Climate Smart Agriculture Thematic Review

Evaluation Report

FCDO

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This evaluation was commissioned by the UK Foreign, Commonwealth, & Development Office, but the views and opinions expressed do not necessarily reflect those of FCDO, the UK Government, NIRAS or any other contributing organisation.

Acronyms

Acronym	Full name
AEZ	Agroecological zone
AMD	Adaptation to climate change in the Mekong Delta in Ben Tre and Tra Vinh provinces
AR	Annual Review
ASAP	Adaptation of Smallholder Agricultural Programme
BC	Business Case
BEIS	Department for Business, Energy and Industrial Strategy
BIRDP	Butana Integrated Rural Development Project
BRACED	Building Resilience and Adaptation to Climate Extremes and Disasters
CA or CF	Conservation agriculture, sometimes termed Conservation farming
CABI	Centre for Agriculture and Bioscience International
CBO	Community based organisations
CC	Climate change
CCAFS	Climate Change, Agriculture and Food Security
CAP	Commercial Agriculture Portfolio
CFU	Conservation farming unit
CMO	Context – Mechanism - Outcome
CoBRA	Community based resilience analysis
COI	Conflict of interest
COP	Conference of the Parties
CS	Climate smart
CSA	Climate Smart Agriculture
CSAP/VUNA	Climate smart agriculture programme (sometimes called Vuna)
CSO	Civil Society Organisation
CSAZ	Promoting Conservation Agriculture in Zambia
CSV	Climate smart village
DAC	Development Assistance Committee
DEFRA	Department for Environment, Food and Rural Affairs
ED	Evaluation Director
EF	Evaluation Framework
EM	Evaluation Manager

Acronym	Full name
EQ	Evaluation Question
EQUALS	Evaluation Quality Assurance and Learning Services
EP	Evaluation Protocol
FAO	Food and Agriculture Organisation
FCDO	Foreign, Commonwealth and Development Office
FFS	Farmer field school
GALS	Gender action learning system
GDPR	General Data Protection Regulation
GHG	Greenhouse gas emissions
HH	Household
HMG	Her Majesty's Government
ICF	International Climate Finance
IGA	Income generating activity
IFAD	International Fund for Agriculture Development
IP	Implementing Partner
KPI	Key performance indicator
LoE	Level of effort
LFSP	Zimbabwe Livelihoods and Food Security Programme
LIFT	Livelihoods and Food Security Trust Fund (also referred to as NUTSEM)
LMICs	Low- and Middle-Income Countries
M4P	Making markets work for the poor
MADE	Market Development in Northern Ghana
NbS	Nature-based Solutions
NEMA	National agricultural land and water management development project
NGO	Non-governmental organisation
NR	Natural resources
P4F	Partnerships for Forests
PAM	Portfolio Assessment Matrix
PCR	Project Completion Report
PES	Payment for environmental services (sometimes referred to as payment for ecosystem services)
PESTLE	Political, economic, social, technical, legal, environmental

Acronym	Full name
PoSA	Program of Support to Agriculture in Rwanda
Propcom (Mai-Karfi or PM)	Rural and Agriculture Markets Development Programme for Northern Nigeria
PROSUL	Pro-poor value chain development in the Maputo and Limpopo corridors
PS	Private sector
SAI	Sustainable agricultural intensification
SAIRLA	Sustainable Agricultural Intensification Research and Learning in Africa
SHF	Smallholder farmer
SILTPR	Sustainable inclusive Livelihoods through Tea Production in Rwanda
SR	Scoping Report
SRO	Senior Responsible Officer
SI	Sustainable Intensification
SSI	Semi structured interview
TL	Team Leader
ToC	Theory of Change
ToR	Terms of Reference
UN	United Nations
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
VC	Value chain
ZRBF	Zimbabwe Resilience Building Fund Programme

Executive Summary

Introduction

The purpose of the thematic review of Climate Smart Agriculture (CSA) across a portfolio of Foreign Commonwealth and Development Office (FCDO) programmes was to aggregate and synthesise existing evidence from the programmes that support CSA and to draw out learning on reducing Smallholder Farmers' (SHF) vulnerability to climate variability and shocks. The scope of the review was to determine the relevance, effectiveness, impact and sustainability of different CSA interventions in the context of different geographies, climate variability and target groups. Its focus was on learning rather than accountability. The review ran from February to November 2021 and was carried out by NIRAS-LTS.

Context

Thirteen programmes were reviewed as outlined in the table below. They were a mix of agriculture, productivity and making markets work for the poor (M4P) programmes; resilience, livelihoods and food security programmes; landscape/environmental programmes; and research programmes. All programmes sought to address poverty through increasing productivity and/or resilience of farmers to climate variability and change. They had been designed to address a range of policy contexts over the last 15 years with differing degrees of focus on climate change. Programmes primarily targeted smallholder farmers either directly or by supporting relevant value chains and agribusinesses. Whilst most gathered gender disaggregated data they varied in their specific focus on women, youth or other aspects of intersectionality.

Programme	Country(ies)
Adaptation for Smallholder Agriculture Programme (ASAP)	Multiple worldwide
Building resilience and adaptation to climate extremes and disasters (BRACED)	Multiple in Sub-Saharan Africa and Asia
Climate Smart Agriculture in Africa (CSAP/VUNA)	Southern Africa
Livelihoods and Food Security Programme (in Zimbabwe) (LFSP)	Zimbabwe
Market Development in Northern Ghana (MADE)	Northern Ghana
Partnerships for Forests (P4F)	Latin America, Africa, Asia
Programme of support to Agriculture in Rwanda (PoSA)	Rwanda
Promoting Conservation Agriculture in Zambia (CSAZ)	Zambia
Rural and Agriculture Markets Development programme for Northern Nigeria (PrOpCom Mai-karfi or PM)	Northern Nigeria

Programme	Country(ies)
Support to develop and deploy the next generation of agriculture technology to support poor farmers by CGIAR (2017 -2021) with a focus on support to CCAFS's work on CSA	Global
Sustainable Agricultural Intensification Research and Learning in Africa (SAIRLA)	Sub-Saharan Africa
Sustainable inclusive Livelihoods through Tea Production in Rwanda (SILTPR)	Rwanda
Zimbabwe Resilience Building Fund Programme (ZRBF)	Zimbabwe

The review's findings and recommendations will assist FCDO in its approach to, and design and development of, sustainable agriculture programmes with a focus on CSA. They will be used to support in country advisors to align programme and portfolio objectives with FCDO's policy messages related to food systems and climate change.

Methodology

In line with the TORs, the review was conducted remotely, drawing mainly on qualitative data. It considered the four OECD Development Assistance Committee (DAC) criteria outlined in the TORs: Relevance, Effectiveness, Impact and Sustainability. Evaluation questions (EQs) were elaborated during the inception phase and were used to structure the findings. A full evaluation framework was developed. For each sub-EQ it listed the areas to consider, data sources, data collection and analysis methods and their evaluability. The evaluation methods included a document review and key informant interviews.

Findings

Relevance: Nine programmes had a goal of increasing resilience to climate variability and shocks measuring changes in resilience mostly through proxy indicators. However, several programmes noted that defining and measuring resilience is challenging. CSA was featured to varying extents in the programmes reviewed, with less than half referring to CSA in relation to resilience. In two cases it was introduced mid-way through implementation. Significant time-periods are required to bring about changes in resilience to climate variability and shocks and this was found to be challenging where programme funding covers a few years only.

While CSA technologies and intervention models identified at the design phase appeared relevant and appropriate as a means to improve farmers' productivity, adaptation to and mitigation of climate change, it was not possible to get to the level of detail needed to identify which were most relevant, why, and for which target groups. However, there is evidence from the reviewed programmes that building participatory approaches and feedback loops into the initial design and identification of a portfolio of CSA practices, technologies and services increases relevance. Most programmes which included CSA focused on potential synergies between at least two of the pillars of CSA (usually productivity and adaptation) rather than making explicit trade-offs between productivity, adaptation and mitigation. Government prioritisation of, and investment in, agriculture provided an enabling environment for CSA whereas poor and/or deteriorating macro-economic contexts were disabling.

Effectiveness: Over 30 CSA approaches were identified in the portfolio review at field, farm, landscape/community and/or institutional levels. Adoption was understood differently amongst the programmes and reports did not go to the level of detail needed to provide information on which specific CSA approaches were adopted or not and why/why not. CSA approaches were more likely to be adopted when they are profitable to farmers, increase productivity and where resources and services to enable adoption are available. Participatory approaches to design and implementation of CSA programmes were reported to further support adoption.

Delivery models were programme-wide rather than specific to CSA and were tailored to the type of programme and the local context. Delivery approaches reflected the nature of the programme and, in most cases the nature of extension delivery in the country (whether it was government led or pluralistic). None of the delivery models included carbon or Payment for Environmental Services (PES) incentives. There was limited analysis in portfolio reports about the effectiveness of specific delivery models for different target groups or different geographies.

Impact: Gathering evidence on the impact of CSA measures in terms of farmers' resilience to climate variability and change was challenging partly due to difficulties programmes found in measuring resilience. A number of programmes reported an increase in farmers' resilience arising from CSA approaches, but this was difficult to confirm given the evidence available. Despite CSA programmes, climate shocks continued to impact on poorer farmers in Zambia and Zimbabwe (some evidence suggests farmers who were better off did increase resilience). Programmes did not distinguish between those CSA measures that are nature based solutions (NbS) and those that are not and did not use the term NbS. Programmes did include women, usually providing gender disaggregated data and some targeted youth and the disabled. However, it was not possible to carry out comparative analysis across the portfolio to identify specific outcomes and impacts for particular target groups.

Programmes focused on delivery of CSA interventions rather than measuring their secondary environmental co-benefits. However, secondary consequences of CSA were noted in some projects in relation to carbon sequestration. There were few findings on trade-offs between short term productivity and longer-term resilience as these tended to be seen as complementary.

Sustainability: There was evidence from several programmes including SILTPR, the CCAFS Climate-Smart Villages (CSVs) and a BRACED project that farmers may continue to use, adapt and benefit from CSA technologies after the programme ends. This was mainly due to enabling government and private sector environments. However, some programmes assumed there would be continued use of adopted practices after they ended but this is not certain without further programme support and subsidies. At the farm level, the continued relevance of CSA and NbS in a future climate will depend on generating sufficient synergies between production, adaptation and possibly in some cases longer-term credits for carbon and other public good services.

An enabling environment for sustainable adoption of CSA exists where farmers find the CSA practice beneficial. Achieving this may require the judicious use of temporary subsidies, long term private sector investments, and governments that demonstrate their

commitment to CSA with matching fiscal expenditure. Factors that constrain sustainability of CSA include high levels of extended implicit and explicit project subsidies, marginal benefits only for farmers and businesses, and lack of government support and commitment.

Reflections on Findings and Opportunities

Resilience and sustainability: There is no common definition of resilience both within the portfolio reviewed and more broadly. Challenges arise when resilience is interpreted and conceptualised differently depending on its framing and use. It is difficult to quantify, as it is relational (more or less than previously or more or less than another community) and it may be different in relation to each shock being considered. There remains uncertainty in the wider development field about the appropriate indicators to measure resilience. One programme reviewed, BRACED, sought to address these difficulties through categorising project activities to build capacity to adapt to, anticipate and absorb shocks through a transformative process. Further experimentation with BRACED's approach would help verify its validity and cost effectiveness, as well as test its efficacy in measuring farmers' resilience to climate variability and shocks in meaningful ways. As noted by BRACED, adaptive capacity and sustainability are linked: if adaptive abilities cannot be sustained, it raises questions about whether projects can claim that resilience has been built.

Adoption: Barriers and solutions: Barriers to adoption identified in this review are largely similar to agricultural programmes more generally. Drawing on the review documents and wider development literature and experience, good practice in overcoming barriers includes participatory design and implementation of programmes; providing baskets of CSA options for different wealth/land-holding categories; consideration of land tenure or equitable access to land; and enabling inclusive access to services, markets and inputs.

Cutting through the jargon – designing for, and measuring, relevant outcomes: Terms like Climate Smart Agriculture (CSA) and Nature-based Solutions (NbS) can be useful for describing generic approaches, but for design, monitoring and evaluation it is important to focus on outcomes like, production, adaptation, CC mitigation and other environmental services. This needs to be done within an understanding of the diversity of participants. Only then can one start to understand, design and implement for what works, for whom, where when and why. This complexity can be navigated with help from appropriate participatory techniques in design and giving voice to a representative range of participants in reporting.

Enabling environment and whether the subsidies can be justified: Key contributors to enabling environments for CSA programmes are governments, the private sector and local organisations, especially those created by smallholder farmers, as well as donors. Carefully targeted subsidies can be enabling, helping to tide farmers over a period of high initial costs and no returns. However, programmes tend to incorporate subsidies for inputs, equipment and services to encourage adoption of CSA. When the programmes and their related subsidies end, the smallholder farmers' increased costs can reduce sustainability if appropriate exit strategies have not been realised.

Carbon finance and CSA/NbS – Holy grail or red herring?: Profitability was found to be a strong driver of CSA and NbS adoption and also for sustaining changes in practice.

There are challenges when CSA and NbS profitability is low, or where the long-term nature of a CSA or NbS approaches mean farmers and communities do not benefit in the short-term from their efforts. There are additional challenges for sustainability where farmers and communities do not benefit from the public good collateral carbon sequestration or other environmental services delivered by their activities. There may however be opportunities to increase CSA and NbS adoption and sustainability in projects like those found in the portfolio through blended sustainable carbon (or PES) finance, complementing development finance.

Minding the gap – addressing time-lag issues: Timeframes for funding should be based on type of project and target group to achieve objectives, sustainability, resilience and transformation. Some CSA and NbS interventions, such as planting slow-growing but long-lived leguminous trees, require significant time between the participant effort required for adoption and the onset of benefit from the effort. This is a challenge for adoption, exacerbated by often relatively short project cycles which may be five years or less. Finding ways to overcome the time-lag funding gap may be a significant adoption-enhancing opportunity which needs to be considered in design. Innovative bridging finance may be necessary. One possible route may be to incorporate carbon and/or environmental services credits as an exit strategy from donor finance, to function as a sustainability strategy supporting longer-term farmer and/or community benefit. There may be robust public good reasons for this type of approach.

Recommendations

On resilience and sustainability: Design for climate resilience by identifying the priority threats and best bet opportunities relevant to different target groups within the specific context of the project. Consider opportunities to enhance anticipation, adaptation and absorption and the future capacity of participants to continue to adapt beyond the project to achieve transformational change. Make resources available for ex-post learning and monitoring and/or evaluation of sustainability. This will show whether the programme has achieved its objective of sustainability. It may also establish whether farmers have developed an ability to cope with climate variability and shocks.

On adoption: Be clear about what is meant by adoption and set appropriate indicators. Build in time for participatory scoping of CSA options and allow for their iterative adaptation during implementation. Ensure inclusive access to resources and support services in a sustainable manner. Build in sufficient granularity in monitoring to be able to establish which groups adopt CSA practices and why/why not.

On designing and measuring relevant outcomes: For CSA (or sustainable agriculture intensification or NbS) programmes, break down the term to its specific components so as to be able to set outcomes that are relevant and measurable. In the case of CSA start by looking at what the programme aims to achieve in terms of productivity, adaptation and mitigation. Key outcomes like production, adaptation, CC mitigation and other environmental services need to be clearly defined, with targets set where possible in relation to objective needs and the priorities of diverse participants. The ToC should reflect the interaction between these diverse participant types, possible CSA approaches and required outcomes. This complexity is likely to require elements of participatory design on what is expected to work, for whom, when, where and why. Monitoring, reporting,

implementation adjustment and evaluation should also reflect outcomes for different participant types, including representative participant voices.

On the enabling environment and subsidies: Create an enabling environment through wide-ranging consultations during programme design to ensure government commitment, private sector participation, legitimate farmer organisations and sufficient intrinsic benefits of CSA interventions to motivate adoption. During programme design, consider the type, level, timing, and need for subsidies – direct and indirect – bearing in mind their impact on sustainability and resilience to climate change when projects end.

On carbon finance and CSA/NbS. FCDO should investigate opportunities to increase CSA and NbS adoption and sustainability through blended sustainable carbon (or PES) finance, complementing development finance in projects like those found in the portfolio. Blended finance approaches can include climate or PES credits to reward public good outcomes and to enable longer-term sustainability. This finance may be most effective at the latter part of the project cycle after awareness raising, CSA demonstration, governance and community organisation capacity building is underway. There may also be a role for FCDO in building capacity in aggregator and other carbon credit and PES service providers, or empowering programme implementors to investigate these financing opportunities.

On addressing time-lag issues: Design CSA programmes with timeframes appropriate to the need and with mechanisms to overcome any incentive gap between adoption and farmer benefit. Finding ways to overcome the time-lag between participant effort and benefit from adopting some longer-term CSA/NbS approaches need to be considered in project design. Project timeframes for should be based on realistic estimates of the time needed to achieve not only immediate objectives but longer-term sustainability, resilience and transformation. This is likely to vary with the type of CSA being proposed and also the readiness of project participants. Where longer-term approaches look likely to deliver significant benefits, longer project timelines and/or innovative ways of bridging this gap may need to be incorporated. In some cases, carbon finance or other PES should be explored as an option.

1 Introduction

The purpose of the thematic review of Climate Smart Agriculture (CSA) across a portfolio of Foreign Commonwealth and Development Office (FCDO) programmes was to aggregate and synthesise existing evidence from programmes that support CSA, to draw out learning on reducing Smallholder Farmers' (SHF) vulnerability to climate variability and shocks. The scope of the evaluation was to determine the relevance, effectiveness, impact and sustainability of different CSA interventions in the context of different geographies, climate variability and target groups[1]. Its focus was on learning rather than accountability; the review learned from, but did not evaluate, the portfolio of programmes.

NIRAS-LTS were contracted for this assignment and put in place a six-person team made up of a core team of three experienced agriculture and evaluation experts and three support team members who provided programme management, technical and QA support. The timing of the report was planned to provide findings to FCDO ahead of the UN Food Systems Summit and COP26 in November 2021. The target audience for the review include staff from FCDO's Evaluation Unit, Research and Evidence Division, and Climate and Environment Division. Other audiences are likely to include FCDO staff at post, and other UK departments with interests in CSA such as the Department for Environment, Food and Rural Affairs (DEFRA) with a developing interest in CSA and NbS. A use and influence plan, developed in collaboration with FCDO, is included in Appendix 3.

Thirteen programmes were reviewed as listed in Table 1 below. They were a mix of agriculture and productivity/M4P programmes (MADE, PM, PoSA, SILTPR); Resilience, livelihoods and food security programmes (ASAP, BRACED, CSAP, CSAZ, LFSP, ZRBF); landscape/environmental programmes (P4F); and research programmes (CCAFS's research on CSA and SAIRLA). Further information on these programmes, including how they were identified, is outlined in Appendix 2 on approach and methodology. Appendix 4 contains the key definitions the review team used e.g. for CSA, NbS, climate resilience etc.

2 Context, Approach and Methodology

2.1 Context

The reviewed programme portfolio contained a mix of programme types, funding sources and amounts, timescales and target countries as shown in Table 1 below. The portfolio was diverse. Only two of the programmes were explicitly designed around CSA (VUNA and CSAZ). Another three (CCAFS, ASAP and BRACED) were large multi-project programmes with a focus on adaptation to climate change and two were research programmes. Within the multi-project programmes some of the individual projects were looked at in more detail to try to reach down to more field level experience. As discussed under EQ4, programmes were implemented either through government agencies, the private sector or non-governmental organisations (NGOs).

[1] See Appendix 1 for the review Terms of Reference (TOR's).

Table 1 Programme types, funding and locations

Programme	Programme Type	Funding	Timeframe	FCDO Budget	Country(ies)
Adaptation for Smallholder Agriculture Programme (ASAP)[2]	Resilience, livelihoods, food security	Multilateral	2012-2023	£150m	Multiple worldwide
Building resilience and adaptation to climate extremes and disasters (BRACED)	Resilience, livelihoods, food security	Bilateral	2013-2019	£41m	Multiple in Sub-Saharan Africa and Asia
Climate Smart Agriculture in Africa (CSAP/VUNA)	Resilience, livelihoods, food security	Bilateral	2011-2018	£31m	Southern Africa
Livelihoods and Food Security Programme (LFSP)	Resilience, livelihoods, food security	Bilateral	2013-2022	£71m	Zimbabwe
Market Development in Northern Ghana (MADE)	Agriculture, productivity, M4P	Bilateral	2013-2020	£16m	Northern Ghana
Partnerships for Forests (P4F)	Landscape, environment	Bilateral	2017-2023	£14m	Latin America, Africa, Asia
Programme of support to Agriculture in Rwanda (PoSA)	Agriculture, productivity, M4P	Bilateral	2014-2020	£43m	Rwanda
Promoting Conservation Agriculture in Zambia (CSAZ)	Resilience, livelihoods, food security	Bilateral	2016-2021	£25m	Zambia
Rural and Agriculture Markets Development programme for Northern Nigeria (PrOpCom Mai-karfi or PM)	Agriculture, productivity, M4P	Bilateral	2013-2021	£51m	Northern Nigeria

[2] There are 41 projects within ASAP. The team looked at ASAP as a whole but then reviewed project level evidence for the following projects: Butana Integrated Rural Development Project (BIRDP) Sudan; National agricultural land and water management development project (NEMA), the Gambia; Pro-poor value chain development in the Maputo and Limpopo corridors (PROSUL), Mozambique and; Adaptation to climate change in the Mekong Delta in Ben Tre and Tra Vinh provinces (AMD), Vietnam.

Programme	Programme Type	Funding	Timeframe	FCDO Budget	Country(ies)
Support to develop and deploy the next generation of agriculture technology to support poor farmers by CGIAR (2017 -2021) with a focus on support to CCAFS's work on CSA	Research	Multilateral	2017-2021	£123m (to CGIAR overall)	Global
Sustainable Agricultural Intensification Research and Learning in Africa (SAIRLA)	Research	Bilateral	2014-2020	£8m	Sub-Saharan Africa
Sustainable inclusive Livelihoods through Tea Production in Rwanda (SILTPR)	Agriculture, productivity, M4P	Bilateral	2016-2023	£12m	Rwanda
Zimbabwe Resilience Building Fund Programme (ZRBF)	Resilience, livelihoods, food security	Bilateral	2015-2022	£40m	Zimbabwe

All programmes sought to address poverty through increasing productivity or resilience of farmers to climate variability and change. Programmes primarily targeted smallholder farmers either directly or by supporting relevant value chains and agribusinesses. Most gathered gender disaggregated data but the extent to which there was specific focus on women, youth or other aspects of intersectionality varied per programme.

The review's findings, conclusions and recommendations will assist FCDO in its approach to, and design and development of, sustainable agriculture programmes with a focus on CSA. They will be used to support/guide advisors in country to align portfolio or programme objectives with FCDO policy messages for events related to food systems and climate change. This focus by FCDO comes at a critical time in which the effects of human-caused climate change are being felt more acutely than ever by communities and nations throughout the world. With the UK hosting COP 26 in November 2021, it is critical that this review, alongside other related studies commissioned by FCDO, provides an evidence base for subsequent action that aims to build the resilience of food producers in developing countries who are amongst those most at risk from climate change.

Whilst donor interest in NbS is recent, interest in CSA has been growing amongst governments and donors over the last decade with a broadly aligned understanding of what it includes emerging over that period supported by definitions and handbooks produced by FAO and others. The FCDO works with multilateral organisations to develop new CSA programmes. This includes providing support through International Climate Finance (ICF) to the International Fund for Agricultural Development's (IFAD) flagship programme, the Adaptation for Smallholder Agriculture Programme (ASAP), through the World Bank to develop national CSA Investment Plans, building upon earlier CSA Profiles and integrating climate into the work of the Global Agriculture and Food Security Programme. The UK also makes significant contributions to major international climate funds, such as the Green Climate Fund and Global Environment Facility, which increasingly include support for CSA. In working bilaterally or multi-laterally, FCDO seeks to mainstream concerns about poverty, human rights, gender and environmental protection in programmes aimed at increasing agricultural productivity, improving adaptation to climate change and or climate change mitigation (the three pillars of CSA).

2.2 Approach and Methodology

Appendix 2 provides detail on the approach and methodology followed. It also includes lessons learned by the review team with regard to the process of designing and implementing portfolio reviews. The review was conducted remotely, drawing mainly on qualitative data. It considered the four OECD Development Assistance Committee (DAC) criteria outlined in the TORs: Relevance, Effectiveness, Impact and Sustainability. Evaluation questions (EQs) were elaborated during the inception phase and were used to structure the findings in Chapter 3. A full evaluation framework was developed listing, for each sub-EQ, the areas to consider, data sources, data collection and analysis methods and evaluability framework. The evaluation methods included a document review and key informant interviews.

2.3 Strength of Evidence

Unless otherwise stated, all findings presented in this report are supported by either (a) a small sample of highly credible evidence sources (i.e. independent verification or

evaluation reports) or (b) a wider sample of less credible or independent evidence (i.e. common trends in multiple programmes' annual reviews).

2.4 Limitations and Mitigation

Nine risks and how they would be mitigated against were identified during the scoping phase. The full risk table is available in Appendix 10. Of the nine risks identified in the scoping phase, implementation saw five being rated as low risk. These were definitions of core concepts; stakeholder availability; conflict of interest; risk of insufficient uptake/utility with lack of context/stakeholder engagement; and risk of overlap/confusion and duplication of deliverables. Four remained at medium risk. These concerned the sources and availability of data; determining attribution; the breadth and diversity of programmes, CSA and plausible change pathways making generalisations (and therefore the provision of useful recommendations) challenging; and the risk of scope increasing as evaluation progresses and going beyond budget and day allocations.

3 Findings

3.1 Relevance

EQ1. How has each programme defined resilience to climate variability and shocks in their ToC?

EQ1a Is there a system for measuring resilience?

Nine of the twelve programmes (SAIRLA excluded) had a goal (in either their logframes or theories of change) of increasing resilience to climate variability and shocks.[3] However, five of the twelve found defining and measuring resilience challenging as indicated from documents and interviews.[4] BRACED understood resilience as "the ability to anticipate, avoid, plan for, cope with, recover from and adapt to (climate-related) shocks and stresses".[5] PM invested time in developing a discussion paper describing resilience as being dynamic and on a continuum. The paper notes resilience is a multifaceted concept and therefore should not be equated with any one indicator. The PCR for MADE (page 6) noted that "More attention should be given to how climate resilience is conceptualised and measured. While the programme was found to have improved the resilience of smallholder farmers to drought, for example, through the use of drought-resistant seeds that were introduced to market supply systems, this alone is an inadequate measure of whether overall 'resilience' has been achieved. Thus, the goals of market systems programmes in promoting resilience to climate change need to be carefully considered both in terms of their ambition and their feasibility, combined with the formulation of meaningful indicators of success or intermediate progress towards success."

Nine of the twelve programmes had proxy indicators for resilience.[6] There is significant debate about their relevance (as is discussed further in Chapter 4). The most common indicators were set at the outcome level and included increased and diversified income; increased agricultural (crop and livestock) productivity and; improved food security and dietary diversity. These are proxy indicators which generally need some time for sufficient evidence to transpire. PoSA. LFSP and PM, for a while, set indicators for resilience at

[3] ASAP, BRACED, CSAP, CSAZ, MADE, PoSA, CCAF's work on CSA, ZRBF and LFSP
[4] ASAP, BRACED, MADE, PM, PoSA, ZRBF
[5] Leavy, J et al 2019, page 8 (listed under BRACED in Appendix 7)
[6] ASAP, BRACED, CSAP, CSAZ, PM, PoSA, CCAF's work on CSA, ZRBF and LFSP

output level which could be measured over a shorter time period (see below). Examples of indicators used to measure resilience by selected programmes are provided below:

- BRACED measured resilience outcomes at the household level through measuring i) increased and diversified income; improved food security and dietary diversity; improved access to water for food and agriculture and ii) Improvements to agricultural systems and practices; improvements to livestock systems and practices; access to financial services, including credit, loans and insurance.[7]
- CSAP's resilience indicators included more diverse incomes, reduced variability in yields, increased market engagement, fewer losses following extreme events and reduced recovery time following disasters.[8]
- PoSA had proxy indicators based on a number of outcomes that are assumed to confer resilience such as ha. of hillside terraced, ha of irrigation, climate smart strategies adopted and number of people supported to cope (ICF KPI 1).[9]
- LFSP measured the number of farmers trained in application of new CSA technologies or management practices, and numbers of farmers accessing these through non-ICT and ICT based extension.[10]
- PM considered farmers were resilient if they had increased or diversified incomes.[11] During Phase 2 they developed three new indicators related to the three pillars of CSA (number of interventions that contributed to improved adaptation (resilience), productivity and reduced GHG emissions).[12] Towards the end of the phase these were adjusted to the new IFC KP1 17 indicator on sustainable land management.[13]

Whilst evidence was not gathered on which programmes use the ICF KPI indicators 1 (Number of people supported to better adapt to the effects of climate change as a result of ICF) and 4 (Number of people whose resilience has been improved as a result of ICF), at least some of those that received ICF funding did look to apply one or both of these.

EQ1b Is CSA in any form referred to in relation to resilience?

Five programmes clearly referred to CSA in relation to resilience.[14] For example, ZRBF developed a resilience and sustainability manual for multiple CSA interventions to build resilience against climate and other shocks and CSAZ sought to sustainably improve the well-being, livelihoods and climate resilience of small-scale rural Zambian farmers by providing training on and building market links for CSA/CA. Other programmes did not make an explicit connection between CSA and resilience, usually because they did not use the CSA terminology, but did support practices that fall under CSA such as improved climate resilient natural resource management (ASAP BIRDP project in Sudan); management of a high value perennial cash crop in which productivity and adaptation are

[7] Leavy J, et al 2019
[8] Genesis Analytics 2018, page 10 (Listed under CSAP/VUNA in Appendix 7)
[9] FCDO 2020 – AgriTAF logframe (listed under PoSA in Appendix 7)
[10] LFSP Logframe April 2017
[11] PM business case extension logframe
[12] PM business case extension logframe
[13] PM 2020 Annual review and see Climate Change Compass/HM government June 2020 (listed under Other in Appendix 7)
[14] CCAFSs work on CSA, CSAZ, LFSP, ZRBF, CSAP/VUNA

integral to the overall project (SILTPR) and the incubation of new investments in agroforestry and non-timber forest products under P4F.

The M4P programmes in the review portfolio, MADE and PM, considered CSA but not at the design phase: These programmes were not primarily focused on resilience to climate variability and shocks neither were they CSA programmes. However, MADE did include minor CSA/CA initiatives in Phase 2, mostly in response to it being a recipient of ICF funding for that phase. PM went further, with the rewording of one Objective for Phase 2 to "To increase the resilience of the rural poor to CC by growing a portfolio of CSA interventions from PM activities and new areas through pioneering CSA approaches".

EQ1c What information/analysis was used to inform the decision to incorporate CSA in programme design?

All of the programmes incorporated CSA either in their original design or, as the programme progressed, in response to the challenge of climate variability and shocks. Common challenges included drought, floods, erratic and late onset of rains, for example:

- Temperature increases in Rwanda affecting tea production (SILTPR).
- Saline intrusion, storms, drought and floods in the Mekong Delta (ASAP AMD project).
- Natural resource degradation and drought in the case of the ASAP BIRDP project, and low agricultural productivity related to natural resource degradation and climate threats in Nigeria, Ghana and the Gambia (PM, MADE and the ASAP NEMA project respectively).

The review did not find strong or consistent approaches to analysing the need for CSA and appropriateness of various types of CSA interventions by the programmes that did incorporate CSA in the initial programme design. Examples of analysis used to incorporate CSA in programme design include:

- ZRBF sought expert advice and drew extensively on the literature to develop a holistic approach that focused on three resilience-building capabilities (anticipation, adaptation and transformation).
- BRACED also enquired into the into the principles and components of an effective resilience programme. Unlike ZRBF, though, transformation was not seen as a capacity-building activity, but as an approach "to reshape people's ability to adapt, anticipate and absorb shocks and climatic stresses." [15] Nearly all BRACED projects included some CSA components. The link between CSA and resilience was not a 'decision' but a basic assumption in the programme.
- SILTPR considered adaptation to temperature change in particular. According to interview respondents, its climate risk assessment identified areas that would become unsuitable for tea in the future and recommended not planting in those. Rather, it recommended investing in tea 200-300m higher than the current ideal.

Even where CSA was incorporated in programme design, it was clear from several programmes[16] that the nature, type and focus of CSA evolved during implementation

[15] Faulkner, L and Sword-Daniels, V 2020, page 6 (listed under BRACED in Appendix 7)
[16] ASAP'S AMD project, CSAZ, LFSP

based on the iterative and participatory manner in which CSA was implemented. For example, CSAZ used an iterative planning process, identifying and starting new activities as the need became apparent. The CCAFS Climate Smart Village (CSV) approach involves multi-stakeholder identification and development of CSA measures suited to different target groups and ASAP's AMD project engaged women from the start in an iterative planning process. For two programmes (MADE and PM), CSA was introduced mid-way (as noted in EQ1b). This was because they were funded mid-way from ICF funding, but also due to DFID and HMG interest in addressing climate threats combined with insecurity and conflict in the Sahel.[17] However, the programmes found it challenging to retrofit CSA into their existing activities and to start new CSA initiatives with only a few years left, knowing that such initiatives need a number of years to take effect.

EQ1d Over what time frames were resilience changes expected?
Findings on time frames for resilience changes varied but were consistent for programmes for which evidence was available. Significant time periods were required, and were often longer than programme plans allowed.[18] A time frame of at least five years was considered necessary for piloting by BRACED, and up to 20 or more years to attain significantly increased resilience (longer for programmes supporting perennial crops, see Chapter 4). ASAP projects run for 10+ years in line with loan periods which may be a key reason for their high levels of success. However, a number of programmes were too short to build significant resilience to climate shocks at outcome and impact levels (BRACED, VUNA, ZRBF), initially failed to gain traction (ZRBF, VUNA), or incorporated CSA in midstream (PM, MADE) limiting impact and sustainability. For example:

- BRACED was intended to have an initial five-year phase followed by at least one more five-year phase, but closed after just four and a half years, including an effective implementation period of just three years. This was not sufficient. The PCR (page 20) noted that to achieve resilience results in fragile states would require a time frame of eight to ten years and the Knowledge Manager recommended that for resilience programmes project design should expand beyond three to five year funding cycles with higher degrees of flexibility and iteration over time.[19]
- VUNA began as the CSAP with a BC in 2011 and ended as VUNA in 2018. However, it failed to gain traction until 2015 and by the time the programme was planned and mobilised it was only possible to implement activities and monitor results over one agricultural season.[20] Yet the same report (page 6) notes that the long term nature of CSA adoption requires at least 3 to 5 years for pilot projects and that 15-20 years of active promotion and support is needed for the adoption of CSA (page 6).

[17] For example, see PM Annual reviews 2017-2019
[18] Note that these findings cover not only design but also implementation.
[19] Faulkner, L and Silva Villanueva, P 2019, page 65 (listed under BRACED in Appendix 7)
[20] Genesis Analytics 2018 page 8 (listed under CSAP/VUNA in Appendix 7)

Conclusions for EQ1: How has each programme defined resilience to climate variability and shocks in their ToC?

Not all programmes defined resilience and over one-third found defining it challenging. Understanding of how resilience can be measured varied between programmes. Whether and the extent to which CSA was referred to in relation to resilience at the design stage depended on the programme type. Whilst CSA may be an appropriate solution to challenges farmers face due to climate variability and shocks, this cannot always be assumed. It is best practice to include CSA at the design stage and in an informed manner, rather than add it mid-way. Participatory identification and selection of CSA practices appears to be effective, particularly when seen as an iterative learning process. It is already well known that changes at the impact level require time, incentives (whether motivational or market based), attitudinal and behavioural change and an enabling environment. Hence, the consistent finding is that changes in resilience to climate variability and shocks need a long (10-20 years) period. This remains a challenge under the prevalent pattern of development programme funding often being for 3-5 years only.

EQ2 Were the CSA interventions and the design of their delivery (delivery models) relevant and appropriate as a means to improve farmers' productivity, adaptation to and mitigation of climate change/shocks and in what contexts?

EQ2a Were trade-offs between sustainable productivity, adaptation and mitigation considered in the design phase, defined and measured?

Five programmes considered trade-offs between productivity, adaptation and mitigation at the design phase.[21] In the CCAFS CSVs, trade-offs between sustainable productivity, adaptation and mitigation were considered at the design phase of each CSV.[22] All prioritised climate smart interventions were grouped into i) yield improving technologies/practices and ii) climatic risks reducing technologies/practices. Interventions that were deployed differed according to these categories. In SILTPR, the main trade-off related to adaptation over time given how long it takes for new tea plantations to become productive. There was a recognition that, with climate change, long-term investment in establishing tea plantations can only be made at higher altitudes which will be suitable for premium (cooler grown) tea in 20-60 years' time (Interview with IP). Five programmes (BRACED, CSAZ, ZRBF, LFSP and some ASAP projects) considered complementarities, rather than trade-offs, at the design phase, with a particular focus on complementarities between productivity and adaptation. This point is again considered under EQ7.

EQ2b On what bases was the design of delivery models (extension approaches etc.) established and how relevant were they?

Design of delivery models depended on country context, funding mechanism and programme type, as well as the nature and strength of existing delivery approaches, policies and services in the countries concerned. Thus, there were multiple delivery models used in programmes that operated across multiple countries such as BRACED and ASAP. For example, ASAP's AMD project in Vietnam was designed to be delivered

[21] There were also a number of articles from the SAIRLA programme that covered trade-offs (see Appendix 11 discussion under EQ2a and EQ7a. Trade-offs occur when choices have to be made between two or more desirable objectives.

[22] Aggarwal P K et al 2018 (listed under CGIAR 2017-2021 in Appendix 7) Multi-stakeholder research platforms assess the benefits, synergies, and trade-offs of the technologies from the perspective of individual farmers (men, women, and youth) as well as of the aggregate community/landscape

through governmental structures,[23] whereas its PROSUL project in Mozambique worked closely with the private sector and farmer organisations,[24] each reflecting the unique context of agricultural development in these two countries. In terms of funding mechanisms, it is possible to contrast different delivery models of two programmes in one country; Rwanda. PoSA is a World Bank programme to which FCDO contributes. The funding is through a sector wide loan/grant to the Government of Rwanda so runs through existing extension and project frameworks from the Ministry of Agriculture. In the same country, the FCDO bilaterally funded the SILTPR project that has a very different delivery model as the focus of the programme is very different. Delivery is through a one-stop PS delivery company providing organisation, training, inputs and establishment finance.

Programmes taking an M4P approach had delivery models focused on the private sector. On the other hand, the broad livelihoods and food security programmes – LFSP, ZRBF and BRACED – mainly operated through NGO implementation partners that were well established in the respective countries, and which worked alongside government and/or private sector partners depending on the local context. Delivery models designed for programmes as a whole, not just their CSA components, were appropriate and relevant.

EQ2c Which CSA technologies were most relevant, why and for which target groups?

Whilst the wide range of CSA technologies identified at the design phase appear relevant, the review was unable to access the level of detail needed to identify which were most relevant, why and for which target groups (as is further discussed under EQ3). Programmes identified particular CSA technologies, delivering them through a number of interventions and aligned practices. For example, CSAZ focused on promoting a clear set of conservation agriculture (CA) techniques: minimum tillage, residue cover, and crop rotation, with the interventions supported by a) training in the various CA techniques, complemented by b) facilitation of linkages between smallholder farmers and agriculture inputs, services and output markets and c) conducting research on CSA techniques, disseminating evidence and good practice and d) influencing CA policies and strategies in Zambia. LFSP promoted a wider range and evolving set of CSA practices and technologies, supported by ensuring smallholder farmers had access to inputs, services (finance, extension) and markets. CCAFS's CSVs overall design allowed for participatory identification of portfolios of CSA practices that a) increased productivity/yield and/or b) addressed adaptation to CC. In the CSVs, portfolios of climate smart interventions are identified by a multi-stakeholder collaborative platform and developed based on existing climatic risks, local (mostly crop) systems and stakeholder priorities. Building participatory identification of a portfolio of practices, technologies and services into design appears to have been effective as discussed under EQ1c, EQ3 and EQ4.

There were no findings from programme designs on which CSA technologies would be relevant to particular target groups in terms of gender and age as this level of detail was not covered in the documentation available. Business cases do consider wealth categories, gender (and sometimes youth or marginalised groups in general) but this was not specific to different CSA technologies. Examples of targeting are given in the box below with reference to four ASAP projects.

[23] IFAD (undated-a) (listed under ASAP in Appendix 7)
[24] IFAD 2020d (listed under ASAP in Appendix 7)

Box 1 Targeting in selected ASAP projects

The **BIRDP** project in Sudan targeted rainfed farmers, irrigation farmers, agro-pastoralists and transhumance pastoralists. Different technologies were relevant for each group. Richer pastoralist households were included because all households use the same water and rangeland resources. Women and youth were mentioned but their differences in relation to alternative CSA approaches were not explored. The **AMD** project in Vietnam focused on women and poor households, including the following categories: those without land or other productive assets, those with land or aquaculture resources, ethnic minority households, and households just above the poverty threshold. Whilst there was some participatory design around CSA technology packages, there are no records of which package was relevant for which target group/s. The PROSUL project in Mozambique targeted indirectly through value chain interventions. Men mainly got involved in the red meat value chain, women in the cassava and horticulture value chains. Women also had a high level of involvement in financial services. More than half of PROSUL's beneficiaries were women. Finally, for the NEMA project in the Gambia, both poor and moderately poor households were targeted with the latter being better positioned to take risks and forge commercial links that may also benefit the former.

EQ2d In which ways did various aspects of the Political, Economic, Social, Technological, Legal, Environmental (PESTLE) context constitute an enabling environment for CSA? Which were disabling?

Factors that constituted an enabling environment for CSA were mainly around an enabling government policy and investment context. For example, with the ASAP PROSUL project, the Mozambican government invested in the development and maintenance of infrastructure and took responsibility for the exit and sustainability strategy by signing collaboration agreements.[25] In the ASAP NEMA project in the Gambia, the government made substantial investments in direct financing, payments of staff and establishing robust arrangements for regular maintenance of infrastructure.[26] The SILTPR programme benefitted from an enabling investment and policy environment, with the Rwandan Government keen to encourage Foreign Direct Investment in a poorer area with few alternatives. This gave confidence to PS investors in two tea factories, further facilitated by front-loaded donor funding and a foundation offering patient capital investment.

There were a few cases of disabling policy environments being identified and addressed in programme design. The ASAP BIRDP in Sudan took place in a challenging wider political and economic context. When the business case for LFSP was developed, there were challenges due to party political dimensions within a fragile political environment, with Ministers of the key Ministries related to LFSP belonging to opposing parties.[27]

Another potentially disabling factor related to the macro-economic context. Many of the programmes reviewed noted a deteriorating and/or disabling macro-economic context, further exacerbated, in the case of Nigeria, by conflict and, of late, by the impact of COVID-19. Examples include those from Zambia (CSAZ), Zimbabwe (LFSP, ZRBF), and Nigeria (PM). In Zambia, (despite assumed continuing economic and political stability) the worsening economic crisis, market distortions and devaluation of the Kwacha all impacted on CSAZ. In Zimbabwe, farmers increasingly could not afford or access external inputs

[25] IFAD 2020d (listed under ASAP in Appendix 7)
[26] IFAD 2020a (listed under ASAP in Appendix 7)
[27] LFSP FCDO business case

due to economic instability and high rates of inflation. PM in Nigeria was impacted by a deteriorating operating environment due to economic recession, inflation, rising unemployment, a humanitarian crisis and increased insecurity. The BC for the extension, which had a strong focus on CSA, noted that with reduced purchasing power, a low-risk appetite and limited understanding of climate change, rural entrepreneurs and farmers are unlikely to invest heavily in CSA practices. An interview respondent noted that: “The CSA activities we picked for the extension period were extraordinarily optimistic for the time scale and areas to function. These were marginal, conflict affected areas, in a war economy, with market distortion from humanitarian delivery. Having to overlay CSA on this was difficult to deliver”.

Conclusions for EQ2: Were the CSA interventions and the design of their delivery (delivery models) relevant and appropriate as a means to improve farmers’ productivity, adaptation to and mitigation of climate change/shocks and in what contexts?

Whilst the TOR reflect FCDO’s interest in design, documentation did not analyse which CSA technologies, practices and services were relevant for particular target groups, where and why. Delivery models were designed based on the country context and focus of the programme. They were relevant and drew on in-country government, NGO and/or PS expertise Many of the programmes under review were not specifically CSA programmes, hence it is not surprising that trade-offs between productivity, adaptation and mitigation were not considered in depth, defined and measured at the design phase. If CSA interventions evolved through the life of a programme then consideration of trade-offs would take place as an iterative process. Building principles from LFSP into programme design may be good practice (e.g. nurturing participation, taking a holistic and pluralistic approach, client orientation and gender mainstreaming). Some governments had policies favourable for CSA uptake, others less so. Government investment in agriculture, including programme infrastructure and its maintenance, was particularly enabling. The macro-economic context worsened in several countries, despite assumptions to the contrary (as in the case of CSAZ).

3.2 Effectiveness

EQ 3 Which promoted CSA approaches (and specific technologies/practices within them) were not adopted, temporarily adopted or continue to be adopted and why?

The projects reviewed had great diversity, with at least 35 different approaches used (see Table 2). Projects often deployed a range of complementary approaches.

The quality and consistency of information accessible to reviewers in a high level portfolio review of this type proved challenging. There was varying disaggregation of individual CSA approaches, variable rigour of adoption reporting, and low incidence of reporting on lack of (or temporary) adoption. Limited information was provided on the reasons for adoption (or failure to adopt). Further, “adoption” was inconsistently defined by programmes with lack of comparability on which CSA approaches, or combinations of approaches, were required to tick the adoption box; for example, how long CSA needs to be practiced, and on what proportion of a farmer’s land for a technology to be considered “adopted”. Numbers of

farmers were often quoted without percentages, so prevalence of adoption was difficult to assess. There was often weak analysis of who was adopting or not, and why.[28]

The available portfolio evidence suggests that CSA approaches will only be adopted where they bring felt benefits to farmers, particularly if they are profitable. The portfolio reports suggest that the approaches listed, and combinations of these approaches, bring felt benefits to some farmers in some contexts and therefore are or will be adopted by those farmers in that context. There is less detailed evidence of how widespread the benefit and adoption is and how this is affected by the different contexts. Even those approaches that have widespread applicability, like weather forecasting, climate smart value chain improvements or reduced tillage, may need to be delivered differently in different contexts. Therefore, choosing appropriate combinations of approaches in a particular context for an appropriate target group is a critical process that benefits from participatory design and clear documentation. The table below gives an indication of the approaches used within the portfolio and the adoption experiences and challenges.

Table 2 Commonly promoted CSA approaches in the portfolio, the adoption experiences and challenges

CSA Approach	Portfolio project/ programme	Analysis of adoption experiences and challenges
Field level		
Conservation Agriculture 1. Reduced tillage 2. Mulch/soil cover 3. Rotation	CSAZ, MADE, LFSP, ZRBF,	Longstanding approach with many years of effort through Zambian Commercial Farmers Union, with spread to other countries in Africa, such as Pfumvudza in Zimbabwe and MADE in Ghana. There is mixed evidence on adoption. Constraints are sometimes labour to construct planting basins and for weeding that can particularly impact on women and may limit the area of adoption. Approaches involving ripping and/or herbicides may address these constraints.
Zai plant pit system	BRACED – BRES (Burkina Faso)	Planting pits based on a traditional Sahelian system with similarity to basin element of some Conservation Agriculture.
Reduced tillage/ direct drilling machinery	CCAFS (India)	Widespread applicability. Machinery access through local hire is a common linked intervention.
Reduced tillage + herbicide	LFSP, CASZ	There is some evidence that herbicide can be a gamechanger in relation to reduced tillage labour demand and cost of weeding. Programmes may be reticent about mentioning agrochemicals in plans and reports because of potential criticism and funding agency policies. Use may be left as 'a decision for the farmer' which may mean farmers are not trained in safer or more effective use. There may be scope for more transparency and discussion on this issue at programme level.

[28] It is entirely possible that some of this knowledge may be available among field staff and in field reports, but was not available in programme reports and interviews.

CSA Approach	Portfolio project/ programme	Analysis of adoption experiences and challenges
Irrigation (micro) + increasing water-use efficiency	Many	Lots of diversity - kitchen gardens, water harvesting, solar pumping, drip etc. Many successes, especially for kitchen gardens. Site specific. Viability and therefore adoption is challenging where equipment costs are high and value chains deliver low prices to farmers.
Alternate wetting and drying of rice/SRI rice	CCAFS	Reduced water demand AND reduced methane emissions from waterlogged soil. Significant evidence of success and adoption. There may be an opportunity to reward the farmer for external benefits (water available to others and reduced GHG), but examples of this were not found in the portfolio.
Drought/CC resistant varieties and crops	Many	Most common adaptation is for drought and temperature. Can involve different varieties or crops. Small grains (e.g. sorghum, millet) are often promoted but adoption results are often mixed – labour, market, taste preference and pest challenges may eclipse drought resistance in farmer decision making.
Salt tolerant crops and varieties	ASAP- AMD (Vietnam)	Reduced risk from saline intrusion from reduced river flows and sea level rise. High level of adoption reported from ASAP-AMD with support from profitable value chains.
Compost, manure	Many	Increasing yield, increasing soil carbon, reducing cost. Can be labour intensive and supply constraints may mean adoption is limited to selected fields/kitchen gardens. Targeted placement in planting basins is used in conservation agriculture.
Disease and pest management	PoSA, ASAP	Addressing risks of new pests and diseases related to increased temperature (or other climate related changes).
Climate smart changes to annual cropping (i.e. intercropping, relay-cropping, cover crops, other spacing/timing techniques).	CCAFS, ASAP and probably other projects without specific mention	Lots of options, many of which may be traditional. Very variable and limited information on adoption.
Changing perennial cropping plans in relation to climate change modelling	SILTPR	The Rwandan example involved moving tea planting up-hill to anticipate future warmer temperatures. High level of adoption enabled by interest free loans.
Farm/HH level		

CSA Approach	Portfolio project/ programme	Analysis of adoption experiences and challenges
Weather forecasting, can be integrated with ICT based advice	Many	Key seems to be sufficiently granular forecasting at the local level combined with training/ support to farmers on how to interpret and use the information. Forecasts are helpful in different ways at a seasonal, daily/weekly rainfall and storm warning level.
Training/sensitisation on climate risks and opportunities.	Widespread but often not explicit	Training on climate change risks and opportunities, usually runs alongside other approaches.
Diversification (both on-farm and off-farm).	CCAFS – CSV, ASAP BIRDP	Diversification generally reduces risk and increases resilience – but local contexts vary. Income generating activities (IGAs) were considered important in BIRDP. In certain circumstances specialisation in a low risk approach may build resilience (e.g. SILTPR Tea)
Agroforestry – on farm	ASAP, P4F, PM	Many different approaches – alley cropping, shade trees, contour strips, boundary hedges, woodlots, fruit/multi-purpose trees. Adoption is variable according to perceived benefits versus the costs. Intensive management is needed for truly integrated systems like alley cropping.
Fodder crops, hay, stall feeding	ASAP, LFSP, P4F, VUNA (Dairy intensification)	Variety of approaches – objective may be drought resilience or intensification (and integration of livestock with crops). Degree of climate smartness likely to vary with context and approach.
Improved livestock management	LFSP, ASAP, ZRBF	Producing more with less ruminants (reduced methane emissions). But various range management projects have seen increased ruminant numbers and increased overall methane emissions. No evidence yet on implementation of approaches to reduce enteric fermentation emissions within the portfolio.
Micro-finance	Many	A means to supporting CSA adoption (when input costs require finance), diversification (financing off-farm enterprises) and resilience building (savings). Also, may in some circumstances build group cohesion for collective action and more transformative change. Adoption reported to be significant, particularly among women.
Landscape/ Community level		
Soil conservation – physical and vegetative structures	ASAP, PoSA, SILTPR, BRES (BRACED)	Terraces, Zai Pits, contour vegetation strips, storm drains – may require government support and community organisation. Construction of terracing significant in Rwanda despite high labour demand due to donor support and community compliance with government.

CSA Approach	Portfolio project/ programme	Analysis of adoption experiences and challenges
Rangeland management (including natural forest regeneration)	ASAP BIRDP Livestock Mobility (BRACED)	Move from open to controlled access, different approaches to rotational grazing. May include participatory planning and conflict resolution with different interest groups (pastoralists and crop farmers). Delivered the largest carbon sequestration in the ASAP portfolio due to large areas being covered (opportunity for Carbon finance). May include provision of water infrastructure. Little independent evidence from ASAP on levels of compliance over time.
Watershed level approaches	ASAP - NEMA	Considered in the ASAP NEMA PCR as the optimal approach to address the many complex cause-and-effect relationships between upland and lowlands vis-á-vis the hydrological dynamics of the River Gambia with land developed for vegetables and rice.
Extensive agroforestry	ASAP	Low density of often large leguminous and other trees across fields and rangeland (e.g. Faidherbia albida). Benefits may include nitrogen fixation, nutrient pumping, wind reduction and multi-purpose timber and non-timber products. Adoption often challenging due to long time-lag between effort and benefit.
Weather resilient rural infrastructure	ASAP, ZRBF	Successful examples were all-weather road access to markets and services and drought resilient access to human and livestock water resources.
Mangrove protection, planting and restoration	ASAP – NEMA (Gambia)	Benefits include reduced risk of storm surge and damage, reduced coastal erosion, increased biodiversity and improved local fisheries, reduced saline intrusion. Adoption can be challenging due to open access and difficulties of enforcement of protection measures.
weLarger scale irrigation	PoSA, CCAFS	Climate smart aspects include water use efficiency, increasing productivity, taking into consideration of downstream secondary effects. Adoption challenges are capital costs, profitability, land rights and water user organisation to enable efficient and equitable water use.
Institutional level		
Government/extension support for CSA practices	PoSA, ASAP, CCAFS, LFSP, ZRBF	Varied level of government engagement and ownership of programme activities. Involvement found to be important for sustainability. Sometimes inflexible/lengthy government approval rules can stifle CSA innovation (but may increase safety /avoid inappropriate investment). Adoption can be challenged by equitable access and relevance (e.g. for women or poorer farmers unable to afford promoted technology).
Local research capacity	ASAP CCAFS. LFSP	Portfolio examples of effective partnerships with local universities etc. Can be beneficial to both project and university.

CSA Approach	Portfolio project/ programme	Analysis of adoption experiences and challenges
CSA value chain (VC) improvement	Many	It is essential for the CSA production to be comparatively profitable to conventional approaches and that farmers access to necessary CSA inputs. Various approaches to improving VCs. ASAP-AMD worked with women's groups to identify priority VCs and used competitive matching grants to reduce VC barriers to good effect with high adoption rates reported.
CSA enabling subsidies	CSAZ, ASAP. Few other explicit examples in the portfolio.	E-vouchers for inputs and weather insurance tried in Zambia. Lead farmers receive incentives in CSAZ. Some soil protection work seems to be supported by food or cash for work (ASAP-Niger).
Carbon finance (and payments for environmental services (PES)	None	Surprising omission from portfolio. Some discussion in P4F and climate finance grant applications through AgriTAF (PoSA). Potential opportunities as intervention exit strategy. Probable challenges of transaction costs for verification.
Disabling subsidies	Government but critiqued by CCAFS, LFSP, PM	CCAFS analysis of Indian State level rural diesel/electricity subsidies for groundwater pumping and fertiliser subsidies being disabling of water and fertiliser use efficiency CSA. PM/LFSP considered government input subsidies non-climate smart.
Land rights and land governance	ASAP	Secure access for women and youth maybe an issue constraining CSA investment in the land. Often an issue in relation to common property grazing regimes involving different user groups (e.g. crop farmers and pastoralists).
Young professional schemes	ASAP, PM	Placing recent agriculture graduates in community settings for example working with public and private sector extension providers. Reported to be effective for project and also future career prospects.
CSA targeted grants	ASAP-AMD	AMD - Community managed grants to improve CSA value chains. Otherwise surprisingly scarce in the portfolio.
Weather insurance	CSAZ	Surprisingly rare in portfolio. CSAZ facilitated farmers' access to donor supported weather insurance. Evidence from outside current portfolio of area based (usually rainfall) monitoring reducing transaction costs of administering pay-out claims.
Disaster Risk Reduction Planning (DRR)	BRACED, ZRBF, ZFLSP	Examples from the portfolio are: • Kenya Ward Adaptation Planning Committees • Anukulan Local Adaptation Plans of Action • Zimbabwe: Disaster Risk Management and Adaptation integrated into ward development plans.

CSA Approach	Portfolio project/ programme	Analysis of adoption experiences and challenges
CS sector standards, benchmarking	P4F	Various deforestation free beef, soya, oil palm good practice certification approaches. Driven by opportunity for more profitable business model. May be less appropriate to local markets if standards raise food prices.
Legislation/policy change to support CSA	ASAP, CCAFS, PoSA, P4F. LFSP	Rules against stubble burning in India, tree cutting (Sahel), grazing in forests (Kenya). Lots of local specificity, effectiveness (and fairness) of enforcement. Sometimes can create perverse dis-incentives (against tree-planting when you can't profit by cutting them later)

EQ3a What were the enabling factors, and those influencing dis-adoption, including contextual factors and mechanisms?

Enabling factors that drive adoption are CSA profitability (many programmes); CSA productivity (many programmes); having appropriate skills and access to resources (inputs, markets) and services (extension, weather and market information, finance) (many programmes); having a basket of options to choose from (SAIRLA, CCAFS); having low entry costs (ASAP PROSUL); having benefits which are experienced early (ASAP BIRDP); where there is secure land tenure, especially for women (CSAZ); where there is peer pressure or legal sanction (SILTPR, CCAFS); and where alternative options are limited (SILTPR). These are supported by an enabling environment, particularly where government, private sector and civil society are working together to deliver change. Improving access to land tenure is a crucial factor in improving incomes and resilience.[29]

Factors that hinder adoption across a number of project contexts are: CSA technologies with high labour demand (like basin construction or which increase weeding) which may place additional burdens on women and children (CSAZ, PM, ZFLSP); where change is difficult, e.g. because minimum tillage or other equipment is not accessible or where there are strong traditions on what constitutes good farming which CSA technologies/practices challenge (such as ploughing) (MADE, PM); where the supporting services (extension, finance, markets) are weak or not supportive of the CSA being promoted (e.g. extension continuing to promote non-CSA methods)(BRACED, ZFLSP) ; and where there are unfavourable subsidies (e.g. subsidised diesel and electricity for groundwater pumping and inorganic fertiliser in parts of India). The ASAP mid-term evaluation noted low adoption where "not enough has yet been done to help smallholders specifically build up the ability to anticipate and adapt to transition between their current and future livelihood contexts by making informed decisions, taking, testing and adjusting their actions".[30] The importance of complementarity between approaches and community buy-in has also been highlighted in ASAP: "Intervention success can be attributed in part to the way a number of activities work together in combination. Credibility has been enhanced through information sharing and collaboration across institutional levels, while responding to contextual needs has contributed to community buy-in".[31]

[29] CABI's review of FCDO's commercial agriculture portfolio highlighted land regulation and tenure as a critical barrier to scaling uptake of climate smart agriculture (CSA) technologies by several programmes. CABI 2021 (listed under Other in Appendix 7)
[30] ITAD 2020b (listed under ASAP in Appendix 7)
[31] ITAD 2020b (listed under ASAP in Appendix 7)

EQ3b Are there lessons on whether particular types of technology, including nature-based solutions, are better suited in different geographical contexts and agro-ecological zones?

The terminology of Nature Based Solutions (NbS) was not widely used in the portfolio or by implementing partners. To an extent, all approaches involved implicit elements of NbS. Differentiating interventions into NbS, or non-NbS was not found to be particularly helpful.

An explicit understanding of the inter-relations between field, farm and landscape/ community level practices and wider ecological functions, including watershed hydrology, soil health and biodiversity, was weak in programme design and reporting. The exceptions were for GHG balances and forest cover, that were considered and calculated in some programmes (P4F, ASAP). There were also a small number of projects that involved a landscape approach of agroforestry and/or range management and/or forest protection and restoration (including mangroves) (ASAP BIRDP, NEMA, Niger[32]). Landscape approaches can be complex, involving different resource users and may involve moving from open access to controlled access and developing property rights. Sometimes parallel 'quick wins' (new water points or fodder crops) may be needed to maintain community buy-in as in the ASAP BIRDP project in Sudan[33].

The key lesson is that context is broader than geography and agro-ecological zone (AEZ), which makes recommending CSA (including NbS) solutions on the basis of geography alone inappropriate. Contextual factors affecting the appropriateness of CSA that were identified from the portfolio review also included topography, farmer type, social context, market and the support context. Many of these may change over time and be further challenged by climate changes. The process of choosing (participation, farmer testing, understanding the changing context, building ownership) is an important part of CSA success or failure (ASAP BIRDP and PROSUL and the programmes using FFS methodologies). Although some types of technology like irrigation, reduced tillage, mulching, resilient varieties, erosion control, and agroforestry may be common across different geographies, they still tend to have different opportunities and threats specific to different contexts.[34] Possible tensions between potentially more nature based indigenous knowledge and programme interventions were not apparent in programme reports.

EQ3c Were there differences in adoption between different target groups and why?

Differences were reported, with disaggregation often by gender and wealth/farm size, but inconsistencies in disaggregation of monitoring data between different programmes and differences in targeting made comparison difficult. Where disaggregated monitoring showed differences in adoption, the level of analysis of the reasons for difference was variable and often quite weak. The farmer/women's/marginal group's voice was not often presented clearly in reporting.

Some projects were targeted by geography (areas of high poverty, climate affected, etc.). Most included all groups within their area of intervention, while some had additional components aimed at women and a few for youth. The ASAP AMD project involved

[32] IFAD 2020c (listed under ASAP in Appendix 7)
[33] IFAD 2019b (listed under ASAP in Appendix 7)
[34] For instance, the profitability of large-scale irrigation was questioned in Rwanda where the dry season is short and markets weak (Key informant inter-view) and, in many contexts, livestock grazing in the dry season can be threats to otherwise beneficial soil covering mulch or to agroforestry trees.

women in co-design and seemed to achieve high levels of women's adoption[35]. The ASAP mid-term review noted "There is strong evidence to suggest achieving women's empowerment and gender equality requires investing in women's participation in the design and operation of project activities, in sensitisation on gender issues, in promoting women's representation, leadership and decision making in local structures, and in capacity strengthening for grassroot organisations. This requires qualitative participation, beyond understanding gender as a proxy for the project targets for ensuring both women and men participate in activities and processes." [36]

Conclusions for EQ3: Which promoted CSA approaches (and specific technologies/practices within them) were not adopted, temporarily adopted or continue to be adopted and why?

A wide variety of CSA and NbS approaches were identified from the portfolio review with adoption being difficult to compare and often very context specific. Programmes typically promote a variety through complementary approaches at field, farm, landscape/ community and/or institutional levels. To be adopted, a technology needs to have felt benefit for farmers/communities, this may be reinforced by peer pressure, supportive services and the policy environment. Participatory approaches to design and implementation are important to address context specific complexity, build ownership and to enable women and other marginalised group adoption. Factors that hinder adoption were also identified, including those technologies with high labour demands, those which require high levels of attitudinal and behavioural change, and those for which there is insufficient support in terms of resources, services or government policy. There is evidence that where women were included in the co-design of implementation, adoption rates were high (ASAP – AMD). In addition, where different groups, like pastoralists and crop farmers, were sharing natural resources it was found to be important to invest in participatory natural resource planning and build in dispute resolution procedures (ASAP – BIRDP).

EQ4. Which CSA delivery models were most/least effective in improving farmers' productivity, adaptation and mitigation outcomes, in what contexts and why?

EQ4a Which delivery models are effective and why (including NbS)?

The portfolio reviewed includes a wide variety (but low replication) of delivery approaches that involve a number of steps with FCDO contracting an implementing partner (e.g. IFAD, CGIAR, PS or INGO), the implementing partner contracting/funding a range of intermediaries (e.g. national or local government, PS, international and/or local NGOs and CBOs) and these intermediaries delivering to farmers through a range of approaches such as extension, training, communications, sales, purchases, subsidies, policy and/or legislation. Delivery approaches were complex with multiple complementary channels (e.g. value chain improvement plus extension plus weather forecasting). What approaches were chosen and effective was highly dependent on the local context, with one size not fitting all. Nearly all implementers tend to report their approaches are appropriate; but insufficient comparative evidence on effectiveness was available to answer which were most or least

[35] The ASAP AMD Project worked with women's organisations to identify value chains they felt most important to make their chosen CSA approaches profitable, and then provided small matching grants to improve those value chains
[36] ITAD 2020b page 53 (listed under ASAP in Appendix 7)

effective. However, significant subsidiary learning on the drivers of effective delivery was obtained with selected findings presented below.

Reviewed programmes had a primary delivery approach either through government, PS or NGOs. However, in practice, success often seemed to rely on a combination of government agencies, diverse private sector actors and civil society organisations playing respective roles. This becomes even more important when looking at sustainability. ASAP projects, primarily delivered through government, were locally designed and seemed good at finding ways to ensure the PS and community organisations played their roles as well.

CSV are used by CCAFS to test combinations of CSA technologies and associated supporting services (i.e. financial and meteorological services) in a range of agro-ecological zones. Reportedly effective approaches followed by many CSVs are participatory processes which involve different types of farmers (gender, size etc.) and other relevant stakeholders.

Landscape level CSAs have an additional level of complexity, with overlapping resource user interests, often including those inside and outside of the immediate community. The ASAP BIRDP programme in Sudan involved moving from an open access to a regulated rangeland access regime, requiring significant training and participatory consultation with different resource user groups, the formation of new community organisations from clusters of villages using shared resources, dispute management capacity and an overarching Natural Resources Governance Framework with buy-in at community, traditional leadership and local government levels. Buy-in was helped by some quick wins like new domestic and livestock water points, fodder crops, community initiative matching funds and market access (all-weather roads and marketplaces). Reported outcomes were positive in relation to productivity, income, climate adaptation and with a public goods element of significant carbon sequestration (as modelled over a 20 year period).

A somewhat different landscape approach is followed by the P4F programme which attempts to change the context in which forests are being destroyed or degraded and/or creates an enabling context for profit driven regeneration. This can involve certification, business peer pressure and incubating profitable CSA opportunities that produce crops and livestock without deforestation.

It was surprising that none of the delivery models in the portfolio included carbon or payment for ecosystem services incentives as part of delivery. Achieving these public good benefits is however a driving force of P4F projects and carbon sequestration was a measured outcome of a proportion of ASAP projects.

EQ4b For whom are these delivery models effective and why?
Whilst projects targeted smallholders including women and sometimes youth, there was limited analysis in portfolio reports about the effectiveness of specific delivery models for different target groups. More often the emphasis was on adapting the agreed delivery model to try to be inclusive of women and youth or to add sub-components to involve women or youth, often with opportunities identified in value addition along the CSA value chain. Although outputs and outcome numbers were often disaggregated by gender, there was disappointingly little analysis or inclusion of participants' voices about reasons for any differences between men and women. There was also limited analysis of the differential

qualitative experiences or outcomes for women or other groups or the inter-relationship of different groups in relation to the delivery model (e.g. gender/poverty/age intersectionality).

Selected programme specific findings are as follows: ASAP generally targeted areas of a country with greater poverty, but within that area involved all groups. Some projects specifically recognised the benefits of including richer, more influential farmers as champions (CCAFS -CSV), influencers (SILTPR) or to avoid opposition (e.g. larger livestock owners sharing community water resources in ASAP BIRDP). The SILTPR tea outgrower project, charged growers with greater than 1ha interest on loans, while smaller growers were interest free.[37] ASAP AMD (Vietnam) selected women headed and poorer households as target groups at the start and used participative planning to design the programme around their needs. Specific matching grants were developed to address these needs and this approach seemed effective in delivering for these target groups.[38] Oxfam supported LFSP partners to use the Gender Action Learning Systems (GALS) methodology to mainstream gender across all project components. The mid-term evaluation noted that 88% of sampled households had at least one female member receiving LFSP training, compared to 62% with at least one male receiving training.[39]

EQ4c In which geographies/AEZs were different delivery models most/least effective and why?

All delivery approaches were reported by implementers to be effective in their geography, but comparative analysis was not possible. Context is dynamic and not just dependent on geography, and the intervention itself changes the context. Programmes either developed a delivery approach to reflect a specific context (ASAP), or adjusted their standard delivery approach to reflect the context (CCAFS CSV'S, P4F). This is overlain by different delivery approaches being appropriate for different programme types, which are often driven by upstream (donor/government) criteria and objectives. For example, SAIRLA and CCAFS were focused on getting research into use, PM and MADE had a focus on the private sector and M4P, and P4F's focus was protecting forests through private sector partnerships. ASAP's approach involved making an existing multi-lateral loan programme more climate smart by designing a context specific combination of interventions. Delivery is thus not a question of simple comparable 'models' for a particular geography, but using a combination of best practice interventions appropriate to the objective and context.

EQ4d What are the enabling and disabling factors and why?

Some enabling factors from the portfolio are:

a) Having a profitable/productive CSA opportunity(s) or CSA value chain(s) (and absence of more profitable non-CSA alternatives) (many programmes).

b) Access to information, financial services, appropriate and trusted inputs and markets (many - sometimes delivered through a one-stop shop like in SILTPR or Private Public Partnerships as in ASAP AMD and VUNA)

c) Appropriate SHF and community organisation and leadership (this needed to be built in ASAP BIRDP).

[37] Key informant interview
[38] IFAD (undated-a) listed under ASAP in Appendix 7.
[39] Key informant interview

d) Supportive institutions (including land security), local and national government policies and practice (e.g. embedding climate resilience into Ward Adaptation Committees – BRACED in Kenya).

e) Having access to small competitive/matching funds to support local initiatives (e,g. to resolve value chain and market access difficulties as in ASAP AMD) and develop local IGAs (ASAP BIRDP).

f) Being able to get cross-community agreement to common property management at landscape level, requiring negotiation, dispute resolution and some early benefits felt across all users (several ASAP programmes).

Disabling factors include having a slow, inflexible approval process within Government to approve new CSA recommendations and having CSA responsibilities split across different ministries/agencies, sometimes with competing interests in winning donor funding (PoSA). For instance, erosion control measures, cropping advice and agroforestry may each be located in a different ministry/agency (PoSA and LFSP). The projectisation of Ministries, often driven by donor requirements, may help initial CSA introduction, but hinders sustainability and mainstreaming (PoSA). In some cases, extension services and farmer expectations continue to favour non-CSA ploughing and some government subsidies are not climate smart (e.g. groundwater pumping and fertiliser subsidies in India).[40]

EQ4e What shocks and changes are being protected against and why?
Programmes varied in their analysis of shocks they are protecting against, usually considering current shocks with an expectation that they may become worse or more frequent. Relatively few explicitly planned against a future predicted climate with reference to climate models for their area (although these may be referred to in annexes to DFID business cases). Programmes referred to adaptation to drought, but were not explicit about the severity of drought being planned for. There was some analysis of dealing with less predictable timing of rain, shorter rainy season or the combination of drought and higher temperature. There was limited explicit analysis or evidence of participant voice about how and why specific shocks were prioritised.

Climate shocks are a reason for interest in CSA approaches. However, when these shocks occur during CSA introduction they can be disabling, with farmers unable to introduce new approaches in the face of the shock. Recently adopted CSA may also be found to be insufficient to cope with extreme shocks. In LFSP (Zimbabwe) five of the seven seasons in which the programme operated experienced drought/very low rainfall, with the remaining two experiencing very good rainfall). Zimbabwe also experienced flooding from Cylone Idai. In Zambia, droughts threatened CSAZ's ability to achieve its desired impact.[41] Also in southern Africa, the ASAP PROSUL project, like much of Mozambique, was impacted by major droughts and floods, the latter again exacerbated by Cyclone Idai.

Conclusions for EQ4: Which CSA delivery models were most effective/least effective in improving farmers' productivity, adaptation and mitigation outcomes, in what contexts and why?

Delivery models were programme-wide rather than specific to CSA. They commonly involved an implementation partners working with, and sub-contracting, others

[40] CIMMYT 2020 (listed under CGIAR 2017-2021 in Appendix 7)
[41] CSAZ 2020 Annual Review page 15

(government, PS and or/NGOs). Most delivery models were complex with multiple complementary channels and appeared to be effective for their local and national contexts. Drivers of effectiveness were listening to participants, responding to the local context, developing partnerships at different levels, developing an enabling environment and promoting approaches that deliver felt benefit to farmers and communities. An unusual feature of CSA and NbS is that some of the benefits are not felt by the participants but contribute to the public good. This includes carbon sequestration, biodiversity, downstream hydrology, and long-term landscape health and productivity. Other benefits may be felt locally but some time into the future, while incurring effort, costs or forgone benefits today. This is both a delivery challenge and opportunity which is discussed further in Chapter 4.

3.3 Impact

EQ5. What is the evidence that CSA approaches (technologies and practices) have contributed to significant positive or negative, intended or unintended, changes in farmers resilience to climate variability and change?

Gathering evidence on the impact of CSA measures in terms of farmers' resilience to climate change was challenging. This relates to the difficulties programmes found in defining and measuring resilience (see EQ1a). At the portfolio level, CSA interventions were generalised, and they derived their measure of resilience from the number of beneficiaries supported in terms of improved resilience (ICF KPI4 - PM, VUNA, MADE). Where attempts were made to measure resilience in more detail, evaluators measured resilience by annual changes in proxies for resilience, such as income, assets, and food security (ZRBF), hence focusing on the impact of the programme as a whole, rather than measuring resilience to climate variability and change brought about by CSA interventions.

Technologies have been introduced to sustainably meet water and income needs in drought-prone areas in at least five countries (Kenya, Nigeria, Egypt, Sudan, Malawi). There are only a few examples of ASAP (unintentionally) encouraging unsustainable practices. Although ASAP promotes NRM and encourages a wider understanding of surrounding ecological systems, CSA interventions are not always sufficient to counteract environmentally damaging agricultural practices outside of the project[42].

It should be noted that there was a difference between reported improvements in resilience and the extent of evidence of resilience. A number of programmes reported an increase in farmers' resilience arising from CSA approaches (CSAZ, VUNA, ASAP, BRACED, ZRBP, MADE) but the review cannot ascertain that this was the case from the evidence available. Some specific examples are:

- At the portfolio level in ASAP there was limited differentiation of information on resilience outcomes from CSA approaches. Increased resilience is usually an intended outcome, but it has not yet been appropriately measured in projects. There is significant, fairly robust reporting that the combination of CSA (and non-CSA) interventions are contributing to improved nutrition, improved incomes, improved access to water, improved assets, improved environmental sustainability and decreased community conflict under the BIRDP in Sudan.[43]

[42] ITAD 2020b (listed under ASAP in Appendix 7)
[43] IFAD 2019b (listed under ASAP in Appendix 7)

- VUNA's PCR reported that CSA approaches improved resilience for over 700,000 smallholder farmers according to ICF KPI 4 for a programme that was only implemented for one agricultural season.[44]
- CSAZ and the LFSP reported that CSA technologies – conservation farming and pfumvudza, respectively – significantly improved productivity[45] but no impact assessments were available to confirm this.

EQ5a Highlight evidence found on this that is relevant to NbS. Explore whether there have been differences in outcomes and impact for women and other disadvantaged groups.

Programmes did not distinguish between those CSA measures that are NbS and did not use the term NbS. The few respondents who had a view on NbS felt that it was imposed on them by donors. However, the review team identified NbS within both the field and landscape levels of the CSA practices promoted by the programmes. NbS – whether landscape (natural resource management), in-field practices (mulching, minimum tillage, etc), or technologies (biogas) – was a component of most programmes, and a major part of ASAP, BRACED, BIRDP LFSP, CSAZ, ZRBF and POSA. Those that reported on resilience suggested that their programmes were improving the resilience of farmers, but they tended to conflate the number of beneficiaries supported by their programmes with resilience. They did not report on NbS solutions separately from CSA. Consequently, it is not possible to identify the impacts of NbS specifically.

On differences in outcomes and impact for women and other disadvantaged groups, all programmes included women with a measure of success. The youth and disabled were also targeted in some programmes. It was not possible from the programme reports to carry out a comparative analysis across the portfolio and identify specific outcomes and impacts for women and other groups. Findings for specific programmes are:

- The promotion of conservation agriculture, particularly in contexts where herbicides are not available, can lead to an increased workload for women (as observed in CSAZ).[46] LFSP addressed this through promoting a form of CA called Pfumvudza which could yield good results from small areas of land that are manageable for family labour.[47]
- Women were targeted for participation in private sector driven projects, such as VUNA and SILTPR, but only a third of beneficiaries of these projects were women because they were based on self-selection in the case of VUNA and land ownership in the case of SILTPR. Rwanda's tea programme (SILTPR) suggested that the lower levels of women's participation were due to traditional land tenure arrangements.[48]
- BRACED recognised that the programme targeted and reached more women than men, but that women were indirectly excluded from decision-making and priority setting due to inequitable societal norms embedded in traditional social structures.[49]

EQ5b Are there any other negative outcomes/risks from the use of CSA technologies? Can these be broken down by geography and by target groups?

[44] Genesis Analytics 2018, page 8 (listed under CSAP/VUNA in Appendix 7)
[45] CSAZ interviewee: "Those under the programme are 30 to 40% more productive in terms of crop yields"
[46] CSAZ Annual Review 2020
[47] LFSP 2021b
[48] SILTPR key informant interview
[49] Leavy J et al 2019, page 13 (listed under BRACED in Appendix 7)

The review did not find reporting of many negative outcomes/risks from the use of CSA technologies, though a few of the SAIRLA articles did include these either in terms of trade-offs or promotion of fixed packages.[50] Some risks relating to market assumptions were noted in two VUNA projects. Dairy farmers in the Malawi Dairy project were exposed to financial risk when making investments based on expected income levels without appreciating the loss potential through recurrent costs and market risks.[51] The VUNA Mozambique programme, supporting the production and export of pigeon peas under CSA, saw the collapse of the pigeon pea market when the Indian government imposed import restrictions.[52] As is also noted under EQ5a, some types of CSA (particularly CA) can have a negative outcome for women where much manual weeding is required.

Under SILTPR, incomes and employment opportunities have increased substantially. It is likely that, despite the single crop focus, this is no more vulnerable to weather challenges than annual crops. There may be more risks from disease, pests, or market failure by growing a single crop. However, there are few alternatives that would increase resilience through diversity while producing similar returns. Existing poverty, plus limited alternative opportunities, suggests there is little livelihood opportunity forgone by adopting tea.

The proposal for the 2017-2022 CRP II of CCAFS (page 94) noted that “CSA is inherently context specific so efforts must be made to guard against the indiscriminate transfer of CSA technologies between different biophysical, socioeconomic, and political settings, sometimes driven by organizational missions rather than context and local needs. Similarly, small-scale farmers are not uniform in their composition. They can range from subsistence to semi-commercial operations. CSA options must cater to this socio-economic diversity as well, risking maladaptation when these conditions are not met. Maladaptation is a cause of increasing concern to adaptation planners, where intervention in one location or sector could increase the vulnerability of another location or sector or increase the vulnerability of the target group to future climate change”.

EQ5c If the programme experienced climate shocks during its lifetime, did the application of CSA technologies protect SHFs from these shocks and how?

Zambia (CSAZ) and Zimbabwe (LFSP and ZRBF) experienced a series of droughts between 2017 and 2019 that set back the programmes and earlier gains from using CSA practices to build resilience against the very climate shocks experienced. The 2018/19 drought continued to impact the 2019/20 agricultural season in Zambia’s CSAZ.[53] Meanwhile under ZRBF, 55% of 1.1 million participants in Zimbabwe’s saw an increase in their resilience capacities, 40% saw a decrease[54] with vulnerable households availing of humanitarian assistance.[55] For those who saw an increase in resilience capacities, ZRBF reported improved agricultural practices amongst those applying three or more CSA activities, which increased well-being and recovery from shocks. These beneficiaries had more diverse livelihoods, greater economic and financial options, and an improved ability to make decisions than the remaining 40% of participants were still food insecure.

[50] See Annex I and/or Masikati P et al 2021, Haggar A et al 2020, Rodenburg J et al 2020, Adolph B et al 2020

[51] Genesis Analytics 2018, Building Climate Resilience for Dairy Farmers, through Climate Smart Solutions: Insights from the Malawi Smallholder Dairy Sector, page 26 (listed under CSAP/VUNA in Appendix 7).

[52] Genesis Analytics 2018, Integrating Climate Smart Agriculture in Pigeon Pea Production: Insights from Export Trading Group in Mozambique, page 6 (listed under CSAP/VUNA in Appendix 7).

[53] CSAZ Annual Review, 2020

[54] ZRBF Annual Review, 2020, p.2

[55] UNDP 2020, page 46 (listed under ZRBF in Appendix 7)

The ASAP AMD area in Vietnam experienced two severe drought induced saline events, at the start and near the project end; losses from the second were reported as significantly less due to the intervention.[56] Lowland areas threatened by saline intrusion related to low river flows in The Gambia (ASAP NEMA project) were reported to have more resilient productivity through water management, compost, mangrove restoration and community forest restitution, but it is unclear whether this had yet been tested by a severe shock.[57]

The impact on farmers of climate shocks was found to be exacerbated when combined with other social and economic shocks. Both Zimbabwe and Zambia experienced deteriorating economic conditions including high inflation and cash shortages at the same time as climate shocks. It was the combination of these that led to increased food insecurity of 38% of the ZRBF target group.[58] Conflict was another factor that combined with climate shocks in impacting on farmers. The BRACED PCR notes that South Sudan's Improving Resilience in South Sudan (IRISS) project working in a country beset by conflict and instability, was able to do little more than change practices at local level, having very little influence on government practices and actions. The impact of conflict and instability in Burkina Faso, Mali and Niger also had a negative impact on the ability to deliver programme activities.[59] Conflict combined with increasing climate variability continue to impact farmer's livelihoods in the PM programme area.[60]

Conclusions for EQ5: What is the evidence that CSA approaches (technologies and practices) have contributed to significant positive or negative, intended or unintended, changes in farmers resilience to climate variability and change?

Assessing the impact of CSA on farmers resilience to climate variability and change was challenging given difficulties in measurement and conflation with other contextual factors. Increased climate resilience was reported by a number of programmes but climate shocks, exacerbated by a deteriorating macro-economic situation still impacted on poorer farmers in Zambia and Zimbabwe. Programmes did not tend to use the term NbS or classify their CSA approaches. In line with findings under EQ1d, programme timeframes were probably too short to have built up sufficient farmers' resilience to overcome climate variability and shocks. Many ASAP programmes promote NRM and encourage a wider understanding of surrounding ecological systems. This practice could be considered by other CSA programmes.

EQ6. To what extent has the adoption of CSA generated other environmental benefits, e.g. improvements in downstream water quality, better on- and off-farm biodiversity conservation, or reduced GHG emissions/sequestration

E6a Explore the secondary consequences of climate smart technologies, especially NbS, and whether these have been beneficial or detrimental

Programmes focussed on the delivery of CSA interventions rather than measuring their secondary environmental co-benefits[61]. However, secondary consequences of CSA were

[56] ITAD 2020b (listed under ASAP in Appendix 7)
[57] ITAD 2020b (listed under ASAP in Appendix 7)
[58] Ibid. (p.32)
[59] BRACED Project Completion Report, 2019, (p.20)
[60] PM annual review, 2020.
[61] Of the remaining programmes, one was a research programme (SAIRLA) and two were primarily M4P programmes that did not have a primary focus on CSA (MADE, PM).

noted in some projects in relation to carbon sequestration, and in particular this was measured in a sample of ASAP projects.

CCAFS showed that CSA technologies used in FCDO agricultural programmes across seven countries significantly improved crop and livestock production, while reducing net GHG emissions, especially cocoa agroforestry.[62] Emissions rose mainly due to increased use of nitrogen fertiliser and mechanisation. Reductions were most commonly the result of soil carbon sequestration from applying manure, minimum tillage, crop rotation and reduced burning. These measures outweighed increased GHG emissions by a factor of five. The report warned that the conversion of land that stored significant levels of carbon, such as forest, grasslands, and peat-lands, was the single highest driver of emissions.

Carbon sequestration analysis of eleven IFAD-managed ASAP interventions estimated that 10.4 million tons of CO_2 will be sequestered over 20 years with large per ha sequestration due to improved forest, rangeland and cropland restoration, and improved agronomic practices including for rice, with the total largest savings due to rangeland restoration. There were GHG emissions due to increase in cattle and some increase in fertiliser but these were off-set by the aforementioned sequestration.[63] The BIRDP project in Sudan mitigated around 4 million tonnes of CO_2e from the improved management of rangelands, and 2 million tons of CO_2e from the conversion of degraded land into croplands (e.g. guar plantations, *jubraka* agroforestry systems, and terrace improvements).[64] Reductions in GHG emissions from NbS were also reported by other projects including PM and the CGIAR CSVs. With regard to perennial crop sequestration, SILTPR tea production is likely to sequester carbon as a secondary NbS consequence and also reduce downstream flooding.[65]

EQ6b Explore how and why, and which groups benefited and those that suffered.

Beyond promoting women's participation, most programmes – including BRACED – did not identify sub-groups other than the youth (ASAP) and the disabled (ZRBF, and lately, PM). The lack of granularity in reporting at the programme level made finding evidence for this question elusive. There was insufficient disaggregated data to assess which groups benefited from the environmental benefits generated by CSA interventions. To understand how and why groups benefitted or suffered one would need to be able to explore these with the groups themselves so as to understand their logic and reasoning.[66]

Conclusions for EQ6: To what extent has the adoption of CSA generated other environmental benefits, e.g. improvements in downstream water quality, better on- and off-farm biodiversity conservation, or reduced GHG emissions/sequestration

Programmes did not generally report on downstream environmental benefits of CSA. Those programmes that promoted NbS – from the improved management of rangeland to in-field practices such as mulching, minimum tillage and growing perennial crops – helped mitigate GHG emissions. However, the measurements of net emissions are affected by many variables, making reporting findings subject to a high degree of uncertainty. While increased nitrogen use, and mechanisation raised carbon emissions,

[62] Costa C J et al CGIAR 2020, page 2 (listed under CGIAR 2017-2021 in Appendix 7)
[63] IFAD 2019b (listed under ASAP in Appendix 7)
[64] IFAD 2019b and ITAD 2020b (listed under ASAP in Appendix 7)
[65] SILTPR Key Informant Interview
[66] Realist evaluation provides this opportunity, but this would have required the team to have interactions with farmer groups in the field, something that would not be feasible given the breadth of the portfolio reviewed.

the main danger and driver of increased emissions is the conversion of land that stored significant levels of carbon, signalling the importance of clear property rights and sustainable management of common property resources.

EQ7. What have been the trade-offs made between short-term productivity, farmers' own longer-term resilience, as well as environmental and biodiversity co-benefits?
The review had few findings on trade-offs between short-term productivity and longer-term resilience, suggesting that trade-offs need not necessarily be made. Productivity and longer-term resilience tended to be seen as complementary. The SILTPR project (see **Box 3**) identified a trade-off between farmers growing food for today and using their land and labour to plant a perennial crop (tea) that would start to give a profitable return after five years, which should continue for the next 50 years. The trade-off was managed through interest free loans including payment for current tea planting labour.[67] The ASAP BIRDP project had similar time-lag trade-offs between longer-term re-afforestation and rangeland regeneration and immediate livelihood needs. They managed these by providing front-loaded benefits like grants for IGAs, improved water points for livestock and people, and improved market access.[68] Time-lag trade-offs are discussed further in Chapter 4e.

EQ7a Have there been differences in trade-offs made when nature-based solutions are a focus of, or incorporated in, CSA approaches?
Given that the review team had little evidence on trade-offs as a whole, there were no robust findings for this question. Usually – as in BIRDP, CSAZ, CGAIR, ZRBF and LFSP – NbS and CSA approaches were considered complementary. This resonates with the finding in EQ2a that a number of programmes considered synergies between productivity and adaptation at the design phase rather than trade-offs.

The P4F programme is based around the trade-off between the public good value of the forest (carbon storage, hydrology, biodiversity etc.) and the shorter term private good value of conversion to agriculture (timber, crops, livestock). The programme aims to reverse incentives for conversion, in favour of sustainable use (and sometimes reforesting) of the converted land by incubating new profitable opportunities. The approach may be regulation, certification or other incentive driven, but the desired outcome is nature based.

EQ7b Have there been trade-offs between different groups involved in landscape scale approaches?
The review did not find many cases, analysis or evidence of trade-offs between different groups involved in landscape approaches in terms of productivity, resilience and environmental benefits. The ASAP BIRDP programme in Sudan had a rangeland management component in which land was used both by semi-nomadic pastoralists and settled crop farmers. There was traditional overlapping use of some land and water points. It seems range-management required some trade-offs with restrictions placed on access to some areas for livestock. Participatory planning and dispute resolution led to the development of a local government and community endorsed Natural Resource Governance Framework. By providing additional water points and fodder crops, the project was able to provide sufficient positive trade-offs to reach an agreement between the

[67] FCDO – SILTPR Annual Review 2018-2020, Business Case 2017, Addendum to Business Case 2018, Logical Framework 2020, Intervention Summary 2018 and key informant interviews.
[68] IFAD 2019b (listed under ASAP in Appendix 7)

groups.[69] Several articles from the SAIRLA programme discuss the importance of multiple-stakeholder engagement in identifying opportunities and trade-offs, particularly in landscape contexts.[70]

EQ7c What lessons are there from addressing potential conflicts over trade-offs?

Productivity and longer-term resilience tended to be seen as complementary, rather than as trade-offs which could incur conflict. Trade-offs largely related to landscape level CSA involving pastoralists and cultivators.

Conclusions for EQ7: What have been the trade-offs made between short-term productivity, farmers' own longer-term resilience, as well as environmental and biodiversity co-benefits?

There were insufficient findings for this question to be able to draw substantive conclusions regarding trade-offs made between short-term productivity, farmers' own longer-term resilience, as well as environmental and biodiversity co-benefits. Trade-offs were noted in the SILTPR programme and the ASAP BIRDP project with the latter also considering trade-offs between project stakeholders. The limited examples in the portfolio suggest a need for consultative processes involving all groups, capacity for dispute resolution, the possible role of local authorities as arbiters and enforcers, and an enabling framework that delivers benefits to the different groups.

3.4 Sustainability

EQ8: What evidence is available to show that farmers will continue to use, adapt and benefit from CSA technologies after the intervention ends?

EQ8a Is there evidence that the CSA and NbS changes will continue to be relevant in the likely future climate?

Given seven programmes are on-going, and completed programmes do not have ex-post evaluations, there is no firm evidence regarding continued relevance of CSA and NbS in the likely future climate. Further, it would be extremely difficult to find such evidence from multi-country programmes (BRACED, ASAP, VUNA, P4F, CCAF's CSVs). However, where CSA approaches have been adopted and proven to be effective in terms of being both profitable and protecting farmers from climate variability, then it could be assumed that they may continue to be relevant. The main condition for continued relevance – as demonstrated by successful projects such as SILTPR, Anukulan (BRACED), Zimbabwe Super Seeds (VUNA), and the CSV model in India) – is that CSA and NbS must offer SHFs and businesses a competitive return on investment as the basis for a mutually beneficial and sustainable relationship. Only one project, SILTPR, explicitly planned for a future climate, based on climate model projections, deciding to plant tea 200-300 metres higher altitude than present to reflect the mid-level 2040-2060 temperature projection.[71]

EQ8b Is there evidence that an enabling environment is in place to continue to support and adapt the CSA after the programme ends?

There was evidence from under half of the programmes and/or projects within them that farmers may continue to use, adapt and benefit from CSA technologies after the

[69] IFAD 2019b (listed under ASAP in Appendix 7)
[70] Grabowski, P et al 2020, Winowiecki L.A et al 2021, Lamboll R et al 2021 (listed under SAIRLA in Appendix 7)
[71] Wood Foundation (undated) (listed under SILTPR in Appendix 7)

programme ends, mainly relating to a variety of enabling government and private sector environments. Examples of an enabling government environment include:

- PROSUL (ASAP) in Mozambique where project infrastructure was handed to local government from the start with participant involvement in its management and maintenance. Farmer organisations' capacity was also built to support value chains.[72]
- ASAP BIRDP work to develop Natural Resource Management Frameworks was taken over by local government to oversee and enforce their continued implementation.[73] The CCAFS CSV model seeks to involve, and build the capacity where necessary, of relevant government ministries (agriculture, meteorology, livestock, banks etc).[74] The CSVs in India stimulated both the government (and private sector, see below) to initiate CSVs across the states.[75]
- The government of Zimbabwe has adopted the conservation agriculture/precision farming model of Pfumvudza and is including it in its subsidy scheme. Further, LFSP supported the formulation of the National Agriculture Policy Framework. Pillar 8 of the framework addresses resilient and sustainable agriculture and LFSP has engaged with the Agroecology and Organic Agriculture Communities of Practice forums resulting in activities under these initiatives now being supported by the government.[76]

Enabling PS environments build mutually beneficial and sustainable relationships between farmers and businesses where both parties profit from CSA interventions. Examples of enabling PS environments include:

- Value added interventions, as in VUNA's seed maize production in Zimbabwe, were financially viable for both the company (ZSS) and farmers, and the delivery model was embedded within the government's extension system. The strong partnership between ZSS, smallholders, and Agritex was based on well-defined responsibilities for each partner and mechanisms for covering their costs.[77] A similar M4P delivery model used by Premier Seed in PropCom, Nigeria, also seems likely to continue.[78]
- In Rwanda's SILTPR the sustaining environment is driven by the mutual inter-dependence of the smallholder owned one-stop delivery company and the private sector tea factory. The tea factory has an interest in ensuring that the smallholders continue to find it profitable to grow and sell them tea and the smallholders have an interest in the tea factory continuing to buy from them.
- One of the largest private sector companies in India, ITC Ltd, has adopted the CSV model and introduced it in many states where it operates. This is beneficial for both the company, as it has better access to more reliable value chains, and farmers, who have a ready market.[79]
- The ASAP NEMA project in the Gambia developed the capacity of 24 key producer groups with relevant entrepreneurship and governance skills with bank accounts into

[72] IFAD 2020d, Project Completion Report (PROSUL Mozambique) (listed under ASAP in Appendix 7)
[73] IFAD 2019b (listed under ASAP in Appendix 7)
[74] Interview finding, and Aggarwal et al 2018 (listed under CGIAR 2017-2021 in Appendix 7)
[75] Aggarwal et al 2018 (ibid)
[76] LFSP 2021a
[77] Genesis Analytics 2018 Building Inclusive Seed Systems for Semi-Arid Areas: Insights from Zimbabwe Super Seeds, pages 1-2 (listed under CSAP/VUNA in Appendix 7)
[78] Propcom's approach to CSA. Webinar, May 2021 and interview findings
[79] CCAFS 2019a (listed under CGIAR 2017-2021 in Appendix 7)

which they contribute part of their proceeds from harvest for the sustenance of the infrastructure provided. Water Users Groups for rice and vegetable producers are responsible for the efficient and sustainable use of water.

However, several programmes assumed there would be continued use of adopted practices when it ended. This was unlikely without project support and subsidies. For example, lead farmers under CSAZ received payments and benefits through the programme to perform community services that would be discontinued once the programme ends.[80] Under BRACED, farmers were unlikely to continue with climate-smart practices without project support or subsidised inputs. In Kenya and Uganda (PROGRESS-X), the majority of respondents said they would not continue to use adaptive seed varieties if or when they were no longer subsidised.[81] Farmers in Burkina Faso (BRES-X) noted that the time needed for composting made them less likely to continue with the practice.[82] The physical demands of digging Zaï (composting) holes in Burkina Faso will depend on the long-term availability and cost of required equipment.[83]

A third of the programmes[84] recognised that continued donor support may be necessary and secured extensions to better secure sustainability of the technologies and practices they had introduced. CSAZ is a prime example given that the Conservation Farming Unit (CFU) has relied on donor funding throughout its lifetime. Whilst some programmes sought to build the capacity of government extension services (such as LFSP and ZRBF) the programmes recognise that the capacity remains low with ZRBF noting that development partners are immediately placed to drive practice forward. Some ASAP projects were extended beyond their intended end dates: in several, the extension was required to meet the necessary conditions for sustainability and scale-up.[85]

EQ8c Is there any post-project evidence of CSA use and benefit? By whom?

Given that some programmes are on-going and other completed programmes do not have ex-post evaluations there is no post-project evidence of CSA use and benefit.

Conclusions for EQ8: What evidence is available to show farmers will continue to use, adapt and benefit from CSA technologies after the intervention ends?

There was evidence from under half of the programmes that farmers may continue to use, adapt and benefit from CSA technologies after the programmes end/ended. “When considering sustainability, we tend to ask if changes will be sustained, independent of project actions or subsidies. If it is not sustainable – that is, it is unlikely to continue without direct project support – then it is not building resilience”.[86] At the farm level, the continued relevance of CSA and NbS in a future climate will depend upon generating sufficient synergies between productivity and mitigation, as well as adapting to methods, including commercialisation and mechanisation, which increase yields, outputs and incomes, while reducing GHG emissions. The challenge for landscape NbS (biodiversity, NTFPs, and environment services) is strengthening property rights and rules governing access to natural resources and solving collective action problems for their effective

[80] Volunteer farmer coordinators selected by their community members received remuneration in the form of an e-voucher. (CSAZ Annual Review, 2020, p.5)
[81] Leavy J et al 2019, page 52 (listed under BRACED in Appendix 7)
[82] Ibid
[83] Leavy J et al 2019 page 52 (listed under BRACED in Appendix 7)
[84] BRACED-X, 8 ASAP projects, ZRBP, CSAZ
[85] ITAD 2020b (listed under ASAP in Appendix 7)
[86] Leavy et al 2019 page 113.

management. The disabling factors that constrain sustainability of CSA include high levels of implicit and explicit project subsidies that are withdrawn once the programme ends; potentially higher opportunity costs of CSA due to marginal benefits for SHFs and businesses; and a lack of government involvement and commitment, especially at the national level. Conversely, an enabling environment includes the use of judicious and temporary subsidies, such as front-loading the establishment costs of perennial crops; long term private sector investments with expectation of viable returns and their continuing demand for produce, such as high quality tea in Rwanda; governments that demonstrate their commitment with matching fiscal expenditure to support donor-funded programmes; farmers who perceive the tangible benefits of participating in and organising themselves to profit from a viable venture; and reputable international certification of good governance and of financial, social and environmental sustainability.

4 Reflections on Findings and Opportunities

a) Resilience and sustainability.

As was clear from findings to EQ1a, there is no common definition of resilience, but 'they're all quite similar'.[87] Challenges arise when resilience is interpreted and conceptualised differently, depending on its framing and use.[88] Conceptual and measurement difficulties are compounded by understanding resilience as a holistic, multi-dimensional concept that operates at different levels and to which different frameworks are applied. For example, FCDO's Disaster Resilience Framework differs from the UN Disaster Risk Management Framework.

Resilience is difficult to measure because: i) it is an abstract concept that cannot be directly observed; ii) resilience is an evolving process rather than a static concept; iii) established MEL tools cannot measure the dynamic interactions of components at different levels; and iv) uncertainty remains that the right indicators are being measured.[89] Even so, commendable attempts have been made to measure resilience. ZRBF used a combination of robust quantitative (multivariate) analysis and qualitative methods to measure how programme 'intensity' (and layering and sequencing) contributed to building absorptive, adaptive and transformation capacities to improve resilience.[90]

However, ZRBF's conceptualisation, methodology and quantitative measurements of resilience are open to debate. Its annual assessments – using proxy indicators – probably measures programme impacts rather than resilience. This is because intrinsic resilience capacities and behaviour change across all dimensions and levels takes many years to build. Second, quantitative analysis takes a static view which is ill-suited to measuring the multi-scale, dynamic and multi-dimensional nature of resilience in a holistic way.[91] Third, quantitative metrics often lack explanatory power about how resilience is strengthened. To address these limitations, subjective measures – including self-assessments and risk perceptions – use bottom-up methods for capturing the voice of beneficiaries. However, these methods bring limitations in terms of the cost of professional effort required;

[87] Sturgess, P. and Sparrey, R. (2016) What is Resilience? Evidence on Demand, DFID, UK page 6
[88] Faulkner, L and Sword-Daniels, V (2020), page 2 (listed under BRACED in Appendix 7)
[89] Faulkner, L and Sword-Daniels, V (2020), page 4 (listed under BRACED in Appendix 7)
[90] UNDP 2020, page 11 (listed under ZRBF in Appendix 7)
[91] Sturgess, P (2016), page 8

uncertainty over whether indicators are valid, measurable, or comparable; and doubts about their evaluative accountability for programme performance.[92]

The BRACED Knowledge Manager attempted to reconcile these approaches through measuring the 'outcomes' of resilience-building processes, conceptualised as a set of interlinked capacities to absorb, anticipate and adapt to shocks and stresses, as well as laying foundations for transformation and transformative change (3A+T).[93]. Unlike ZRBF, it treats transformational change (KPI 15) as an approach rather than a capacity. BRACED's approach lays stress on tracking and building resilience as a dynamic, adaptive learning and transformative process.[94] Building people's adaptive capacity and agency are stepping stones towards transforming power structures and relationships that sustain social exclusion and inequality.[95] BRACED subsequently developed 'a transformational scorecard' to track and measure resilience using four processes: sequencing and linking activities; 'including' by changing society's discriminatory norms; responding flexibly to adapt as contexts evolve during projects; and embedding interventions in local policy and planning to bring change at all levels.[96]

Further experimentation with BRACED's approach would help verify its cost effectiveness, and test its efficacy in measuring farmers' resilience to climate variability in meaningful ways. One way forward is to recognise that the 3As' effectiveness in building resilience capabilities is granular and context specific. In other words, what delivers resilience to a pastoralist will be very different from a settled farmer – even in the same climate or geography. Such granularity needs to be evident when identifying participation by particular groups by using a stratified inclusive sample in a representative, robust manner.

For BRACED, adaptive capacity and sustainability are keenly linked. Its key message is that sustainability not only requires maintaining resilience activities and capacities (reshaped through policy and transformational changes), but the ability to respond flexibly to adapt to an uncertain future. It is this adaptive way of thinking and behaving that, in their view, underpins sustainability. If adaptive abilities cannot be sustained, it raises questions about whether projects can claim resilience has been built.[97] It seems certain, though, that commissioning ex-post evaluations after project completion will allow FCDO to confirm the level of sustainability and resilience built, as well as exploring lessons for learning.[98]

Conclusions

Resilience takes time to build and has proved challenging for most projects to measure. For this reason, it has not been possible to analyse the amount of resilience delivered by projects in the portfolio. Different ICF KPIs (mainly KPI 1 and KPI 4), individual proxy indicators, composite indices and scores, and a variety of qualitative approaches, which give participants more of a voice, have been tried with varying degrees of success. Some parts of resilience building may be quite specific to a particular threat, participant type and context and resilience can only really be measured as an experienced outcome

[92] Ibid. (p.17)

[93] Absorptive capacity refers to the ability to face and manage adverse conditions, using available skills and resources. Anticipatory capacity means anticipating and reducing the impact of climate variability and extremes through preparedness and planning. Adaptive capacity is being able to adapt to multiple, long-term and future climate change risks, and also to learn and adjust after a disaster. Building these capacities lays foundations for transformation and transformative change – fundamental changes to systems, institutions and the 'rules of the game'. See Leavy et al 2018 pages 8 and 26

[94] Faulkner, L and Sword-Daniels, V (2020), page 8 (listed under BRACED in Appendix 7)

[95] Faulkner, L and Silva Villanueva, P (2019) pages 48,63 (listed under BRACED in Appendix 7)

[96] Faulkner, L and Sword-Daniels, V (2020) page 10 (listed under BRACED in Appendix 7)

[97] Faulkner, L and Silva Villanueva, P (2019) pages 56-57 (listed under BRACED in Appendix 7)

[98] BRACED Project Completion Review (December 2019) page 28.

from a particular shock. It is therefore probably more functional in design and monitoring to consider resilience in relation to its functional parts, rather than strive for a single metric of limited practical relevance.

b) Adoption: Barriers and solutions.[99]

The barriers to adoption identified in this review are largely reflected in agricultural programmes more generally. These include access to land (including land tenure, enough land, quality land, etc.), finance/credit/capital, labour, inputs, extension, and markets. Subsidies can make a difference, as can social expectations and pressures. These barriers are greater for the poorest and most disadvantaged farmers including women, youth and other vulnerable groups. Women have less access to land, finance, inputs, labour, extension and markets than men in all regions of the world. This is often the case for youth in rural areas also. An article resulting from the SAIRLA programme[100] notes that the potential for SAI remains low until access to land and financial support for the youth receive special attention in all relevant circles including policy discourses. Specific types of CSA, such as conservation agriculture, can be labour intensive (where minimum tillage equipment and herbicides are not available) and these labour demands, due to women's gender roles in agriculture, fall disproportionally on women and children.

The following good practice in overcoming barriers to adoption is drawn from an analysis of best practice learned from this portfolio review, a number of articles arising from the SAIRLA programme, relevant publications[101] and wider experience in CSA and more general agricultural development programmes.

- **Participatory design and implementation of programmes**: Findings from EQ3 and EQ4, that participatory design and implementation of CSA programmes can be effective, reflect wider understanding in agricultural programming. Several articles arising from SAIRLA discuss the importance of multiple-stakeholder engagement in identifying opportunities and trade-offs, particularly in landscape contexts.[102] Early engagement of farmer group representatives including women and youth, and of government, private sector and other local partners in design of programmes can enhance targeting and reduce the likelihood of any interventions having negative impacts on particular target categories. The ASAP-AMD project found that by involving poor women in the detailed co-design of the programme, the intervention was more suitable for them and adoption rates among women high. During implementation, following participatory processes of trying out CSA practices and ensuring feedback loops are in place, such as through farmer-to-farmer extension can increase adoption, particularly if relevant options are available to different target groups.[103]
- **Baskets of CSA options for different wealth/land-holding categories**: Whilst fixed technologies or packages of technologies can limit adoption, baskets of CSA options for different farmers hold more potential, particularly when identified in a participatory manner with the farmers and other stakeholders as in the CSVs and on FFS and other iterative learning contexts. In the CSVs, a wider range of options was usually open to better-off farmers with resources and larger landholdings, and a smaller range of less

[99] Informed by findings on effectiveness (EQ3 and EQ4), SAIRLA publications and wider practice and literature.
[100] Lindsjö K et al (2020) (listed under SAIRLA in Appendix 7)
[101] Such as Fuglie K et al 2020; FAO 2014; FAO, IFAD, UNICEF, WFP and WHO 2021 (chapter 4)
[102] Grabowski, P et al 2020, Winowiecki L.A et al 2021, Lamboll R et al 2021 (listed under SAIRLA in Appendix 7)
[103] Much of what is recognised as good practice is encapsulated in the FCDO PrOF guide on Beneficiary engagement

expensive options that can be applied on a small area of land by smaller farmers. Appendix 11 discusses results regarding baskets of options from SAIRLA articles.[104]

- **Consideration of land tenure and equitable access to land**: Consideration of equitable land access, and, if possible, land tenure in collaboration with governments, is important in that some CSA practices take some years to yield a profit to farmers and those without secure access to land are less likely to consider adopting them.[105]
- **Enabling access to services and inputs for poorer farmers, women and youth:** Given substantial evidence regarding differential access to services and inputs for the poorest and more vulnerable farmers, programme design can build in specific preferential access to financial services (whether formal or informal), weather information, insurance and markets for these groups. Equipment hire schemes can make equipment available to smaller farmers who cannot afford them otherwise. Women's producer groups can be linked with other value chain actors to ensure access to information and markets. These are common practices in agricultural programmes and apply just as well to CSA programmes.[106]

Conclusions

The portfolio review revealed enabling and disabling factors for adoption which are reflected in the wider literature on adoption. This evidence base from development practice provides good guidance on how best to plan for adoption by considering what could be barriers to adoption and by working to reduce these from the design phase. Factors enabling adoption include participatory design and implementation of programmes, providing appropriate CSA options for different stakeholders and ensuring equitable access to resources and services.

c) Cutting through the jargon to design and measure what works to deliver key outcomes.

Terms like CSA and NbS can be useful shorthand for communication, but they can lead to a focus on generic means rather than specific ends (or outcomes). This in turn can obscure the all-important learning of what works, for whom, when, where and why.

The approaches under the CSA umbrella have been highlighted in Table 2. It is necessary in design and monitoring to move beyond the adoption of a particular CSA approach and consider the component outcomes. All of these can be prioritised, designed for, measured, evaluated and learnt from. The three pillars of CSA are a useful starting point:

- **Production** – how much is needed, whether in $, calories or and/or nutrients, at a farm livelihood, community or indeed national level. This needs to be considered in relation to availability of land, labour, inputs, other resources and market demand and also overall sustainability of production.
- **Adaptation** – ensuring the ability to continue to produce with current and projected climate change and shocks or the need to include other mechanisms to cope with temporary falls in production. This requires understanding what climate models tell us and clear options to address their challenges and opportunities.

[104] Adolph B et al 2020, Rodenburg et al 2020. (Listed under SAIRLA in Appendix 7)
[105] Haggar J et al 2020 (Listed under SAIRLA in Appendix 7)
[106] See Appendix 11 for some information regarding the use of ICTs for agricultural extension drawing on Steinke J et al 2020, Silvestri S et al 2020, Ortiz-Crespo B et al 2020.

- **CC Mitigation** – modelling outcomes in relation to GHG balances, these may be a combination of field (mainly soil), farm (livestock, fuel, vegetation) and landscape (soil and vegetation). Secondary outcomes on the agricultural frontier or fallow areas are likely to be important as well.

To these, there probably need to be considered a fourth pillar related other **environmental services** – biodiversity, water cycles, soil conservation and cooling (e.g. shade trees).

These four outcomes need to be designed for and learnt from in relation to the diversity of the producers and resource users. This goes beyond disaggregation by gender or wealth class – the interaction between categories, often referred to as intersectionality[107], may be more important. The farming production opportunities and constraints of a rich married woman farmer may have limited commonality with those of a poor widow – aggregating their adoption figures may obscure more than it reveals. Similarly, the opportunities and constraints for a pastoralist may be very different to a crop farmer, although they may share many resources. Whose voice is heard in prioritising production, adaptation, mitigation and other environmental services is critical and needs to be explicit in design.

Knowing what works in relation to these production, adaptation, mitigation and other environmental services objectives, as well as where, for whom, when and why are critical design and learning needs.

This complexity can be addressed by rigorous and representative participatory techniques during design and monitoring. Participant voice does not mean just including a few carefully selected (and translated) participant quotes in annual reports, it means applying rigour in determining who to listen to and how to build their voice into design, monitoring and evaluation. Overall the lack of participant voice and detail on who, where and when adopted or benefitted and why was noted in the majority of reporting in this portfolio.

Within a framework which focusses on component outcomes and diversity of participant, some of the approaches listed in Table 2 can be useful reminders of the CSA approaches to consider.

This portfolio review ToR encouraged investigation into where NbS were being used and contributing to outcomes achieved The NbS term, which is relatively recent, was not really used in the portfolio or found particularly helpful in identifying NbS (or non-NbS) projects or approaches. The term may sometimes obscure more than it reveals. To an extent all agriculture is nature based (and relies on manipulating nature to produce more of what we want and less of what we don't) – so NbS is more of a continuum that a binary term. Looking at specific approaches and their outcomes in relation to production, adaptation, mitigation and environmental services was more instructive. Working with the dynamism of nature is important. Considering whether to enable natural regeneration or to plant trees may be an example, and ASAP programmes followed options in different contexts. Looking beyond the farm and considering the wider landscape level ecosystem dynamics affected by the farming technique is important but was quite limited in the portfolio.

Conclusions

[107] Intersectionality (noun) - the interconnected nature of social categorisations such as race, class, and gender, regarded as creating overlapping and interdependent systems of disadvantage or opportunity. See definition in Appendix 4.

Terms like CSA and NbS can be useful for describing generic approaches, but for design, monitoring and evaluation it is important to focus on outcomes like, production, adaptation, CC mitigation and other environmental services. This needs to be done within an understanding of the diversity of participants and the interaction between their different components of diversity. Only then can one start to understand, design and implement for what works, for whom, where when and why. This complexity can be addressed by using appropriate participatory techniques in design and giving voice to a representative range of participants in reporting.

d) Enabling environment and whether subsidies can be justified.[108]

Enabling environments bring together the strengths of donors, government, private sector, and local organisations. Strong programme performance invariably includes governments prioritising climate change and building resilience by linking local CSA interventions to national policies within an enabling regulatory and institutional framework. In the wider political economy context, governments support an enabling environment for CSA interventions by creating conditions for macro-economic stability, security of land tenure, and well-functioning markets, while promoting and protecting local and foreign investment.

Programmes that create enabling environments generally involve private sector participation within a transparent and effective development policy framework. A vibrant private sector can strengthen value chains and thicken markets, by creating hubs for the supply of inputs, extension services, information and finance, coupled with a continuing demand for SHF produce – such as high quality tea in Rwanda – to both motivate adoption and achieve sustainability when programme support ends. Examples include centralised tea processing operations (Rwanda), commercial pocket approaches (Nepal), and CSA opportunities benefitting farmers and related value chains in climate smart villages (India).

It is essential that programmes are designed so that farmers feel the tangible benefits, not only from adopting CSA but, as importantly, continuing to do so beyond the life of the programme. Real benefits empower SHFs with incentives to organise themselves into authentic village or community farmer representative organisations that are often necessary to reduce transaction costs and improve efficiency and project viability.

Carefully targeted subsidies to establish plantation crops (tea in Rwanda) can be enabling, helping tide SHFs over a period of high costs with no returns. However, some programmes incorporate subsidies for inputs, equipment or other benefits to encourage CSA adoption. When the programme and these subsidies end, the change in SHFs' relative costs and benefits may reduce sustainability. Moreover, while donors often assume they are building resilience and sustainability, they seldom consider that their technical assistance – designing interventions, training participants, organising activities, and monitoring and reporting on progress – is an inherent, indirect subsidy on which beneficiaries depend. As noted by BRACED's Knowledge Manager: "When considering sustainability, we tend to ask if changes will be sustained, independent of project actions or subsidies. If it is not sustainable – that is, it is unlikely to continue without direct project support – then it is not building resilience." To counterbalance inherent programme subsidies, a case can be

[108] Informed by findings related to sub EQ questions focusing on the enabling environment, under Relevance, Effectiveness and Sustainability in Chapter 3, and on wider experience.

made for building potential future revenues by incorporating payment for environmental services (PES) and carbon finance into the design of CSA programmes.

Conclusions

Enabling environments are created by governments committed to building resilience to climate variability, supported by active private sector investment and participation, legitimate local organisations, and carefully targeted donor support. Strategically targeted subsidies have a role in promoting sustainability and resilience, but both direct and indirect programme subsidies can create dependency and unsustainable outcomes.

e) Carbon finance and CSA/NbS – Holy grail or red herring?[109]

A review by CCAFS found that smallholder farmers can contribute significantly to climate change mitigation but will need incentives to adapt their practices. Incentives from selling carbon credits are limited by low returns to farmers, high transaction costs, and the need for farmers to invest in mitigation activities long before they receive payments. Improved food security, economic benefits and adaptation to climate change are more fundamental incentives that should accompany mitigation. Designing agricultural investment and policy to provide up-front finance and longer-term rewards for mitigation practices will help reach larger numbers of farmers than specialized mitigation interventions.[110]

Examples of carbon finance (and/or Payment for Environmental Services – PES[111]) to sustain CSA were notable by their absence in the portfolio reviewed. Even discussion of the concept seems to be absent from the reports analysed, with the exception of P4F and PoSA. This is unexpected given the importance of agriculture to the global GHG challenge. Carbon in soil, methane emissions from ruminant digestion, conversion of forest to crops and pasture and the biomass on rangeland are major emission sequestration opportunities and threats. NbS and CSA have important interactions with all of these. Despite the lack of examples in the portfolio, there is some learning on wider CSA and NbS that is pertinent to the carbon finance issue:

1. The profitability of CSA is essential to its adoption and is a common challenge across the portfolio. Labour requirements and input costs can be a dis-incentive to continued adoption after projects end.
2. Farmers are not being rewarded for the public good benefits of CSA/NbS (e.g. in carbon sequestration, biodiversity maintenance, water and silt management etc.).
3. Some current processes for accessing carbon finance are centralised, time-consuming, slow, technical and are not farmer/community organisation/local business friendly. (PoSA experience)
4. The sustainability of short-term projects was found to be a challenge across the portfolio. An exception was a project like the SITPR Tea where a long-term profitable model was integral along with short and medium term bridging finance.

[109] Informed by wider knowledge and included due to perceived gaps in carbon credit experience in the portfolio
[110] CCAFS 2012
[111] Carbon finance is a special (and rapidly developing) off-shoot of PES. Environmental services that might be considered for payment have typically been thought of as upstream flood prevention (reducing costs downstream), upstream silt reduction (prolonging the life of costly downstream reservoirs), payment for wildlife damage or biodiversity management etc. Experience is mixed. Punishment approaches attend to be more common than rewards.

5. Some of the landscape level projects, particularly those involved in rangeland regeneration, were calculated to deliver significant carbon sequestration over a 20 year period, but there was no financial reward to farmers or communities for doing this.
6. Some seemingly beneficial CSA/NbS interventions have a significant time-lag between the investment of effort/resources and the delivery of benefits to participants (see Appendix 9) – often 10-20 years. This puts them outside the timespans of most current development programme funding cycles. Could carbon finance fill this gap as a continuation of donor support?

Information from outside the current portfolio suggests that carbon offsetting projects can be driven top-down by the need and timetables to invest carbon finance. As such, they sometimes pay insufficient attention to the broader capacity development, development needs and opportunities of farmers, agricultural systems, communities and landscapes. Sometimes there may be insufficient consultation and capacity building in advance of the carbon funds needing to be spent. A limiting factor is often that farmer/community capacity to measure and verify sequestration/avoided emissions is limited so they often need to rely on expensive or distant aggregator services in order to qualify.

Box 2 Carbon finance opportunities calculated[112] for the BIRDP Project, Sudan[113]

Sinks: Improved forest and rangeland management, cropland restoration

Sources of emissions: Increase in the number of heads of cattle, road construction

GHG balance of ASAP BIRDP in CO_2eq over 20 years (total project)	-4,787,000 MT
GHG balance of ASAP BIRDP in CO_2eq per hectare over 20 years	-46.5 MT
IFAD Financing Grant $9.52 million, Loan $16.8 million	$26.32 million
Total population in project area	436,648 people
BIDDP GHG sequestration in CO_2eq per person per year	-0.55MT
Average CO_2eq emissions per year in Sudan[114]	+0.5 MT
Indicative value of GHG balance in CO_2eq per person per year @$10/MT	$5.5
Total value of GHG balance in CO_2eq over 20 years @$10/MT	$47.9 million

These indicative figures suggest that:

- Per capita carbon sequestration by BIRDP is significant compared to average individual emissions in Sudan (110%).
- At $10/MT CO_2eq the total value of sequestration is high compared to the project cost (181%).
- At $10/MT CO_2eq the potential payment for sequestration is small $5.50/yr per person or $44/yr for a family of eight.

[112] Based on results achieved as per March 2020. Calculations made for 20 years (6 years of project implementation and 14 years of further impacts). EX-ACT calculations are based on the Intergovernmental Panel on Climate Change (IPCC) methodology, and include GHG emission and sequestration across seven categories: Land Use Change; Crop Production; Grassland/Livestock; Management of Degradation; Coastal/Wetlands; Inputs and Investments; Fisheries/Aquaculture. The avoidance of atmospheric CO2eq is estimated as the estimated difference caused by project activities to a Business-As-Usual trajectory http://www.fao.org/tc/exact/ex-act-home/en/

[113] IFAD 2019b, ITAD 2020b, IFAD 2019c

[114] 2018 figure https://data.worldbank.org/indicator/EN.ATM.CO2E.PC

- If the payment were made to the community as a whole this would might be more enticing at $2.4 million per year.
- If the carbon price were to rise to a more realistic figure of $30/$CO_2$eq the payment per family for maintaining the rangeland and forest would be a more enticing $132/yr.

There may be a model of blended carbon finance, complementing development finance in projects like those found in the portfolio under review. Sustained Carbon finance (and/or PES) could provide the long-term support for the public good outcomes delivered by the CSA and NBS activities. Effective, affordable and sustained systems for verifying and transferring payment to farmers and communities will need to be developed which may be a helpful role for donor finance. Embedding carbon finance in a wider donor funded development package that builds capacity, addresses equity, supports adaptation and increases production would add value to pure carbon finance projects. Carbon finance could replace the exit strategy with a sustainability strategy.

Conclusions

Profitability was found to be a strong driver of CSA and NbS adoption and also for sustaining changes in practice. There are challenges when CSA and NbS profitability is low, or where the long-term nature of a CSA or NbS approaches mean farmers and communities do not benefit in the short-term from their efforts. There are additional challenges on sustainability where farmers and communities do not benefit from the public good collateral carbon sequestration or other environmental services delivered by their activities. There may however be opportunities to increase CSA and NbS adoption and sustainability through blended sustainable carbon (or PES) finance, complementing development finance in projects like those found in the portfolio.

f) Minding the gap – addressing time-lag issues.[115]

Many of the projects reviewed stressed the time needed to promote the adoption of CSA and, through this, contribute to increased resilience. However, there was little information in programme reports about whether different CSA approaches require different lengths of time and little indication on whether some CSA approaches were ruled-out in project design because the length of time needed for adoption compared to the project timespan.

The need for potential adopters to receive benefits in the short term was noted in at least two projects (BIRDP and SILTPR). The time lag from effort to benefit poses specific delivery challenges that need to be incorporated into design. The case-study box on SILTPR gives one example of how this was achieved. Due to the long-term sustainability of many of these CSA approaches (once the time lag has been overcome) and the probability that many are complementary with other short-term approaches, addressing the time-lag from effort to benefit is an issue that should be considered in CSA/NbS design.

Box 3 Learning from the SILTPR Tea outgrower project – planning for the future climate and overcoming the benefit time-lag[116]

[115] Informed by findings on time needed to build resilience under Relevance (EQ1), Effectiveness (EQ4), Impact and Sustainability, and team reflections based on wider knowledge and experience.

[116] FCDO – SILTPR Annual Review 2018-2020, Business Case 2017, Addendum to Business Case 2018, Logical Framework 2020, Intervention Summary 2018, Wood Foundation (undated) - Climate Risk Assessment (CRA) of The Wood Foundation Tea Out-grower Project in Rugabano: Summary and four key informant interviews

SILTPR is a joint venture between a tea factory investor, smallholders, a donor and a patient capital provider. The climate smart element was planting the long-lived tea bushes at a cooler altitude likely to be optimal for tea in 30 years' time. The time-lag element was to enable farmers to plant tea today with expectation of benefit over a period of 5-50 years into the future. This was achieved by some front-loaded donor support to build a farmer owned one-stop delivery company, patient capital to provide interest free loans over the 0-5 year 'effort without income' period and trust built between all parties that tea would be grown by the smallholders and bought by the factory. Enforceable contracts countersigned by local government embedded this.

Appendix 9 gives an indication of those CSA approaches that require significant time between farmer effort, expense and/or benefits forgone and farmer/community benefit. Actual projects need longer than indicated to give time at the start to build initial effort and then at the end to translate felt benefit into continued adoption. Thus, project support of 5-20+ years may be required depending on the intervention. An advantage of many of these approaches is that the benefits can continue for a long time once established. They can be good investments if the lime-lag can be overcome. A number of ASAP Programmes, which tend to have longer timeframes are reporting success with some of these approaches including rangeland management and forest regeneration (ASAP BIRDPB, ASAP Kyrgyzstan) and extensive agroforestry (ASAP Niger).

Conclusions

Timeframes for funding should be based on type of project and target group to achieve objectives, sustainability, resilience and transformation. Some CSA and NbS interventions, such as planting slow-growing but long-lived leguminous trees, require significant time between the participant effort required for adoption and the onset of benefit from the effort. This is a challenge for adoption, exacerbated by often relatively short project cycles which may be five years or less. Finding ways to overcome the time-lag funding gap may be a significant adoption enhancing opportunity which needs to be considered in design. Innovative bridging finance may be necessary. One possible route may be to incorporate carbon and/or environmental services credits.

5 Recommendations

The recommendations below are derived from the reflections in Chapter 4, which in turn are based on findings reported in Chapter 3, and provided in priority order below. They are intended for FCDO's consideration, though some could be applicable to a wider audience, for example other donors/potential donors funding CSA.

a) Ensure ongoing engagement, monitoring and learning on resilience are part of programme design with dedicated resources to better prepare for and understand long-term resilience.

Design for climate resilience in relation to the priority risks and best bet opportunities relevant to different target groups in the specific project context(s). This is likely to involve a combination of listening to potential participants, local experts, technical experts and interpretation of climate models in relation to the local context. Consider opportunities to enhance anticipation, adaptation and absorption and the future capacity of participants to continue to adapt beyond the project (transformational change). Measure change of ability to cope in relation to local priorities, different groups and different threats. This may involve

a combination of structured inclusive participant voice (what works, for whom, why, when and where), and relevant quantitative metric(s).

Ex-post learning, monitoring and evaluation of sustainability – whether defined as activities, benefits or adaptive behaviour – can establish whether and how resilience was improved during implementation and whether there were any impacts of withdrawing subsidies and programme support after closure. Such monitoring can involve the farmers and other value chain players that engaged in the programme in a participatory manner and may be particularly important for programmes that have operated in harsh environments (as BRACED did) to really assess if the programme did achieve its objective of sustainability, that farmers have developed an ability to cope with climate variability and shocks and that transformational change supported by the programme still stands. Resource requirements for this ex-post learning need to be identified early in programme design and approved at a senior level within FCDO to be ringfenced as part of a separate monitoring and evaluation budget.

b) Use collaboration and engagement early in design and implementation to overcome adoption barriers later in the programme.

If considering including CSA in a programme, FCDO SROs, advisors and implementation partners should build in time for participatory scoping of CSA options with different (by wealth/landholding and gender categories) farmers in specific geographies. Allow for collaborative iterative adaptation of CSA options/baskets of options throughout a programme through on-going multi-stakeholder engagement. The former can be done once the BC has been approved and the initial implementation is underway. For both the scoping and on-going collaboration with stakeholders in identifying CSA options, FCDO should make clear, in their invitations to tender, what they expect of implementation partners in terms of ensuring participation in scoping, implementation and further development of CSA options. Previous experience of IPs in this area could be included amongst the criteria for their selection. Build into design of programmes inclusive access to financial services, extension, inputs and equipment, weather information and markets. Engaging local partners (government, private sector, NGOs etc) can help greatly in identifying best options for provision of such support services. Ensure clarity on what is meant by adoption e.g. in terms of how long farmers have been using the adopted technology/practice, whether they have applied all or just some of it, whether they have adapted it and with what results, on how much of their land they have applied it etc. Learning from farmers as to whether they will continue to apply the technologies/practices after the project ends (and why or why not) would be useful as well as learning about who benefits most and why, and who does not benefit, or benefits least, and why. Build in sufficient granularity in monitoring to be able to establish which different groups adopt CSA practices and why/why not.

c) Develop consistent, accessible definitions for CSA and NbS processes early in programme design to inform the development of realistic, measurable outcomes, incorporating participant voices throughout the process.

Terms like CSA and NbS can be useful for describing generic approaches, but for design, monitoring and evaluation it is important to focus on outcomes like production, adaptation, CC mitigation and other environmental services. This needs to be done within an understanding of the diversity of participants and the interaction between their different components of diversity. This complexity can be addressed by using appropriate

participatory techniques in design and giving voice to a representative range of participants in reporting.

In FCDO programme design, key outcomes like production, adaptation, CC mitigation and other environmental services need to be clearly defined, with targets set where possible in relation to objective need and the priorities of diverse participants. The ToC should reflect the interaction between these diverse participant types, possible CSA approaches and required outcomes. This complexity is likely to require elements of participatory design on what is expected to work, for whom, when, where and why. FCDO monitoring, reporting, implementation adjustment and evaluation should also reflect outcomes for different participant types including representative participant voice on what is working, for whom, when, where and why.

d) Include enabling environment components to promote longevity and replication.
First, recognise the importance of creating an enabling environment by wide-ranging consultations during programme design that ensure government commitment, private sector participation, and sufficient intrinsic benefits of CSA interventions to motivate adoption and the formation of farmer organisations. Second, during programme design, consider the type, level, timing, and need for subsidies – direct and indirect – bearing in mind their impact on sustainability and resilience to climate change when projects end. Third, FCDO should consider designing opportunities into CSA programmes for generating additional long-term revenues for communities from payments for environmental services (PES) and carbon finance support.

e) Investigate blended finance approaches which include climate or PES credits to reward public good outcomes and to enable longer-term sustainability
Profitability was found to be a strong driver of CSA adoption and for sustaining changes in practice. There are challenges when CSA and NbS profitability is low, or where the long-term nature of a CSA or NbS approaches mean farmers and communities do not benefit in the short-term from their efforts. There are additional challenges to adoption where farmers and communities do not benefit from the public good collateral carbon sequestration or other environmental services delivered by their activities.

FCDO should investigate opportunities to increase CSA and NbS adoption and sustainability through blended sustainable carbon (or PES) finance, complementing development finance in projects like those found in the portfolio. This finance may be most effective at the latter part of the project cycle after awareness raising, CSA demonstration, governance and community organisation capacity building is underway. At the time of this review, the primary options for carbon financing are offered by the voluntary market, via organisations such as Gold Standard, with the regulatory market currently stalled in anticipation of the new carbon crediting mechanism to be negotiated under Article 6 of the Paris Agreement. While FCDO may not have a mandate to purchase carbon credits directly, there may be a role for FCDO in building capacity in carbon credit aggregators, verifiers and facilitators, or PES service providers, to enable farmers to access this potential revenue more effectively, or by empowering programme implementors to investigate these financing opportunities.

f) Design CSA programmes with timeframes appropriate to programme needs and with mechanisms to overcome incentive gaps between adoption and benefits

Some CSA and NbS interventions, such as planting slow-growing but long-lived leguminous trees, take longer than others. Project timeframes for CSA should be based on realistic estimates of the time needed to achieve both immediate objectives and longer-term sustainability, resilience and transformation. FCDO funding and spending review cycles need to be able to support these high potential longer-term approaches.

Some CSA approaches require significant time between the farmer effort required for adoption and the benefit from that effort. This is a challenge for adoption. Finding ways to overcome the time-lag between participant effort and benefit from adopting some longer-term CSA/NbS approaches need to be addressed in project design. Preferred approaches are likely to vary with the type of CSA being proposed and also the readiness of project participants. Where longer-term approaches look likely to deliver significant benefits, innovative ways of bridging the incentive gap may need to be designed. In some cases carbon finance or other PES should be explored as an option.

Appendix 1: CSA ToR

ITT Volume 2 - Terms of Reference

Thematic Evaluation – Climate Smart Agriculture

- **Introduction**

DFID is seeking a supplier to conduct a thematic evaluation of FCDO programmes supporting climate smart agriculture (CSA) to examine the extent to which climate smart agriculture technologies have contributed to reducing vulnerability of smallholder farmers to climate shocks.

- **FCDO and strategic, thematic evaluation**

The Foreign Commonwealth and Development Office (FCDO) will build upon the experience of Department for International Development (DFID) with evaluation, bringing important learning to the creation of the evaluation system within the FCDO. A key priority will be strategic, centrally managed thematic evaluations that will draw together insights and evidence across sectors and geographies. Thematic evaluations will provide analysis of effectiveness and learning from FCDO funded programmes on what works across different contexts to address high priority development challenges, such as what has worked to address the primary and secondary impact of the Covid19 pandemic in LMICs, climate change and other key Ministerial priorities. This will help to bridge the current gap in knowledge, arising out of the former DFID's decentralised approach to evaluation where evaluation evidence generated by individual programmes is often not shared across the organisation, missing opportunities to capitalise upon learning.

Thematic evaluations will be led by the FCDO's Evaluation Unit, within the FCDO Research and Evidence Division (RED), working closely with relevant policy and programme teams within FCDO. The Evaluation Unit will commission 3 – 4 thematic evaluations this financial year, using rapid evidence review and light touch learning techniques to explore strategic priority areas and create targeted, user-focused thematic evaluation products that can feed into upcoming policy influencing and programme portfolio level decision-making opportunities.

- **Purpose and Objectives**

The purpose of this thematic evaluation is to aggregate and synthesise evidence from FCDO programmes supporting climate smart agriculture to draw out learning on reducing vulnerability of smallholder farmers to climate shocks. It should consider the quality and strength of the evidence from programme documentation (including independent evaluations) and propose actionable recommendations related to geographical contexts, types of climate variability and target groups to inform FCDO programme and policy decision-making.

This thematic evaluation will provide evidence from FCDO programming to inform the development of FCDO policy briefings for the UN Food Systems Summit 2021 (scheduled for September or October 2021), the COP26 Nature campaign in December 2021 and it may

also have relevance to the current FCDO-led famine prevention campaign. This evaluation will also contribute to the evidence needed to support FCDO agricultural policy and programme development on food systems that can deliver 'triple wins' by delivering outcomes that improve nutrition, climate resilience and adaptation, alongside economic benefits. The evaluation will also inform understanding of environmental/biodiversity benefits from climate smart agriculture and possible trade-offs between the different outcome areas. The evaluation will be published, in line with FCDO commitments to transparency, on the Research for Development page on gov.uk, so that the findings are available to other donors, agencies and academic bodies working in this field, as well as to members of the public.

- **The Recipient**

The recipient of these services is the FCDO Evaluation Unit. The primary target audiences for the thematic evaluation products are teams within (i) the FCDO Research and Evidence Division: Evaluation Unit, Evidence into Action, Agriculture and Climate Research Teams; (ii) FCDO Growth and Resilience Division: Agriculture and Land; (iii) FCDO Climate and Environment Department.

Secondary target audiences for the evaluation products are:

- FCDO country offices and other government departments funding climate smart agriculture
- Other donors/potential donors funding climate smart agriculture
- For published outputs, audiences will also include academic institutions and civil society organisations operating in this field as well as the UK public.

- **Climate Smart Agriculture**

The development of the concept of Climate Smart Agriculture (CSA) has helped to raise awareness of the dynamic relationship between agriculture and climate change. CSA has acted as a powerful framing to mobilise collaboration amongst a wide range of organizations and institutions promoting CSA in a variety of global contexts. CSA has also been influential in gaining recognition of agriculture as an implementation target under the United Nations Framework Convention on Climate Change (UNFCCC).[117]

Recognising that technologies described as 'climate smart agriculture' are diverse and implemented in a wide variety of geographical, political and ecological contexts, a recent World Bank report[118] has identified key principles that should be common to all CSA interventions and sets out this definition, 'The CSA concept reflects an ambition to improve the integration of agricultural development and climate responsiveness. It aims to achieve food security and broader development goals under a changing climate and increasing food demand. CSA technologies sustainably increase productivity, enhance resilience, and reduce or remove GHGs. However, implementation of technologies requires planning to address trade-offs and synergies (co-benefits and "triple-wins") between the three CSA

[117] Sova, C. A., G. Grosjean, T. Baedeker, T. N. Nguyen, M. Wallner, A. Jarvis, A. Nowak, C. Corner-Dolloff, E. Girvetz, P. Laderach, and Lizarazo. M. 2018. "Bringing the Concept of Climate-Smart Agriculture to Life: Insights from CSA Country Profiles Across Africa, Asia, and Latin America." World Bank, and the International Centre for Tropical Agriculture, Washington, DC.
[118] Sova et al, 2018 p7.

pillars: productivity, adaptation, and mitigation.' CSA technologies cover a range of interventions including those that are infrastructure and ICT-reliant, Nature-based Solutions (NbS), governance and management approaches.

The role of NbS to respond to climate change and to support a better, greener recovery from the economic impact of the COVID-19 pandemic are being cited widely in preparatory discussions for the G7 Summit and UNFCCC COP26 in 2026. Although definitions of NbS in agriculture are still debated, they would usually fall under the broader umbrella term of climate smart agriculture. Understanding the role NbS plays in climate smart agriculture can help to better inform ongoing policy discussions.

- **FCDO support to climate smart agriculture**

FCDO aims to develop the global knowledge base on climate smart agriculture through bilaterally funded programmes and through multilateral organisations. Bilaterally, a number of FCDO programmes integrate climate considerations into agricultural programming and seek to drive uptake of climate-smart practices as appropriate within their country contexts. These often also seek to deliver on other economic development priorities including growth of firms and markets, and creation of jobs and higher incomes.

FCDO also works with multilateral organisations to develop new climate smart agriculture programmes. This includes support through International Climate Finance (ICF) to the International Fund for Agricultural Development's (IFAD) flagship programme, the Adaptation for Smallholder Agriculture Programme (ASAP), support through the World Bank to develop national Climate Smart Agriculture Investment Plans, building upon earlier Climate Smart Agriculture Profiles and integrating climate into the work of the Global Agriculture and Food Security Programme (GAFSP). The UK also makes significant contributions to the international climate funds, such as Green Climate Fund and Global Environment Facility, which increasingly support climate smart agriculture.

FCDO's Research and Evidence Division (RED) is funding longer term research on climate change and agriculture through various initiatives, including the Consultative Group for International Agricultural Research (CGIAR) Climate Change, Agriculture and Food Security (CCAFS) programme and the Sustainable Agricultural Intensification Learning Alliance.

Through multilateral, regional and bilateral agriculture and food security programmes, FCDO supports the integration of climate concerns into national and international policies and investment decisions as well as the uptake of climate-smart agricultural practices on farms.

- **Evidence base on the impact of climate smart agriculture on poverty reduction**

FCDO has conducted internal analysis of published research on cost-effectiveness of a selection of climate smart agriculture technologies on delivering increased incomes and/or consumption outcomes. This found limited but promising evidence of the cost-effectiveness of Alternate Wetting and Drying in rice production, but low levels of evidence of the impact of practices with a long history, such as agro-forestry and conservation agriculture (zero-till,

maintenance of soil cover with residues and crop rotation).[119] Analysis of research related to climate change adaptation interventions found positive but modest cost-benefit ratios for CSA interventions and cautions that interventions are often site-specific and application of similar interventions in different contexts can yield large differences in cost-benefit ratios.[120] These internal analysis processes did not attempt to aggregate evidence from FCDO programmes supporting climate smart agriculture interventions.

FCDO has supported other initiatives to analyse and understand the impact of commercial agriculture programming in the three areas of productivity, adaptation and mitigation. Results from a study led by CGIAR show that improving farming management practices and technologies due to FCDO investments are expected to lead to a significant increase in cropping and livestock productivity while reducing net GHG emissions.[121] The mid-term review of the FCDO-funded Adaptation for Smallholder Agriculture Programme (ASAP), implemented by IFAD, assessed the extent to which the design and results to date of ASAP are relevant for farmers facing climate change. It also considered ASAP's potential to transform the adaptation support available to farmers via the scaling up of successful approaches, changes to supportive systems, and by encouraging sustainability in support options. The mid-term review found that ASAP projects employ a range of activities that bode well for their sustainability. Although farmers are benefiting from access to new technology and capacities, they still face many uncertainties regarding the near-term availability or condition of natural resources.

FCDO has also commissioned the forthcoming Commercial Agriculture Portfolio Review (CAPR) which will include a deeper analysis of the subset of FCDO-funded bilateral commercial agriculture programmes that aim explicitly to change farmers' use of inputs and practices to make them more resilient to climate change. It will also summarise how programmes are measuring increases in resilience and the approaches being used in terms of hardware, software, and orgware[122], and identify trends, emerging good practice and areas of innovation, as well as potential gaps in the portfolio. Details of programmes included in this subset of programmes are included in Appendix 1.

Recognising the need for systemic transformation of food systems to meet global nutrition needs sustainably under climate change, CCAFS have published a report, 'Action to Transform Food Systems' developed by a global panel of experts, setting out priority actions for climate resilient agriculture and food systems. The report recognises that such a transformation of food systems requires the type of approach to agriculture that can be described as 'climate smart agriculture' but avoids use of such terms to focus upon outcomes to be achieved and mechanisms for delivery.

As part of the Sustainable Agriculture component of the COP26 Nature Campaign, the FCDO RED Agricultural Research Team, in collaboration with CGIAR CCAFS, is commissioning a series of rapid evidence reviews in order to provide the evidence needed

[119] DFID, May 2020. 'Best Buys in improving incomes for the poorest, focusing on social protection and agriculture'.
[120] DFID, April 2020. 'Sector Best Buys: Climate Change'
[121] CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), 2020. "Climate change impacts of the UK Foreign, Commonwealth and Development Office's (FCDO) commercial agriculture portfolio."
[122] This will follow the definition of these terms by the UNFCCC. Hardware relates to physical tools; Software relates to processes, knowledge, and skills to use the technology; Orgware relates to ownership and institutional arrangements pertaining to a technology. https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/TEC_column_L/544babb207e344b88bdd9fec11e6337f/bcc4dc66c35340a08fce34f057e0a1ed.pdf

to bring about this transformation of food systems. Three evidence reviews will be conducted on:

- Incentivisation and measurement of end to end approaches for innovation in agriculture (led by CGIAR CCAFS) – reviewing and defining 'end to end' approaches and innovation systems, documentation of lessons and good practice.

- Agro-ecology approaches in low and middle income countries (LMIC) – current practices, opportunities, challenges and 'trade-offs' in scaling agro-ecological and regenerative practices in LMICs

- Agriculture and biodiversity – re-integrating biodiversity into food and agricultural systems for climate, environment and nutrition gains in LMICs Land and Ecosystems (led by CGIAR Water, Land and Ecosystems (WLE) – mapping of evidence available, identifying gaps and implications for future research and development, investment and policy making.

Alongside these evidence reviews, the Commission on Sustainable Agriculture Intensification (supported by CGIAR Research Programme on Water, Land and Ecosystems) is also conducting a study on Investment in innovation for Sustainable Agriculture Intensification.

- **Scope and approach**

Given the evidence reviews already commissioned by FCDO and underway to synthesise learning from externally funded programmes and research, the scope of this thematic evaluation will focus upon FCDO-funded interventions. The thematic evaluation will cover FCDO funded programmes which include climate smart agriculture interventions, funded through bilateral and multilateral funding channels. It is proposed that the thematic evaluation could focus upon the subset of 25 programmes that have been identified in the CAPR for deeper analysis in relation to climate change outcomes, to take advantage of a pre-identified sample of interventions and thus expedite the progress of the thematic evaluation. This subset of programmes all receive UK International Climate Finance (ICF) and report against objectives to increase people's resilience to climate change[123], programmes which promote CSA technologies (including agroforestry, climate resilient crops, water harvesting) and other relevant programmes identified by the review team (see Appendix 1). If additional relevant programmes promoting use of climate smart agriculture technologies are identified by the Supplier for this evaluation, the supplier may propose adding these to the sample.

We wish to commission an independent structured review and synthesis of the evidence from FCDO's climate-smart and sustainable agricultural programmes on **the extent to which they have improved farmers [and value chains / other value chain players] resilience to climate variability and change**.

[123] This is defined as reporting against ICF key performance indicators 1 'Number of people supported to better adapt to the effects of climate change as a results of ICF' and/or 4 'Number of people whose resilience has been improved as a results of ICF'.

Within the analysis of CSA solutions, we are also interested to understand the role played by nature-based solutions in increasing farmer's resilience to climate variability and change.[124]

The evaluation should address the OECD-DAC criteria of *relevance*, *effectiveness*, *impact* and *sustainability*:

Relevance:

- How have the programmes included in the sample defined resilience within their 'theory of change', over what time frames were changes expected and how have they attempted to measure resilience?
- How have the programmes included in the sample defined resilience within their 'theory of change', over what time-frame were changes expected, and how have they attempted to measure resilience?
- Were the CSA technologies and delivery models appropriate to address the farmers' vulnerability to climate variability and change in the different contexts where they were applied?

Effectiveness:

- Which CSA technologies and delivery models were most effective/least effective in improving farmers' resilience to climate variability and change in different contexts, agro-ecological zones and in response to different types of climate variability? In which contexts, AEZs and climate variations did nature-based solutions perform well?
- Which technologies were successfully taken up by farmers initially but later dropped and which were 'sustainably adopted' (continued to be used after the intervention ended)? What were the enabling factors and factors influencing disadoption?
- Have there been differences in levels of improvement during different types of climate variability?
- Are there lessons around whether particular types of technology, including nature-based solutions, are better suited in different geographical contexts / agro-ecological zones? Are there any significant enabling factors (or lack of) affecting take up and sustained adoption of technologies?

Impact

- What is the evidence that the CSA technologies have contributed to significant positive or negative, intended or unintended changes in farmers' resilience to climate variability? Please highlight evidence found on this that is relevant to nature-based solutions.

[124] We are using the term 'climate variability and change', rather than shocks, so that the focus of the study goes beyond extreme events such as flooding, drought, hurricanes, etc and takes into account the more commonplace variations in climate that are experienced by farmers during more typical seasons as well.

- Have there been differences in outcomes and impact for women and other disadvantaged groups?

- To what extent have the climate smart technologies adopted by farmers generated other environmental benefits, such as improvements in downstream water quality, better on and off-farm biodiversity conservation or lower air pollution?

- What have been the trade-offs made between short-term productivity, farmers' own longer term resilience, as well as environmental and biodiversity benefits? Have there been differences in trade-offs made when nature-based solutions are being used, rather than other types of CSA technology?

Sustainability:

What evidence is available to show that farmers will continue to use CSA technologies adopted ('sustained adoption') and will continue to benefit after the intervention ends ? Are there any differences in levels of adoption for NbS?

What the factors that influence sustained adoption of CSA technologies and/or benefits from their use?

Further specific questions for analysis include:

- What lessons can be learnt from this analysis of FCDO's programming in relation to advancing the sustainable agriculture agenda in preparation for COP26 and what evidence gaps remain? (This should include lessons learnt from interventions that have not been effective).

- Are there any other negative outcomes and/or risks arising from the use of climate smart agriculture technologies?

The supplier is expected to develop an appropriately rigorous evaluation design and methodology during the scoping phase. The scoping assessment should include:

a) Development of an overarching theory of change or intervention logic, showing the expected causal links between farmers' adoption of CSA technologies, improved resilience to shocks and environmental and biodiversity benefits. This should highlight key assumptions and available supporting evidence.

b) Assessment of evaluability options based on the theory of change,

   i. Refining/clarifying evaluation questions, based on the theory of change and taking into account the purpose of the evaluation

   ii. Assessment of proposed evaluation approaches and recommendations for strengthening/improving, if necessary

   iii. Assessment of availability of data sources and access to key stakeholders (particularly policy decision-makers in LMICs) to address the evaluation questions.

As the programmes included in the review will be using a range of climate smart technologies in diverse contexts, it will be important that the evaluation sets its findings and recommendations in the context of both the interventions, target groups and locations. The review should make clear the strength of evidence supporting the findings. Findings should differentiate between those that apply to CSA technologies that can be categorised as 'nature-based solutions' and those use non-nature-based methods.

It is expected that this evaluation will be conducted through quantitative and qualitative analysis of publicly available evaluation and monitoring data on FCDO funded programmes which include climate smart agriculture interventions, such as business cases, log frames, annual reviews, project completion reviews and evaluations. Suppliers are expected to appraise the quality of evidence contained in these documents, particularly where it has not been subject to independent external verification and quality assurance (as is the case with evaluations) and ensure that such evidence is used appropriately and transparently when drawing overall conclusions.[125]

During the initial review of evidence and the development of the inception report, the supplier should engage with experts from CCAFS who have been involved in the recent study on climate change impacts of FCDO's commercial agriculture portfolio and from CABI, who are conducting the climate analysis for the CAPR.

The evaluation should include qualitative interviews with relevant key informants involved in design, implementation, monitoring and evaluation of programmes included in the sample. This could be considered as part of the scoping phase to build understanding of the theory of change that underpins these programmes and/or during the implementation phase, to obtain feedback on interventions promoting CSA technologies.

The supplier is also invited to propose innovative approaches to generate additional analytical insight into possible impacts of climate smart agriculture technologies upon farmers' resilience. This could include interrogation of proxy information from national level data on climate shocks and CSA to draw out further insights.

Cross-cutting issues: the supplier should set out clearly how the evaluation will address cross-cutting issues of gender and inclusion of vulnerable populations, in relation to consequences and outcomes for rural populations targeted for adoption of CSA technologies and in terms of environmental/biodiversity outcomes. The supplier should consider the extent to which effective pro-poor approaches were used in design, targeting and implementation of CSA interventions and whether it took into account the influence of power dynamics and political economy factors upon adoption of CSA technologies.

Given the desire to generate evaluation evidence rapidly to feed into ongoing UK government policy and programme decision-making, a joint or partnership-based evaluation is not being considered. FCDO staff are in regular communication with peer agencies with an interest in this field and will ensure co-ordination with other planned evaluations and that findings are disseminated in a timely manner.

[125] All FCDO evaluations are conducted by independent external experts and are quality assured by a member of an independent panel of experts, managed by the FCDO Evaluation and Quality Assurance and Learning Services programme. Thus all evaluations are judged to have met a satisfactory standard and we are not requesting that this thematic evaluation provide detailed critique on the quality of the evaluations include in the review in addition to the quality assurance reviews that have already been conducted.

- **The Requirements**

a) **Kick off meeting** – on initiation of the project the suppliers will review and reconfirm the planned scope and approach.

b) **Scoping Report -** the scoping report should include

- Updated evaluation questions, evaluation design and methodology to be followed
- Theory of change, key assumptions and available supporting evidence
- Assessment of evaluability options, taking into account the availability and quality of data and whether the available data will enable evaluation of resilience and environmental outcomes that can be attributed to CSA interventions (rather than a broader package of interventions). Options could include proxy measures/ means of assessment if information from programmes is insufficient.
- Analytical framework
- Details of programmes to be included.
- Documenting of key risks to the evaluation and mitigating actions
- Plan for engaging stakeholders, communication and uptake of evaluation findings
- Timeline for completion of key tasks.
- Proposed structure for internal brief, full report and policy summary.

c) **Full protocol** – a full finalised methodology and work plan for the evaluation, making any changes to the methods outlined in the proposal in response to the scoping analysis. This should delivered with the scoping report.

d) **Internal brief for FCDO** – early summary of findings for FCDO advisors for internal use to inform ongoing policy engagement and programme decision-making, flagging key issues and risks emerging and proposing recommendations. The summary should be no more than 10 pages long and be supported by a Q&A session for FCDO advisors.

e) **Report for publication –** this should be concise and logically structured, with a focus on meeting the overall purpose and objectives of thematic evaluation and responding to the evaluation questions. A draft version of the report should be shared with FCDO for feedback and a final version should be submitted that addresses the feedback received. The report should include an Executive Summary (max 3 pages) and be no more than 30 pages in length (not including Executive Summary, contents page, acronyms, Appendixes, references, etc.). It should be presented in an easily digestible format, using visuals and graphics to highlight key points.

The report should make clear the strength of evidence that supports the findings. A clear distinction should be made in the findings of the report, between those that are based upon

independently verified evaluation evidence and those that are based on data included in annual reviews and project completion reports (not independently verified).

The report should focus upon the consolidated findings and recommendations for future policy and programming from the thematic evaluation, disaggregated by geographical context, climate variation and target groups and illustrated with relevant examples from individual programmes as relevant. Summary findings for each programme should be presented in an Appendix.

f) Presentation slides – that can be used by FCDO to share the work with stakeholders.

g) Delivery of a presentation to key stakeholders within FCDO/xHMG and external partners.

h) **Two-page policy summary –** for briefing policy decision-makers on key findings and recommendations of the evaluation, using non-technical, easily accessible language, with visuals and graphics to highlight/illustrate key points.

The evaluation should adhere to international best practice standards in evaluation, including the OECD DAC International Quality Standards for Development Evaluation, the OECD DAC Principles for Development Evaluation and FCDO's Ethics Guidance for Research, Evaluation and Monitoring.

- **Budget**

Proposals are invited within the range of £50,000 - £70,000 excluding VAT, but inclusive of all other taxes.

- **Submitting a proposal**

Proposals should clearly set out the supplier's suggested approach to conducting the thematic evaluation, in line with the requirements set out in this terms of reference, team skills and experience and proposed team composition. The final evaluation questions, scope, and methodology for project delivery will be agreed between FCDO and the selected supplier at the end of the scoping stage.

The proposal should set out an approach to engaging stakeholders and communication and uptake of evaluation findings; and explain how they will address challenges and risks to the evaluation.

Proposals should include the CVs for all project staff and clarify roles and responsibilities of each member of the project team(s) (including days required for each and the associated day rates).

The proposal should also demonstrate that the supplier has considered FCDO's Ethical Guidance on Research, Evaluation and Monitoring (see section 19 below).

- **Skills and experience required**

The team should include the following expertise:

- Strong understanding of climate smart agriculture technologies and agricultural systems in LMICs
- Strong expertise in gender issues in relation to climate smart agriculture
- Knowledge and understanding of the programme contexts and political economy in lower and middle income countries (LMICs) in Africa and Asia
- Demonstrable understanding of the key issues related to use of evidence for programme design, implementation and policy influencing
- Significant experience in portfolio-level evaluation, quantitative and qualitative research, synthesis and analysis skills;
- Excellent communications skills, including writing for policy audiences and ability to distil succinct conclusions presented in non-technical language.

The Supplier should consider the use of consultants based in LMICs, dependent on skills and availability.

- **Constraints and dependencies**

Key sources of data – the evaluation should be based upon publicly available evaluation and monitoring data on FCDO funded programmes which include climate smart agriculture interventions on FCDO Development Tracker, such as business cases, log frames, annual reviews, project completion reviews and evaluations. There may be limitations to the availability and quality of monitoring data, particularly for programmes operating in difficult contexts, or where an insufficient length of time has elapsed since new practices have been promoted to allow a change to be observed. Also, there can be time lags between finalising reports and publication. Information available in publicly available data and gathered through key informant interviews may also be subject to bias.

Determining attribution - it should also be noted that programmes often promote CSA as one of a package of interventions for improving incomes/livelihoods, so the initial evaluability assessment should consider to what extent it will be possible to determine attribution of resilience outcomes to climate smart agriculture using the data available.

Multiple change pathways to achieve resilience through climate smart agriculture – CSA encompasses a wide range of technologies, implemented in diverse contexts. Thus, the breadth of activities and outcomes included within the evidence base is likely to make it harder to synthesise and limiting potential to identify generalisable findings across contexts and interventions. The evaluation should focus upon drawing out understanding on what works and what doesn't work, for which groups of people and in what contexts.

Definitions of core concepts – definitions of the concepts 'climate smart agriculture' and 'resilience' are widely debated and may be interpreted differently by stakeholders consulted. The supplier will need to develop a clear approach to navigating such differences the methodology proposed and the evaluation outputs.

Stakeholder availability – interviews with key informants should be conducted virtually due to COVID restrictions on travel. Schedules should allow flexibility to accommodate likely constraints on availability due to heavy workloads and competing urgent priorities.

Conflicts of interest – FCDO wishes to commission an independent objective evaluation of its CSA interventions. It is recognised that some team members proposed by the Supplier may have prior experience with one or more of the interventions to be evaluated. Prior involvement with programmes included within the sample should be declared in the proposal for all team members and the Supplier should demonstrate in the proposal the mechanisms that will be put in place to ensure the integrity and independence of the evaluation.

- **Performance Requirements**

FCDO will set key performance indicators (KPIs) to ensure that the evaluation is delivered in a timely manner and meets expected quality standards. KPIs will relate to:

- Timeliness and quality of reporting
- Flexibility and responsiveness to a dynamic and evolving context within FCDO and externally.

Payments may be withheld if outputs do not meet expected quality standards and/or if are delivered late.

The supplier should arrange regular check in meetings with FCDO for both components at key stages to provide progress updates.

- **Time frame and Reporting**

It is anticipated that the thematic evaluation will have a 26 week timeframe from signing the contract.

Reports are expected as detailed below.

	Date expected (after contract signing)	**% of total payment to be released on successful completion**
Kick off meeting	1 week	
Scoping report and full protocol	4 weeks	25%

Internal brief for FCDO/Q&A session for FCDO advisors	20 weeks	10%
Draft report	21 weeks	25%
Full report, addressing FCDO comments	24 weeks	25%
Presentation slides	25 weeks	
Presentation to key stakeholders	26 weeks	10%
Two-page policy summary	26 weeks	5%

In line with FCDO's evaluation policy, the evaluation reports will be published together with a management response setting out how FCDO will respond to the recommendations. The scoping report, protocol and evaluation report will be independently quality assured by the FCDO EQUALS service.

- **Use and Influence**

The findings, lessons and recommendations from this thematic evaluation will be used by FCDO advisors to guide programme design, implementation and the development of appropriate monitoring and evaluation strategies for climate smart agriculture interventions. It will also be used to inform the development of FCDO policy briefings for the UN Food Systems Summit 2021 (scheduled for September or October 2021), COP26 on nature-based solutions and other upcoming opportunities. The report will be published on the Research for Development Outputs page on gov.uk so that findings may be used by other donors and agencies working in this field.

- **Break points**

The contract will be subject to break points after completion of the scoping report and full protocol. Continuation of the services after these periods will be based on agreement of deliverables and on satisfactory performance and the progress of the supplier against the specified outputs.

- **FCDO Coordination and Governance**

The supplier will report to the FCDO Evaluation Unit Evaluation Advisor (Thematic Lead) and the Head of Evaluation Unit. A reference group will be established by FCDO to provide technical advice to the evaluation.

To ensure effective governance of the evaluation, the scoping report and reports will be signed off by the FCDO Evaluation Advisor and the Reference Group convened by FCDO. The scoping report, protocol and the final report will also be quality assured by the FCDO Evaluation Quality Assurance Service (EQUALS).

- **Other requirements**

- Compliance with FCDO's Environmental and Social Safeguards and the Ethical Guidance for Research, Evaluation and Monitoring Activities.

- The supplier should consider whether external ethics approval is needed. If it is decided that submission to Institutional Review Board (IRB)/Research Ethics Committee (REC) (and the relevant regulatory authority in the country) is not required, the FCDO expects the planning of data collection and analysis to reflect active consideration of FCDO's ethics principles and standards and for the process to be documented.

- FCDO will have unlimited access to the material produced by the supplier in accordance with FCDO's policy on open access to data as expressed in DFID's general conditions of contract.

- The supplier will be expected to comply with General Data Protection Regulation (GDPR) governing the processing of personal data.

- Please refer to the details of the GDPR relationship status and personal data (where applicable) for this project as detailed in App A and the standard clause 33 in section 2 of the contract.

- The supplier must use the UK aid logo on all outputs to be transparent and acknowledge that they are funded by UK taxpayers. The supplier should also acknowledge funding from the UK government in broader communications, but no publicity should be given without the prior written consent of FCDO.

- **Duty of care**

Please note, it is assumed that no travel will happen for the purposes of this review and that it will be conducted virtually, meaning that no face to face interviews should happen and presentations should be given virtually.

The supplier is responsible for the safety and well-being of their personnel and third parties affected by their activities under this contract, including appropriate security arrangements. They will also be responsible for the provision of suitable security arrangements for their domestic and business property.

Appendix 2: Approach and Methodology

This appendix summarises the approach and methodology used by the team. It also includes some reflections on or lessons learned about design and implementation of portfolio reviews which may be of use to FCDO in designing portfolio reviews in future.

The review started in February 2021 with a scoping phase, followed, from April, by an analysis and synthesis phase. The last phase, the reporting and dissemination phase, started in late July and is due to run through to early November. In line with the TORs, the review was conducted remotely due to COVID-related travel restrictions, drawing mainly on qualitative data. It considered the four OECD Development Assistance Committee (DAC) criteria outlined in the TORs: Relevance, Effectiveness, Impact and Sustainability. The team took a theory of change (ToC) approach, having developed three ToC's during the inception phase, one for CSA in general, with the other two being specifically for a) field/farm level and b) landscape level CSA. These are available in Appendix 6. There were no significant TOR departures.

The review team included six members: one team leader; two senior experts; a research analyst; a project manager; and a contract director. The team leader was responsible for the development and quality of the review deliverables, and coordinating inputs across the team. The project manager was responsible for project resourcing, risks, timelines and stakeholder communications, and provided first stage quality assurance of review outputs. The contract director was responsible for managing escalated risks, ensuring contractual compliance, and providing second stage quality assurance.

Evaluation questions (EQs) and sub-questions were elaborated further from the TORs during the inception phase and are used to structure the findings by DAC criteria in Chapter 3. A full evaluation framework was developed listing, for each sub-EQ, the areas to consider, data sources, data collection and analysis methods and evaluability framework. The evaluation framework is available in Appendix 5.

A rapid evaluability assessment of the 26 Commercial Agriculture Programmes (CAP) included in the TORs for consideration for inclusion in this review was undertaken in the scoping phase. Several criteria were identified by which each programme was assessed, including start and end dates, availability of key documents, relevance of the programme to this review, CSA typologies and interventions covered, and cross-cutting issues addressed. Through this process, eleven programmes were shortlisted. In addition, the review team, in consultation with the review SRO, added the joint FCDO/BEIS programme P4F as suggested in the NIRAS-LTS proposal. This was included in anticipation that there would be useful findings regarding landscape level CSA (given that many of the CAP programmes involved mainly field and farm level CSA). In the analysis and synthesis phase some adjustments were made to the programmes in the review portfolio. Two of the shortlisted programmes[126] were removed from the portfolio during this phase when further examination of the documents and discussion with the programme SROs made it clear that they may not yield sufficient evidence. This paved the way to take on board three additional programmes (CGIAR 2017-2021, LFSP and ZRBF) that were proposed to the

[126] These were AgResults and the Livelihoods and Food Security Trust Fund (LIFT), also known as NUTSEM.

review team by FCDO in the scoping phase. These are included in Table 1 in the main report.

The evaluation methods included a document review and key informant interviews. As proposed in the TORs, the documents reviewed were all publicly available. Key documents included the FCDO business cases (BC's), annual reviews (AR's) and, where available, Programme Completion Reports (PCRs) produced by both FCDO and IFAD (in the case of the ASAP projects). In addition, the team reviewed documents from the programme websites and provided by implementation partners and knowledge managers. These included brochures, annual reports and studies. Where independent mid-term reviews or end-evaluations were available, these were also drawn upon (where there was content relevant to the review). In the case of the research programmes, particularly SAIRLA, the team drew on journal articles that were programme outputs. A full list of literature reviewed is in Appendix 7, along with a description of how each piece of literature was rated (see below).

Interviewees for semi-structured interviews (SSI's) were selected purposively and included (but were not limited to) programme Senior Responsible Owners (SROs) and Implementation Partners (IP's). To protect the anonymity of respondents only the organisations and positions of those interviewed are listed in Appendix 8. A generic SSI interview guide was shared with the FCDO prior to interviews commencing and the first interviews with SROs and IPs were used as pilots. Prior to, or at the start of, each interview, the team secured the respondent's consent to the interview taking place and being recorded in note form in compliance with General Data Protection Regulations (GDPR). An information note about the review was provided to each respondent at the point of first contact. The note emphasised that the review was for learning rather than evaluation purposes. The SSI guide for each respondent, tailored to their programme and based on prior document review, was shared with each respondent at least 24 hours before each interview. NIRAS-LTS used GDPR compliant security storage for storing and sharing data within the team and will delete or redact all personal data (e.g. names of interviewees) on completion of the review. The team followed FCDO ethics principles and standards[127] in their approach to the review and, specifically with regard to interactions with interviewees. Interviewees were offered no reward for participating and provided responses independent of any influence from the evaluation team. The team sought to go beyond "do no harm" to maximise benefits for both the review and the interviewees. In relation to the latter, the team respected stakeholders' rights and acted with honesty, competence and accountability, so as to best deliver work with integrity and merit. Where stakeholders asked for feedback on our findings regarding their programme this was carried out verbally, as was the case for the PM implementation partners. The team remained open to queries and comments from stakeholders throughout.

The review team triangulated findings between documents, and between documents and interviews, and cross-checked any findings that appeared to be contradictory. As far as was possible, the methodology allowed for an appropriate exploration of Paris Declaration principles within the context of the TORs. Given that the review involved a desk-based and light-tough review of publicly available data, the most relevant principles were ownership and mutual accountability. In terms of ownership, when requested, the team shared review findings verbally with either the programme SROs or IPs. Q&A sessions during the

[127] IOD PARC (2019) DFID ethical guidance for research, evaluation and monitoring activities.

reporting and dissemination phase of the review also allowed for sharing and validation of findings, further enhancing ownership. Mutual accountability is more relevant at FCDO level, but the team sought to ensure sufficient robustness of findings and recommendations included in the report. It is hoped that, given the timing of this review, it may address declaration principles of alignment and harmonisation in relation to other related reviews and the forthcoming COP26.

As far as was feasible from the documents reviewed and interviews, the team sought to understand outcomes and impacts for different stakeholder groups. In terms of cross-cutting issues, the EQS included a focus on gender and poverty (in relation to target groups) and the environment (due to the focus on CSA). Given the breadth of the portfolio review, it was not possible to consider other cross-cutting issues such as HIV/AIDS, anti-corruption and power relations.

The team developed a findings matrix in excel which included, for each programme, each EQ and each sub-question under each EQ. For each sub-question there were three columns, one for document review findings, one for interview findings and one for the overall findings i.e. bringing together document review and interview findings. For each EQ there was also a column for other findings and then a final column summing up the findings for each EQ. Collating findings in this format (including providing references to documents and interviewees) allowed for later synthesis and findings across each EQ, including each EQ sub question, across all the programmes and projects therein.

In order to assess the strength of evidence for evaluation findings, the team graded all documentary evidence according to its independence, per the evaluation ToR. This assessment is provided in Appendix 7. The team combined this assessment with other strength of evidence dimensions including quality of the evidence, triangulation or commonality within and across the programmes, the consistency of the evidence, and the context of the evidence to determine confidence in evaluation findings. Unless otherwise stated, all findings presented in this report are supported by either (a) a small sample of highly credible evidence sources (i.e. independent verification or evaluation reports) or (b) a wider sample of less credible or independent evidence (i.e. common trends in multiple programmes' annual reviews). Where the evidence available remained subject to interpretation or led to a difference of opinion, this has been acknowledged in the report and both interpretations or opinions have been presented for consideration.

Two opportunities were built into the review process for relevant FCDO staff to comment on the draft findings and recommendations. First, an internal brief was provided by the review team in late July 2021 followed by a presentation and Q&A session. Second, in mid-August, the draft report was shared followed by a Q&A session and opportunity to provide comments in writing. In terms of reaching the wider target audience, the team presented final findings to FCDO/xHMG and external partners in a workshop towards the end of the assignment and, further, provided FCDO with a slide deck to use when disseminating the findings further.

There were several steps in place to ensure robust quality assurance. First NIRAS-LTS conducted internal QA of every deliverable, which the team acted on accordingly. The internal QA included a first stage review by the project manager focused on language, formatting and technical content, and a second stage review by the contract director

focusing on compliance and overall quality. Second, the inception reports (scoping report and evaluation protocol), internal brief, draft report, final report and policy summary were reviewed by the evaluation reference group with feedback provided to the team for their consideration in further refining each deliverable. Finally, the inception reports and final report are subject to EQUALS independent review, to which the team has responded to/will respond to (in the case of the inception reports and final report respectively).

The evaluation team confirms they were able to operate independently and free from influence in conducting this review. The team also confirms there were no direct conflicts of interest, but acknowledges that NIRAS-LTS provides monitoring and evaluation services to several of the programmes included in the review.

Appendix 3: Use and Influence Plan

Engagement with stakeholders is an important component of this assignment and will take place in the second analysis and synthesis. This assignment has three key outputs for use and influence:

1. This final evaluation report, including the executive summary;
2. A policy brief summarising key findings relevant for future programming; and
3. Presentation slides on the key findings and recommendations for use by FCDO.

Each of these deliverables is designed to be used for communication with different stakeholders and in different forums. The following table summarises the use and influence plan for these outputs, to be refined in discussion with FCDO.

Output	Primary Audience	Primary use	Dissemination pathway
Final evaluation report	• FCDO evaluation team • FCDO Reference Group • FCDO SROs • FCDO agriculture/climate policy and programming teams	• Provide in-depth, contextualised findings and recommendations based on review. • Present full analysis and evidence base supporting findings and recommendations	• Report including executive summary is expected to be published by FCDO. • Link to the published report will be shared by NIRAS-LTS through a project completion blog article.
Policy summary brief	• FCDO policy and programming teams • Cross HMG policy and programming teams	• Share distilled key findings and recommendations for use in policy/programming decisions more broadly.	• Shared internally by FCDO evaluation team with relevant cross HMG teams.
Presentation slides	• Cross HMG audiences • Wider stakeholders including implementation partners or practitioners.	• Disseminate findings to a wider audience to share lessons learned by FCDO for sector level information.	• NIRAS-LTS to prepare and share slides with FCDO • FCDO to share via engagement platforms (seminar, webinar, etc.)

In terms of stakeholders anticipated for engagement and which outputs they are expected to receive, the following three-point scale has been applied (with “1” as highest priority, and “3” as lowest priority while still receiving the output).

Stakeholder	Final Evaluation Report	Policy Summary Brief	Presentation Slides
FCDO evaluation team	1	1	1
FCDO Reference Group	1	1	1
FCDO SROs for the programmes included in the review	1	1	1
FCDO climate and agriculture policy or programming teams	2	1	1
Relevant policy and programming teams in other HMG departments including BEIS and DEFRA	2	1	1
Implementation teams for the programmes included in the review	1	2	2
Implementation teams for other HMG CSA programmes where findings/lessons may inform course correction	3	2	2
External or third party groups (knowledge managers, evaluation teams, etc.) supporting HMG CSA programmes	2	2	2
CSA practitioners	3	3	3
Academics	3	3	3
CSA/NbS advocacy groups	3	3	3

Appendix 4: Definitions Used by the Review Team

Climate Smart Agriculture - an approach that helps guide actions needed to transform and reorient agricultural systems to effectively support development and ensure food security in a changing climate. CSA aims to tackle three main objectives: sustainably increasing agricultural productivity and incomes; adapting and building resilience to climate change; and reducing and/or removing greenhouse gas emissions, where possible[128]. In this evaluation it is considered that CSA is an approach rather than a specific technology or practice; that it can be applied at a field, farm and landscape level; that it can involve field crops, grazing areas, tree crops and areas managed for natural products, biodiversity and ecosystem services. CSA approaches include both technologies (inputs. tools etc.) and practices. Appendix 4 provides a typology of CSA approaches.

Three Pillars of CSA[129]:

- **Productivity**: CSA aims to sustainably intensify and increase agricultural productivity and incomes from crops, livestock and fish, without having a negative impact on the environment.
- **Adaptation**: CSA aims to reduce the exposure of farmers to short-term risks, while also strengthening their resilience by building their capacity to adapt and prosper in the face of shocks and longer-term stresses.
- **Mitigation**: CSA should help reduce and/or remove greenhouse gas (GHG) emissions.

Whilst we define CSA as an approach above, the review also refers to both CSA technologies (as per some of the EQs in the TORs) and CSA interventions. For clarity, what is meant by each is outlined below:

CSA intervention –The planned action of a project or programme to introduce, promote or encourage one or more CSA technology/practice so as to increase resilience of vulnerable groups to climate variability and shocks. The CSA intervention may be the main action of a project or part of a wider suite of interventions.

CSA technology or practice – specific application of knowledge to achieve climate smart goals – e.g. reduced tillage, mulching, drought resistant variety. (A technology is more likely to involve scientific knowledge and a practice indigenous). CSA normally involves a number of different and evolving CSA technologies/practices as noted in Appendix 4.

Climate Resilience - the ability to anticipate, prepare for, respond to and recover from hazardous events, trends, or disturbances related to climate.

Climatic shocks – an unpredictable event of sufficient scale to cause significant welfare losses[130]. These are events like drought, flood, storm, extreme-heat, glacial collapse or pest/disease disaster made more severe or more frequent by climate change.

[128] FAO http://www.fao.org/climate-smart-agriculture/en/ accessed 17/03/2021
[129] https://csa.guide/csa/what-is-climate-smart-agriculture
[130] Adapted from UNDP http://hdr.undp.org/en/content/climate-shocks-and-their-impact-assets

Climate variability and change – changes in current and future climate and weather patterns like rainfall distribution, intensity, temperatures and climate induced changes like pest and disease incidence. These may have positive or negative outcomes for agriculture.

Climate vulnerability - the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes[131]. Vulnerability can also be disaggregated to describe elements within the system such as gender, farmer types, cropping types, communities, value chains etc.

Landscape – a loosely defined area of land that can include different communities, watersheds, ecosystems, land ownership and management types. In this evaluation it refers to the wider area affected by a suite of community wide CSA approaches and parts may lie beyond the original area of intervention.

Climate adaptation - adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts. It refers to changes in processes, practices, and structures to moderate potential damages or to benefit from opportunities associated with climate change[132].

Nature Based Solutions – an approach to solving social and ecological challenges that focuses on working with nature to provide both human wellbeing and biodiversity benefits[133]. In relation to field crops this may include the use of fallows, rotation, nitrogen fixing plants, intercropping, plant and animal residues and mulches to maintain soil health; resistant varieties, biological control and integrated pest and disease management to maintain crop health. Grazing systems may be designed to mimic the actions of natural herbivores (e.g. mob grazing). Tree crops may be managed in mixed species, mixed age forest gardens. Watersheds may be protected by natural regeneration with biodiversity and diverse ecosystem service co-benefits. Flood protection may be provided by vegetation and natural flood management along rivers and mangroves along coastlines rather than engineered structures. At a mitigation level, NBS often refers to the use of vegetation and tillage practices to sequester carbon, with soil carbon and peatlands being particularly important.

Target groups – The TORs and EQs require that the team look at the effectiveness and impact of CSA on different target groups. The team understand target groups to, in effect, refer to Gender and Social Inclusion and/or Intersectionality (see below). Most of the EQs contain areas to consider in relation to target groups (sometimes referred to as different groups). The team will be looking at impact on different poverty groups, on men and women (in male and female headed households), on youth, and on other factors as listed under our understanding of Intersectionality. The extent to which the team will be able to learn about these will depend on the extent to which these variables were monitored by the programmes and to what insights we can gain from programme documents and interviews, particularly with the programme implementation agencies.

Intersectionality – Intersectionality is a perspective that acknowledges the concrete experiences of inequality that result from the interaction of gender with other social markers of difference. These markers include but are not limited to age, race, class, caste, religion, ability, sexual orientation, gender identity and expression, and sex characteristics.

[131] IPCC https://www.ipcc.ch/assessment-report/ar3/
[132] UNFCCC https://unfccc.int/topics/adaptation-and-resilience/the-big-picture/what-do-adaptation-to-climate-change-and-climate-resilience-mean
[133] Adapted from https://www.iucn.org/theme/nature-based-solutions/about

When these markers interact with gender, compounded forms of discrimination emerge that amplify people's individual constraints and opportunities. Rather than defining men and women as homogenous groups, an intersectional approach acknowledges and works to understand the differences within and among groups of men and women and how these differences create unequal opportunities and access to resources.

Appendix 5: Evaluation Framework

Evaluation Question (EQ)	Areas to consider	Data sources	Data collection and analysis methods	Evaluability
Relevance				
EQ1. How has each programme defined resilience in their ToC?	Is there a system for measuring resilience? Is CSA in any form referred to in relation to resilience? Over what time frames were resilience changes expected?	• Documentation (business cases, annual reviews, any M&E data available) • Interviewees (SRO and/or implementation agency respondents that were involved in the design stage of the programme)	Data collection: Whilst relevant sources are available they may not discuss resilience or CSA specifically, in which case the team will draw on interviewees. Analysis will involve review of the ToC/sub-ToC and logframe if useful, in relation to CSA – whether through productivity adaptation or mitigation or a mix of these. Design logic of programmes will be tested against the evaluation ToC	Variable depending on whether programme documents define resilience and refer to CSA.
EQ2. Were the CSA interventions relevant and appropriate to farmers' sustainable productivity, adaptation and mitigation outcomes and in what contexts?	Were sustainable productivity, adaptation and mitigation defined and measured? Which CSA technologies were most effective, why and for which target groups? In which ways did various aspects of the (PESTLE) context constitute an enabling environment for CSA? Which were disabling?	• Documentation (annual reviews, PCRs, evaluations, other programme documents) • Further data/documentation regarding the programme context and any climate shocks experienced during the programme lifetime	Data collection: the team will search for detailed programme documentation to gain sufficient information on CSA measures. The team will search more widely for context information where not available in programme documentation. Disaggregated data (by target group, gender) will be sought. Analysis will assess the relevance and appropriateness of the CSA interventions (drawing on the available material and the ToC developed for the review).	Most programmes should have information on at least some of the three outcomes, relating these to the enabling context may be more challenging.

Evaluation Question (EQ)	Areas to consider	Data sources	Data collection and analysis methods	Evaluability
Effectiveness				
EQ3. Which promoted CSA technologies were not adopted, temporarily adopted or continue to be adopted and why?	What were the enabling factors, and those influencing disadoption including contextual (PESTLE) factors and mechanisms? Are there lessons on whether particular types of technology, including nature-based solutions, are better suited in different geographical contexts and agro-ecological zones? Were there differences in adoption between different target groups and why?	• Documentation: Likely sources are recent ARs, PCRs and evaluations. Where documents are not presently available or lack information on CSA, more granular information will be sought. • Interviewees – particularly those who designed, implemented and/or monitored CSA interventions	Data collection to extend to programme websites and requests to implementation agencies for relevant documents. Analysis will involve identifying the types of CSA interventions implemented and exploring adoption/disadoption either through the documents and/or through interviews. The team may draw on realist evaluation principles in exploring this and EQ4 (questions related to effectiveness) in combination with assessing the interventions against the ToC developed for the review and in particular the assumptions between output and outcome levels.	Evaluability is dependent on the extent to which CSA adoption is covered in programme documents. Evidence relating adoption to the enabling context may be more challenging.
EQ4. Which CSA delivery models were most effective/least effective in improving farmers' productivity, adaptation and mitigation outcomes, in what contexts and why?	Which delivery models are effective and why? For whom are these effective and why? In which geographies/AEZs were different delivery models most/least effective and why? What are the enabling and disabling factors and why?	• Programme documents including where accessible annual reports from programme implementation agencies and any studies that look into this area. • Interviews particularly with the IP's where possible.	Data collection: the team will collect further information as indicated under sources. Data analysis: The team will triangulate findings from documents and interviews and examine them in relation to the ToC developed for this evaluation. Where the team has access to IP's they team may develop one or two simple context-mechanism-outcome statements to inform exploration of this question with the IP.	Evidence availability will be variable across programmes. However, there are likely to be experience and opinions on what is working to deliver sustainable productivity, adaptation and mitigation. These can be triangulated but need to be presented with appropriate caveats on evidence quality.

Evaluation Question (EQ)	Areas to consider	Data sources	Data collection and analysis methods	Evaluability
Impact				
EQ5. What is the evidence that CSA technologies have contributed to significant positive or negative, intended or unintended, changes in farmers resilience to climate variability and change?	Highlight evidence found on this that is relevant to NbS. Explore whether they have been differences in outcomes and impact for women and other disadvantaged groups. Are there any other negative outcomes/risks from the use of CSA technologies? Can these be broken down by geography and by target groups? If the programme experienced climate shocks during its lifetime, did the application of CSA technologies protect SHFs from these shocks and how?	• Programme documents and interviews • Meteorological and agro-ecological data to determine if and how climate variability have impacted on farmers • Information on climate shocks that occurred in the programme location/s during the programme lifetime	Data collection: Access information on agro-ecological zones of the programme and the success of otherwise of the interventions. Analysis: Match the evidence of climate variability against the performance of smallholder farmers disaggregated by gender and vulnerability. Test findings against the outcome-impact hypotheses in the relevant evaluation ToC.	Evaluability will depend on whether data is sufficient to establish a causal link between the CSA practice of different vulnerable groups and their responsiveness to climate variability Resilience is difficult to measure (even after an observed shock) and not many programmes seem to have recorded specific shocks. However, there is likely to be experience and opinions on what is working, for whom, in what context and why (or why not). These can be triangulated but need to be presented with appropriate caveats on evidence quality.

Evaluation Question (EQ)	Areas to consider	Data sources	Data collection and analysis methods	Evaluability
EQ6. To what extent has the adoption of climate smart technologies generated other environmental benefits, e.g. improvements in downstream water quality, better on- and off-farm biodiversity conservation, or reduced GHG emissions/ sequestration?	Explore the secondary consequences of climate smart technologies, especially NbS, and whether these have been beneficial or detrimental. Explore how and why, and which groups benefited and those that suffered.	• These secondary affects are most likely to be found in interviews with those with those familiar with the CSA intervention. • During interviews, explore recommended documents to find good evidence of benefits or costs.	Data collection: interview and recommended documentation Analysis: Link the type of CSA to the downstream affects. Define which groups were affected and whether they benefited or not.	Other environmental benefits are not often documented if they fall outside the purview of the business case and logframe, but where they are recorded, or can be elicited in questions, there may be some examples with useful learning.
EQ7. What have been the trade-offs made between short-term productivity, farmers' own longer-term resilience, as well as environmental and biodiversity co-benefits?	Have there been differences in trade-offs made when nature-based solutions are used compared to other types of CSA technology? Have there been trade-offs between different groups involved in landscape scale approaches? What lessons are there from addressing potential conflicts over trade-offs?	• Annual and evaluation reports between initial and final stages of the project. • Supplementary reports and interviews.	Data collection: access data on productivity, resilience, and environmental and biodiversity benefits. Analysis: Establish the relationship between productivity and resilience-cum-environmental benefits	There is unlikely to be systematic evidence of trade-offs across many of the programmes. However, where they can be found they are likely to provide some helpful learning for future programming.

Evaluation Question (EQ)	Areas to consider	Data sources	Data collection and analysis methods	Evaluability
Sustainability				
EQ8: What evidence is available to show that farmers will continue to use, adapt and benefit from CSA technologies after the intervention ends?	Is there evidence that the CSA and NbS changes will continue to be relevant in the likely future climate? Is there evidence that an enabling environment is in place to continue to support and adapt the CSA after the programme ends? Is there any post-project evidence of CSA use and benefit? By whom?	• Sustainability usually requires project completion evaluations to be able to assess. • Secondary literature can provide circumstantial evidence of continued CSA use.	Data collection: Proxy data on farm and landscape level, such as production or water flow data. Analysis: Extrapolate from data whether the CSA technologies have continued to be used and if farmer still benefit.	There may be some evidence on whether institutional capacity has been put in place to create a continuing enabling environment. Overall evidence is likely to be meagre, but worth looking for nevertheless.

Appendix 6: Theories of Change

This Appendix provides the three theories of change (ToCs) developed for the evaluation. The ToCs are:

1. The overall ToC exploring how the identification and design of appropriate interventions to address increased farmer vulnerability to climate shocks can lead to the development of CSA interventions, resulting in farmer resilience at an impact level.

2. The field/farm level ToC which explores how CSA interventions at a farmer level, such as training and extension services, can trigger a behavioural shift towards CSA practices among farmers, reducing vulnerability at an impact level.

3. The landscape level ToC which explores how higher level engagement with key actors, such as national governments, and market strengthening activities, such as subsidies, can create the necessary conditions for the adoption of CSA and reduce farmer vulnerability at an impact level.

Figure 1 Overall ToC for the evaluation

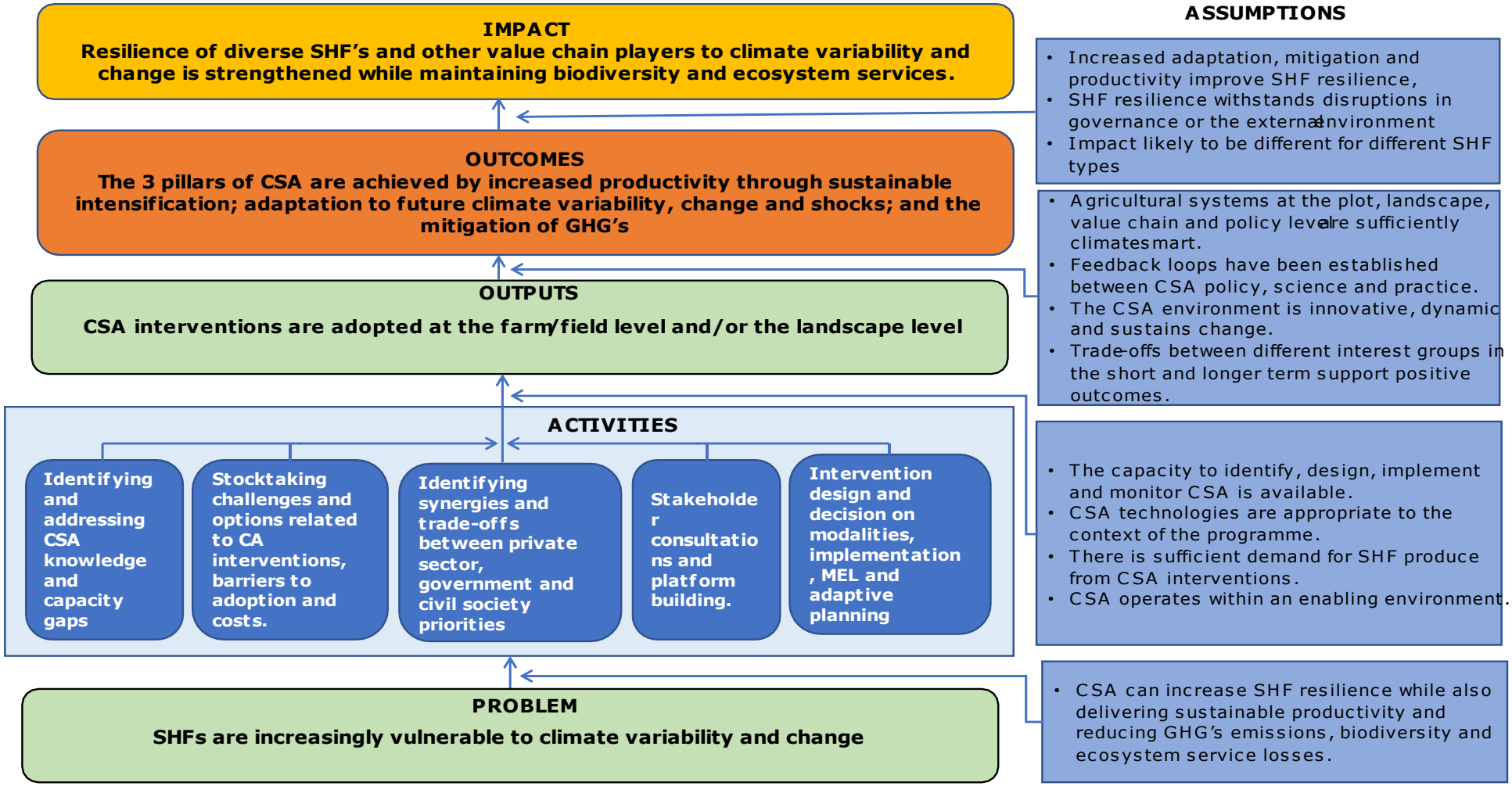


Figure 2 Field/farm level CSA ToC

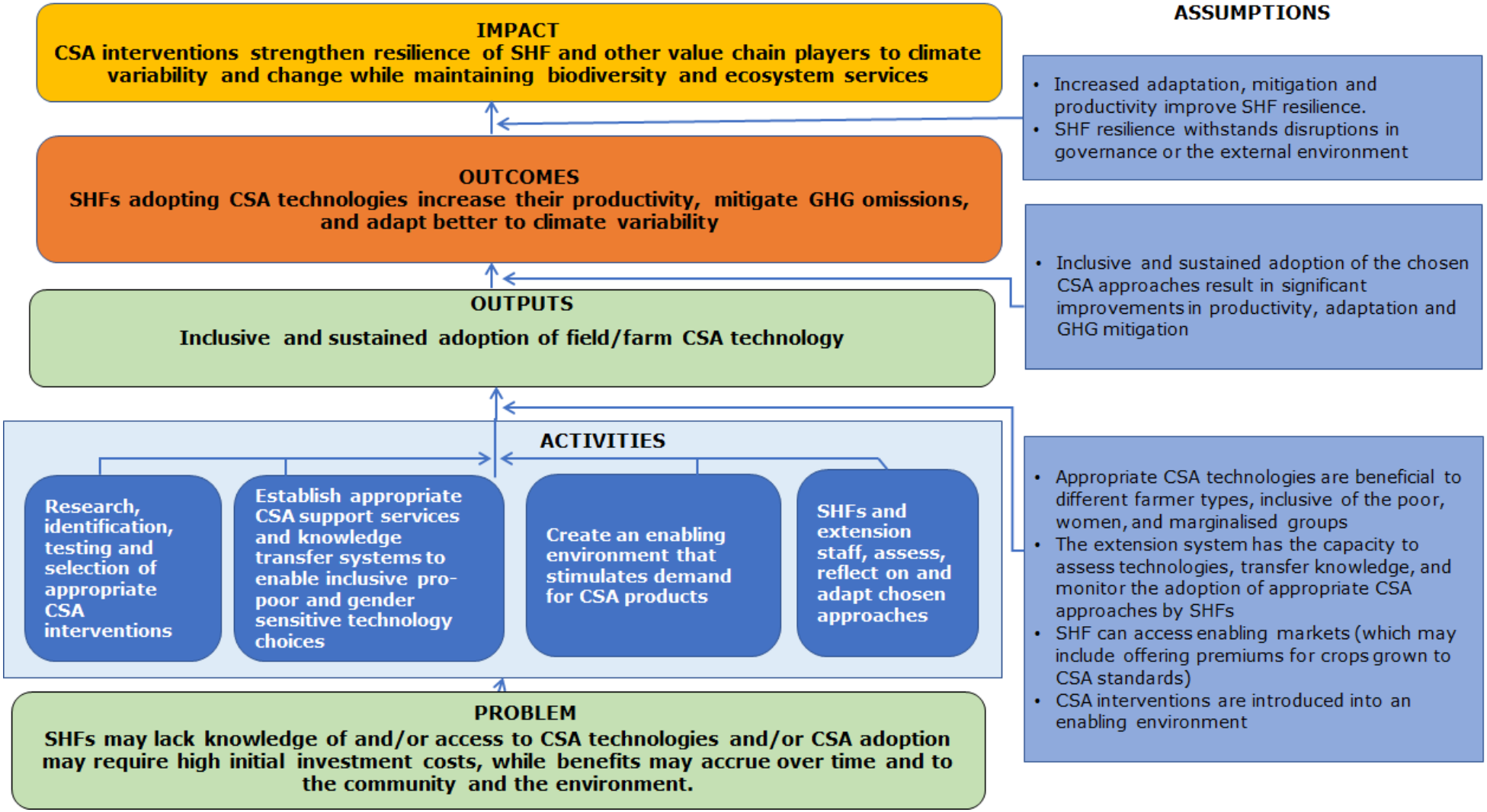
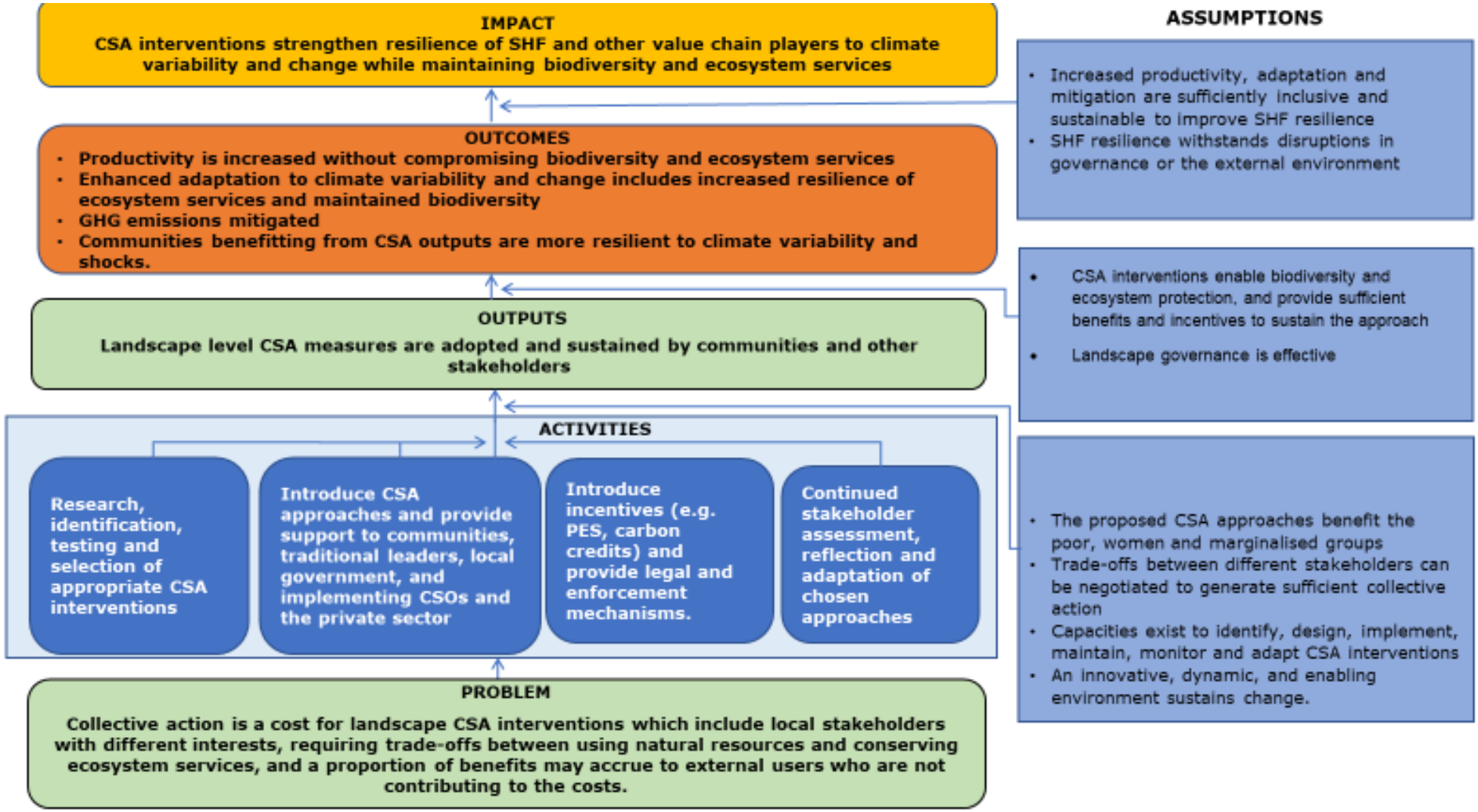


Figure 3 Landscape level CSA ToC



Appendix 7: Literature Reviewed

Independence of Literature

All literature and materials reviewed for this evaluation have been scored based on their level of independence, per the ToR. The team have used two categories for independence:

- No asterisk = not independent or low independence;
- One asterisk (*) = medium to high independence.

The team initially looked to include a third category for medium independence but found this category only covered a small number of documents which sat on the fringe of no independence or high independence. As such, the two categories were broadened slightly to simplify the classification process.

Under no asterisk, for not independent or low independence, the team have assigned the following document types:

- FCDO Business Cases, log frames, Annual Reviews and Project Completion Reports, including those prepared by external consultants on the understanding that the external consultants do not provide any additional results or data verification;
- Programme annual reports and other publications from their website or which they have produced based on internal data only;
- Outputs produced by knowledge managers or dissemination teams for the programmes (i.e. publicity materials); and
- Poor quality studies carried out for programmes which use only internal programme data and which do not seek to analyse or verify the results.

Document types assigned one asterisk, for medium to high independence, include:

- Independent evaluations and reviews, both those which are descriptive and those which are evaluative provided they undertake some degree of data verification or contextualisation;
- Journal and academic articles; and
- Other peer reviewed studies such as those presented by CCAFS on CC mitigation.

Where documents have been reviewed that fall under the second category, but where they didn’t contain material relevant to this evaluation, this has been explicitly noted in brackets.

Literature Reviewed by Programme

ASAP

FCDO – Annual Reviews 2015-20, Business Case 2015, Logical Framework 2020*

IFAD (undated-a) - Adaptation to Climate Change in the Mekong Delta in Ben Tre and Tra Vinh Provinces (AMD), Vietnam. Project completion report.*

IFAD (undated-b) - Compendium of Nema-Chosso Innovations and Lessons Learned (NEMA), Gambia*

IFAD (undated-c) - Adaptation for Smallholder Agriculture Programme

IFAD (undated internal document) – Nature based solutions in IFAD

IFAD 2019a – Climate Action Report

IFAD 2019b - Butana Integrated Rural Development Project (BIRDP Sudan) Project Completion Report

IFAD 2020a - National Agricultural Land and Water Management Development Project (NEMA) Project Completion Report Gambia (The)

ITAD 2020b - Mid-term review of IFAD's Adaptation for Smallholder Agriculture Programme*

IFAD 2020c - Report on IFAD's Development Effectiveness 2020 (RIDE)

IFAD 2020d - Pro-Poor Value Chain Development in the Maputo and Limpopo Corridors

IFAD 2021 - COSOP completion review, Republic of Uganda, 2013-2020

IFAD (Meryl Richards, Aslihan Arslan, Romina Cavatassi, Todd Rosenstock) 2019 - Climate change mitigation potential of agricultural practices supported by IFAD investments - An ex ante analysis*

ODI 2015 - Adaptation for Smallholder Agriculture Programme (ASAP) - Progress Review*

Radcliffe D. 2021 - lesson learning and enhancing the use of knowledge from the ASAP - Phase 4. Annual report 2020 – 2021, FCDO*

BRACED

Annual Review (2018)

Business Case (2013) Building Resilience and Adaptation to Climate Extremes and Disasters Programme (BRACED) DFID Climate and Environment Department

Bahadur, A., Peters, K., Wilkinson, E., Pichon, F., Gray, K. and Tanner, T. (2015) The 3As: Tracking resilience across BRACED. Working Paper; BRACED Knowledge Manager*

Business Case (Addendum)

Faulkner, L and Silva Villanueva, P (2019) Routes to Resilience: Insights from BRACED to BRACED-X, Synthesis Paper, September*

Faulkner, L and Sword-Daniels, V (2020) Improving resilience measurement: Learning to adapt. Practice Paper 01, Itad (with Chris Barnett and Emmeline Henderson) *

HMG Climate Change Compass (2019) Number of people whose resilience has been improved as a result of ICF: KPI 4 Methodology Note, September

Leavy J, Sladkova B, Hepworth C, and Punton M (2019) Resilience Results: Braced Final Evaluation, Synthesis Paper, September *

Project Completion Review (December 2019)

CGIAR 2017-2021 (CCAF'S work on CSA)

Aggarwal, P. K., A. Jarvis, B. M. Campbell, R. B. Zougmoré, A. Khatri-Chhetri, S. J. Vermeulen, A. Loboguerrero, L. S. Sebastian, J. Kinyangi, O. Bonilla-Findji, M. Radeny, J. Recha, D. Martinez-Baron, J. Ramirez-Villegas, S. Huyer, P. Thornton, E. Wollenberg, J. Hansen, P. Alvarez-Toro, A. Aguilar-Ariza, D. Arango-Londoño, V. Patiño-Bravo, O. Rivera, M. Ouedraogo and B. Tan Yen. 2018. The climate-smart village approach: framework of an integrative strategy for scaling up adaptation options in agriculture.* *Ecology and Society* 23(1):14. https://doi.org/10.5751/ES-09844-230114

CCAFS/World Bank 2018 - Bringing the Concept of Climate-Smart Agriculture to Life - Insights from CSA Country Profiles across Africa, Asia, and Latin America

CCAFS 2012 - Helping smallholder farmers mitigate climate change. Eva Wollenberg, Sophie Higman, Christina Seeberg-Elverfeldt, Constance Neely, Marja-Liisa Tapio-Biström, Henry Neufeld. Policy Brief 5.

CCAFS 2013 Climate smart villages. A community approach to sustainable agriculture development.

CCAFS 2018. Integrating Gender into the Climate-Smart Village Approach of Scaling out Adaptation Options in Agriculture. Nitya Chanana, Arun Khatri-Chhetri, Kunal Pande and Rajashree Joshi. Info Note. July 2018.

CCAFS 2019a - Increasing Adaptive Capacity of Farmers to Climate Change thru Climate Smart Villages in India - Borlaug Institute for South Asia (BISA), CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), CIMMYT, New Delhi, India 2019 - Final Report ITC-CCAFS Climate Smart Village Project Implementation, Impact and Way forward.

CCAFS 2019b 8 guide steps for setting up a CSV

CCAFS Info Note 2020 - How are smallholder households coping with and adapting to climate-related shocks in Doyogena climate-smart landscapes, Ethiopia?

CCAFS 2021 - Prioritizing value chains for climate-smart agriculture (CSA) promotion in Mali, Niger and Senegal

CCAFS 2021 - Implementation Manual: CCAFS Climate-Smart Monitoring Framework - Tackling uptake of CSA options and perceived outcomes at household and farm level

CCAFS 2021 - Meeting climate-smart agriculture goals with agroforestry

CCAFS website (Accessed July 2021) - Developing climate-smart agricultural practices in South Asia. https://ccafs.cgiar.org/index.php/research/projects/developing-climate-smart-agricultural-practices-south-asia

CGIAR (undated) - DESIGN AND ADAPTATION OF THE CSA CALCULATOR

CGIAR 2016 - CGIAR Research Program on: Climate Change, Agriculture and Food Security. Full Proposal 2017-2022

CGIAR 2020 – nomination of CSV as one of CGIAR's 50 greatest innovations

CIMMYT 2020 - A Compendium of Key Climate Smart Agriculture Practices in Intensive Cereal Based Systems of South Asia*

Ciniro Costa Jr., Kyle Dittmer, Gabriel de Oliveira Quintana, Sadie Shelton, Eva Wollenberg. CGIAR 2020 - Climate change impacts of the UK Foreign, Commonwealth & Development Office (FCDO) commercial agriculture portfolio. Working Paper No. 331*

FCDO – Annual Review 2018,2019,2020, Logical Framework 2018, Business Case 2018 addendum 2019

Nelson V. and Morton J 2020 - CGIAR Research Program 2020 Reviews: Climate Change, Agriculture and Food Security (CCAFS)*

Snapp S, Kebede Y, Wollenberg E, Dittmer KM, Brickman S, Egler C, Shelton S. 2021. Agroecology and climate change rapid evidence review: Performance of agroecological approaches in low- and middle- income countries. Wageningen, the Netherlands: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)*

CSAP/VUNA

Business Case (2011) Climate Smart: Scaling up Climate Smart Agriculture in Eastern and Southern Africa, DFID, Final, November

Design Report (September 2015) Climate Smart Agriculture Programme [Executive Summary]

Genesis Analytics (2018) Climate Smart Agriculture in East and Southern Africa: Synthesis from Vuna Agribusiness Innovation Models: Pretoria *

Incorporating:

* Building Climate Resilience for Dairy Farmers, through Climate Smart Solutions: Insights from the Malawi Smallholder Dairy Sector*

* Integrating Climate Smart Agriculture in Pigeon Pea Production: Insights from Export Trading Group in Mozambique; *

* Integrating Climate Smart Agriculture Capacity Development in Outgrower Schemes: Insights from Musoma Food Company Ltd and G2L Ltd in Tanzania**;** *

* Integrating Climate Smart Agriculture into E-Voucher Farmer Input Subsidy Programme: Insights from Zambia; ***** and,

* Building Inclusive Seed Systems for Semi-Arid Areas: Insights from Zimbabwe Super Seeds *****

Genesis Analytics (2018) Private Sector Driven Extension Models for Smallholder Farmers: Insights from Vuna Innovation Models in East and Southern Africa *****

Genesis Analytics (2018) CSA Capacity Development in Outgrower Schemes: Insights from Musoma Food Company Ltd and G2L Ltd in Tanzania. Vuna Research Report. Pretoria: Vuna. *****

Project Completion Review (April 2018)

CSAZ

Annual Review (June 2020)

Business Case (July 2016)

LTS Midline Evaluation Report (2019): Climate Smart Agriculture Zambia Impact Evaluation, December*

LTS Synthesis Report (2020) Synthesis of recent evidence from CSAZIE, March*

LFSP

Coffey (2018) LFSP Midline Evaluation Report. Final Report*

FCDO Business case 2013-2017, Business case costed extension

Logframes (2016, 2017, AMD, MD and 2014-2021 updated 2021), Annual reviews (7: 2014-2020)

LFSP Farmer Field Schools capacitating communities to sustainably manage Fall Armyworm

LFSP Factsheet. Empowering smallholder livestock farmers through local feed formulation: The LFSP experience

LFSP 2014 LFSP-APN overall strategy

LFSP 2019 Rapid Rural Appraisal Study on Quick Win Practices to Enhance Productivity. (November 2019)

LFSP Pfumvudza Performance Results for 2019/20 Season

LFSP 2021a Summary of Climate Smart Agriculture Interventions supported by LFSP

LFSP 2021b Zimbabwe Livelihoods and Food Security Programme (LFSP)1 - Innovations on Low Input and Sustainable Agriculture (LISA) (Pfumvudza consolidated report)

MADE

FCDO – Business Case 2013, Logframe 2014, Annual reviews (7, from 2013-2020), Project Completion Report 2020

FCDO Ghana (2014) Appendix 7 – Climate Change and Environment Strategy. Submitted revised version with comments. (This is a draft appendix to the Business Case)

MADE (undated) Farm Enterprise Advisory Services Business Case. The case for FEA service delivery to commercialise agriculture in Northern Ghana

MADE (undated) Gender-Sensitive Business Case. The Case for Private Sector Actors in Northern Ghana

MADE Annual reports (redacted) (5: 2015-2019)

MADE 2019 Gender assessment report June 2019 (Redacted)

MADE 2020 Sustainable Intensification in Northern Ghana. Case for conservation farming. January 2020 (authored by the Conservation Farming Unit, Zambia)

MADE 2020 Mechanisation and climate smart agricultural practice model farms – field day demonstrations report, May 2020 (Redacted)

upperquartile 2014 PO6322 - Market Development in the North of Ghana Independent Evaluation. Inception Report. November 2014I* (but not relevant to the CSA review)

upperquartile 2016 PO 6322 Market Development in the North of Ghana Independent Evaluation – Wave 1 Evaluation Report* (but not relevant to the CSA review)

Other

CABI 2021. FCDO's Commercial Agriculture Portfolio Review 2020

Climate Change compass and HM government, 2020. Hectares of land that have received sustainable land management practices as a result of ICF, KPI 17 Methodology Note. June 2020

FAO The State of Food and Agriculture (SOFA) 2014 Innovation in Family Farming

FAO, IFAD, UNICEF, WFP and WHO. 2021. The State of Food Security and Nutrition in the World 2021. Transforming food systems for food security, improved nutrition and affordable healthy diets for all. Rome, FAO. https://doi.org/10.4060/cb4474en (Chapter 4)

FCDO, 2021, Beneficiary Engagement

FCDO, 2016, Measuring Resilience

FCDO, 2016, What is Resilience?

Fuglie, Keith, Madhur Gautam, Aparajita Goyal, and William F. Maloney. 2020. Harvesting Prosperity: Technology and Productivity Growth in Agriculture. Washington, DC: World Bank. doi:10.1596/978-1-4648-1393-1.

Steiner A, Aguilar G, Bomba K, Bonilla JP, Campbell A, Echeverria R, Gandhi R, Hedegaard C, Holdorf D, Ishii N, Quinn K, Ruter B, Sunga I, Sukhdev P, Verghese S, Voegele J, Winters P, Campbell B, Dinesh D, Huyer S, Jarvis A, Loboguerrero Rodriguez AM, Millan A, Thornton P, Wollenberg L, Zebiak S. 2020. Actions to transform food systems under climate change. Wageningen, The Netherlands: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).*

UN Convention to Combat Desertification/Government of Ireland (undated) - the great green wall implementation status and way ahead to 2030*

World Bank 2018 - Bringing the Concept of Climate-Smart Agriculture to Life. Insights from CSA Country Profiles across Africa, Asia, and Latin America.*

Partnership for Forests P4F

FCDO – Annual Reviews 2018-2020, Logframe, Business Case + extension business case.

P4F (undated) – Strengthening sustainable sourcing commitments: Early results on improving sustainability in the Brazilian Beef industry

P4F (undated) - Initiative for Sustainable Landscapes (Kenya), Baseline Survey Dec 2018, Plan (undated 2017?)

P4F 2021 - P4F evaluative case study: Cocoa cluster Ghana. Endline and overall assessment DRAFT report*

P4F 2021 - P4F evaluative case study: Palm oil in West Africa. Final Evaluation Report. Jan Willem Molenaar*

PM

FCDO Business case 2012, Business case Annex C: Climate and Environment Assessment, Logframe 2019-2021, Annual reviews (7: 2013 – 2019/2020)

IIED 201) Integrating a climate smart agriculture (CSA) approach into a pro-poor rural and agricultural market development supporting women's economic empowerment in northern Nigeria. Conceptual framework*

PM Annual Highlights: 2018-19

PM Lessons Learned, 2012–2017

PM Discussion Paper. Resilience as a continuum and a multi-faceted concept

upperquartile 2018 PO6311 Independent Evaluation for Promoting Pro-poor Opportunities in Commodities and Service Markets (Propcom) Mai-karfi Programme, Northern Nigeria, 2018 Final Evaluation Report October 2018* (but not relevant to the CSA review)

PoSA Rwanda

AgriTAF? (undated) - Mainstreaming: Early guidance and lessons from the MINAGRI pilot

AgriTAF 2017 - Climate Change Training Needs Assessment

FCDO – Annual Review 2015-2019, Logframe, Business Case 2016

FCDO 2021 – Project Completion Review

Government of Rwanda Ministry of Agriculture And Animal Resources 2018 - Strategic plan for agriculture Transformation 2018-24

World Bank 2014 - transformation of agriculture sector program phase 3 Program-for-results

World Bank 2019 - Implementation Completion And Results Report*

SAIRLA

FCDO Business case and intervention summary, Annual Reviews (5: 2015-2019), PCR 2020.

Articles arising from SAIRLA and published in a special edition of the International Journal of Agricultural Sustainability.

Adolph B et al 2020: Barbara Adolph , Mary Allen , Evans Beyuo , Daniel Banuoku , Sam Barrett , Tsuamba Bourgou , Ndapile Bwanausi , Francis Dakyaga , Emmanuel K. Derbile , Peter Gubbels , Batchéné Hié , Chancy Kachamba , Godwin Kumpong Naazie , Ebenezer Betiera Niber , Isaac Nyirengo , Samuel Faamuo Tampulu & Alex-Fabrice Zongo (2020): **Supporting smallholders' decision making: managing trade-offs and synergies for sustainable agricultural intensifi**cation, International Journal of Agricultural Sustainability, DOI: 10.1080/14735903.2020.1786947. ARTICLE 11. To link to this article: https://doi.org/10.1080/14735903.2020.1786947*

Fischer G et al 2020: Gundula Fischer , Akosua Darkwah , Judith Kamoto , Jessica Kampanje-Phiri, Philip Grabowski & Ida Djenontin (2020): **Sustainable agricultural intensification and gender-biased land tenure systems: an exploration and conceptualization of interactions**, International Journal of Agricultural Sustainability, DOI: 10.1080/14735903.2020.1791425. ARTICLE 5 To link to this article: https://doi.org/10.1080/14735903.2020.1791425*

Grabowski, P. et al 2020: Philip P. Grabowski , Ida Djenontin , Leo Zulu , Judith Kamoto , Jessica Kampanje-Phiri , Akosua Darkwah , Irene Egyir & Gundula Fischer (2020): **Gender- and youth-sensitive data collection tools to support decision making for inclusive sustainable agricultural intensification**, International Journal of Agricultural Sustainability, DOI: 10.1080/14735903.2020.1817656 ARTICLE 2

To link to this article: https://doi.org/10.1080/14735903.2020.1817656*

Haggar J et al 2020: Jeremy Haggar, Valerie Nelson, Richard Lamboll & Jonne Rodenburg (2020): **Understanding and informing decisions on Sustainable Agricultural Intensification in Sub-Saharan Africa**, International Journal of Agricultural Sustainability, DOI: 10.1080/14735903.2020.1818483. ARTICLE 17. To link to this article: https://doi.org/10.1080/14735903.2020.1818483*

Haggar J and Rodenburg J 2021: Jeremy Haggar & Jonne Rodenburg (2021**): Lessons on enabling African smallholder farmers, especially women and youth, to benefit from sustainable agricultural intensification**, International Journal of Agricultural Sustainability, DOI: 10.1080/14735903.2021.1898179. ARTICLE 8 To link to this article: https://doi.org/10.1080/14735903.2021.1898179*

Lamboll R et al 2021: Richard Lamboll, Valerie Nelson, Million Gebreyes, Daimon Kambewa,

Blessings Chinsinga, Naaminong Karbo, Audax Rukonge, Martin Sekeleti, Wesley Litaba

Wakun'uma, Tamene H. Gutema, Magreth Henjewele, Jessica Kampanje-Phiri, Patricia

Masikati-Hlanguyo, Wilhelmina Quaye, Solomon Duah, Mbarwa Kivuyo, Progress Nyanga,

Mavis Akuffobea Essilfie, Nana Yamoah Asafu-Adjaye, Victor Clottey & Adrienne Martin (2021): **Strengthening decision-making on sustainable agricultural intensification through multi-stakeholder social learning in sub-Saharan Africa**, International Journal of Agricultural Sustainability, DOI: 10.1080/14735903.2021.1913898. ARTICLE 10

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Lindsjö K et al (2020): Karin Lindsjö, Wapulumuka Mulwafu, Agnes Andersson Djurfeldt & Miriam Kalanda Joshua (2020**): Generational dynamics of agricultural intensification in Malawi: challenges for the youth and elderly smallholder farmers**, International Journal of Agricultural Sustainability, DOI: 10.1080/14735903.2020.1721237. ARTICLE 13. To link to this article: https://doi.org/10.1080/14735903.2020.1721237*

Masikati P et al 2021: Patricia Masikati, Givious Sisito, Floyd Chipatela, Howard Tembo & Leigh Ann Winowiecki (2021): **Agriculture extensification and associated socio-ecological trade-offs in smallholder farming systems of Zambia**, International Journal of Agricultural Sustainability, DOI: 10.1080/14735903.2021.1907108. ARTICLE 9 To link to this article: https://doi.org/10.1080/14735903.2021.1907108*

Morris, J et l 2020: Joanne Morris, Jonathan E. Ensor, Catherine Pfeifer, Robert Marchant,

Dawit W. Mulatu, Geofrey Soka, Salifou Ouédraogo-Koné, Mekonnen B. Wakeyo & Corrado Topi (2020): **Games as boundary objects: charting trade-offs in sustainable livestock transformation**, International Journal of Agricultural Sustainability, DOI: 10.1080/14735903.2020.1738769 ARTICLE 1

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Orr, A et al 2020: Alastair Orr, Zoltan Tiba, Jenny Congrave, Peter Porázik, Asmare Dejen

& Seid Hassen (2020): **Smallholder commercialization and climate change: a simulation game for teff in South Wollo, Ethiopia**, International Journal of Agricultural Sustainability, DOI: 10.1080/14735903.2020.1792735 ARTICLE 3

To link to this article: https://doi.org/10.1080/14735903.2020.1792735*

Ortiz-Crespo B et al 2020: Berta Ortiz-Crespo, Jonathan Steinke, Carlos F. Quirós, Jeske van de Gevel, Happy Daudi, Majuto Gaspar Mgimiloko & Jacob van Etten (2020): **User-centred design of a digital advisory service: enhancing public agricultural extension for sustainable intensification in Tanzania**, International Journal of Agricultural Sustainability, DOI: 10.1080/14735903.2020.1720474. ARTICLE 16 To link to this article: https://doi.org/10.1080/14735903.2020.1720474*

Pfeifer, C et al 2020: Catherine Pfeifer , Joanne Morris , Jonathan Ensor , Salifou Ouédraogo-Koné , Dawit W. Mulatu & Mekonnen Wakeyo (2020): **Designing sustainable pathways for the livestock sector: the example of Atsbi, Ethiopia and Bama, Burkina Faso**, International Journal of Agricultural Sustainability, DOI: 10.1080/14735903.2020.1824419. ARTICLE 7. To link to this article: https://doi.org/10.1080/14735903.2020.1824419*

Rodenburg et al 2020: Jonne Rodenburg , Lucie Büchi & Jeremy Haggar (2020): **Adoption by adaptation: moving from Conservation Agriculture to conservation practices**, International Journal of Agricultural Sustainability, DOI: 10.1080/14735903.2020.1785734. ARTICLE 14. To link to this article: https://doi.org/10.1080/14735903.2020.1785734*

Silvestri S et al 2020: Silvia Silvestri, Musebe Richard, Baars Edward, Ganatra Dharmesh

& Romney Dannie (2020): **Going digital in agriculture: how radio and SMS can scale-up smallholder participation in legume-based sustainable agricultural intensification practices and technologies in Tanzania**, International Journal of Agricultural Sustainability, DOI: 10.1080/14735903.2020.1750796. ARTICLE 6

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Steinke J et al 2020: Jonathan Steinke, Jacob van Etten, Anna Müller, Berta Ortiz-Crespo, Jeske van de Gevel, Silvia Silvestri & Jan Priebe (2020): **Tapping the full potential of the digital revolution for agricultural extension: an emerging innovation agenda**, International Journal of Agricultural Sustainability, DOI: 10.1080/14735903.2020.1738754. ARTICLE 12. To link to this article: https://doi.org/10.1080/14735903.2020.1738754*

Winowiecki L.A et al 2021: Leigh Ann Winowiecki, Mieke Bourne, Christine Magaju, Constance Neely, Boniface Massawe, Patricia Masikati, Tor-Gunnar Vågen, Faith Musili, Muhammad Nabi, Anthony Nguyo, Hadia Seid, Kiros Hadgu, Aikande Shoo, Howard Tembo, Floyd Chipatela, Sabrina Chesterman, Karl Hughes, Emmanuel Temu, Anthony Anderson Kimaro & Fergus Sinclair (2021): **Bringing evidence to bear for negotiating tradeoffs in sustainable agricultural intensification using a structured stakeholder engagement process**, International Journal of Agricultural Sustainability, DOI: 10.1080/14735903.2021.1897297. ARTICLE 15.

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Zulu L.C et al 2020: Leo C. Zulu, Ida N. S. Djenontin, Akosua Darkwah, Judith Kamoto, Jessica Kampanje-Phiri, Gundula Fischer, Philip Grabowski & Irene Egyir (2020): **Realizing Inclusive SAI: contextualizing indicators to better evaluate gender and intergenerational inequity in SAI processes and outcomes – cases from Southern and Western Afri**ca, International Journal of Agricultural Sustainability, DOI: 10.1080/14735903.2020.1737356 ARTICLE 4 To link to this article: https://doi.org/10.1080/14735903.2020.1737356*

SILTPR

FCDO – Annual Review 2018-2020, Business Case 2017, Addendum to Business Case 2018, Logical Framework 2020, Intervention Summary 2018.

Wood Foundation (undated) - Climate Risk Assessment (CRA) of The Wood Foundation Tea Out-grower Project in Rugabano: Summary*

ZRBF

Annual Review (November 2019)

Annual Review (September 2020)

Brief Strategy Repositioning Paper on how the programme will continue to adapt its supported interventions (2021)

Business Case (2015)

Resilient and Sustainable Agriculture (RSA) Plan (2021)

UNDP (2020), ZRBF Resilience Knowledge Hub: Langworthy, M., Fox, K., Martin, S., Woodson, L., Aziz, T., Al-haddad, R., Cuellar, E., Hein, C., and Stack, J. 2020. ZRBF Outcome Monitoring Survey: Round Two Program Learning Report. *

ZRBF Resilient and Sustainable Agriculture Extension Manual: A Guide To Ecological Resilient-Sustainable Agriculture In Zimbabwe

Appendix 8: List of Respondents by Programme

Table 3 Interview Respondents by Programme

Programme	Organisation	Position
ASAP	FCDO/DAI	Consultant
	IFAD	Independent Evaluation ASAP Manager Technical Specialist – Climate Change
BRACED	FCDO	SRO
VUNA	FCDO	SRO
CSAZ	FCDO	SRO
CGIAR 2017-2021	FCDO	SRO
	CCAFS	Science officer Flagship 2 lead Asia programme leader
LFSP	FCDO	SRO Private sector adviser Livelihoods adviser Lead adviser agriculture
	Food and Agriculture Organisation, Zimbabwe (FAO)	Programme planning and liaison officer Data analysis specialist Crop specialist Livestock specialist
P4F	P4F	Monitoring officer
PoSA	FCDO	SRO
	Adam Smith	Consultant
SILTPR	FCDO	SRO
	Wood Foundation	Monitoring Officer Executive Officer
ZRBF	FCDO	Outgoing SRO Incoming SRO
	UNDP	Resilience Capacity Building Specialist Data Analyst

Programme	Organisation	Position
MADE	FCDO	Ex SRO
	Nathan	Project Director Team Leader
PM	FCDO	SRO
	Palladium	Team Leader Director or results, knowledge management and learning Technical Director
SAIRLA	FCDO	SRO

Appendix 9: CSA Approaches and timescales

Throughout the portfolio literature, the time needed to promote the adoption of CSA, and through this contribute to increased resilience, was noted. However, there was little discussion about whether different CSA approaches require different lengths of time and little indication on whether some CSA approaches were ruled-out in project design because the project timetable was too short for a particular approach.

The table below gives an indication of those CSA approaches that require significant time between farmer effort (in time, materials or cash)/adoption and farmer benefit. It should be noted that a project would normally need to run for longer than the timespan in column two to deliver these approaches. This is because a number of project years will normally be needed before a significant quantity of farmer or community effort and adoption starts being invested in by farmers and/or communities.

The need for potential adopters to receive benefits in the short term was noted in at least two projects (BIRDP and SILTPR). The time lag from effort to benefit poses specific delivery challenges that need to be incorporated into design. The case-study box on SILTPR gives one example of how this was achieved. Because of the long-term sustainability of many of these CSA approaches (once the time lag has been achieved) and the probability that many are complementary with other short-term approaches, addressing the time-lag from effort to benefit is an issue that should be considered in design.

CSA Approach	Time from effort to benefit[134]	Duration of benefit	Observations
Mangrove planting and restoration	3-5 yrs	Permanent if protected/ managed	Multiple benefits – coastal protection, fisheries, wood
Soil conservation – physical and vegetative structures	2-5 yrs	5+ yrs if maintained	Often significant initial labour investment required at community scale – may require subsidy and organisation
Agroforestry – on farm	1-5 yrs	5+ yrs	Relatively quick returns but cost of initial watering and protection from livestock may be challenging in some contexts.

[134] These times are examples only. Times can vary with type of intervention and context. There was limited information in the portfolio on some timescales, so much of the information comes from experience from beyond the portfolio. Benefits include financial, food security and any others as experienced by the farmer and/or community.

CSA Approach	Time from effort to benefit[134]	Duration of benefit	Observations
Agroforestry extensive (landscape level)	7-15 yrs	15-100 yrs	Times quoted are for Faidherbia albida in fields and rangeland. Low maintenance costs and significant benefits once established, but most project timetables cant support long establishment time.
Rangeland management (including natural forest regeneration)	3-10 yrs	Permanent if managed	Main cost can be foregone grazing while range recovers (and sometimes fencing cost). Managing different interests (e.g. livestock owners versus crop farmers) can be challenging. ASAP BIRDP – found providing quick win benefits of improved water enabled community agreement.
Changing to perennial cropping in relation to climate change modelling	3-7+ yrs	7-50+ yrs	The time lag will depend on the perennial crop. SILTPR (tea plantation) found initial donor support, plus 3-5 year interest free loans from patient capital to pay for establishment cost, was successful in enabling very poor farmers to invest in a long term opportunity.
Land rights and land governance	Variable	Can be permanent	Underpins many of the other long-term investments.

Appendix 10: Risks and Limitations

The table below lists the risks and for each there is a brief discussion on whether the risk actually materialised, and, where it did, what mitigation measures were taken.

Table 4 Specific anticipated and actualised risks, their mitigation and any remaining risk

Specific risks anticipated	Risk actualised or not, mitigation, remaining risk[135]
1. Key sources of data: incomplete, time lagged/limited, and potentially biased data.	Anticipated risks did materialise: a) Two shortlisted programmes that were not sufficiently evaluable were dropped; but three reserve programmes, suggested by FCDO, were picked up. b) Many documents lacked sufficiently comparative and granular data to generalise and compare findings, or provide the level of specificity required to answer some EQs, such as what worked for who, how, where, when and why. The team sought to mitigate this risk by triangulating findings from FCDO documentation and studies, along with interviews with SROs and IPs. But ideally, and given a longer timeframe, the team needed access to field reports and interviews with field workers and farmers themselves. c) The team had to rely on a high proportion of internally generated documents, which tended to emphasise successes (more than challenges) without providing sufficient evidence. Interviewees were also more likely to present programmes in a positive light. The team sifted through the data – cross-checking findings between documents and across programmes – to include only those findings that were based on sufficiently robust evidence.
2. Determining attribution: attribution to particular CSA technologies and role in resilience outcomes challenging to discern.	Attribution was not a primary focus of the refined EQs though EQs 5 and 6 called for an element of attribution. The team drew on the data analysis methods outlined in the evaluation framework and the theories of change developed during the inception phase. These informed the analysis of document and interview findings and allowed for sufficient attribution related to particular CSA technologies.

[135] Green = low risk level, amber = medium risk level

Specific risks anticipated	Risk actualised or not, mitigation, remaining risk[135]
3. The breadth and diversity of programmes, CSA approaches and plausible change pathways will make generalisations (and therefore the provision of useful recommendations) challenging.	The team used the nested and overall ToC to interrogate CSA interventions and outcomes at programme level to draw what generalisations were possible. Given the distance the review team were from the stakeholders on the ground it was not possible to deploy realist evaluation measures to establish what works for whom, why and under what circumstances. Generalisation remained challenging, but that is a finding in itself, related to the high context-specificity of CSA (including NbS). Most programmes deployed a combination of delivery mechanisms which made it difficult to discern which were effective. This did not prevent the team from drawing out lessons and examples of good practice from the different programmes.
4. Definitions of core concepts: definitions of many of the key concepts in the evaluation are contested/variously understood.	The team developed definitions for the core concepts of the review during the scoping phase (see Appendix 4). The fact that definitions of core concepts are contested/variously understood by both the stakeholders interviewed and more broadly in the wider literature, were interesting findings in themselves.
5. Stakeholder availability: remote evaluation, evaluation stakeholders with competing priorities, staff turnover.	This did not transpire to be a risk for the review, as despite competing interests both FCDO staff (such as programmes SROs) and implementation partners fully cooperated with the review team, even when the programmes had already finished.
6. Conflict of interest: NIRAS-LTS/evaluation team members potential conflict of interest.	Due to mitigation in the scoping phase (involving ensuring that no team member reviewed any programme they had worked on) no conflict of interest arose.
7. Alignment and use: risk of insufficient uptake/utility with lack of context/stakeholder engagement.	This risk was mitigated through maintaining good communication with FCDO throughout the review process and by following the UK government's updated accessibility guidance.
8. Deliverables: risk of overlap/confusion/duplication of deliverables.	This risk was mitigated against during the scoping phase where a clear timeline was agreed for each deliverable.
9. Managing expectations: risk of scope increasing as evaluation progresses and going beyond budget and day allocations.	Scope did increase due to the time it took to eliminate two shortlisted programmes and then take on three new ones in their place. All team members worked a considerable number of days beyond the available resource. As this is a risk that may be common to future thematic reviews commissioned by FCDO, consideration is needed as to how to address this in future.

Appendix 11: Findings from Selected SAIRLA Publications

The SAIRLA programme led to a number of research outputs. Some of these are included in the 2021 special edition of the International Journal of Agricultural Sustainability. The team reviewed all the articles and identified several that were pertinent to particular EQs. Below, extracts from and discussion of selected articles is provided, organised around EQs.

EQ1. How has each programme defined resilience to climate variability and shocks in their ToC?

Eq1c What information/analysis was used to inform the decision to incorporate CSA in programme design?

Masikati P et al 2021, in "Agriculture extensification and associated socio-ecological trade-offs in smallholder farming systems of Zambia" describe a trade-off analysis model that could be used to assist in decision-making regarding whether to incorporate CSA in programme design. The authors were interested in learning the consequences of agricultural extensification in the north western province of Zambia as compared to the consequences of sustainable agricultural intensification. They combined empirical analysis (drawing on existing data, a household survey and a participatory workshop with farmers, extension agents and other stakeholders) with simulation modelling and a trade-off analysis model for multi-dimensional impact assessment to assess potential trade-offs under current agricultural management practices and identify pathways to improve synergies and reduce trade-offs. In this case they found (page 1) that "agricultural extensification will lead to loss of soil organic carbon and total soil nitrogen of about 23% and 22% respectively, leading to yield reductions of about 35% and increased poverty levels. However, SAI approach results showed that poverty can be reduced by about 20% for farmers with land holdings of 3 ha while those with 2 and 5 ha can be reduced by 10% and 5% respectively".

Where donors are planning large, costly development projects and considering including the promotion of SAI technologies and practices (including CSA) it may be worth the investment in carrying out such modelling and trade-off analyses to inform decision making at the design and/or scoping phase. (The citation of the article, which could be included as a footnote rather than the example box with the above text under EQ1c is:

EQ2. Were the CSA interventions and the design of their delivery relevant and appropriate as a means to improve farmers' productivity, adaptation to and mitigation of climate change/shocks and in what contexts?

EQ2a Were trade-offs between sustainable productivity, adaptation and mitigation considered in the design phase, defined and measured?

Haggar A et al 2020 provides an interesting contextual study for EQ2a. The article, entitled "Understanding and informing decisions on Sustainable Agricultural Intensification in Sub-

Saharan Africa" discusses definitions of SAI then mentions two competing worldviews on SAI: The term SAI has been conflated by many observers with a high-input, agro-biotechnological pathway of intensification, while Agroecological Intensification (AEI) is frequently associated solely with the application of ecological principles to agricultural production as an alternative to the use of agrochemicals and genetically modified germplasm. It also notes two different pathways, one via smallholder farming and the other via commercial farming. It develops a ToC for SAI that can help in the complex decision making that SAI requires.

The trade-offs in SAI relate to those between economic aspects (productivity, profitability, income, economic development); social & political aspects (food, nutrition and livelihood security, well-being, empowerment) and; environmental aspects (balance of ecosystem services and nature's contribution to people). These are similar to the productivity, adaptation and mitigation pillars of CSA. The paper defines SAI as a multidimensional outcome of increasing agricultural productivity while maintaining social, economic and environmental sustainability; recognizing that each of these aspects individually encompass multiple It goes on to note that this is similar to how climate smart agriculture has been defined; i.e. by the expected outcome of increasing food security, adaptation and resilience while reducing greenhouse gas emissions from agriculture. It notes that SAI and CSA are closely interlinked concepts and all cases of CSA invariably turn out to be cases of SAI. Since the relative priority of each objective varies across locations, with for example greater emphasis on productivity and adaptive capacity in low-input smallholder farming systems in least developed countries, an essential element of CSA is identifying potential synergies and trade-offs between objectives.

The distinctions the article makes between high-input SAI versus agroecological intensification, and between the smallholder versus commercial farming pathways, are pertinent to the topic of the portfolio review.

EQ 3. Which promoted CSA approaches (and specific technologies/practices within them) were not adopted, were temporarily adopted, or continue to be adopted and why?

"Adoption by adaptation: moving from Conservation Agriculture to conservation practices" authored by Rodenburg 2020 is relevant to EQ3. The article is based on a literature review on conservation agriculture (CA) involving direct seeding, use of crop residues/mulch/cover crops and promotion of crop rotation. It argues that CA is not always beneficial and there needs to be move from fixed packages of CA being promoted to "conservation practices" adapted to local conditions. "While CA can improve soils and sustain crop yields, benefits are inconsistent and there are trade-offs with crop residue use, weeds and insect pests, labour demands and short-term yield penalties. Adoption rates by smallholders in sub-Saharan Africa are generally low" (page 1). The authors identify the following adoption constraints to CA: the magnitude of transformation of management practices required from farmers moving to CA; the multiple inherent trade-offs associated with CA practices; and the incompatibility of CA practices to local conditions.

The authors conclude (page 12) that “Conservation Agriculture as a fixed package is often not adapted to the biophysical and socio-economic, cultural and institutional conditions of smallholder farms in SSA. Adoption rates of CA among smallholder farmers across SSA are therefore low, in particular when only adoption of the ‘complete package’ of CA is considered. Improving adoption rates would require for CA promotion to be better targeted, i.e to the environments where these practices likely fit best and deliver most. Simultaneously or alternatively, it would require CA practices to be adapted in order to overcome trade-offs and to adjust CA to locally prevailing conditions, through a farmer-participatory process. This requires moving from Conservation Agriculture, as a fixed package of three components, to Conservation Practices, encompassing a basket of options for sustainable agricultural intensification”.

EQ4. Which CSA delivery models were most effective/least effective in improving farmers’ productivity, adaptation and mitigation outcomes, in what contexts and why?

EQ4a Which delivery models are effective and why (including NbS)?

Three articles are pertinent to the design and implementation of effective delivery models drawing on ICT.

The first of these by Steinke J et al 2020 and entitled “Tapping the full potential of the digital revolution for agricultural extension: An emerging innovation agenda” reviews the literature on use of ICT in agricultural information services. The article notes that one reason for failure of ICT based extension is due to communication challenges of the potential users. The article proposes that user-centred design methods can help. It identifies eight emerging aspects of using ICT for development and draws on examples to highlight the possibilities and limitations of each.

The second article provides evidence on how radio and SMS can scale-up smallholder participation in legume-based sustainable agricultural intensification practices and technologies in Tanzania. The article, by Silvestri S et al 2020 and entitled “Going digital in agriculture: how radio and SMS can scale-up smallholder participation in legume-based sustainable agricultural intensification practices and technologies in Tanzania” found that both awareness and adoption are boosted if SMS supports radio campaigns, but that radio alone is the most cost-effective approach. The authors concluded that “The choice of what methods to use should be informed by the knowledge of the underlying institutional environment and constraints, together with the level of complexity of the practice or technology to be transferred, the desired reach, and the characteristics of the intended target audience, with the latter including also cultural and gender norms. Available resources for the implementation of a communication campaign will also drive the choice of the media”.

The third article, authored by Ortiz-Crespo B et al 2020, is entitled “User-centred design of a digital advisory service: enhancing public agricultural extension for sustainable intensification in Tanzania.” The article argues that SAI (and therefore for CSA) there are three challenges in the provision of extension advice that a) caters for the heterogeneity of

farming systems, b) involves relatively complex agricultural practices and c) adapts to changing needs, to enable continuous innovation processes. The focus of this article is a pilot of using mobile phones with farmers in the south of Tanzania to communicate extension advice regarding the groundnut value chain and aflatoxin control. As promoted in the second article above, user-centred design was followed. The research found that farmers did actively engage with the service to access agricultural advice and extension agents were able to answer questions with reduced workload compared to conventional channels.

Given the content of these articles and other studies e.g. the Performance Evaluation of the New Alliance Information and Communication Technologies Agriculture Extension Challenge Fund Final Report 2019 (https://issuu.com/concernuniversal/docs/po8151_-_na-ict_cf_evaluation_-_fin) and the experience of some programmes covered in this review of FCDO programmes that are using ICT extension means (such as LFSP) it is worth considering augmenting traditional extension practices with ICT based ones whenever feasible when designing delivery models for CSA. Lessons can be learned from these articles with regard to effective design of delivery models for CSA when considering the use of ICT channels for extension.

EQ7. What have been the trade-offs made between short-term productivity, farmers' own longer-term resilience, as well as environmental and biodiversity co-benefits?

EQ7a Have there been differences in trade-offs made when nature-based solutions are a focus of, or incorporated in, CSA approaches?

Adolph B et al 2020; "Supporting smallholders' decision making: managing trade-offs and synergies for sustainable agricultural intensification" is based on research over 2016-2019 in Eastern Burkina Faso, north west Ghana and Central Malawi. The authors note that the concept of SAI in itself requires a careful consideration of the potential trade-offs between its three sustainability dimensions or pillars – social/human, environmental, and production/economic). The paper explores how smallholders in Northwest Ghana, Eastern Burkina Faso and Central Malawi perceive and manage trade-offs and synergies between production, socioeconomic and environmental factors. The study considered trade-offs in relation to Sustainable Agricultural Intensification (SAI), whereby a choice needs to be made between two or more desirable but competing objectives. Different individuals and households, depending on their current socioeconomic situation, would emphasize different objectives (food security, education, income, social harmony, environmental quality). In order to achieve these objectives, people used a combination of strategies, which in themselves could be expressed as (subordinate) objectives. For example, in order to achieve food security, a farmer may want to plant his or her crops early (as soon as the rains start), or be able to purchase good quality seed, or keep good relations with other community members so that they are willing to provide labour or capital. These specific objectives, relating to the overall selected livelihood strategy, varied between individuals and households and depended to some extent on their (perceived) ability to implement the strategy.

Trade-offs occurred whenever objectives or sub objectives competed – either because resources were not sufficient to achieve several objectives simultaneously, or because the objectives themselves were mutually exclusive. The farmers' ability to succeed in managing competing objectives depends on the resources available to them and the wider socioeconomic, environmental and institutional context. The authors note that current agricultural policies and interventions are not well geared towards supporting long-term environmental and social objectives whilst also meeting farmers' immediate needs. To achieve this would require changes in financial and technical support, in order to help poorer farmers in particular to make investments in assets and adopt practices that would provide benefits in the future.

Research findings showed that farmers' most common trade-off management strategy was to compromise and 'do a bit of everything' for example, to use residues for livestock feed, as a mulch and as a fuel; use some herbicide but also undertake manual weeding; grow some cash crops and some food crops, and so on. In some cases, these management practices may have been a way of coping with insufficient resources rather than a deliberate choice; for example, a farmer may have had insufficient cash to buy more herbicides and hence was forced to weed manually. During discussions with the case study households, it became evident that the extent to which choices are made deliberately depended largely on the individual's awareness of all management options.