles have been completed for the following countries (by regions): Latin America and the Caribbean: Argentina, Belize, Colombia, Costa Rica, El Salvador, Grenada, Mexico, Nicaragua, Peru, Uruguay; Africa: Benin, Côte d'Ivoire, Ethiopia, Kenya, Lesotho, Malawi, Mozambique, Rwanda, Senegal, the Gambia, Uganda, the United Republic of Tanzania, Zambia, Zimbabwe; Asia: Bangladesh, Bhutan, Kyrgyzstan, Nepal, Pakistan, Pakistan (Punjab), Sri Lanka, the Philippines, Viet Nam; Europe: Moldova. They are under development for Ghana, Mali and the Niger.

In cases where these country profiles are not available, it is advisable to determine whether there is another compilation of CSA projects or source of information in the country. Malawi and Zambia have both recently developed national CSA frameworks. The Malawi National CSA Framework, for example, may serve as a reference, as it contributes to the country's efforts to fulfil commitments under the Comprehensive Africa Agriculture Development Programme (CAADP), the 23rd Ordinary African Union Assembly Decisions and Declaration (Malabo Declaration), the SDGs, the Southern African Development Community Regional Indicative Strategic Development Plan (SADC RISDP) and the Common Market for Eastern and Southern Africa Treaty (Nowak *et al.,* 2019). Zambia's recently produced CSA framework intends to ensure coherence among policies and programmes and focuses on its goals to sustainably increase agricultural productivity and incomes, and adapt and build resilience to climate change with mitigation as a co-benefit. The framework identifies 38 CSA technologies, but does not yet have an M&E plan. It does mention a plan that prioritizes simple metrics and capacity building.

4. List and assess all monitoring and evaluation/monitoring, reporting and verification systems directly associated with projects or related to national commitments

The next step is to assess whether there are existing M&E/MRV systems directly associated with projects or related to national climate change commitments, the national development plan, sectoral systems, or other national M&E and MRV systems (including those associated with other plans, programmes, or agriculture, development and disaster risk reduction projects). "MRV" is the term used in particular for the monitoring, reporting and verification of mitigation activities. Because there are several links to national and international reporting for MRV (e.g. the UNFCCC for reporting on GHG inventories and mitigation actions), it is critical that the status of MRV systems be known since these can serve as a foundation. To avoid "reinventing the wheel," an effort should be made to build on existing M&E/MRV systems, where possible, and subsequently integrate any newly developed data collection, sharing, dissemination, reporting, quality assurance, or archiving protocols and the information collected using them.

Box 2

Building on existing M&E/MRV systems and tools: Malawi, the United Republic of Tanzania and Zambia

As part of the research conducted by CCAFS for a CSA monitoring, reporting and verification (MRV) country profile, CSA stakeholders in Malawi identified seven different tools being used to track progress in the agriculture sector that could be useful for CSA monitoring and evaluation (M&E) and applied in an integrated system. In its CSA Framework, Malawi sets out a vision for CSA MRV that draws on these existing systems. The vision specifically highlights the aim of ensuring that CSA MRV indicators are integrated into the national and sector M&E frameworks, and indicates that decentralized district-level CSA players should report on CSA activities through existing government machinery upward to the central planning and development agency.

Likewise, in the United Republic of Tanzania, fourteen different tools were identified that are currently used for tracking progress and outcomes related to CSA, including the Agricultural Routine Data System (ARDS), which is the government's management information system for the agriculture sector used by key government ministries and some donors to track implementation of agriculture projects at the district level. It is a web-based system and can integrate information from the village and ward levels into regional and national databases. The system is already operational at the national level, and thus could become a sustainable system upon which to build, assuming that challenges such as data sharing with non-governmental stakeholders and reported budget constraints are addressed.

Source: CCAFS and ICRAF, 2019a: 2019b

5. Determine and map the institutions involved in project, programme and policy monitoring and evaluation/ monitoring, reporting and verification

The importance of institutions to CSA implementation in general cannot be overstated, and the diversity of institutions involved in CSA is broad. It is important to identify all of the institutions involved since they define the way things are and can be done (FAO, 2013). Government is the largest institutional group for CSA in both Asia and Latin America, and in Africa international development partners (including multilateral and bilateral development agencies, international NGOs, networks and alliances) represent over one-third of all institutional actors (FAO, 2013).

Determine which institutions are involved in already existing M&E of activities. For each CSA project, make a list of the institutions involved in the implementation and M&E of the specific projects and activities, noting what has already been planned or implemented with regard to monitoring. Where available, CSA country profiles are a useful resource. The identification of institutions in charge of and involved in M&E is fundamental to a successful M&E process.

For example, Zambia has implemented several policies relevant to CSA, but most of these do not yet have established operational M&E frameworks. M&E responsibilities lie with various ministries and agencies, including the Council of Ministers (the highest decision-making body) and its Steering Committee of Permanent Secretaries, which has the specific

responsibility of carrying out M&E for policies and international agreements under various ministries. These include the Ministry of National Development Planning, the Ministry of Lands and Natural Resources, and the Ministry of Agriculture, which is also responsible for national agricultural investment plans. Therefore, the identification and mapping of the various institutions and their responsibilities is critical in order to coordinate and establish a harmonized M&E system (CCAFS and ICRAF, 2019c).

6. Make a list of all climate-smart agriculture stakeholders that maps key stakeholders and their roles, responsibilities, coordination and capacity

Make a list of all CSA stakeholders to consult over the course of the whole process (encompassing phases 1-4) from governmental and non-governmental institutions, map key stakeholders, and assess key stakeholders to determine roles and responsibilities, coordination and capacity. In the context of CSA, this can be more challenging than, for example, compiling a list for agriculture projects because stakeholders associated with both agriculture and climate change ministries are involved. In several countries, a multi-stakeholder CSA assessment has been completed as part of the CSA country profile.

Tools that can support the multi-stakeholder assessment are summarized in the Wageningen University and Research MSP Tool Guide (Brouwer and Brouwers, 2017). NetMapping is a tool developed by the International Food Policy Research Institute (IFPRI) to facilitate a better understanding, visualization, and discussion in situations where many different actors influence outcomes. It depicts the various stakeholders in a given network, how they are linked, how influential they are, and what their goals are. A second tool for stakeholder analysis from the MSP Tool Guide is the "Importance/Influence Matrix," which assists in mapping stakeholders to capture the degree of influence and level of interest in the implementation of the system of each stakeholder.

The Climate Smart Investment Plan (CSIP) approach, developed by the World Bank, CIAT, CCAFS and the World Agroforestry Centre (ICRAF), builds on CSA Country Profiles and uses multi-stakeholder consultations and economic analyses as integral components of its development. Climate Smart Investment Plans identify transformative, cost-effective CSA investment and policy opportunities that support a country's climate commitments (Sova *et al.,* 2018). They support investors and decision-makers in understanding best-bet CSA investment options, and the benefits, costs and risks associated with them. If Climate Smart Investment Plans are available for the country, they can also serve as good resources for the list of involved or potential stakeholders.

When compiling the list of stakeholders, it is recommended that all administrative levels be considered. Table 2 provides a list of stakeholders to consult for CSA M&E by administrative level.

Table 2. Types of stakeholders to consult for CSA M&E and their main roles in M&E, by administrative level

Administrative level	Stakeholders	Monitoring and evaluation
	Project/programme planner	X (lead)
Local	Farmers (men and women)	X (design, collect data)
	Local community	X (design, collect data)
	Farmer association (and women's groups)	C
	Local business	C
	Extension workers	X (design, collect data, support)
	Local government	X (design, support)
	Other affected people	C
National	National government – Ministry of finance, planning, environment, livestock and fisheries, water and irrigation, other ministries	C (and help design, support)
	National government – climate change office	X (design)
	Research institutions	C
	Donor agencies	X (design)
	United Nations and other international organizations	C
	Civil society, NGOs	C
	Private sector	C
	National meteorological agency	C
	Sector-specific commissions or environmental commission	C
International	International climate change community	C
NGOs	CARE, Concern, Catholic Relief Services (CRS)	X (possibly design, support)
Research programmes and centers	ICRAF CCAFS	X (possibly design, support)
Civil society organizations	National farmers Federations/Organizations	C

X = full involvement in the process of M&E development/harmonization

C = consultation during the process of CSA M&E development/harmonization

Source: FAO, 2013

7. Take stock of stakeholder information needs and define the purpose and goals of monitoring and evaluation

After completing the analysis of all relevant stakeholders, the next step is to compile their information needs, after which the stakeholders should be consulted to define the purpose and goals of the M&E system (assuming that the objectives and goals for the projects themselves have already been articulated).

In general, M&E is conducted for the following reasons:

- Learning: to track progress and collect lessons learned to inform decision-making in the future
- Evidence: to show evidence-based results
- Accountability: to account for climate finance
- Reporting: to comply with national and international reporting obligations

For CSA projects, M&E is based on the desired CSA objectives ideally stated in project design assessments, which include an assessment of system-wide capacities (FAO, 2013). Often the objective is to track progress for domestic purposes and collect lessons learned to inform future improvements. Alternatively, M&E might be conducted for the sake of accountability and to report on the use of donor funds. There are trade-offs when monitoring for differing objectives, especially when resources are limited and decisions must be made regarding what and what not to measure. When M&E is conducted to ensure that donor objectives are being met, efforts and resources are channelled into this type of verification rather than fostering learning, which can be very important during early implementation.

Indicator selection is based largely on the monitoring objectives.

Phase 2. Defining the approach, selecting indicators and gathering data

2

Figure 7. Steps in phase 2 of the design and implementation of the M&E system

In this second phase, practitioners define the contributions of the project to each CSA pillar and the results-based management framework, taking into consideration the ToC developed in step 2 of phase 1. They identify and prioritize existing indicators, select and refine new indicators, develop baselines, and determine data sources and data collection protocols.

1. Identify contributions to sustainable agricultural production, adaptation and resilience, and mitigation (pillars 1, 2, and 3)

These contributions are the specific objectives of the CSA projects themselves, articulated for pillars 1, 2 and 3. The identification of contributions to the three CSA pillars is intended to demonstrate the contribution of inputs, activities and processes to the achievement of outcomes. The M&E system is designed and implemented largely to track whether these objectives and targets are being met or are on track to be fulfilled, so they must be clearly articulated. These initial assumptions and expectations are useful later in the process when analysing why expected results were or were not achieved (Price-Kelly *et al.,* 2015).

The CSA Programming and Indicator Tool (Quinney, Bonilla-Findji and Jarvis, 2016) is recommended to support this process. The tool guides users to examine the extent to which the intervention addresses each CSA pillar and to compare the scope and CSA intentionality among different project designs. It supports the identification and selection of an appropriate

set of indicators to measure and track CSA outcomes. This process can strengthen the planning phase for interventions to ensure that all potential outcomes are included in M&E design.

Example questions related to the three CSA pillars (productivity, adaptation, mitigation) from the CSA Programming and Indicator Tool:

To what extent does your project aim to:

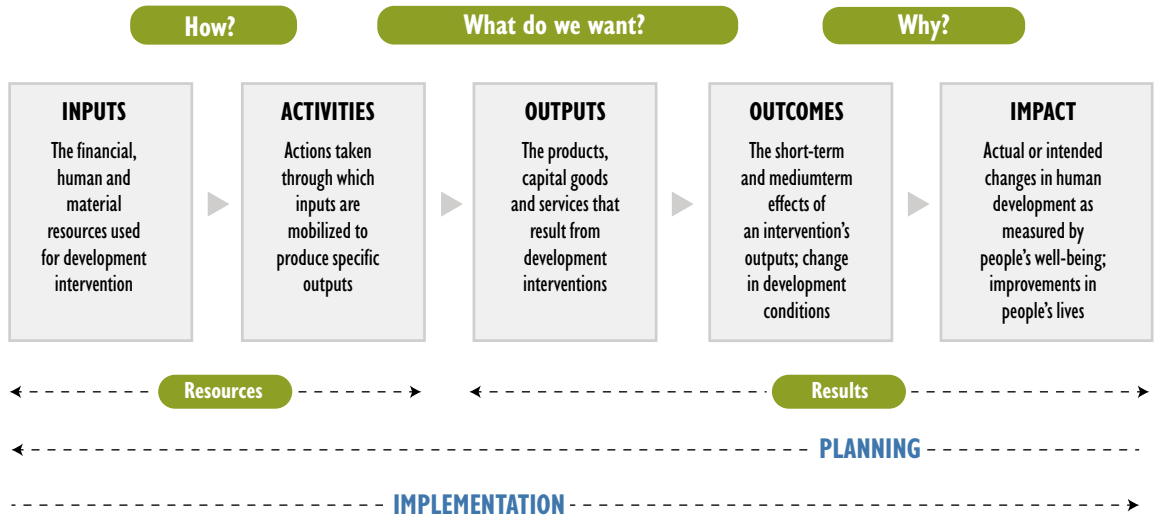
- increase yield and productivity?
- promote adaptation strategies (e.g. diversification) that increase livelihood resilience and decrease vulnerability to climatic variability and extreme weather events?
- reduce GHG emissions and/or increase removals?

2. Develop a results-based management framework

Results-based management frameworks use M&E to drive stakeholders to focus much more on results (outputs and outcomes) rather than inputs and activities. Project and programme frameworks support the characterization of the expected outputs and outcomes of the project. A results-based framework tells the story of how CSA practices link to intermediate variables at the output and outcome level, and instigate change and improvements in sustainable agricultural production, adaptation and mitigation (FAO, 2013). Changes in the biophysical, socio-economic and institutional setting may occur as a result of CSA activities. The outcome variables are usually defined as changes in behaviour, agricultural systems and institutional capacity that translate into benefits for effective climate change adaptation and mitigation and food security (FAO, 2013). The links between the different interventions, outputs and outcomes provide an overall logical framework (FAO, 2013), which serves as a results-oriented planning method. This process facilitates and helps organize the development of indicators.

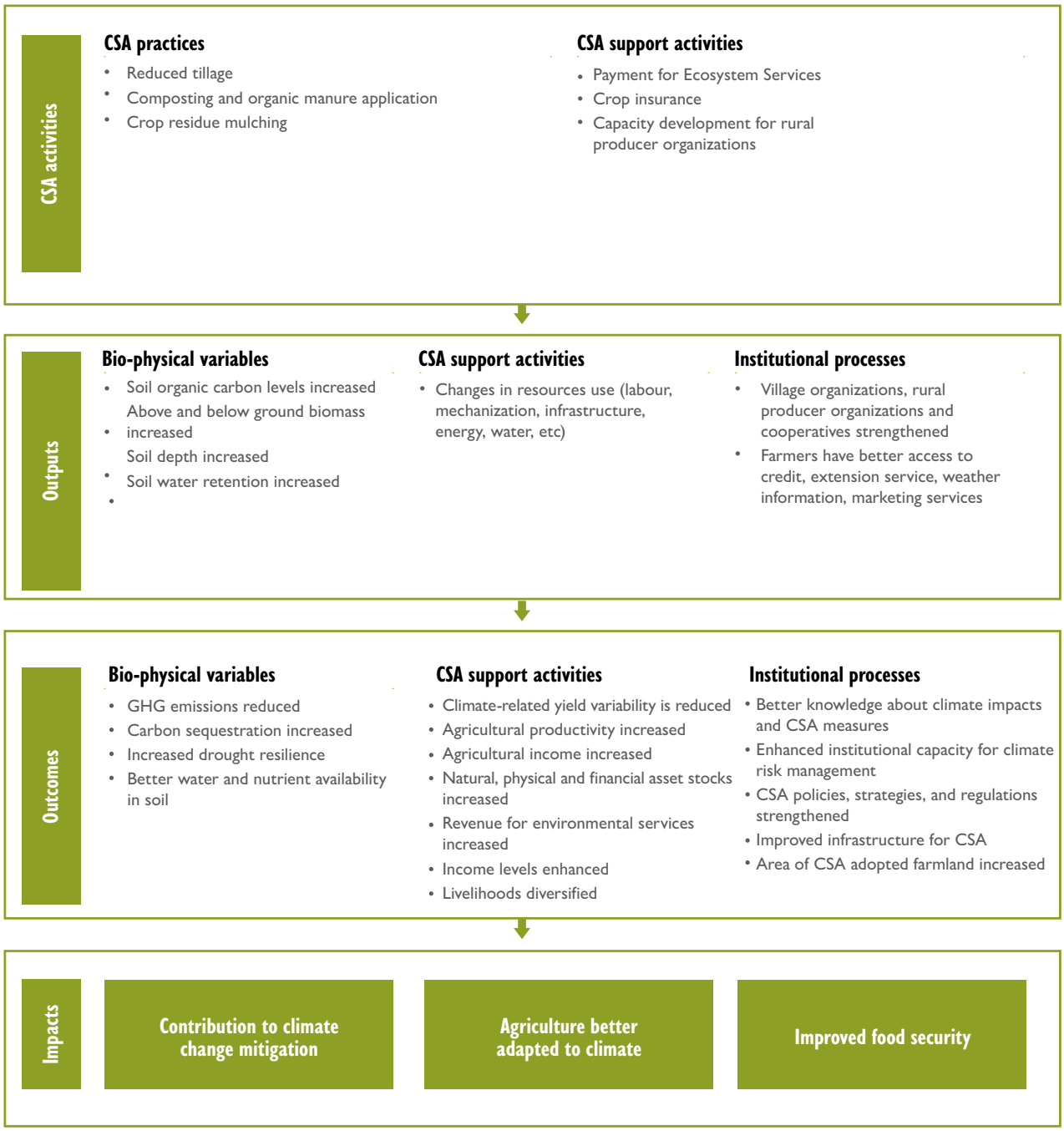
Figure 8 displays the key elements of a results chain, a central component of a logical framework, and provides a basic explanation of key terminology: inputs, activities, outputs, outcomes and impact. Figure 9 provides CSA-specific examples using this terminology.

Figure 8. Key elements of a results chain



Source: UNDP, 2009

Figure 9. CSA-specific example of a results-based framework that provides an entry point for the development of indicators



Source: FAO, 2013.

Similar to the development of a ToC, detailed guidance on results-based management frameworks is beyond the scope of this document. See FAO, 2012 for additional guidance.

3. Identify and prioritize existing indicators

Indicators are quantitative or qualitative factors or variables that provide a simple and reliable means to measure the achievement of outcomes and impacts, reflect the changes connected to an intervention, or help assess performance (OECD-DAC-WP-EV, 2002). Box 3 provides definitions for different types of indicators. Indicators are ideally identified during the CSA project design stage, particularly when preparing a results-based framework. They can then be further refined when there is more clarity on the specific interventions and their expected outcomes and impacts within a programme (FAO, 2013). Table 3 provides example indicators for the monitoring of CSA by type.

Box 4 provides an example of a results chain that links activities to outcomes for food security, which is one of the seven strategic priorities in the Philippines National Climate Change Action Plan. It shows how the chosen indicators link to the output, intermediate outcome, and ultimate outcome.

BOX 3

Types of indicators to track CSA projects

Impact indicator: An indicator that measures positive and negative, primary and secondary long-term effects produced by a development intervention, directly or indirectly, intended or unintended. (OECD-DAC-WP-EV, 2002)

Outcome indicator: An indicator that measures the quantity of goods produced and services provided, or the level of achievement or performance that has occurred because of the activities or services provided. (Horsch, 1997)

Output indicator: Quantitative or qualitative measures of activities, work products, or actions. (OECD-DAC-WP-EV, 2002).

Process indicator: An indicator that measures the ways in which services and goods are provided. (GIZ, 2013)

Table 3. Examples of indicators relevant to the M&E of CSA, by type

Type	Uses	Indicator (examples)
Input	Track the resources invested	Budget disbursed for CSA activities at district/national level; number and type of institutions implementing CSA projects
Activity	Determine whether resources, processes are managed efficiently	Number and type of CSA projects/programmes implemented; number of farmers trained in manure management
Output	Measure effectiveness of interventions	Percentage of farmers implementing CSA practices; percentage of land area under CSA
Outcome	Evaluate the envisioned change	Enhanced resilience from implementation of CSA practice; reduced GHG emissions from CSA practice implementation

Source: Nowak *et al.,* 2019

BOX 4

Sample of the Philippines National Climate Change Action Plan results-based M&E system food security matrix

Ultimate outcome: Enhanced adaptive capacity of communities and resilience of natural ecosystems to climate change

Intermediate outcome: Ensure food availability, stability, access and safety amidst increasing climate change and disaster risks

Intermediate outcome: Enhanced resilience of agriculture and fisheries production and distribution systems from climate change. Output area: Enhanced knowledge on the vulnerability of agriculture and fisheries to the impacts of climate change

Indicators:

- Provincial level agriculture and fishery sector vulnerability and risk assessment conducted nationwide
- National and provincial agriculture and fisheries climate information and database established
- Number of researches conducted on agriculture and fisheries adaptation measures and technologies developed
- Number of appropriate climate change adaptation technologies identified and implemented

Source: GIZ, 2017

At a minimum, CSA project M&E developers should use indicators that have been selected by the country to meet reporting requirements under the Paris Agreement and for the SDGs. If these are too high-level, outcome indicators should be chosen that can be easily aggregated (see the section, Indicator Selection by CSA pillar, for more guidance on selecting indicators that are more easily streamlined for national reporting). The indicators can also be prioritized by linking

back to the ToC. Once these indicators are identified and prioritized, developers can select additional indicators that are necessary. This additional selection will depend on stakeholder objectives, resource availability and cost efficiency.

4. Select/refine indicators and develop baselines

Indicator selection is one of the most difficult steps in the M&E process. In order to produce a list of indicators, practitioners should compile a preliminary list of criteria and then further pare it down. The criteria selected depend on the M&E objectives, monitoring capacity and the timeframe of the assessment. These criteria might include policy relevance, comparability, universality and cost effectiveness.

A first step in selecting indicators is applying the SMART principles. SMART stands for *specific*, *measurable*, *attainable*, *relevant* and *time-bound*. Another set of principles for developing indicators that are focused on fostering learning are the ADAPT principles. ADAPT stands for *adaptive, dynamic, active, participatory* and *thorough*. Basing indicators for adaptation on the on the ADAPT principles ensures that the complexities and dynamics involved in a constantly changing environment are captured (Villanueva, 2011). These concepts are important for building capacity and fostering a culture that prioritizes learning and process through iterative M&E rather than simply focusing on outcomes and efficiency. This most likely involves selecting indicators that are process-based. Process-based indicators track the process of meeting CSA objectives and the progress being made along an implementation continuum. These indicators measure variables such as the level of involvement of international organizations and research institutes in climate change adaptation, or the strength of public-private partnerships on climate change adaptation in agriculture.

Output indicators can be as numerous as necessary and are specific to the project. Output indicators in projects can be used to inform the outcome indicators. In general, at the outcome level, it is recommended to choose fewer and more generic indicators to facilitate comparison and aggregation. The bottom line is to limit the number of indicators where resources are lacking, and enable monitoring and reporting on indicators that can be aggregated in order to align with Paris Agreement and SDG reporting. The challenge is to strike a balance and not sacrifice context-specific information, which is particularly crucial for adaptation monitoring, while striving for aggregable information. If resources and data exist that can inform a more specific or extensive monitoring protocol, then it is sensible to collect data on as many indicators as is feasible either at the output or outcome level.

For indicators to be useful in tracking progress, practitioners must develop a baseline (FAO and UNDP, 2019). They should determine which sources of data are accessible and available for the indicators chosen. Baselines describe the business-as-usual scenario. They are projections of climate impacts, agricultural production, and food security and vulnerability without the programme or project in place. The information found in national climate reports and/or pledges can be used to create a baseline for monitoring if there is not one already being used. Baseline projections can be developed using climate impact assessments for expected future climate variations and the subsequent variations in agricultural production. These projections are used to evaluate long-term impacts of CSA, and therefore need to be revised as new information becomes available. Longer-term projects need to be adjusted according to the revised baseline projections. This is not as relevant to shorter CSA projects, where shifts in baselines are not as pronounced.

In particular, for CSA pillar 3 (mitigation) baselines, the steps are similar across projects since they use similar indicators derived from the estimation of GHG emissions reductions and removals in carbon dioxide equivalent (see the section, Indicator Selection by CSA pillar). Box 5 provides recommendations for the development of baselines for mitigation in agriculture projects related to enteric fermentation and soil carbon sequestration as examples.

BOX 5

Key recommendations for estimating the baseline scenario and emissions in agriculture projects

For enteric fermentation:

- Determine livestock categories and feed characterization
- Estimate the baseline average annual population for the species mix
- Choose or derive emission factors
- Calculate the cumulative greenhouse gas (GHG) emissions for the baseline scenario over the assessment period

For soil carbon sequestration:

- Stratify land by Intergovernmental Panel on Climate Change (IPCC) land-use category and soil management practices
- Estimate the area of land in each stratum
- Determine the soil carbon stock for each stratum
- Calculate the net change in soil carbon stock over the assessment period for each stratum
- Calculate the cumulative GHG emissions and removals for the baseline scenario over the assessment period

Source: ICAT, 2018

Indicator selection by climate-smart agriculture pillar

According to FAO (2018a), food and agriculture is the prime connection between people and the planet, and thus can help achieve multiple SDGs. The FAO vision for improved sustainability in production systems has been translated into an approach based on five principles that balance the social, economic and environmental dimensions of sustainability (FAO, 2018a): 1) Improving efficiency in the use of resources is crucial to sustainable agriculture; 2) sustainability requires direct action to conserve, protect and enhance natural resources; 3) agriculture that fails to protect and improve rural livelihoods, equity and social well-beings is unsustainable; 4) enhanced resilience of people, communities and ecosystems is key to sustainable agriculture; 5) sustainable food and agriculture requires responsible and effective governance mechanisms.

Pillar 1

"Sustainable food and agriculture" (based on the above five principles) is a broad concept and encompasses a variety of specific ideas about what constitutes "sustainable." For CSA projects, a decision is needed on the most appropriate aggregable indicators at the outcome level based on Paris Agreement and SDG commitments. Most relevant to CSA pillar 1 is SDG indicator 2.4.1, which is the percentage of agricultural area under productive and sustainable agriculture, and

Recommendation

Consider the 11 sub-indicators of SDG 2.4.1 as a first step in the selection of indicators for pillar 1.

falls under SDG Target 2.4.[5] The indicator reflects the multiple dimensions of sustainability and enables measurement of progress toward more productive and sustainable agriculture through monitoring at the farm level. The scope of the 2.4.1 methodology concerns the types of farms and agricultural production. The focus for indicator 2.4.1 is on crops and livestock. Forestry, aquaculture and fisheries are excluded, and progress in these sectors will be captured through indicators for SDGs 14 and 15. Therefore, for indicator 2.4.1 the scope is most consistent with the use of a country's agricultural area as the denominator of the sustainability indicator.[6] The methodology uses the farm survey as the main data collection instrument for all sub-indicators, but also notes the possibility of using a combination of different data sources as an alternative option for countries that would like to do so.

The 11 sub-indicators shown in Table 4 capture multiple aspects of sustainable agriculture and encompass, in a sense, a microcosm of CSA's first two pillars. The indicator choices for pillar 1 are the first two themes and sub-indicators: farm output value per hectare (under theme of land productivity) and net farm income (under theme of profitability). These two indicators are appropriate for a diverse range of CSA activities, and can cover a wide range of practices, which may then be aggregated to compute the indicator.

If, for example, net farm income was used as a more generic outcome indicator, other location or project-specific indicators could be added to provide more granular information.

Tool for pillar 1

The SDG indicator 2.4.1 methodology (FAO, 2018b) was developed by FAO in their capacity as custodian agency for the indicator, and approved by the Inter-Agency and Expert Group on SDG indicators (IAEG-SDGs) in November 2018. It provides background on the 11 sub-indicators, criteria to assess sustainability levels for the sub-indicators, sampling design, and information on reporting the indicator.

5 SDG Target 2.4 states: "By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality."

6 Agricultural area is defined as arable land plus permanent crops plus permanent meadows and pastures.

Table 4. SDG 2.4.1 eleven sub-indicators

	Theme	Sub-indicators
Economic	Land productivity	Farm output value per hectare (reference period: calendar year)
	Profitability	Net farm income (Measures if the farm is consistently profitable over a 3-year period, focusing on income from farming operations as distinct from the total income of the farming household) (reference period: last three calendar years)
	Resilience	Risk mitigation mechanisms (Measures the incidence of the following mechanisms: access to or availed credit; access to or availed insurance; on-farm diversification (share of a single agricultural commodity not greater than 66 percent in the total value of production of the holding) (reference period: last calendar year)
Environmental	Soil health	Prevalence of soil degradation (Measured via farm surveys conducted on four threats over the last three calendar years: 1. Soil erosion 2. Reduction in soil fertility 3. Salinization of irrigated land 4. Waterlogging) (reference period: last three calendar years)
	Water use	Variation in water availability (Measures irrigated agricultural area of the holding, reduction in water availability experienced on the holding, and existence of organizations dealing with water allocation) (reference period: last three calendar years)
	Fertilizer pollution risk	Management of fertilizers (Farm survey asks farmers about their use of fertilizer, in particular mineral or synthetic fertilizers, their awareness about the environmental risks associated with fertilizer and manure applications, and their behaviour in terms of plant nutrient management) (reference period: last calendar year)
	Pesticide risk	Management of pesticides (Farm survey asks for information on the use of pesticides on farms, the type of pesticide used and the type of measure(s) taken to mitigate the associated risks) (reference period: last calendar year)
	Biodiversity	Use of biodiversity-supportive practices (Measures the level of adoption of biodiversity-friendly practices by the farm at ecosystem, species and genetic levels for both crops and livestock) (reference period: last calendar year)
Social	Decent employment	Wage rate in agriculture (Measures the farm unskilled labour daily wage rate in Local Currency Units (LCU)) (reference period: last calendar year)
	Food security	Food insecurity experience scale (FIES) (Produces a measure of the severity of food insecurity experienced by individuals or households, based on direct interviews. The questions focus on self-reported (individual respondent or of the respondent's household as a whole) food-related behaviors and experiences associated with increasing difficulties in accessing food due to resource constraints) (reference period: last calendar year)
	Land tenure	Secure tenure rights to land (Measures the ownership or secure rights over use of agricultural land areas using the following criteria: formal document issued by the Land Registry/Cadastral Agency, name of the holder listed as owner/use right holder on legally recognized documents, rights to sell any of the parcel of the holding, rights to bequeath any of the parcel of the holding) (reference period: last calendar year)

Source: FAO, 2018b

All-purpose indicators

It is important to note that there are indicators that can serve the purposes of more than one CSA pillar. Capitalizing on these indicators is preferable in order to ease the monitoring and reporting burden. An example of such an indicator is from the list of SDG 2.4.1 indicators, "prevalence of soil degradation". The assessment of this indicator could contribute to information on soil carbon sequestration under the mitigation pillar, as well as adaptation and resilience under pillar 2.

Pillar 2

It is difficult to track the reduction of vulnerability or increased resilience in a standard way since there is no universal indicator. While striving to select indicators that are cross-cutting to best capture high-level outcomes that exist across

the many different activities under pillar 2, it is important to recognize that quantitative indicators are best suited to this purpose, as they are measured in numerical units and thus easier to aggregate and compare across projects.

Reaching consensus on key definitions

In order to choose the appropriate indicators, it is necessary first to agree on definitions of the key concepts being measured. This can be especially tricky when it comes to the concepts of adaptation, vulnerability and resilience, whose definitions are usually context-specific. The word "resilience" does not exist in every language and is difficult to translate. "Resilience" also has several commonly used definitions developed by a variety of organizations including the Intergovernmental Panel on Climate Change (IPCC), the Sendai Framework, USAID, DFID and FAO. All of these definitions are all slightly different. Using consistent concepts and terminology across different scales is key to enable a coherent M&E system for pillar 2 (UNEP, 2017).

Tracking ecological resilience can be somewhat easier, if not entirely straightforward since it is still context-specific. There are indicators that can be employed across a diversity of ecosystems and agricultural production systems (e.g. the number of drought-resistant crops or the improved management of water resources under drought conditions).

Recommendation

Choose from the following outcome indicators that can be aggregated.

To measure adaptive capacity and adaptation outcomes:

- Number or percentage of farmers adopting CSA practices

  and/or
- Number and types of adopted CSA practices

To measure loss and damage:

- Loss and damage or avoided loss and damage/ economic losses associated with CSA practices

These indicators can be mapped to similar outcome indicators from other common frameworks. See Table 5 for a mapping of the recommended pillar 2 indicators with their counterparts in donor-funded M&E frameworks, as well as the SDGs and the Sendai Framework.

The following recommended pillar 2 outcome indicators are more easily aggregated across a diversity of projects and enable the tracking of progress, albeit at a coarse level. As already mentioned, to carry out M&E at a more granular level, additional context-specific output indicators can be added.

To measure adaptive capacity and adaptation outcomes:

1. *Number or percentage of farmers adopting CSA practices.* These data should be sex-disaggregated. See the Gender Dimension section for more information.
2. *Number and type of CSA practices.* This covers a wide range of project-specific output indicators, such as the area under improved (CSA) management practices (e.g. percentage or ha of land under no-till/rotational grazing); the area planted with diversified crop types (percentage or ha); the use of improved management practices for fertilizers and pesticides (percentage or ha); increases in water availability (change in m^3/year); and improved food security. It must be noted, however, that these are proxies for resilience and that measurement of "increased resilience," as previously mentioned, remains problematic and of course context-specific.

To measure loss and damage:

3. *Loss and damage, avoided loss and damage or economic losses associated with CSA practices.* The use of this indicator requires a well-defined baseline scenario. Loss and damage refers to impacts of climate change that occur despite adaptation and mitigation efforts. For agriculture, this indicator might include output indicators that are relevant to the CSA project such as livestock lost (number of animals), crop insurance payments (in USD) and tonnes/acreage of crops damaged/destroyed. It should be noted that loss and damage data collection still poses significant challenges in terms of monitoring. Not all countries systematically collect loss and damage data, and even fewer integrate these data into official national statistics (Fakhruddin, Murray and Maini, 2017).

These indicators align with several similar outcome indicators from other common frameworks. See Table 5 for a mapping of the recommended pillar 2 indicators with their counterparts in donor-funded M&E frameworks, as well as SDGs and Sendai Frameworks.

FAO methodology for assessing direct loss in agriculture to align with Sendai Framework Indicator C-2, Direct Agricultural Loss Indicator

FAO is developing a methodology for assessing direct loss from disasters in agriculture to align with the Sendai Framework indicator C-2 and the SDGs. For the Sendai C-2 indicator, "direct agricultural loss attributed to disasters", agriculture includes the crops, livestock, fisheries, apiculture, aquaculture and forest sectors as well as associated facilities and infrastructure. The indicator measures loss in physical stocks and assets and loss in flows in five sub-indicators:

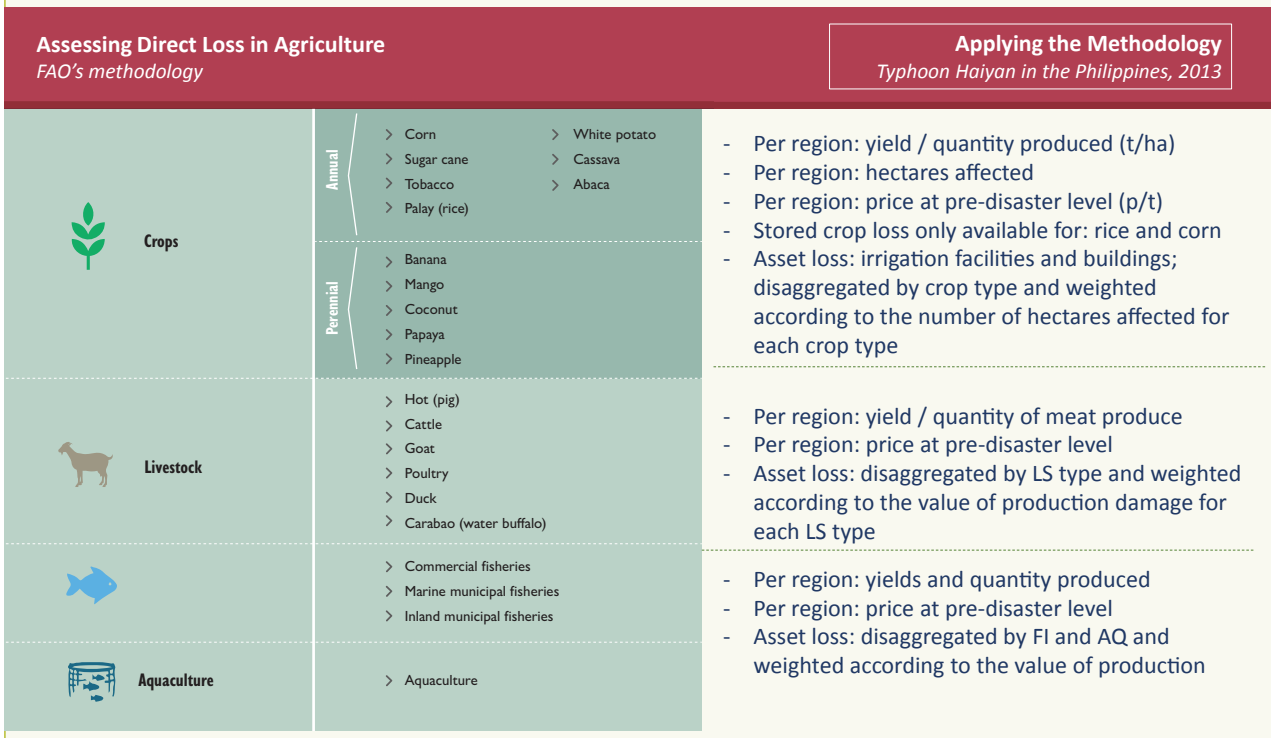
- C2(C): Impact to crops
- C2(L): Impact to livestock (and apiculture)
- C2(FO): Impact to forestry
- C2(AQ): Impact to aquaculture
- C2(FI): Impact to fisheries

Here, crop loss includes:

- Loss in annual crop stocks: pre-disaster value of destroyed stored annual crops and inputs;
- annual crop production loss: 1) difference between expected and actual value of crop production in non-fully damaged harvested area in disaster year; 2) pre-disaster value of destroyed crops in fully-damaged areas; 3) short-run post-disaster maintenance costs;
- loss in perennial crop stocks: 1) pre-disaster value of destroyed stored perennial crops and inputs; 2) replacement value of fully damaged perennial trees;
- perennial crop production loss: 1) difference between expected and actual value of crop production in non-fully damaged harvested area in disaster year; 2) pre-disaster value of destroyed standing crops in fully damaged areas; 3) short-run post-disaster maintenance costs; and
- crop assets loss: pre-disaster value of partially or fully destroyed assets.

BOX 6

Applying the FAO methodology for direct loss in agriculture: Typhoon Haiyan in the Philippines, 2013



Source: Markova and Khim, 2017.

FAO, which is developing an online monitoring tool and works with a range of "data availability scenarios," has noted that disaggregation by crop/livestock type is key (UNISDR, 2017; *Markova and Khim,* 2017). Also, see Annex II for more general information on DesInventar, the methodological tool for the Sendai Framework, which supports the generation of national disaster inventories and loss and damage database construction.

Table 5. Mapping of recommended CSA pillar 2 indicators to corresponding indicators in donor, SDG, and Sendai frameworks

Frameworks and their pillar 2-aligned indicators	CSA M&E guidance pillar 2 recommended outcome indicators	
	Increases in adaptive capacity: Number or percentage of farmers adopting CSA practices or Adaptation outcomes	**Loss and damage, avoided loss and damage or economic losses associated with CSA practices**
Adaptation Fund (Adaption Fund, 2014)	Adaptive capacity: Core indicators Number of beneficiaries (direct and indirect) Adaptation outcomes: · Assets produced, developed, improved, or strengthened · Natural assets protected or rehabilitated	Core indicators: · Increased income/avoided decrease in income · Natural assets protected or rehabilitated
World Bank Climate Investment Fund (CIF) Pilot Program for Climate Resilience Monitoring and Reporting (PPCR) Toolkit (CIF, 2018)	Adaptive capacity: Core indicators · Indicator 4. Extent to which vulnerable households, communities, business and public-sector services use improved PPCR-supported tools, instruments, strategies and activities to respond to climate variability or climate change · Indicator 5. Number of people supported by the PPCR to cope with the effects of climate change	
International Institute for Environment and Development (IIED) Tracking Adaptation and Measuring Development (TAMD) (Brooks et al., 2011)	Adaptive capacity: Track 2 indicators: · Number of beneficiaries of climate change interventions · Number of people experiencing reductions in vulnerability	Track 2 indicators: · Value of assets and economic activities protected or made less vulnerable as a result of adaptation interventions
Green Climate Fund (GCF, 2018)	Adaptive capacity: Indicator 1.2 · Number of males and females benefiting from the adoption of diversified, climate-resilient livelihood options · Least Developed Countries Fund (LDCF)/Special Climate Change Fund (SCCF) Indicator 4: Extent of adoption of climate resilient technologies/practices · Proposed 7.1: Use by vulnerable households, communities, businesses and public sector services of GCF-supported tools, instruments, strategies and activities to respond to climate change and variability. Adaptation outcomes: Indicator 4.1 · Coverage/scale of ecosystems protected and strengthened in response to climate variability and change	Indicator 1.1 · Change in expected losses of lives and economic assets (USD due to the impact of extreme climate-related disasters in the geographic area of the GCF intervention)

GEF Adaptation Monitoring and Assessment Tool (GEF, 2014)	Adaptive capacity: · Indicator 1: Number of direct beneficiaries · Indicator 3: Population benefitting from the adoption of diversified, climate resilient livelihood options · Indicator 4: Extent of adoption of climate resilience technologies/ practices Adaptation outcomes: · Indicator 2: Type and extent of assets strengthened and/or better managed to withstand the effects of climate change	
World Bank Operational Guidance for monitoring and evaluation (M&E) in climate and disaster resilience-building operations (World Bank, 2017)	Adaptive capacity (examples of cross-cutting outcome indicators): · Number of people/households with increased resilience · Number of people/households benefitting from resilience-building operations Adaptation outcomes: · Agricultural area under improved (resilient) management practices	· Avoided impacts · Reduced welfare impacts of asset losses
IFAD Adaptation for Smallholder Agriculture Programme (ASAP1/2) (IFAD, 2017)	Adaptive capacity: Core indicators: Indicator 1.2.2 · (Number) percentage of persons/households reporting adoption of new/improved inputs, technologies, or practices Indicator 3.2.2 · (Number) percentage of persons/households reporting adoption of environmentally sustainable and climate-resilient technologies and practices Adaptation outcomes: Indicator 3.1.4 · Number of hectares of land brought under climate-resilient management	
SDGs (UNSD, 2019)	Indicator 2.4.1 Sub-indicators (output indicators to be aggregated to adaptation outcomes – "increased resilience"): · Prevalence of soil degradation · Variation in water availability · Management of fertilizers · Management of pesticides · Use of biodiversity-supportive practices · Wage rate in agriculture · Food insecurity experience scale	· Number of deaths, missing persons and directly affected persons attributed to disasters per 1 000 000 population - **1.5.1** (under Goal 1, End poverty in all its forms everywhere) - **11.5.1** (under Goal 11, Make cities and human settlements inclusive, safe, resilience and sustainable) - **13.1.1** (Under Goal 13, Take urgent action to combat climate change and its impacts)
Sendai Framework (UNISDR, 2017)		**Indicator C-2** · Direct agricultural loss attributed to disasters

Also relevant to pillar 2 and climate resilience is a discussion of financial climate resilience metrics that could be useful in tracking progress on CSA projects and identifying projects with potential to deliver substantial economic and social benefits. In some cases, it could be beneficial for countries to valorize CSA interventions. Box 7 describes the European Bank for Reconstruction and Development's (EBRD) methodology for valorizing project outcomes.

BOX 7

Valorizing project outcomes: a potential strategy to drive additional investments for CSA

The European Bank for Reconstruction and Development (EBRD) Green Economy Transition (GET) Approach for valorizing project outcomes

Going forward, financial climate resilience metrics could be useful in identifying CSA projects or investments with high potential to deliver substantial economic and social benefits. This would increase public and private finance to these higher impact projects. Putting a monetary value on the outcomes of CSA interventions could be implemented using the example set forth by the EBRD and their Green Economy Transition (GET) approach. The EBRD launched the GET approach in 2015 to increase green financing to 40 percent of total EBRD financing by 2020, which was expected to correspond to financing of up to EUR 18 billion over the 2016-20 period. The approach is based on the overall multilateral development bank (MDB) climate finance tracking methodology, as well as the joint approach of the MDB Climate Finance Group on climate resilience metrics. The first step in assessing climate resilience results is to determine the context of climate vulnerability for the project, which enables the identification of key climate risks. Once these risks have been identified, they are used to determine the non-financial or physical climate resilience outcomes the project is intended to deliver in response to each climate risk.

The final step in the process is the valorization of each physical climate resilience outcome in monetary terms to estimate the Climate Resilience Benefit (CRB). In projects with more than one physical climate resilience outcome, the valorized outcomes are summed to provide a single CRB for the project. The CRB may then be used to calculate a Climate Resilience Benefit Ratio, expressed as a percentage to indicate the CRB per euro or dollar invested. Physical and valorized outcomes are calculated on an annual basis against a pre-project baseline, and are based on current climate conditions and not predicted future climate conditions. Hence, they are based on a "snapshot of the system adjustment'. For example, for increased water availability, the valorized outcome is the value of additional water (EUR), understood to be annual additional water, measured on a volumetric basis (e.g. m^3) valorized using a shadow water price (EUR/m^3) that takes into account the full cost of production plus resource use and environmental externalities. The valorized outcome of increased agricultural potential is the value of additional potential agricultural production (EUR) estimated using annual crop yield increases that can be expected as a result of soil quality improvements for a given crop or crops produced.

Source: Government of the Kyrgyz Republic, 2018.

BOX 8

References and tools for CSA pillar 2

After reviewing the indicators that are available from existing tools, M&E practitioners need to select what is relevant to their project. The following references are recommended as tools and guidance for pillar 2.

- **FAO.** 2017b. *Tracking adaptation in agricultural sectors: climate change adaptation indicators.* Rome.
- **FAO. forthcoming.** *Dare to Understand and Measure (DaTUM): A Literature Review of M&E Frameworks for Agriculture and Climate Change.* Rome.
- **FAO & UNDP. 2019.** *Strengthening Monitoring and Evaluation for Adaptation Planning in the Agriculture Sectors. Bangkok.*
- **Hammill, A., Dekens, J., Leiter, T., Olivier, J., Klockemann, L., Stock, E. & Gläser, A.** 2014. *Repository of adaptation indicators. Real case examples from national monitoring and evaluation systems.* Bonn and Eschborn, GIZ. - Also available in Spanish
- **Leiter, T. & Pringle, P.** 2018. Pitfalls and potential of measuring climate change adaptation through adaptation metrics. In L. Christiansen, G. Martinez & P. Naswa, eds. *Adaptation metrics: perspectives on comparing, measuring and aggregating adaptation results.* pp. 29-47. Copenhagen, United Nations Environment Programme - Technical University of Denmark (UNEP DTU) Partnership.
- **Spearman, M. & McGray, H.** 2011. *Making adaptation count: concepts and options for monitoring and evaluation of climate change adaptation.* Bonn and Eschborn, GIZ.

At the household level:

- **CSIRO** (Commonwealth Scientific and Industrial Research Organisation). 2019. *Rural Household Multi-Indicator Survey (RHoMIS).* (Website)- Potentially a tool for all 3 CSA pillars
- **FAO.** 2016. *RIMA–II: Resilience Index Measurement and Analysis–II.* Rome.
- **FAO.** 2015. *Self-evaluation and Holistic Assessment of Climate Resilience of Farmers and Pastoralists* (SHARP). Rome.

Gender dimension

It is important to include the gender dimension and consider adding gender-responsive indicators. M&E practitioners should determine whether data disaggregated by sex is available and include this type of data to facilitate an analysis that incorporates gender. For example, household decision-making about agricultural practices often has a gender dimension since men and women take the lead in decisions in different domains, but they may also make joint decisions in particular circumstances (FAO, 2013). Collection of sex-disaggregated data is important for measuring these changes.

Pillar 3

For pillar 3, the universal standard indicator is GHG emissions reductions and removals in carbon dioxide equivalent (on-farm carbon dioxide equivalent, avoided GHG emissions, GHG emissions intensity, soil carbon sequestration). It is simply more straightforward to compare and aggregate using this universal standard indicator. The challenges for monitoring GHG emissions and related indicators are usually related to incompatible methodologies for direct vs indirect emissions,

activity data access and availability, large uncertainties and the overall expense of quantification. Project-level methodologies and quantification methods to assess GHG emissions often rely on default data, and many tools available for project-level calculations use IPCC guidelines. However, with regard to CSA, historically there has been insufficient data on GHG emissions for smallholder systems, as this type of quantification is extremely difficult, labour-intensive and expensive to conduct in the absence of a landscape approach. The references and tools in Box 9 provide methodologies, tools and guidance for quantifying GHG emissions at the project and national level.

BOX 9

Methodologies and tools for CSA pillar 3

Methodologies and tools for estimating GHG emissions for GHG inventories, projects, policies and actions

- **Greenhouse Gas Protocol.** 2014. *GHG Protocol Agricultural Guidance: interpreting the corporate accounting and reporting standard for the agricultural sector*. World Resources Institute (WRI) and WBCSD.
- **Greenhouse Gas Protocol.** 2019. *Greenhouse Gas Protocol*. (Web site)
- **IPCC.** 2006. *2006 IPCC guidelines for national greenhouse gas inventories*, Prepared by the National Greenhouse Gas Inventories Programme. H.S. Eggleston, L. Buendia, K. Miwa, T. Ngara & K. Tanabe, eds. Kanagawa, Japan, Institute for Global Environmental Strategies.
- **Tubiello, F.N., Condor-Golec, R.D., Salvatore, M., Piersante, A., Federici, S., Ferrara, A., Rossi, S.** *et al.,* 2015. *Estimating greenhouse gas emissions in agriculture: a manual to address data requirements for developing countries*. Rome, FAO.
- **UNFCCC.** 2018. *CDM methodology booklet*.

Tools for baselines and GHG quantification/calculators

- **Bernoux M., Tinlot, M., Bockel L. & Branca G. & Gentien, A.** 2011. *EX-Ante Carbon balance Tool (EX-ACT) Technical Guidelines for Version 3*. Rome, FAO.- Used for emission calculations
- **MacSween, K. & Feliciano D. 2018.** *Co-benefits of mitigation options in the CCAFS-Mitigation Options Tool (CCAFS-MOT). CCAFS Working Paper No. 229. Wageningen, The Netherlands, CCAFS.* **Cool Farm Alliance.** 2019. *Cool Farm Tool.* (Website)
- **Woollen, E., Berry, N., Cross, A., Hagdorn, M., Hughes, M. & Ryan, C.M.** 2014. *SHAMBA v 1.0 Methodology*. University of Edinburgh, Edinburgh. - Currently used in Plan Vivo projects
- **FAO.** 2018c. *Global Livestock Environmental Assessment Model (GLEAM) - Model Description Version 2.0.* Rome.
- **FAO.** 2019. FAOSTAT statistical database. (Website)

5. Map indicators to data sources and determine data collection protocols

In a sense, every indicator constitutes its own miniature M&E system (World Bank, 2004). Key questions to be answered for every indicator are:

- What are the sources of data needed to report on the indicator?
- What are the data collection methods for the indicator?
- Who will collect the data?
- How frequently will the data be collected?
- What is the cost and difficulty of collecting the data?
- Who will analyze the data?
- Who will report the data?
- Who will use the data?

Data are measurements or statistics used as a basis for reasoning, discussion or calculation. In the case of M&E, data are used to calculate and report on each indicator.

Data collection methods

Data can be collected using a variety of methods depending upon the CSA pillar. More traditional data collection is from ministry statistics, censuses, international organization surveys and statistics, field surveys and studies. Data can also be collected using methods such as focus groups, community interviews and field experiments. Increasingly, data is collected using newer technological methods such as information and communication technologies (ICTs), satellite imagery and big data. The data needs and sources for the three CSA pillars will obviously be different, but all will be determined based on the chosen indicators.

It is recommended to involve existing M&E systems, ministries, national statistical offices and research centres to ensure the long-term sustainability of the system. Often, complex and elaborate M&E and data collection systems are developed and implemented for shorter-term projects that cannot be sustained by the government, either financially or logistically, once the project has concluded. Governments need to build upon what is implemented using the influx of funds during the project and sustain these systems into the future.

For example, in Malawi, the Agriculture Sector Wide Approach (ASWAP) M&E system has been used since 2017 to monitor the World Bank's USD 215 million investment. This project's goal is to harmonize agriculture-sector development with many stakeholders, and its results framework uses 26 indicators. Data quality assessments are conducted monthly and quarterly. This relatively elaborate system could be used as the foundation for a lasting and sustainable system that accommodates CSA indicators, but, some of the more common challenges cited by staff (e.g. insufficient technical knowledge and budget constraints) would need to be addressed (Nowak *et al.,* 2019).

Having a limited number of indicators helps to keep data collection realistic and sustainable, and helps to manage costs. Box 10 provides an overview of Syngenta's simple and straightforward approach using a minimal set of indicators, as well as their approach to data collection and open data sharing.

BOX 10

Syngenta's Good Growth Plan

Syngenta developed their "Good Growth Plan' with the following goals in mind: more food, less waste; more biodiversity, less degradation; more health, less poverty. The plan contains six commitments/indicators and sub-indicators that have linkages with the Sustainable Development Goals (SDGs). The six commitments and their related SDGs are:

1. Make crops more efficient: link to SDG 12
2. Rescue more farmland: link to SDGs 13 and 15
3. Help biodiversity flourish: link to SDGs 13 and 15
4. Empower smallholders: link to SDGs 1 and 8
5. Help people stay safe: link to SDGs 1, 3 and 8
6. Look after every worked: link to SDG 8

This strategy focuses on a limited number of indicators to manage costs, enhance the feasibility of data collection and foster replicability. Additionally, Syngenta is an example of a private sector initiative to develop a collaborative approach to data sharing. It is partnering with Open Data Institute to share farm-level data and make it available and accessible to all. This is the first time this type of crop-level information has been made public by a commercial organization. Syngenta has 2 600 benchmark farms that share data to track GHG emission reductions and agricultural efficiency.

Source: Syngenta, 2019.

See Annex III for a discussion of data issues, including data access, ownership, privacy, and technical and capacity challenges, as well as the role of the private sector.

Phase 3. Operationalization and ensuring sustainability of the system

3

Figure 10. Steps in phase 3 of the design and implementation of the M&E system

The third phase encompasses the implementation of CSA projects and the operationalization of the associated M&E system. In this phase, appropriate and sufficient arrangements are made to ensure the sustainability of the system. The phase emphasizes the role of the national government, which has the responsibility for taking the lead on the main recommendations.

1. Assign roles and responsibilities for monitoring and evaluation tasks

For this step, it may be useful to consult the list of institutions from phase 1, step 5, and (where necessary) the list of CSA stakeholders from phase 1, step 6 (who may also play a role).

These tasks may include:

- designating the lead agency/individual coordinating these efforts and liaising with other staff and other projects;
- identifying data sources and data collection tools and/or developing new tools (using phase 2, step 5 where data sources and collection methods are identified);
- training the data collection staff, which may be government staff or an external firm that has been hired to collect baseline data, and the subsequent staff who will carry out tasks beyond the initial implementation;
- training the staff dedicated to reporting and communication (see phase 4 for reporting and communication); and
- connecting all actors involved in the M&E process to the multi-stakeholder coordination platform (discussed under phase 3 in the final section, Recommendations for project developers and governments by phase).

2. Develop a monitoring plan: set up a schedule for data collection and monitoring of indicators

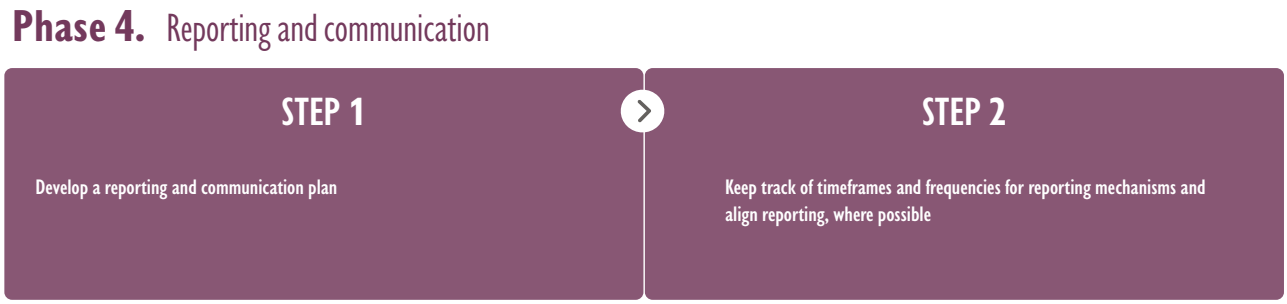
A monitoring plan is a living document that helps to track results throughout the project or programme, and should be updated on a regular basis. It is usually developed before starting the monitoring activities to facilitate the scheduling for data collection, the analysis and reporting of the data, and the communication of results to the stakeholders. The monitoring plan can be developed in conjunction with step 1, assigning roles and responsibilities for M&E tasks. The plan may also include other components, such as the ToC and the results framework.

3. Begin the process of continuous data collection and monitoring of indicators

The final step marks the beginning of the actual monitoring process. Everything is scheduled and the wheels are now set in motion. However, the government-level recommendations in the section, Recommendations for project developers and governments by phase, outline a very important and overarching task that can tie the entire monitoring effort together: the development of a multi-stakeholder coordination platform. The importance of the institutional arrangements supporting and enabling the M&E system cannot be overstated. If the planning for and creation of the multi-stakeholder coordination platform has not yet begun, it should be initiated now and revisited throughout all the phases.

Phase 4. Reporting and communication

Figure 11. Steps in phase 4 in the design and implementation of the M&E system



Phase 4 involves reporting and communicating results to relevant stakeholders. The goal of reporting is to provide comprehensive and regularly updated information on progress. It may include some or all of the following elements: description of the project, timeframe of the project and its assessment, objectives of the assessment, assumptions, methodologies used, indicators, data sources, reporting frequency and progress.

1. Develop a reporting and communication plan

It may be beneficial to develop a reporting and communication plan. This plan would ideally outline protocols to communicate results, roles and responsibilities for disseminating results, timeframes and levels of dissemination, successes and challenges to donors, project managers and other relevant stakeholders, as well as to the farmers and beneficiaries themselves; and how results will feed into other national and international reporting and future planning and decision-making. Reporting is often upward, but it should also be downward. It is critical to manage both components of reporting and not to allow the pressures and requirements of upward reporting overshadow the necessity of reporting to farmers and beneficiaries.

There is an added challenge for CSA M&E in some regions where additional levels of reporting are required. Countries in sub-Saharan Africa are expected to report at the continental level to the African Union on the Comprehensive African Agricultural Development Program (CAADP) Results Framework. There is even one more reporting level for the Southern African Development Community (SADC): the Centre for Coordination of Agricultural Research and Development for

Southern Africa (CCARDESA) (Rosenstock *et al.,* 2018). Therefore, CSA M&E systems often need to account for project, national, regional, continental and international reporting requirements.

2. Keep track of timeframes and frequencies for reporting mechanisms and align reporting, where possible

The next step in phase 4 is to keep track of timeframes and frequencies for reporting mechanisms corresponding to indicators related to pillars 1, 2 and 3, and align reporting, where possible. The keys to effective monitoring and reporting are to develop consistent reporting tools and establish information-sharing mechanisms (World Bank, 2017). It is worth noting that project reporting for output indicators is usually done in shorter intervals, whereas reporting for outcome indicators may require longer intervals. This could create a certain level of difficulty for reporting related to outcome indicators that are aligned with international agreements vs project-specific output indicators. However, it is important to attempt to align reporting on CSA to various stakeholders to the extent possible.

Table 6 outlines reporting protocols and timeframes currently established under the UNFCCC Paris Agreement, CSA projects and programmes more generally, the SDGs and the Sendai Framework.

Table 6. Reporting mechanisms and frequency for indicators related to pillars 1, 2 and 3 under the UNFCCC Paris Agreement, CSA projects/programmes more generally, the SDGs and the Sendai Framework

Pillar	Reporting frequency			
	Under Article 13 of the Paris Agreement (Current reporting framework and Enhanced Transparency Framework)	**CSA project/ programme**	**SDGs**	**Sendai Framework**
Pillar 1: Sustainable production	N/A	Annually or biannually, dependent on the results framework, donor, project cycle and specific indicators	Annually countries adopt one of three formats: • Incorporating SDG reporting within an existing national website or platform. • Developing an entirely new platform dedicated to providing data on the SDGs. • Providing their data to a regionally maintained platform. Also, countries are reporting and sharing experiences through Voluntary National Reviews to the High-level Political Forum (HLPF) on Sustainable Development (IAEG-SDGs, 2018)	N/A
Pillar 2: Adaptation and resilience	Countries have to submit their Adaptation Communications (as part of their NDCs or other documents); for five-year accounting periods; common timeframe is still under negotiation (see UNFCCC, 2019) and report via Biennial Transparency Reports under the Enhanced Transparency Framework	Annually or biannually, dependent on the results framework, donor, project cycle and specific indicators	For indicators related to SDG targets 1.5, 11.5, 11.b and 13.1, the SDG reporting system will ask the UN Office for Disaster Risk Reduction (UNDRR) to provide data countries have reported in the Sendai Framework Monitor to reduce reporting burden (UNDRR, n.d). Also, annually through Voluntary National Reviews	Biennially to UNDRR: Analysis and trends are reported in the Sendai Framework Progress Report.
	Most likely reporting more frequently to domestic stakeholders			
	Every four years as part of the NC for developed countries			
	Updated Biennial Reports and BURs every two years as part of UNFCCC processes			
Pillar 3: Mitigation	Countries have to submit their NDCs for five-year accounting periods; common timeframe still under negotiation (see UNFCCC, 2019)	Annually or biannually, dependent on the results framework, donor, project cycle and specific indicators		N/A
	Every four years as part of the NC for developed countries			
	Most likely reporting more frequently to domestic stakeholders			
	Updated BRs and BURs every two years as part of UNFCCC processes			

Recommendations for project developers by phase

For each phase of this process, these guidelines offer specific recommendations for actions or strategies to overcome obstacles and challenges. This section addresses some of the salient challenges presented by certain steps and proposes recommendations for project developers on methods to overcome these challenges.

Phase 1

Build on existing systems. Attempt to tie into M&E systems and protocols that already exist. Bridge the needs of users at the project level with capacity developed at the national level. This is cost-effective and can help to mainstream CSA into existing processes, which also ensures the sustainability of the system. When CSA is mainstreamed into associated processes, its longevity is potentially increased, as it becomes an integral part of already established policies and initiatives.

Consult national climate documents, such as Adaptation Communications, NDCs, NAPs, NAPAs, and NCs to identify quantified targets and indicators, ensure alignment of targets, goals and priorities; confirm that there are no conflicts among the different agreements and projects; and inform the selection of indicators.

Phase 2

Consult donors if the indicators they require are too burdensome, or to request additional discussion on whether indicators could be better aligned with those already adopted or identified for national/international reporting obligations (e.g. Paris Agreement, SDGs).

Create clear data collection protocols for the project:

- Formulate data collection, dissemination, reporting, quality assurance, archiving and monitoring protocols
- Assign roles and responsibilities to staff and set up a monitoring schedule
- Train staff on protocols
- Link trained staff with national coordination platform (see phase 3)

Phase 3

Develop capacity for agricultural extension staff, field data collectors and data processors to ensure the sustainability of the system. There is often a shortage of skilled M&E personnel due to the lack of a suitable M&E system and/or the low priority given to M&E. There may also be a shortage in the number of field personnel or agricultural extension staff, and therefore a need to invest in technologies and tools that can support data collection and analysis.

Develop data collection training modules for project and government M&E officers. If hiring an external firm, research institute, or other entity for data collection or baseline development, ensure that the firm has the capability and commitment to train and build the capacities of the project and government personnel involved. The M&E officers are invested in collecting recurring data needed after baselines have been developed, and therefore they need to be properly trained. Training modules are valuable in supporting and sustaining this process.

Phase 4

Make data, data sources, assumptions, objectives, methodologies, results, and lessons learned available to other national-level project practitioners. Develop case studies to share what has been particularly effective in achieving results. The development of a stakeholder engagement plan could help with this.

Maintain communication channels with M&E experts and government officials at all levels to improve alignment of reporting and ideally throughout the entire process.

Recommendations for governments by phase

For each phase of this process, these guidelines offer specific recommendations for actions or strategies to overcome obstacles and challenges. This section addresses some of the salient challenges presented by certain steps and proposes recommendations for governments on methods to overcome these challenges. The steps in phase 3 are particularly important for governments, since these guidelines recommend that governments take the lead in setting up and overseeing the multi-stakeholder coordination platform.

Phase 1

Set targets and quantify contributions. There is a dearth of clear adaptation targets and quantified contributions and indicators in NDC submissions and Adaptation Communications. Without targets, there is no clear goal upon which to plan a course of action, nor is there an incentive to act. Targets serve as the impetus for action and enable all stakeholders to share in a common understanding of the goal. Setting targets can help to empower governments as well as external actors. Countries should be encouraged to set targets and define contributions so that stakeholders can align their actions to achieve them.[7] It is difficult to measure and track specific targets without quantifying contributions.

In a 2019 publication, a group of researchers proposed a new methodology for tracking government-level adaptation progress for the purposes of reporting under the enhanced transparency framework of the Paris Agreement[8], while also recognizing country-specific vulnerabilities and diverse governance and administrative structures. In this methodology, the evaluation of adaptation efforts is based on the proper alignment of government targets with the country's specific vulnerabilities and goals. The premise is that adaptation progress can be judged, in part, by assessing whether the government is articulating goals that are aligned with vulnerabilities, whether the adaptation efforts are aligned with the adaptation goals, and thus whether they are sufficient (Berrang-Ford *et al.,* 2019).

Phase 2

Create mechanism for open data sharing. The government should devise and oversee a mechanism to facilitate, manage and incentivize open data sharing. It is not always profitable for entities to share data with farmers. The data sharing bottleneck is problematic for a number of reasons, one of which being that it increases the already large divide between those who do and do not have access to data.[9] Farmers are already at a disadvantage in accessing, using and sharing data due to infrastructure challenges and insufficient capacity to use newer digital technologies. Additionally, smallholder farmers often have little influence on rapidly changing digital environments. The development of country-level policies, rules, regulations and use of standards is important. Incentives are needed to safeguard and prioritize smallholders. Data service suppliers and operators can create opportunities and mitigate risks by adopting ethical guidelines, reinforcing capacities, offering smallholder-friendly services, returning benefits to data owners and being rewarded for this (Maru *et al.,* 2018). This may be done in a variety of ways (e.g. social certification schemes).

7 Going forward, adaptation targets will be presented in Adaptation Communications, which may be part of an NDC, but may also be contained in other documents.

8 This national reporting will eventually be synthesized and aggregated for a collective assessment under the global stocktake.

9 There are several types of digital divides, including sectoral, age-based and rural-urban.

Design and implement a data privacy safeguard system to counteract issues with digital data. Data and information should be managed and shared fairly among governments, farmer associations, financial institutions, policies, regulatory frameworks and infrastructure (Maru *et al.,* 2018). There are few countries with formalized processes to manage farm data. Governments should take the lead in devising and overseeing the creation of a data safeguard system or protocol for data ownership and privacy. In addition to governments, farmer organizations can participate in safeguarding data, maximizing returns in value chains, exploiting third-party data service providers and negotiating incentives with other actors. Arguments have also been made in favour of international treaties with legal protocols and licensing frameworks in order to make data flows more equitable.[10]

Phase 3

Determine whether there is a multi-stakeholder coordination mechanism or platform that links CSA projects or is already in place under the national government; if not, its creation is a first priority.

This is an extremely important step, preferably taken while designing the M&E system, but also during operationalization and independently of the four phases. Because the M&E system depends on the participation of a range of different stakeholders, coordination mechanisms are crucial (UNEP, 2017). In 2015, the 2030 Agenda for Sustainable Development and the Addis Ababa Action Agenda promoted multi-stakeholder partnerships (MSPs) as a way to complement the efforts of national governments and international organizations and "mobilize and share knowledge, expertise, technology and financial resources, to support the achievement of the SDGs in all countries and in particular developing countries" (HLPE, 2018).[11]

First of all, it is recommended that practitioners determine whether there is already a multi-stakeholder platform in place, or whether there is a foundation for stakeholder outreach similar to those set up through CSA multi-stakeholder assessments that can be used to start. These platforms can lay the groundwork for stakeholder engagement throughout the entire M&E process. Box 11 outlines the relatively recent creation of two national platforms in Africa: CSA alliances in Malawi and the Untied Republic of Tanzania.

10 For example, the Draft United Nations Declaration of the rights of peasants and other people working in rural areas proposes that 1) States shall ensure meaningful participation, directly and/or through their representative organizations, of peasants and other people working in rural areas in decision-making processes with regard to data identification, research, analysis and interpretation of findings; 2) peasants and other people working in rural areas have the right to seek, receive, develop and impart information; and 3) States shall ensure that relevant information may be adequately disseminated and appropriated by peasants and other people working in rural areas.

11 The High Level Panel of Experts for Food Security and Nutrition (HLPE) is the science-policy interface of the United Nations' Committee on World Food Security (CFS), which is, at the global level, the foremost inclusive and evidence-based international and intergovernmental platform for food security and nutrition (FSN). The HLPE reports serve as a common, evidence-based starting point for the multistakeholder process of policy convergence in CFS.

BOX 11

National CSA Alliances in Africa

Tanzania CSA Alliance (TCSAA)

TCSAA was established in December 2016 as a multi-stakeholder platform to coordinate actors involved in CSA to ensure coherence in the implementation of CSA initiatives and learning. The objective is to promote and accelerate the adoption of CSA approaches, technologies and best practices by creating and strengthening partnerships and synergies in CSA approaches across the United Republic of Tanzania. The alliance also focuses on creating and maintaining effective linkages with key CSA initiatives at the regional, continental and global levels.

Malawi CSA Alliance

The Malawi CSA Alliance is governed by a steering committee made up of local partners including government, international non-governmental organizations (NGOs), the private sector, farmer organizations, technical groups and research organizations. The Malawi Alliance was created when the Alliance for CSA in Africa (ACSAA) identified four "fast-start' countries (Ethiopia, Malawi, Niger and Zambia) to begin operationalizing the alliance.

Source: TCSAA, 2019

Governments should take the leading role in creating a multi-stakeholder coordination platform. The government should create and host the multi-stakeholder coordination platform to promote collaboration, streamline M&E and reporting across agencies, and foster learning and adaptive management. The platform should be managed at a high level and granted authority over ministries to avoid a situation of "peers managing peers". Research was conducted on the Policy Action for Climate Change Adaptation (PACCA) project (2014–2017). The PACCA project, which was an initiative of CCAFS, focused on building climate-resilient food systems in Uganda and the United Republic of Tanzania by coordinating policies and institutions at the local, regional and national levels using multi-stakeholder platforms. This research asserted that embedding the platforms within government structures proved beneficial because it "provided those official bodies with convening power, a greater sense of ownership over the process and, ultimately, offered the platforms a pathway to sustainability." (Acosta *et al.,* 2019). The national platform in Uganda was hosted by the Climate Change Department of the Ministry of Water and Environment, and in the United Republic of Tanzania by the Environmental Management Unit of the Ministry of Agriculture Livestock and Fisheries (MALF-EMU).

The platform should include members from government, private sector, NGOs, civil society organizations, and research institutes, as well as all relevant technical sectors (e.g. agriculture, forestry, water, health). The platform serves as a mechanism by which vertical and horizontal coordination is strengthened for M&E processes.

Where possible, it is recommended that the platform includes or builds upon the work of National Councils for Sustainable Development (NCSDs), if one has been established in the country. NCSDs have been established by governments over the last 25 years to further sustainable development at the national level through the engagement of a wide range of stakeholders in the process of creating national sustainable development strategies. Political momentum for NCSDs has increased since the establishment of the SDGs. A core function of most NCSDs is to operate as an advisory body to government on the evolution and the successes of sustainable development strategies and policies (SDplanNet, 2014). NCSD composition and membership can take many forms, including government representative memberships, mixed memberships that include government and non-governmental members, and memberships consisting of entirely non-state actors.

The multi-stakeholder coordination platform should lead on tasks related to institutional coordination, indicator development and data issues.

1. Recommendations for the multi-stakeholder platform's leading role on institutional coordination

Building additional task forces and/or inter-ministerial working groups. These groups take the lead in various tasks such as building M&E for projects during the design stage, linking different ministries for the purpose of budget planning, harnessing expertise and investment to build technical capacity, creating alliances of non-state CSA actors, and coordinating monitoring and reporting to multiple initiatives across projects at the national scale.

Fostering institutional coordination. The platform ensures that memorandums of understanding are signed between ministries to facilitate collaboration on data and information sharing, for example by linking the reporting ministry and the M&E system or focal point for SDGs with the reporting ministry for the Paris Agreement (assuming that a clear delegation of responsibility for SDG reporting has been made, which is not necessarily the case). The platform also takes the lead in creating linkages to groups working at the subnational, regional and local levels.

> **Guidance on institutional arrangements.** Additional guidance for developing countries on establishing and maintaining institutional arrangements for preparing NCs and BURs may be useful when applied in this context. It is provided in *UNFCCC Toolkit for non-Annex I Parties on establishing and maintaining institutional arrangements for preparing NCs and BURs (UNFCCC, 2013).*

Building partnerships. The platform facilitates partnerships to enable technical agencies (e.g. FAO) to work directly with local entities (e.g. meteorological offices) to address the challenges of data accessibility and availability and facilitate and improve the use of technology (e.g. for data analysis using spatial data/geospatial tools). The platform might enable the creation of a separate donor coordination platform under its leadership.

Facilitating alignment on climate reporting. The platform serves as the central body responsible for updating NDCs, as well as aligning NAPs with NDCs, and ensuring that targets are established and quantified. Specific and concrete adaptation targets should be established in Adaptation Communications and updated NDCs so that organizations can determine how to mobilize and align with each other. The platform also helps to ensure that targets and information on activities are consistent in different climate reports and documents.

Creating a national registry of farmers. The platform creates a national registry of farmers for more inclusive outreach and capacity building, and to counteract double counting, which can impede the accuracy of reporting on the number and percentage of farmers adopting practices. This can be done by linking government databases on subsidies, for example, with information detailing the portion of the population receiving assistance (e.g. via the Ministry of Social Protection).

Systems to generate and manage farmer registration and profiles are seen to be especially critical to deliver services and products where they are most needed. Farmer profiling allows farmer organizations to connect better with their members and deal with third parties (*Maru et al., 2018*). There are three main beneficiaries of farmer profiling: cooperatives and farmer organizations, the farmers themselves, and policy-makers and public agencies. Cooperatives and farmer organizations potentially reap the most benefit from profiling. It allows them to know their members better, which in turn allows for better planning and coordination of services, greater membership and more effective advocacy and communication, and presents a potential source of revenue for additional research, market surveys and advertisements. Farmers themselves benefit from better access to services, improved communication and more visibility. Lastly, for policy-makers and public agencies, the greatest benefit is the access to data that is necessary for measurement and planning. Profiling also allows policy-makers and public agencies to ensure that they are reaching representative organizations. (Boyera, Addison and Msengezi, 2017).

Planning, hosting, and facilitating regular meetings. The platform assumes this role to facilitate communication and support the provision of stakeholder input on a regular basis.

2. Recommendations for the multi-stakeholder platform's leading role on indicator development

Decision-making, indicator development and streamlining of indicators for reporting under multiple objectives. The platform convenes stakeholders to make decisions regarding indicators for reporting purposes. Where feasible, for countries sharing specific commonalities (e.g. across regions), a joint effort between several national platforms could develop core sets of indicators that can be expanded to meet specific donor requirements. Additionally, the platform or an assigned task force would be responsible for mapping out how SDG indicators and data sets correspond to each CSA pillar for particular projects and national programmes. Tracking systems could then be aligned for each indicator that is designed to support both CSA and SDGs, with the objective of merging the two systems into one that can be used to track and report against these multiple objectives. The platform is also responsible for identifying roles for CSA stakeholders at national and global levels to support the streamlining of monitoring and reporting for multiple objectives.

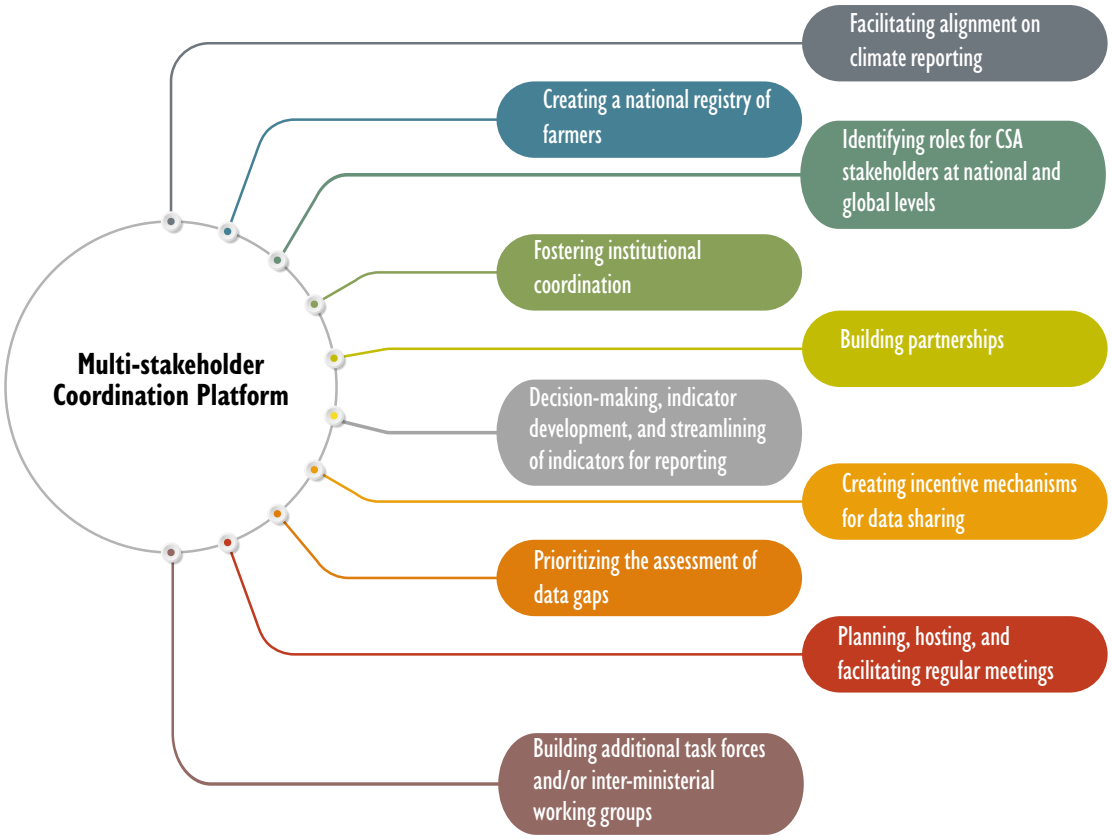
3. Recommendations for the multi-stakeholder platform's leading role on data issues

Prioritizing the assessment of data gaps. The platform or an assigned taskforce undertakes the task of assessing the data gaps for CSA and SDG reporting, the options to address these data gaps, and the limitations in the system capacity.

Creation of a mechanism for open data sharing and design and implementation a data privacy safeguard system. See Phase 2 Government-level recommendations for more information on these recommendations.

Figure 12 depicts the multiple mandates and leadership areas for the multi-stakeholder coordination platform.

Figure 12. The multiple mandates of the multi-stakeholder coordination platform



Additional government-level recommendations for Phase 3

Streamline national funding. At the project level, M&E would ideally be aligned with national-level annual planning, M&E, and budgeting systems to harmonize different projects under national programmes and policies (FAO, 2013). The government should create a mechanism to integrate M&E into national budgets. This would ensure that M&E is prioritized and funded, and would enhance the sustainability of the system by enabling the hiring of more permanent staff and the establishment of protocols that can be sustained over the long term. According to the CSA Sourcebook (FAO, 2013), CSA programmes should be anchored to local or national institutions, national systems, or organizations, and should plan budgets to ensure long-term continuity even after external funding for development projects ends. This may entail that M&E be linked to budgets as well in the National Climate Change Commissions or Offices. In order to institutionalize the inclusion of M&E in national budgets, ministries of finance and planning may also need to be involved.

Lastly, it is important to note that there must be a certain level of political will to commit funds to M&E from national and regional organizations, for example the SADC, the Common Market for Eastern and Southern Africa (COMESA) and the Economic Community of West African States (ECOWAS).

Develop national capacities to implement M&E for CSA. A few recommendations for governments on building capacity to develop and implement the framework, which are drawn from *The Climate Investment Programme Operational Framework for Managing and Accessing Climate Finance in the Kyrgyz Republic* (Government of the Kyrgyz Republic. 2018), are listed below:

- Ensure an M&E specialist is part of the team. This recommendation is to ensure that institutional arrangements recognize the importance of including an M&E specialist to take the lead in establishing various elements (e.g. the results-based framework) and navigating specific challenges.
- Develop indicator templates/scorecards to record progress. This would be the responsibility of government agencies and development partners. The creation of the scorecards would also facilitate the development of baselines and baseline assessments.
- Develop a stakeholder engagement plan. This type of plan outlines a strategy for engagement with key stakeholders in a continuous and participatory fashion. It supports effective communication and engagement with a wide range of stakeholders and collaboration on M&E design, implementation and harmonization.

Phase 4

Harmonization and streamlined reporting. Local, national and subnational government staff involved in reporting take the lead in ensuring that M&E data collected on these levels can be harmonized with the national M&E system and assist national staff with streamlining the reporting process. National-level M&E staff and ministry focal points responsible for reporting under international agreements lead the reporting process, unless a singular focal point has been designated for all climate reporting. Government staff should consult or collaborate with the private sector and NGOs.

Conclusion

These guidelines present steps and recommendations for project developers and governments engaged in developing and harmonizing M&E systems for CSA projects at the national level. The purpose of the guidelines is to assist the major public and private investors in CSA to align their M&E systems to national climate change commitments such as the SDGs and those expressed under the Paris Agreement and Sendai Framework. The guidelines build upon existing resources and a solid foundation of already established steps for M&E processes, while introducing some new approaches for the selection of aggregable indicators to streamline CSA monitoring and reporting with obligations to donors and under international agreements. The priorities for the design of the M&E system are to keep it simple and limit the number of indicators in order to be as realistic, feasible and cost-effective as possible. The objectives of the M&E system should drive its development and the selection of indicators for tracking progress.

The guidelines present a unique perspective focused on the three pillars of CSA. However, they do not comprise a new methodology, nor do they cover all aspects of this process in detail. They are a reference for project developers and governments to structure M&E in the most efficient and effective way possible in an era of increasing national and international M&E commitments and obligations.

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Annex I. Glossary

Adaptation: The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects (IPCC, 2014).

Adaptive capacity: The ability of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences (IPCC, 2014).

Attribution: The process of evaluating the relative contributions of multiple causal factors to a change or event with an assignment of statistical confidence (Hegerl *et al.,* 2010).

Baseline: The baseline is the state against which change is measured. A baseline period is the period relative to which anomalies are computed (IPCC, 2014).

Data: Factual information (such as measurements or statistics) used as a basis for reasoning, discussion or calculation (Merriam Webster Dictionary).

Impact: Positive and negative, primary and secondary long-term effects produced by a development intervention, directly or indirectly, intended or unintended (OECD-DAC-WP-EV, 2002).

Impact indicator: An indicator that measures positive and negative, primary and secondary long-term effects produced by a development intervention, directly or indirectly, intended or unintended (OECD-DAC-WP-EV, 2002).

Indicators: Quantitative or qualitative factors or variables that provide a simple and reliable means to measure achievement, to reflect the changes connected to an intervention, or to help assess the performance of a development actor (OECD-DAC-WP-EV, 2002).

Monitoring: A continuing function that uses the systematic collection of data on specified indicators to provide management and the main stakeholders of an ongoing development intervention with indications of the extent of progress, the achievement of objectives, and progress in the use of allocated funds (OECD-DAC-WP-EV, 2002).

Outcome indicator: An indicator that measures the quantity of goods produced and services provided, as well as the efficiency of production and services (Horsch, 1997).

Process indicator: An indicator that measures the ways in which services and goods are provided (GIZ, 2013).

Resilience: The capacity of social, economic and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity and structure, while also maintaining the capacity for adaptation, learning and transformation (IPCC, 2014).

Vulnerability: The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity and its adaptive capacity (IPCC, 2007).

Annex II. DesInventar: Sendai Framework tool for the creation of national disaster inventories and databases for loss and damage

DesInventar is the disaster risk framework for the Sendai Framework, which has already attained some alignment of indicators with the SDGs. It is a conceptual and methodological tool for the generation of national disaster inventories and the construction of databases of damage, losses and in general the effects of disasters. In DesInventar, the first indicator of conditions of vulnerability in communities, regions and countries are "effects," or the sum of losses or adverse effects that take place in a specific geographical unit (UNDRR, 2019). These are the direct indicators of conditions of vulnerability in communities, regions and countries, and they are grouped into four categories: people, homes, infrastructure or economic losses. Some of the more generic "effects" are deaths, missing, injured, sick, affected, victims, evacuated, relocated, houses damaged, houses destroyed, loss value in local currency, and loss value in USD.

The specific indicators relating to agriculture in DesInventar are:

- **Crops and woods (ha):** The amount of cultivated or pastoral land or woods destroyed or affected.
- **Livestock:** The number of animals lost (bovine, pig, ovine, poultry) regardless of the type of event (e.g. flood, drought, epidemic).
- **(Affected) agriculture and fishing:** For the qualitative field there are two options: "Affected" or "Not Affected". These relate to damage to the agriculture and fishing sector, which includes crops, granaries and pastoral zones.

(UNDRR, 2019)

Annex III. Data issues

Challenges related to data include availability, accessibility, quality and consistency, analysis and processing, potential for double counting, lack of appropriate methodologies, inadequate baseline data, and legal challenges to the sharing of data. In this annex, the focus is on the specific issues of digital data privacy and ownership in CSA, overcoming challenges with new technology, the role of private sector data, and the potential basis for a digital code of conduct going forward.

Digital data privacy and ownership

Information and Communication Technologies (ICTs) are improving efficiency for farmers. This has led to an information and data explosion with an associated boom in new applications, tools, business models and entire industries (*Maru et al., 2018*). With the ever-increasing numbers of new technologies for digital data, there are rapidly growing data that farmers are seeking to protect.

There are two main challenges for farmers: 1) accessibility of data and data services, and 2) ensuring that data sharing does not negatively impact them or weaken their positions (*Maru et al., 2018*). The underlying challenge unique to farmers and the agriculture sector is that land is not always owned and cultivated by the same entity. Therefore, it is not always straightforward to determine the ownership of the data generated on that land. Whether they own their farms or not, farmers should be considered owners of data generated on their farms and be consistently included in the collective data flows within agri-food systems (*Maru et al., 2018*). Thus, policies, platforms and mechanisms that enable open data sharing should be established and at the same time protect privacy, individual interests and intellectual property, and prevent the stifling of innovation.

Capacity to overcome data and technology challenges. Technology can bolster the collection and quality of data and support its analysis and interpretation. There are many technologies available to support the M&E process, but often capacity is lacking to access, adopt and use these technologies. Project planners should be able to rely on technical partners, and these partnerships should be fostered and facilitated through a coordinated platform to ensure that the appropriate agreements and/or memorandums of understanding are in place. CSA implementing agencies cannot forge these types of partnerships in isolation. Coordinated multi-stakeholder platforms, which are discussed in phase 3 of the guidelines, are integral to this process.

Many existing tools are intended for highly skilled technical experts and may not be suited for the purposes of implementing CSA in developing countries. Improved communication between the tool developers and their users is necessary. Some tools may produce coarser results but still meet the needs of the CSA community. Therefore, it is important to find the right balance between the simplicity of the tools and the reliability of the results (FAO, 2013).

Importance of private sector. The private sector plays a large role in the implementation of CSA. Private sector engagement is increasing as markets are becoming more important in developing countries. The private sector is also a significant provider of research and development, education and extension services (FAO, 2013). The private sector has developed some important partnerships among multinational corporations (WBCSD) and with farmers (via Syngenta's Good Growth Plan). All major multinational agribusinesses have their own M&E systems and are implementing activities that have an impact on agricultural production and climate change. The private sector's CSA activities are not included in the countries' national targets nor their reports. It is important that the private sector's CSA results are incorporated in national reporting. Omission of these activities and results poses a risk of underestimating impacts at the national level. The best method by which to achieve and institutionalize the systematic inclusion of this and other data from external agencies is through the government's establishment of a mechanism for data sharing that enables the incorporation of external data. This is a top-down solution to ensure that the national M&E system maintains a systematic flow of data and information from external actors such as the private sector and NGOs.

Additionally, according to a global synthesis report examining the CSA Country Profiles (Sova *et al.,* 2018), the most commonly identified barriers to CSA technology adoption were not economic, but rather training and information barriers, which affected almost 90 percent of all interventions. Overcoming these barriers requires the improved dissemination of information and engagement with the private sector. Certain technologies (e.g. biodigesters) require private sector engagement in their design, manufacture and repair.

European Union (EU) Code of Conduct on Agricultural Data Sharing. A coalition of associations from the EU agrifood chain launched a joint EU Code of Conduct on Agricultural Data Sharing in 2018. The EU Code of Conduct on Agricultural Data Sharing by Contractual Arrangement was agreed by Copa and Cogeca, CEMA, Fertilizers Europe, European Organisation of Agricultural, Rural and Forestry Contractors (CEETTAR), European Council of Young Farmers (CEJA), European Crop Protection Association (ECPA), European Forum of Farm Animal Breeders (EFFAB), The European Feed Manufacturers' Federation (FEFAC) and Euroseeds. It provides guidance regarding agricultural data access and use rights and could be a good model upon which to base similar codes of conduct for data sharing at the national level. The code emphasizes that "the farmer remains at the heart of the collection, processing and management of agricultural data" (Copa-Cogeca *et al.,* 2018), and that to enable the full realization of the benefits of digital agriculture, data sharing in the agrifood chain should be fair and transparent. Importantly the code acknowledges the data originator as having the lead role in controlling access to and use of data, and as being the main beneficiary of sharing data with interested partners. In essence, data rights belong to the farmer in charge of the farm or farming operations where the data were produced. Table A3.1 presents the contract checklist for agricultural data related to the main legal principles that are necessary to have a balanced contract. These questions raise key topics for discussion on agricultural data sharing and could be useful in formulating various levels of contractual agreements regarding data sharing.

Table A3.1. The EU Code of Conduct on Agricultural Data Sharing by contractual agreement: Main legal principles in order to have a balanced contract: Contract checklist for agricultural data

1. Is there an agreement/contract in place?
2. What obligations are there? What warranties and indemnities are there for each party?
3. What data is collected?
4. Who owns/controls access to the data?
5. What services are delivered?
6. Will my data be used for purposes other than providing me, the data originator (e.g. farmer), a service? Is it clear what these are? Can I agree/disagree? What are/is the benefits/value for me (as data originator)?
7. Is the data shared with other parties? What rules do the external parties adhere to? Can I agree/disagree with sharing data with other parties?
8. Can the service provider change the agreements unilaterally?
9. What happens when the service provider changes ownership?
10. Can I retrieve my dataset from the system in a usable format?
11. Will I be updated on security breaches?
12. Can I opt out of the service and have my data deleted from the system?
13. Is there a contact point to assist me with any questions that I may have?
14. Do I need insurance?
15. What are the confidentiality terms?

Source: Copa-Cogeca *et al.,* 2018.

Another important resource that could be useful in the development of mechanisms and platforms for data sharing is the FAIR principles. The four foundational FAIR principles are:

- Findable: Data and supplementary materials have sufficiently rich metadata and a unique and persistent identifier.
- Accessible: Metadata and data are understandable to humans and machines. Data are deposited in a trusted repository.
- Interoperable: Metadata use a formal, accessible, shared and broadly applicable language for knowledge representation.
- Reusable: Data and collections have clear usage licenses and provide accurate information on provenance.

These principles provide guidance for data producers and publishers and help to maximize the added-value gained by contemporary, formal scholarly digital publishing (Wilkinson *et al.,* 2016). They guide scientific data management and stewardship by helping practitioners locate and access data more easily and thereby promoting maximum use of research data. The principles should apply not only to "data" in the conventional sense, but also to the algorithms and tools that led to those data.

Annex IV. Checklist for phases 1 to 4 and all steps in the process

Phase 1: Framing and context

Step 1. Determine whether national targets, commitments and indicators have been established in national climate change reports, pledges and communications, including for the SDGs

Step 2. Develop a theory of change

Step 3. Identify and map CSA policies, programmes and projects in the country

Step 4. List and assess all M&E/MRV systems directly associated with projects or related to national climate change commitments, the national development plan, sectoral systems, or other national M&E and MRV systems

Step 5. Determine and map the institutions involved in project and programme M&E/MRV

Step 6. Make a list of all CSA stakeholders

Step 7. Take stock of stakeholder information needs and define the purpose and goals of M&E for the project(s) in conjunction with the stakeholders

Phase 2: Defining the approach, selecting indicators and gathering data

Step 1. Identify contributions to sustainable agricultural production, adaptation and resilience, and mitigation (pillars 1, 2 and 3)

Step 2. Develop a results-based management framework

Step 3. Identify and prioritize existing indicators

Step 4. Select/refine indicators and develop baselines

Indicator selection by CSA Pillar

(i) **Pillar 1**, consider the 11 sub-indicators of SDG 2.4.1 as a first step in the selection of indicators.

(ii) **Pillar 2**, choose from the following outcome indicators that can be aggregated:

To measure **adaptive capacity** and **adaptation outcomes:**

- Number and types of adopted CSA practices

and/or

- Number or percentage of farmers adopting CSA practices

To measure loss and damage:

- Loss and damage, avoided loss and damage, or economic losses associated with CSA practices

(iii) **Pillar 3**, choose an indicator related to the reduction and/or removal of GHG emissions

Step 5. Map indicators to data sources and determine data collection protocols

Phase 3: Operationalization and ensuring sustainability of the system

Step 1. Assign roles and responsibilities for M&E tasks

Step 2. Develop a monitoring plan: set up a schedule for data collection and monitoring of indicators

Step 3. Begin the process of continuous data collection and monitoring of indicators

Phase 4: Reporting and communication

Step 1. Develop a reporting and communication plan

Step 2. Keep track of reporting timeframes and frequencies for reporting mechanisms corresponding to indicators related to pillars 1, 2 and 3, and align reporting, where possible

Additional considerations for reporting and communication

- Be cognizant of and responsive to the needs and demands of all the stakeholders to whom you will be reporting (UNFCCC Paris Agreement, SDGs, donors, domestic CSA reporting)
- Be mindful of all of the elements that may need to be communicated/reported: description of the project, timeframe of the project and its assessment, objectives of the assessment, assumptions, methodologies used, indicators, data sources, reporting frequency, results and progress.

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