

CGIAR Research Program on:

Climate Change, Agriculture and Food Security

Full Proposal 2017-2022

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1.0 CRP Narrative

1.0.1 Rationale and scope

Overview and development context

Climate change will have far-reaching consequences for agriculture and natural resources – demanding a response that integrates food and nutrition security, adaptation and mitigation, and puts greatest investment towards poor people whose agriculture-dependent livelihoods are most at risk ([Porter et al. 2014](#); [Kelley et al. 2015](#); [Wiebe et al. 2015](#)). The overall purpose of CCAFS is to marshal the science and expertise of CGIAR and partners to catalyse positive change towards climate-smart agriculture (CSA), food systems and landscapes, and position CGIAR to play a major role in bringing to scale practices, technologies and institutions that enable agriculture to meet triple goals of food security, adaptation and mitigation. Climate change is now mainstreamed throughout the CGIAR portfolio, so CCAFS' role is to integrate across CRPs, providing the tools and advice on priorities in different contexts, making the links to the climate science community, and representing CGIAR in climate-related policy processes.

In 2015 a number of major global policy processes put emphasis on climate change and food security. The SDGs include a dedicated climate change goal “13: Take urgent action to combat climate change and its impacts”, with the targets under this goal including work covered by CCAFS (both long-term change and extreme events; early warning; human and institutional capacity on climate change; climate change in national policies and planning; effective financing). Many other SDGs also have climate change elements, including that on poverty (SDG 1), hunger, food security and nutrition (SDG 2), gender (SDG 5), sustainable consumption (SDG 12, on food loss and waste), marine resources (SDG 14, on resilience and ocean acidification) and terrestrial ecosystems and forests (SDG 15). The SDGs provide a major global imperative to tackle climate change.

After many years of slow progress on agriculture in the UNFCCC, in 2015 two substantive agenda items on agriculture were discussed in SBSTA, the Paris COP21 included text on food security ([Meadu et al. 2015](#)), and the national commitments to the UNFCCC included widespread reference to adaptation and mitigation in agriculture ([Richards et al. 2015a,b](#)). CGIAR and the global agriculture community must engage in key UNFCCC processes between now and 2020 to drive action and innovation on issues related to agriculture, help countries achieve ambitions expressed in their national commitments, and work with the Green Climate Fund (GCF) to deliver ambitious investments in agricultural adaptation and mitigation. The global processes are complemented by numerous similar developments on agriculture and climate change at national/ regional levels, often under the banner of climate-smart agriculture. More than 70 countries and other partners established the Global Alliance for CSA (GACSA) in 2014. The Africa CSA Alliance was initiated in 2014, facilitated by NEPAD. In 2015 two major regional alliances were established, one for West Africa hosted by ECOWAS, and one for Central America hosted by CAC. More than 25 countries refer to CSA in their UNFCCC national commitments.

CCAFS Phase II builds directly on the experience of CCAFS Phase I but repositions CCAFS as an Integrating CRP, and thereby helps CGIAR achieve its ambitions for a more coherent and integrated portfolio. CCAFS will comprise four Flagship Programs (FPS): FP1: Priorities and Policies for CSA; FP2: Climate-Smart Technologies and Practices; FP3: Low Emissions Development; and FP4: Climate Services

and Safety Nets. Mainstreamed in the FPs are six Learning Platforms (LPs, see Section 1.0.7). These are a key mechanism to integrate climate change work across CRPs while providing a facilitated platform for knowledge sharing, integration and coordination. Involvement of other CRPs in CCAFS LPs may include direct programmatic research involvement and/or co-investment.

2030 outlook for climate change, agriculture and food security

CCAFS' meta-analysis of future impacts of climate change finds that 70% of studies project declines in crop yields by the 2030s, with yield losses of 10-50% in half the studies ([Challinor et al. 2014](#)). The meta-analysis finds that incremental adaptation options (e.g. varieties and crop management regimes) can reduce but not eliminate losses. Climate extremes, which may exceed critical thresholds for agricultural production, will increasingly require effective mechanisms to mitigate risk ([IPCC 2012](#); [Cai et al. 2014](#), [Thornton et al. 2014](#)). Thus, even by 2030, we face a future in which both incremental and transformative adaptation options must come into play. Transformative changes might include shifts away from certain crop-livestock systems, moving out of agriculture, or changes in diets ([Vermeulen et al. 2013](#); [Rippke et al. 2016](#)). While analyses of livestock systems and fisheries are less developed, we would expect similar patterns of impact and response, for example major shifts in fishing areas ([Cheung et al. 2009](#)). Turning to emissions, CCAFS analyses suggest that a reasonable target for mitigation in developing country agriculture is 1-1.2 Gt CO₂e yr⁻¹ by 2030 ([Scholes et al. 2014](#); [Wollenberg et al. 2015](#)). Incremental actions, such as sustainable intensification to achieve emissions efficiencies, will be necessary yet insufficient to achieve these targets. Society will need to transform the whole food system, for example to manage waste, dietary patterns and use of biomass for fuels ([Smith et al. 2013](#)).

The 2030 adaptation and mitigation challenges in agriculture are framed by rapid change in smallholder farming and food systems. Rapid urbanization is likely to reduce the importance of smallholder agricultural incomes in achieving food security, and lead to concentration in farmland ([Collier and Dercon 2014](#)). At the same time, rural development is likely to be geographically uneven ([World Bank 2008](#)), centred on development corridors along transport routes ([Weng et al. 2013](#)). Nonetheless, with population growth, the number of smallholder households globally is projected to grow from about 560 million today to some 750 million by 2030, largely in Africa and Asia ([Campbell and Thornton 2014](#)). Farming in 2030 is likely to be characterized by a higher degree of inequality in farm incomes, sizes, technologies and market linkages. Trends in feminization of agriculture may well continue ([FAO 2011](#)). For CCAFS, the implication of this 2030 future is to use the research process to distinguish more carefully among farming systems and households, some of which may follow non-agricultural adaptation pathways. The 'Stepping out' development pathway which focuses on on-farm accumulation of assets to move into other sectors ([Dorward 2009](#)) will have to be broadened to include strategies to facilitate migration as an adaptation option ([Black et al. 2013](#); [Kelley et al. 2015](#)). CCAFS will provide the most policy-relevant outputs by including a range of options that in some cases go beyond smallholder agriculture sectors. Relevant options may lie in the realms of food system functions including governance, diets and nutrition (FP1), options to support "stepping out" (FP1), financial innovation in support of transformative adaptation (FP2), supply chain governance and food loss and waste (FP3), food security safety nets (FP4), and closing gender gaps in assets and decision-making (all FPs).

Key developments in CCAFS

The proposal for Phase II differs from that of Phase I by rising to the challenge of being an ICRP and by responding to the ISPC commentary as follows: (1) updated Theory of Change (ToC), particularly development of hypotheses on change mechanisms and assumptions on CRP behaviours promoting impact ([Vermeulen and Campbell 2015](#)); (2) more explicit focus on food systems and links to nutrition (particularly FP1); and (3) greater integration with other CRPs, both thematically and geographically. Retained from Phase I is the strong focus on outcomes and partnerships. To provide a platform for all CRPs to engage in climate partnership and policy processes, a LP “Partnerships and capacity for scaling CSA” has been established. The regional hubs, with Regional Program Leaders (RPLs), remain the central mechanism for connecting research and policy engagement across all FPs. The development of agriculture in sub-Saharan Africa (SSA) over the next 30-40 years will be particularly important. With populations projected to double ([Cohen 2003](#)) and current under-performance of the agricultural sector, SSA will remain a central focus for CCAFS.

The FPs remain essentially the same having received a major update on the basis of learning during Phase I, but now each incorporates a LP to foster collaboration and synergy across CRPs. Dropped from Phase I is the knowledge-to-action research theme, now mainstreamed, while gender and social inclusion (GSI) has been elevated through new appointments and a new strategy.

Scientific framework to produce International Public Goods (IPGs)

CCAFS will use the CSA concept to structure its approach to climate-responsive options. CSA is defined as agriculture that (a) sustainably increases agricultural productivity and incomes, (b) adapts and builds resilience to climate change, and (c) reduces and/or removes GHG emissions where possible ([FAO 2013](#)). The origin of the concept is in the realization that many proposed actions in agriculture deliver on both adaptation and mitigation, signalling a move away from the clear distinction between adaptation and mitigation streams within the UNFCCC negotiations. A wide range of public, private and civil society entities, including funds and development banks, are now committed to achievement of CSA. However, it is important for CSA to offer a scientific as well as a political frame. The IPG basis for using CSA as a scientific frame is agriculture’s unique capacity among sectors to offer globally significant mitigation potential that may or may not have trade-offs for food security or for adaptation to climate change.

The relative importance of outcomes for food security, adaptation and mitigation varies across locations and situations, as do potential synergies and trade-offs between objectives ([Lipper et al. 2014](#)), providing a challenge for prioritising investments. CSA is closely aligned with sustainable intensification at the farm level ([Campbell et al. 2014](#)) and also includes agro-ecological approaches ([Sugden 2015](#)). But the concept extends beyond on-farm practices to include landscape-level interventions (e.g. management of farm-forest boundaries), services (particularly information and finance), institutions (particularly market governance, incentives for adoption) and the food system (particularly consumption patterns and wider climate-informed safety nets). CSA may also be understood as a process that comprises parallel elements of institution-building ([Lipper et al. 2014](#)), as per CCAFS’ ToC.

Yet, as CCAFS has identified ([Neufeldt et al. 2013](#)), the scientific basis for CSA needs considerable work. Fundamentals include establishment of credible metrics for the three goals of CSA, empirical research to understand how selected interventions deliver on these metrics, improved understanding of trade-offs,

and thus definition of which agricultural development pathways can lead towards a “safe operating space” ([Beddington et al. 2012](#)). These fundamentals need to be explored within a wider research design that addresses the enabling environment needed for CSA to deliver on green economy and SDG agendas ([Steenwerth et al. 2014](#)). CSA will be highly context-specific – for example, some technologies will deliver the “triple-wins” of CSA under some conditions but not others (e.g. [Powlson et al. 2014](#) on no-till agriculture), and there is limited evidence on how technologies interact with other measures to address climate change (that include e.g. improved access to climate information services, local adaptation planning, enhanced social safety nets, insurance). A major challenge is to identify the context-specific technologies and supporting measures that may be needed; and the trade-offs and co-benefits that different combinations of options will deliver for different stakeholders including women ([Beuchelt and Badstue 2013](#); [Locatelli et al. 2015](#); [Thornton and Herrero 2015](#)).

CCAFS proposes to address the fundamental questions via participatory research at Climate-Smart Villages (CSVs), sites ranging from village to district scale at which portfolios of CSA interventions are tested in a globally comparable manner with farmers, development agencies and the private sector (see Section 2.2.1.6 CoA 2.1 for detailed description of the CSV concept). This research will be linked to higher-level analyses (e.g. models of scaling processes and trade-offs) to generate IPGs relevant to societal questions on alternatives for agricultural development. Ground-breaking science will include advanced methods to produce high-resolution historical meteorological data, multi-dimensional scenarios science applied to food systems at multiple scales, and gender analysis to explore intra-household differences in perceptions of and responses to climate change. A key feature of emerging adaptation science (and linked mitigation science) is that it is both basic – improving understanding of biophysical and socio-economic processes – and applied, being problem-focused and demand-driven ([Moss et al. 2013](#)).

It is also important to recognize that none of the technical or institutional issues featured from a CSA perspective are unique to CSA. They are subject to active investigations and action in their own domains, whether agronomy, landscape functionality or policy research. This is the reason CSA generates so much heated debate: everyone has an interest and something to offer. But the unique focus and value-add of CSA in terms of delivering on IPGs is how these multiple goals come together in both theory and practice. This is also the reason that CCAFS will operate differently in Phase II, as an integrative platform across CGIAR and partners rather than as stand-alone entity.

Iterative definition of research areas

CCAFS will continue the internal learning processes that were successful in Phase I, including formal reviews, to develop a more nuanced focus on areas of comparative advantage. For example, FP4 has moved from the broad scope of climate risk management towards specific types of interventions for which the CRP has the clearest niche relative to other providers (e.g. climate information services and insurance products). At a finer scale, deliberative processes with partners have defined specific areas of comparative advantage, for example definition of precise research outputs that CCAFS can provide that complement the functions of the Global Research Alliance on Agricultural Greenhouse Gases (GRA). CCAFS has also used deliberative processes with development partners to avoid mission creep from research to development, defining clear research niches, for instance on decision tools and metrics for CSA to support the development work of USAID’s Feed the Future program.

1.0.2 Goals, objectives and targets

SRF alignment: The CGIAR SRF frames the context and structure of CCAFS. CCAFS focuses on all three SLOs, eight IDOs and 12 sub-IDOs (CRP Table 1; CRP Figure 1). All five sub-IDOs of the IDO “Mitigation and Adaptation Achieved” are targeted (though the sub-IDO on carbon sequestration is regarded as a subset of the sub-IDO on GHG emissions). The cross-cutting IDOs on capacity development and gender/youth are also targeted.

CRP goal and targets: The overall goal of CCAFS is to catalyse positive change towards climate-smart agriculture, food systems and landscapes, and thereby contribute to the SLOs on poverty alleviation, food and nutritional security, and natural resources. SLO targets have been calculated through a bottom-up process of considering the proposed activities and interventions in each target country, as well as the ambitions of key partners in these interventions and in global and regional initiatives (CRP Table 2).

For the poverty SLO, CCAFS aims to have contributed by 2022 to 11 million farm households having adopted CSA (including improved varieties, breeds or trees, and/or improved management practices). Through this action, and through policy engagement that has benefits for other stakeholders (e.g. the urban poor), CCAFS aims to assist 9 million people, of whom 50% are women, to exit poverty. Because climate change is now mainstreamed throughout the CGIAR portfolio, CCAFS has a special role in bringing the technologies and practices developed in other CRPs into integrated CSA solutions that also include local adaptation planning, climate information services and climate-informed safety nets. Overall, 59% of the budget is allocated to achieving these two SLOs (for all budget figures, allocations differ by funding source – see budget narratives).

For the food and nutrition security SLO, CCAFS aims to have removed by 2022 nutritional deficiencies of one or more essential micronutrients in 6 million more people, of whom 50% are women. This work will be conducted jointly with A4NH, with CCAFS providing the climate lens on the actions and interventions, and CCAFS using its climate-smart village approach to test options in an integrated manner. Overall, 28% of the budget is allocated to achieving this SLO.

For the natural resources SLO, CCAFS will have contributed by 2022 to reduction of agriculture-related GHG emissions by 160 Mt CO₂e yr⁻¹ compared with the BAU scenario in 2022 (=0.16 Gt CO₂e yr⁻¹). This will involve close collaboration with the AFS-CRPs where the technical development of mitigation options will take place. A key partner here is the WBCSD which has set an ambitious target for emissions reductions in its member company supply chains. With FTA, the collaboration also focuses on avoided deforestation, with joint work aiming to conserve 0.8 million ha of forest. There is also collaboration with WLE on soil carbon sequestration. Overall, 13% of the budget is allocated to achieving this SLO.

Flagship outcomes: To achieve the above SLO targets, and in line with the ToC, CCAFS has selected 12 sub-IDOs to target (CRP Figure 1). Each is associated with a specific outcome target (CRP Table 3). While the gender and capacity development sub-IDOs are truly cross-cutting, some of the specific climate change sub-IDOs are closely aligned with the poverty SLO and food and nutrition security SLO (improved forecasting of impacts of climate change and targeted technology development; enhanced capacity to deal with climatic risks, extremes; enabled environment for climate resilience), while one sub-IDO is directly aligned with the natural resources SLO (reduced net GHG emissions from agriculture, forests and other forms of land use) (alignment illustrated in CRP Table 1; CRP Figure 1).

In some cases the FPs target different sub-IDOs, but in these cases it is often the collaboration amongst FPs that will deliver the outcome (e.g. FP1 providing improved enabling environment for the uptake of technologies in FP2). In other cases the FPs may target the same sub-IDO but have different statements for outcome targets – this often relates to the targeting of different stakeholders (e.g. FP1 working more at national to global levels, and FP2 working more at local levels).

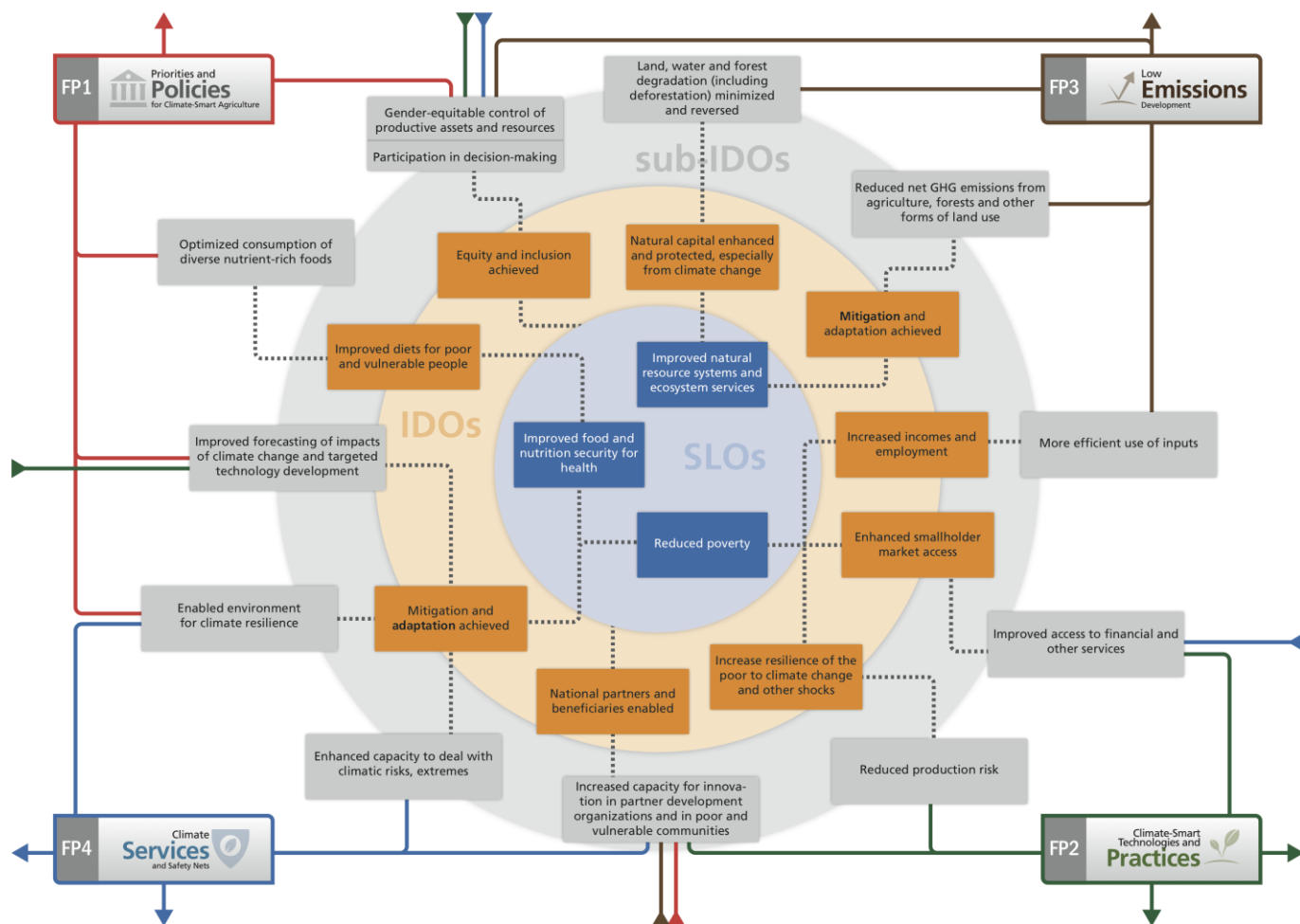
Target countries and regions – SRF geographical alignment: CCAFS is aligned with the SRF geographically, with around 42% of investments focused on Africa, 39% on Asia and 19% on poverty hotspots in Latin America, with small amounts of additional work in hotspots for agricultural mitigation (e.g. Brazil). CCAFS will work in 14 of the Site Integration countries (Annex Table 6). The bulk of the CCAFS work will be carried out in 21 countries (CRP Figure 2).

CCAFS will focus on five regions – Latin America, West Africa, East Africa, South Asia and Southeast Asia. There is much demand and pressure for work in other regions. Given the resources to CCAFS and the CCAFS External Evaluation that has a recommendation to focus in fewer countries, the intention is to maintain only five regions and specific target countries. Bilateral funds will enable some additional work in other regions. CCAFS will continue taking a dynamic approach to comparative advantage by phasing geographies as progress is made on outcomes, and by so doing address the specific Evaluation recommendations on particular countries. Several countries will be phased out in years 3-6, with the possibility of others being targeted. [Geographic priority setting](#) is based on a mix of modelling approaches, formalized scoring systems with stakeholders and regional consultations. Work in some countries may also be driven by the need to facilitate South-South learning on specific topics. South-South learning has proven a success in Phase I.

Links to global targets and processes: CCAFS will deliver on the following SDGs: 1, 2, 5, 14 and 15, but the primary focus will be goal 13 on climate change (CRP Figure 3). CCAFS will also play a major role in goal 12.3 on food loss and waste – given that food loss and waste are seen as one of the crucial dimensions for achieving emissions reductions (see FP3). The CSA framework speaks directly to emerging metrics under the SDGs (CRP Table 4).

Within the public and private sector, there is increasing focus on CSA and targets are being developed in GACSA, in the Alliance for CSA in Africa and in WBCSD, representing major commitments by CCAFS partners. More than 25 countries indicated an interest in CSA in their INDCs. CCAFS is involved in helping frame these targets and will co-develop activities to contribute to them, in line with a recommendation from the CCAFS External Evaluation.

Being an Integrating CRP, CCAFS intends to position CGIAR to play a major role in national to global processes and implementation of CSA. It will draw on the options developed in various CRPs, provide tools and advice on priorities in different contexts (including information on trade-offs and co-benefits) and make the links to the climate science community. A particular focus will be on the various partnerships and alliances on CSA, the UNFCCC, the IPCC and the GCF.



CRP Figure 1. SLOs, IDOs and sub-IDOs targeted by CCAFS and how they relate to FPs

CRP Table 1. System-level outcomes (SLOs) and associated 2022 targets addressed by CCAFS, together with the targeted Intermediate Development Outcomes (IDOs) and sub-IDOs. The columns indicate the relationship of crosscutting sub-IDOs to SLOs

SLO: Reduced poverty			SLO: Improved food and nutrition security for health	SLO: Improved natural resource systems and ecosystem services
11 million farm households have adopted improved varieties, breeds or trees, and/or improved management practices			6 million more people, of which 50% are women, without deficiencies of one or more essential micronutrients	160 Mt CO ₂ e yr ⁻¹ reduction of agriculture-related GHG emissions (4%) compared with the BAU scenario in 2022
9 million people, of which 50% are women, assisted to exit poverty				0.8 million ha of forest saved from deforestation
IDO: Increased resilience of the poor to climate change and other shocks	IDO: Enhanced smallholder market access	IDO: Increased incomes and employment	IDO: Improved diets for poor and vulnerable people	IDO: Natural capital enhanced and protected, especially from climate change
Sub-IDO: Reduced production risk	Sub-IDO: Improved access to financial and other services	Sub-IDO: More efficient use of inputs	Sub-IDO: Optimized consumption of diverse nutrient-rich foods	Sub-IDO: Land, water and forest degradation (including deforestation) minimized and reversed
IDO: Mitigation and adaptation achieved				
Sub-IDO: Improved forecasting of impacts of climate change and targeted technology development				Sub-IDO: Reduced net GHG emissions from agriculture, forests and other forms of land use
Sub-IDO: Enhanced capacity to deal with climatic risks, extremes				
Sub-IDO: Enabled environment for climate resilience				
IDO: Equity & inclusion achieved				
Sub-IDO: Gender-equitable control of productive assets and resources				
Sub-IDO: Participation in decision-making				
IDO: National partners and beneficiaries enabled				
Sub-IDO: Increased capacity for innovation in partner development organizations and in poor and vulnerable communities				

CRP Table 2. Quantified 2022 targets for SLOs broken down by CCAFS targeted regions (overall CCAFS targets rounded) ¹

SLO targets	CCAFS targeted regions					Overall budget allocation (%)
	Latin America	West Africa	East Africa	South Asia	Southeast Asia	
Main countries targeted	Colombia, El Salvador, Guatemala, Honduras, Nicaragua	Burkina Faso, Ghana, Mali, Niger, Senegal	Ethiopia, Kenya, Rwanda, Tanzania, Uganda	Bangladesh, India, Nepal	Cambodia, Laos, Vietnam	
SLO Reduced poverty: 11 million farm households have adopted improved varieties, breeds or trees, and/or improved management practices	1.2	1.0	2.3	4.0	2.4	35%
SLO Reduced poverty: 9 million people, of which 50% are women, assisted to exit poverty	1.0	0.7	1.7	4.0	1.6	23%
SLO Improved food and nutrition security for health: 6 million more people, of which 50% are women, without deficiencies of one or more essential micronutrients	0.2	0.6	1.2	2.7	0.8	28%
SLO Improved natural resource systems and ecosystem services: 160 Mt CO ₂ e yr ⁻¹ reduction of agriculture-related GHG emissions (4%) compared with 2022 BAU	95.7	0.8	9.5	35.5	18.5	9%
SLO Improved natural resource systems and ecosystem services: 0.8 million ha of forest saved from deforestation	0.7	0	0	0	0.1	4%

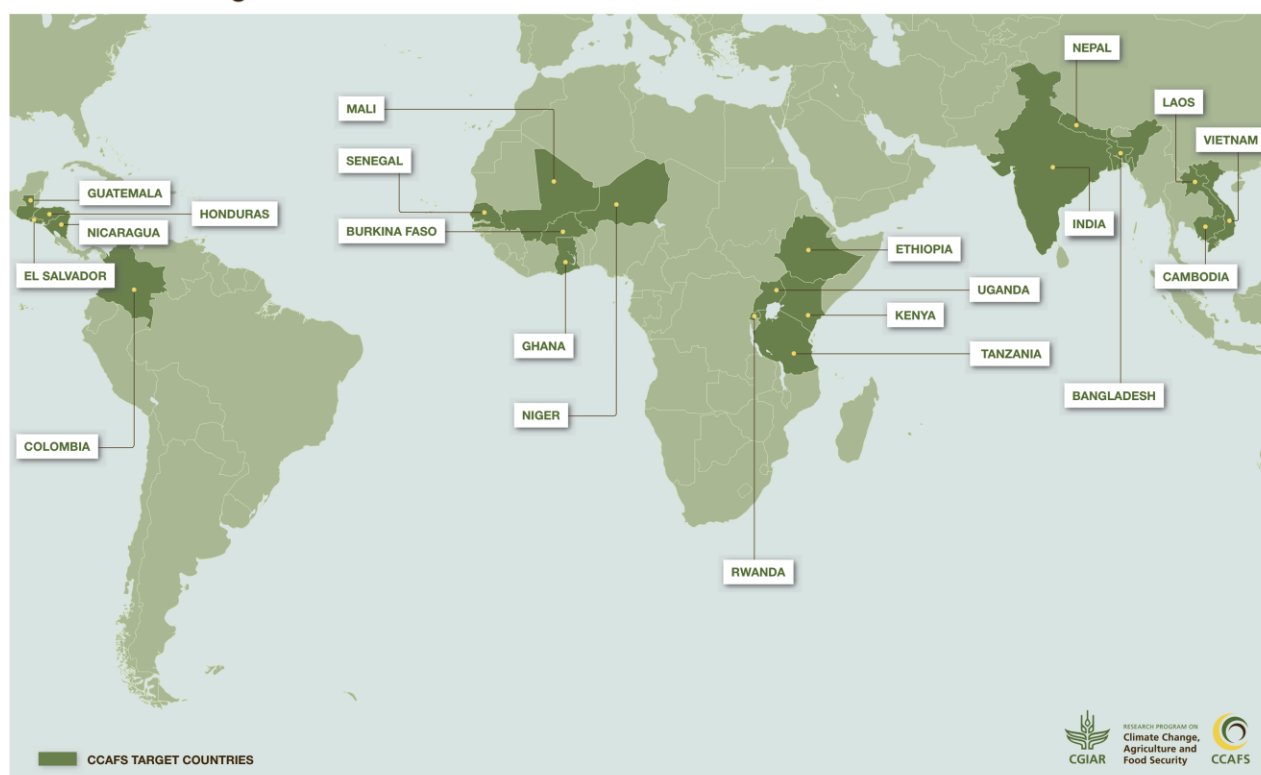
¹ For budget allocation, these figures are of total CCAFS budget

CRP Table 3. The sub-IDOs and associated outcomes targeted by the four CCAFS FPs²

SLOs, IDOs and sub-IDOs	Outcome	Fs			
		1	2	3	4
SLO Reduced poverty	11 million farm households that have adopted improved varieties, breeds or trees, and/or improved management practices	X	X	X	X
	9 million people, of which 50% are women, assisted to exit poverty	X	X	X	X
IDO: Increased resilience of the poor to climate change and other shocks			X		
Sub-IDO: Reduced production risk	6 million farm households receiving incentives (training, financial, programmatic, policy-related) for adopting CSA related practices and technologies that potentially reduce production risks		X		
IDO: Enhanced smallholder market access			X		X
Sub-IDO: Improved access to financial and other services	15 subnational public/private initiatives providing access to novel financial services and supporting innovative CSA business models		X		
	8 million farm households with improved access to capital, with increased benefits for women				X
IDO: Increased incomes and employment				X	
Sub-IDO: More efficient use of inputs	20 agricultural development initiatives where CCAFS science is used to target and implement interventions to increase input efficiency			X	
SLO: Improved food and nutrition security for health	6 million more people, of which 50% are women, without deficiencies of one or more essential micronutrients	X	X		X
IDO: Improved diets for poor and vulnerable people		X			
Sub-IDO: Optimized consumption of diverse nutrient-rich foods	14 organizations and institutions in selected countries/states adapting plans and directing investment to optimize consumption of diverse nutrient-rich foods, with all plans and investments examined for their gender implications	X			
SLO: Improved natural resource systems and ecosystem services	160 Mt CO ₂ e yr ⁻¹ reduction of agriculturally-related GHG emissions (4%) compared with 2022 BAU			X	
	0.8 million ha of forest saved from deforestation			X	
IDO: Natural capital enhanced and protected, especially from climate change				X	
Sub-IDO: Land, water and forest degradation (including deforestation) minimized and reversed	0.8 million hectares targeted by research-informed initiatives for restoring degraded land or preventing deforestation			X	
CROSS CUTTING					
IDO: Mitigation and adaptation achieved		X	X	X	X
Sub-IDO: Improved forecasting of impacts of climate change and targeted technology development	20 countries/states where CCAFS priority setting used to target and implement interventions to improve food and nutrition security under a changing climate	X			
	50 site-specific targeted CSA technologies/practices tested, with all options examined for their gender implications		X		
Sub-IDO: Enhanced capacity to deal with climatic risks, extremes	40 institutions or major initiatives that use CCAFS research outputs for services that support farm households' management of climatic risks				X
Sub-IDO: Enabled environment for climate resilience	USD 600 million of new investments by state, national, regional and global agencies, informed by CCAFS science and engagement (FP1: USD 450 million; FP4: USD 150 million)	X			X
Sub-IDO: Reduced net GHG emissions from agriculture, forests and other forms of land use	10 low emissions plans developed that lead to significant mitigation by 2030, i.e. will contribute to at least 5% GHG reduction or reach at least 10,000 farmers, with all plans examined for their gender implications			X	
IDO: Equity and inclusion achieved		X	X	X	X
Sub-IDO: Gender-equitable control of productive assets and resources	55 organizations adapting their plans and directing investment to increase women's access to, and control over, productive assets and resources (FP1: 20 national/state organizations; FP2: 15 development organizations, with the focus on investments for CSA activities; FP4: 20 development organizations, with a focus on access to climate services and safety nets)	X	X		X
Sub-IDO: Participation in decision-making	15 organizations adapting their plans or directing investment to increase women's participation in decision-making about LED in agriculture			X	
IDO: National partners and beneficiaries enabled		X	X	X	X
Sub-IDO: Increased capacity for innovation in partner development organizations and in poor and vulnerable communities	51 (FP1: 11; FP2: 10; FP3: 15; FP4: 15) policy decisions taken (in part) based on engagement and information dissemination by CCAFS	X	X	X	X

² Note that cross-cutting IDOs contribute to SLOs.

CCAFS main target countries in Phase II



CRP Figure 2. The main countries where CCAFS will work. In line with the CCAFS External Evaluation, work has been reduced in a number of countries (e.g. Brazil, Peru, Indonesia).

CRP Table 4. Alignment of CSA with the proposed SDG indicators

CSA dimension	SDG proposed indicators	Relevant CCAFS sub-IDOs
Productivity	Crop yield gap Livestock yield gap	(AFS-CRPs will measure this)
Adaptation/ resilience	Losses from natural disasters, by climate and non-climate-related events Farmers with nationally appropriate crop insurance (%) – to be developed	Reduced production risk; Enhanced capacity to deal with climate risks, extremes Improved access to financial and other services
Mitigation/ emissions	Net GHG emissions in the Agriculture, Forest and other Land Use (AFOLU) sector Nitrogen use efficiency in food systems	Reduced net GHG emissions from agriculture, forests and other forms of land use More efficient use of inputs
Other environmental dimensions	Annual change in forest area and land under cultivation	Land, water and forest degradation (including deforestation) minimized and reversed



CRP Figure 3. SDGs targeted by CCAFS

1.0.3 Impact pathway and theory of change

CCAFS has committed with partners (see Section 1.0.8) to globally ambitious targets for action in the face of climate change (CRP Table 3). Yet there are numerous challenges in agricultural research for development (AR4D) that are a barrier to rapid and sustainable transformation of agriculture. These include paralysis in the face of complexity and weak mechanisms for engagement and negotiation among relevant stakeholders ([Sayer and Campbell 2004](#); [Hall et al. 2014](#); [Harrington and Fisher 2014](#)). Uncertainty around future pathways and complex causal relationships under climate change create difficulties for clear-cut decisions ([Vermeulen et al. 2013](#)) and exacerbate scepticism and inaction. Solutions to the grand challenges require working from farmers' fields to global processes, forging linkages across the environment-agriculture divide, building bridges between the global change community and the agricultural community, and giving equal attention to technology, institutions, power and process.

Fundamental to CCAFS is a series of nested "impact pathways" that link research activities and outputs to desired outcomes and impacts on people's wellbeing, up to the global level of the SDGs. The impact pathways depend in turn on a comprehensive ToC at program level, which recognizes impact pathways as non-linear, dynamic and polycentric (CRP Figure 4). The program-wide ToC is linked to theories of change for the nested FPs (four thematic research programs), Regions (as an example of a Regional ToC, see Annex Figure 1), projects, and the cross-cutting area of work on gender and social inclusion, and on partnerships and capacity for scaling CSA.

ISPC commentary has noted that in the Extension Phase CCAFS presented a set of coherent impact pathways linked to compelling IDOs, but was insufficiently clear on the ToC. The subsequent ISPC commentary on the Phase II pre-proposal was that the ToC at CRP level was informative and clear, but

with hypotheses that were too generic and thus not testable, particularly at the FP level. CCAFS has subsequently reduced the number of hypotheses across the CRP, and has sought to standardize these as a set of hypotheses about the impact pathway from research to uptake and positive impact of CSA at scale – they are thus primarily hypotheses about the change process.

Eight of these hypotheses are spelt out in the FP sections of this proposal (two per FP), and summarized in the ToC diagram (CRP Figure 4). Each FP also has a gender-related hypothesis, plus one stand-alone gender hypothesis (see Section 1.0.4), giving thirteen hypotheses in total (CRP Figure 4). Our ToC for how large-scale CSA adoption might occur builds on the theory presented by Lipper et al. (2014) for CSA, which proposes four areas for action: (1) building evidence; (2) developing capacity of institutions and services; (3) coordinating climate and agricultural policies; and (4) stable, strategic investment to reach scale. The CCAFS ToC, as shown in CRP Figure 4, locates twelve of the CCAFS hypotheses within the four areas of action:

- (1) Working with partners, especially implementing partners and local organizations, to **build field-based evidence** (bottom left corner of CRP Figure 4)
- (2) Working with partners, especially climate risk management service providers, to understand how to **strengthen institutions and services** through better use of climate information (top left corner of CRP Figure 4)
- (3) Working with partners, particularly policy partners, to understand what works for **coordinated policy and governance** (top right corner of CRP Figure 4)
- (4) Working with partners, particularly the large agencies and companies driving implementation, to understand what works for **investment to reach scale** (bottom right corner of CRP Figure 4)

Each hypothesis has assumptions presented in the FP sections. Key assumptions relate to maintained political will and readiness to tackle challenges of future food security under climate change and institutional capacity to meet these political aspirations (CRP Figure 4). Project-level impact pathways within each FP will specify assumptions at a more detailed level. While unintended outcomes have largely been serendipitous and positive under Phase I (e.g. additional partners adding scale to outcomes, or unexpected results on gender differences leading to better tailoring of ICT services), regular evaluation and update of the ToC is crucial. Mechanisms for internal learning are introduced in Section 1.0.11 on program management and governance, and are elaborated on in Annex 3.5. On the basis of monitoring change, qualitative research that examines outcomes, processes and stakeholder perceptions, and on the basis of external review, the hypotheses will be revisited after two years of implementation.

In general, we posit that the selected 12 sub-IDs (CRP Table 3) will be achieved through large-scale, equitable adoption of climate-smart practices, services and institutions, within the context of agricultural development pathways that prioritize resilience-building and, where appropriate, low emissions. We need to drive, with partners, implementation of CSA on the ground and simultaneously to foster policy and institutional change to enable such implementation (black boxes in CRP Figure 4). Partnerships – the “who” of the ToC shown in rounded brackets for each action area in CRP Figure 4 – are seen as crucial to the “How” of the ToC (see Annex Table 1 for examples of modes of working with partners).

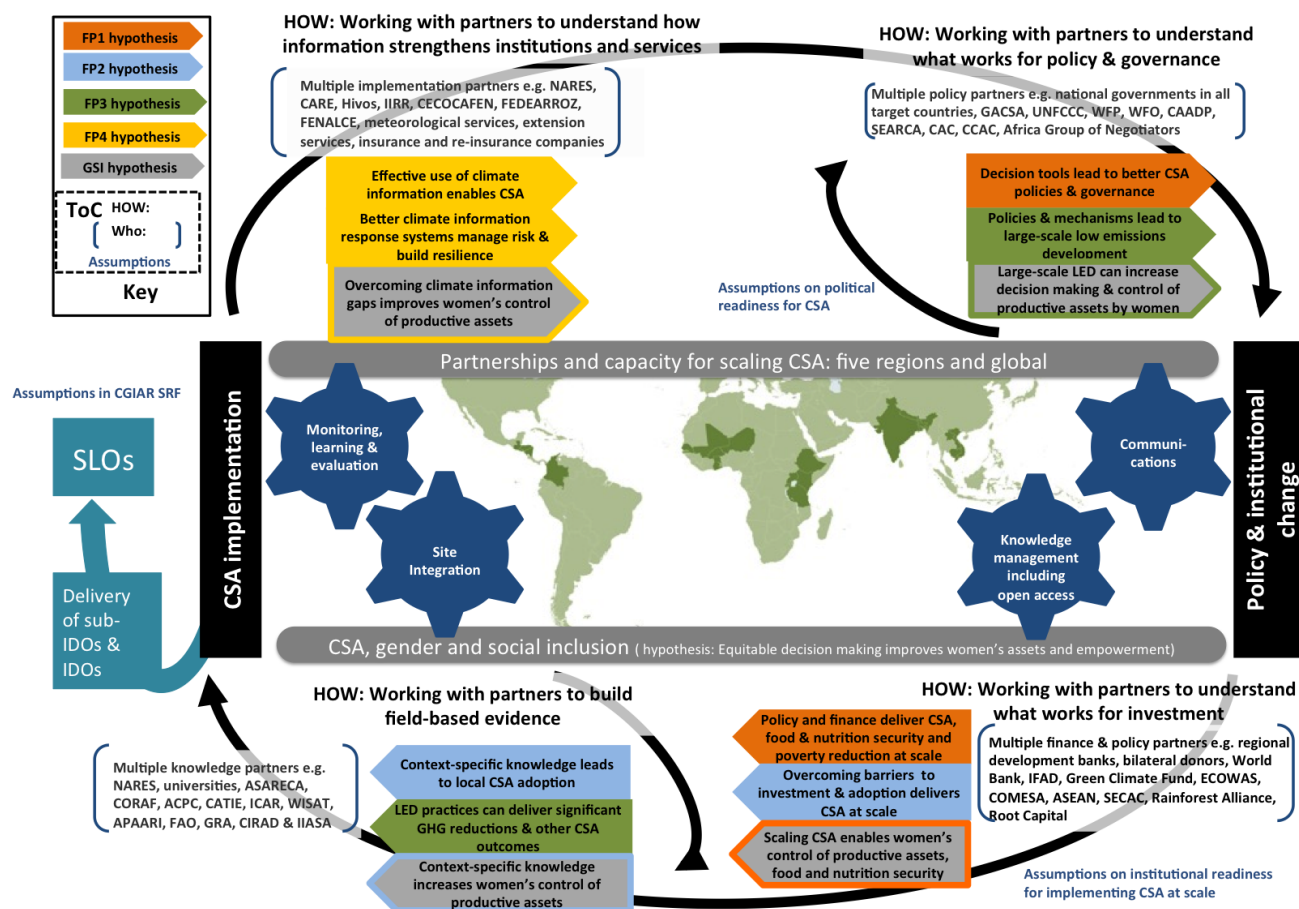
The “How” also involves the way that CCAFS should operate. CCAFS has used internal learning to develop 10 principles about how CRP behaviours can enhance the likelihood and quality of outcomes ([Vermeulen and Campbell 2015](#)). One of these is “Navigate towards specific points of leverage”. We propose that an effective AR4D program inquiries into complexity and confronts wicked problems, but – rather than get lured into either reductionist approaches or vast attempts to model complexity – uses “best-bet” prioritization to navigate towards a limited number of leverage points most likely to drive change. Another is “Allocate resources in three thirds – needs, research, capacity”. We propose that an effective AR4D program invests a third of resources in working with next users to build relationships and to define their needs from research, a third on research per se (often with partners), and a third on enhancing next users’ capacity so as to improve the uptake of the research. A further example of one of the principles is “Tackle power and influence”. We propose that an effective AR4D program actively addresses gender and other power differences within deliberative approaches in which the CRP participates. One important aspect of this approach is recognition of the power and influence of the AR4D program itself. In most cases science is only one among many influences on policy and action, and scientific inputs are not given privilege on account of being more “objective” or “factual”. These principles will be reflected on during internal learning and updated where appropriate.

Capacity development is pivotal to the impact pathways of CCAFS as a whole and the individual FPs, providing the mechanisms whereby increasing abilities to demand, undertake and utilize research lead to sustainable improvements in capacity to manage climate change. Thus the CCAFS capacity development strategy (Annex 3.2) addresses the full ToC, with particular emphasis on developing capacity to generate policy-relevant knowledge on CSA (“building evidence” hypothesis of ToC) and developing institutional capacity particularly among boundary organizations to put knowledge into effective use (“developing capacity” hypothesis of ToC). CCAFS also understands knowledge management (including open access) and communications as central drivers of change (shown as gears CRP Figure 4). Integration of CCAFS with other CRPs is also a critical driver, both in terms of Site Integration but also at all levels up to the global arena (e.g. UNFCCC, GCF, GACSA) to provide a unified voice and powerful body of science on agriculture under climate change (see Section 1.0.8 on Partnerships and comparative advantage).

Gender, youth and social inclusion are integral to the ToC. CCAFS has a LP on CSA, gender and social inclusion, described further below, which integrates gender into the four areas of action identified by Lipper et al. ([2014](#)). The LP on CSA, gender and social inclusion seeks to test five hypotheses on empowerment of women and youth; four hypotheses link with FPs while one is cross-cutting. Gender is built strongly into the CCAFS impact pathway, for example by selecting gender as a focal area for capacity development (see capacity development strategy in Annex 3.2) and direct engagement around gender at policy and institutional scales from local (e.g. women’s self-help groups) through to global (UNFCCC Lima work program on gender). Youth is mainstreamed into the LP on CSA, gender and social inclusion, providing in particular engagement and capacity development activities aimed at youth. These are designed to use youth-friendly approaches such as ICTs to help to deliver CCAFS impact pathways for reaching CSA at scale.

The recommendations of the IEA review of CCAFS propose that CCAFS can increase its policy-informing role and thereby be more effective in achieving movement along the higher level ToC. CCAFS will take on board this recommendation to undertake more concerted higher level policy engagement and synthesis. CCAFS will not expect impact pathways to happen by themselves, as a natural outcome of high quality scientific publications and other IPGs. Instead CCAFS will invest seriously in working with

partners to ensure that CGIAR research is fully embedded into development cycles, and, vice versa, development embedded into research cycles. This will be done through a LP on Partnerships and Capacity for Scaling CSA. In terms of structure, this platform will include five RPLs and a Global Research Leader on Scaling CSA (CRP Figure 6) as well as communications and capacity development staff, taking forward a core team of staff from Phase I. Through this explicit and committed investment in impact pathways beyond research, with clear targets, CCAFS will make pathways from research to impact more measurable for performance evaluation, including value for money. The LP will aim to position the entire CGIAR as the leading global research organization for developing country food systems and climate change.



CRP Figure 4. Theory of Change diagram for the CRP, with envisaged change mechanisms, hypotheses and some key partners

1.0.4 Gender

Gender as a crucial focal area in climate change research

Agriculture is the largest sector for women's employment in three regions – Oceania, South Asia and sub-Saharan Africa – employing 60% of women. Rural women play an increasing role in smallholder agriculture as a result of out-migration of males ([United Nations 2015b](#); [Sugden et al. 2014](#)). CCAFS research in the lead up to COP21 found that women and men farmers in developing countries have different vulnerabilities and capacities to deal with the impact of climate change on agriculture ([Huyer et al. 2015](#); Gonda, in press; CRP Figure 5). Women appear to be less able to adapt because of financial or resource constraints and less access to information and extension. In rural Bangladesh, women are less likely to buy micro-insurance if risk is low-probability, while men are likely to buy more units of insurance ([Jost et al. 2015](#); [Twyman et al. 2014](#); [Tall et al. 2014](#); Kumar, in press). Women are also important agents of innovation in response to climate-induced change. Engaging women and men in technology design and management encourages changes in gender relations, and improves community outcomes ([Hottle 2015](#); [Edmunds et al. 2013](#)). Additionally, women's resilience strategies and local environmental knowledge are valuable resources for recovery and adaptation ([United Nations 2015a](#); [Lane and McNaught 2009](#)). While generally the participation of women in agricultural sciences is increasing in most regions of the world ([Huyer 2015](#)), gender is not well integrated into climate change policy at national or global levels ([Gumucio and Rueda 2015](#); [Huyer 2016](#); [Pham et al. 2015](#)). The UNFCCC has recognized the importance of gender in climate change through the Lima work program.

Rural women in particular are at high risk of negative impacts from climate change, due to household responsibilities as well as increased agricultural work from male out-migration. The intensification of women's workloads is one effect of environmental stress in farming systems, while another is decreases in assets of poor households ([Jost et al. 2015](#); [Agwu and Okhimamwe 2009](#); [Goh 2012](#)). Climate variability and weather-related shocks affect women's and men's assets in different ways. For example, in one case women gained increased control of the household's livestock because men sold their livestock first ([Kristjanson et al. 2010](#)). Changes in cropping practices in response to climate variability, have different impacts for women and men on control of the income from crops and workloads ([Jost et al. 2015](#); [Nelson & Stathers 2009](#)). CSA options have the potential to provide benefits for women – when they have access to information on CSA, they are just as likely as men, if not more so, to adopt the practices. However, the possibility of increased labour loads is a significant barrier for women ([Twyman et al. 2014](#); [Bernier et al. 2015](#); [Jost et al. 2015](#)).

These examples illustrate the centrality of gender in agriculture under climate change. Changes in farming systems that are likely to occur in the face of climate change, for example, instability of food supply and need for increased irrigation, make it even more important. Some are topics of research in CCAFS, such as accelerating out-migration and threats to food and nutrition security (FP1), massive investments in CSA (FP2) and the reshaping of climate-informed safety nets in response to increasing frequency of extreme events (FP4). Actions need to be put in place to ensure that gender and social inclusion is achieved, and that in fact, the gender gap in agriculture does not increase as a result of climate change.

Social inclusion involves gender, socioeconomic status, ethnicity and age, and affects dynamics around perspectives, needs and access to resources (FAO and CCAFS 2013). Differences exist among women and men according to these characteristics. Scientific information and agricultural assets are set within

contexts of power relationships, so that existing gender norms and power inequalities will influence climate change impacts and adaptations (Roncoli 2006; Rossi & Lambrou 2008; Boyd 2010). CCAFS will take a problem-oriented, combined top-down and bottom-up approach (Vermeulen et al. 2013) that relies on engagement and capacity strengthening in the context of power relations analysis.

Gender and Social Inclusion (GSI) Strategy

To ensure that the CRP can deliver to the ToC, a new GSI strategy is in place¹ to integrate gender in keeping with commitments in the CGIAR SRF; it builds on research in Phase I (see the Gender Annex 3.3). The main goal of CCAFS GSI is to promote gender equality in CSA, food systems and landscapes. GSI contributes to the three CGIAR SLOs through research to inform, catalyse and target CSA solutions to women and vulnerable groups, increase their control over productive assets and resources, and increase participation in decision-making at local and national levels – in order to close the gender gap by 2030 ([CGIAR 2015](#)). The GSI Strategy places women at the centre of agriculture in developing countries within a framework of power and inclusion, recognizing their importance in agricultural production, food and nutritional security, and livelihoods. A focus on gender potentially opens spaces for other inequalities, and is thus complemented by other strategies to deal with marginalization in communities.

GSI will undertake strategic and integrated research.² In particular, in line with the external evaluation, GSI will undertake inter- and intra-household level research on GSI and CSA adoption, including generation and analysis of gender-differentiated data through baseline and monitoring; develop frameworks for addressing GSI in project design; identify opportunities for generating benefits to women through LED (with FP3); and work with FPs and RPLs to increase gender and social inclusion expertise and analyse gaps and lessons learned. GSI **Strategic research** is cross-cutting across FPs and relevant to climate dimensions in all CRPs. It uses qualitative and quantitative methods in six categories mapped against the CCAFS ToC (see CRP Table 5): (1) Analysis of data in the Gender Household Survey conducted in CSVs, to provide a baseline for the gender and youth sub-IDOs ([CCAFS et al. 2013](#)), and updated in 2017 in six CCAFS sites across 4 countries – Kenya, Uganda, Senegal and Bangladesh. (2) Analysis of household decision-making methodologies in adaptation and mitigation. Studies in three countries in EA (to be expanded to LAM and WA) will include baseline analyses, surveys of existing research, testing of technologies and practices, and measuring behavioural change. (3) Enabling mechanisms, tools and frameworks for gender in CSA, along with strategies for scaling up and measurement frameworks will be tested in CSVs in all five regions. (4) The potential for climate finance instruments to support women’s adaptation and mitigation-based enterprises will test the [W+ standard](#) with a pilot in Nepal; the CARE CSA/SuPER framework in EA and WA; and others. (5) Global and national climate policy research will investigate the extent to which women and gender are integrated. Research will include analysis of GSI in national and global climate policy. Work with WISAT will develop statistical

1 Through a globally competitive process CCAFS hired a Gender and Social Inclusion Leader as a result of the major programmatic changes made in 2014, and Sophia Huyer (WISAT) took up this position in May 2015.

2 Beneficiary population numbers will be sex-disaggregated and all impact analysis will assess benefits to men and women, both within households and as heads of households ([Deere et al. 2012](#); [Doss 2013](#)).

and policy analysis in 21 countries. (6) Value chain research will assess women's engagement in supply chains, access to technical information, and barriers to participation with a focus on dairy, tree crops and agroforestry, coffee, cocoa and rice.

GSI integrated research in all CCAFS projects (except those that are purely biophysical) will assess and synthesise gender research as well as support new research. Mechanisms include: (1) CSA gender focal points at each Centre; (2) gender analysis in design, implementation and ex post Impact Assessment; gender indicators, outputs and outcomes; (3) GSI integration into conceptual frameworks, research guides and workplans; (4) allocating resources explicitly to support Flagship research and activities. Strategic Partners will provide additional expertise as needed. Outputs include a gender and CSA impact assessment framework; GSI scaling up methodologies; gender and household decision-making methodology for CSA; gender-responsive climate finance instruments.

Research will be communicated to researchers, advocacy groups and policy makers through policy briefs summarizing key findings and recommendations; toolkits; info briefs; and working papers. The CRP work will be disseminated through the CRP GSI website, contributions to international publications, presentations and panels.

Theory of Change for delivering gender outcomes

The GSI ToC integrates gender into the CRP ToC, and as described in Section 1.0.3, sees partnerships and capacity development as core to achieving the "How". As above, the gender ToC also embraces the four areas identified by Lipper et al. (2014) and Vermeulen (2015) for large-scale, equitable adoption of climate-smart practices, services and institutions. CRP Table 5 maps the above-mentioned GSI research categories against these four areas. For the GSI strategy the four areas are: (1) *Implementing a program of integrative and strategic research to "build evidence" that is informed by gender research*. CCAFS gender research with FPs and partners will build a field-based evidence base to inform, catalyze and target context-specific CSA solutions that target women and other social groups and facilitate scaled adoption of CSA practices. (2) *Ensuring that gender and women's empowerment are dealt with in coordinated climate and agricultural policy*. CCAFS will work with multiple global and national policy partners for policies and programs to improve food and nutrition security and enable large-scale LED. (3) *Building mechanisms to engender finance*. This will involve engendering finance tools to overcome barriers to adoption and investment in CSA technologies by and for women and catalyze the increase of targeted investments in CSA technologies across scales. (4) *Enhancing the capacity of local institutions and services to close the gender gap*. This includes promoting the use of climate services to enable increased adoption of CSA by women. All of these activities will contribute to the scaling of CSA which increases women's access to, and control over, productive assets and resources.³

³ CCAFS developed five regional gender impact pathways in 2013, which are now integrated into the ToC.

Gender development outcomes

Each FP has identified gender indicators for one gender sub-IDO and at least one other sub-IDO. CCAFS focuses on two gender sub-IDOs (control of productive assets and participation in decision-making), taking into account effects on women's workloads. Of the 12 CCAFS sub-IDOs, six have outcome targets that include a gender dimension (CRP Table 6). The 2022 target for CCAFS is to bring benefits to at least 11 million women and assist 4.5 million women out of poverty (based on Targets implicit in CRP Table 3). FP4 aims to provide 8 million farm households with *improved access to financial and other services* (sub-IDOs in italics) and increase women's access to climate services and safety nets. Research on GSI dimensions of CSA will influence organizations and institutions to direct investment to *optimize consumption of diverse nutrient-rich foods* and enhance *gender-equitable control of productive assets and resources* (FP1). It will also involve identifying gender-sensitive CSA options for scaling out (e.g. by examining all technologies and practices for their gender implications as part of *improving forecasting of impacts of climate change and targeted technology development*) (FP2). This will include identifying trade-offs among food security, adaptation, and mitigation for men and women. FP2 will track how organizations adapt their plans and direct investment to *increase women's access to, and control over, productive assets and resources*. Research and MELIA systems ensuring women farmers will benefit from LED options will contribute to *reduced net GHG emissions* (FP3). FP3 aims to influence organizations to adapt plans or direct investment to *increase women's participation in decision-making* about LED in agriculture. Partners will report annually on gender activities, achievements and indicators, so as to track progress to the outcome targets.

Hypotheses for achieving the IDOs

Five gender-related hypotheses are proposed in relation to the ToC. **H1-H4** are each aligned with one FP, while **H5** is cross cutting CCAFS. CRP Table 7 indicates planned Flagship gender research to help to produce the outcomes outlined in the hypotheses. All these hypotheses will be examined in the course of the research, through MELIA; qualitative research that examines processes, outcomes and stakeholder perceptions; and external evaluation. The hypotheses are:

H1: Scaling up CSA through improved policies and programs, and increased investments, will influence national/ state organizations and institutions to adapt their plans and direct investment to increase women's access to, and control over, productive assets and resources, as well as enhance food and nutrition security.

H2: Context-specific knowledge on the GSI impacts of practices, technologies and information systems on CSA lead to investment and scaled adoption of CSA practices which increase women's control of productive assets at the local level and are scalable.

H3: Improved evidence, incentives, technical capacity, and social mobilization for LED will support governments, the private sector and donors to implement LED policies and programs at large scales that will increase participation in decision-making and control of productive assets by women and vulnerable groups.

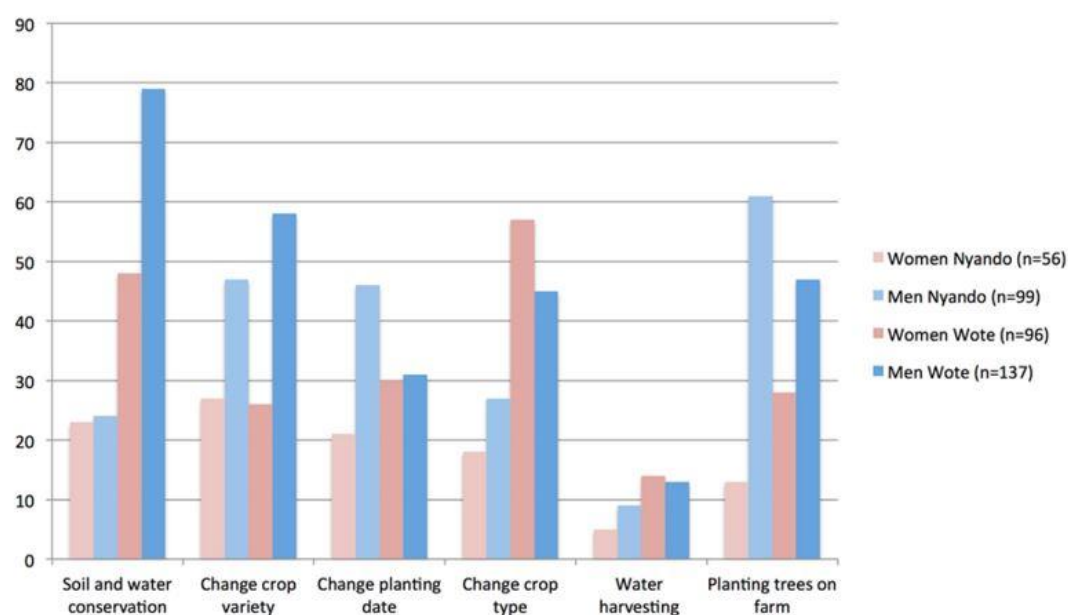
H4: Overcoming key gaps in climate information, knowledge and methods to effectively target and implement climate-informed services and interventions, and evidence of their benefits, leads to more

effective use of climate information by women farmers and gender-equitable control of productive assets.

H5: Promoting equitable decision-making in the household will lead to women's increased control of productive resources and increased empowerment.

Organization and management

CSA gender specialists, located in Centres, work across FPs. The current gender FTE is approximately 21. A GSI Research Leader and Program Manager work with RPLs and Flagship Leaders (FPLs) on design, implementation and monitoring. Through RBM, the extent of serious gender research will feed back to budget adjustments. CCAFS is coordinating a system-wide LP on "CSA, gender and social inclusion", including a Gender and CC researchers' network, to promote collaborative research and sharing of methods, tools, and experience. Members have close links with other CRPs and so will be key nodes for building connections between CCAFS and other CRPs. CCAFS will actively participate in and liaise with the CGIAR Gender and Agriculture Platform. CCAFS management and governance bodies are updated regularly on gender research through membership of the GSI Leader on the PMC; major seminars presenting gender research; periodic gender reviews and other activities. For CCAFS as a whole, 20% of the budget goes to gender research (see budget narratives).



CRP Figure 5. Response to climate change by women and men in Kenya

Source: [CCAFS et al. 2013](#)

CRP Table 5. GSI research and elements of the ToC

Elements of the ToC related to how large-scale CSA adoption might occur (Lipper et al. 2014)	Gender research categories
(1) Implementing a program of integrative and strategic research to “build evidence” that is informed by gender research;	<p>Analysis of data in the Gender Household Survey conducted in CSVs, to provide a baseline for the gender and youth sub-IDOs (CCAFS et al. 2013), and updated in 2017 in six CCAFS sites across 4 countries – Kenya, Uganda, Senegal and Bangladesh.</p> <p>Analysis of household decision-making methodologies in adaptation and mitigation. Studies in three countries in EA (to be expanded to LAM and WA) will include baseline analyses, surveys of existing research, testing of technologies and practices, and measuring behavioural change.</p> <p>Enabling mechanisms, tools and frameworks for gender in CSA, along with strategies for scaling up and measurement frameworks will be tested in CSVs in all five regions.</p> <p>Value chain research will assess women’s engagement in supply chains, access to technical information, and barriers to participation with a focus on dairy, tree crops and agroforestry, coffee, cocoa and rice.</p>
(2) Ensuring that gender and women’s empowerment are dealt with in coordinated climate and agricultural policy;	Global and national climate policy research will investigate the extent to which women and gender are integrated. Research will include analysis of GSI in UNFCCC policy and the INDCs. Work with WISAT will develop statistical and policy analysis in 21 countries.
(3) Building mechanisms to engender finance;	The potential for climate finance instruments to support women’s adaptation and mitigation-based enterprises will test the W+ standard with a pilot in Nepal and the CARE CSA/SuPER framework in EA and WA; and others.
(4) Enhancing the capacity of local institutions and services to close the gender gap.	Enabling mechanisms, tools and frameworks for gender in CSA, along with strategies for scaling up and measurement frameworks will be tested in CSVs in all five regions.

CRP Table 6. The sub-IDOs with gender dimensions

IDOs and sub-IDOs	Outcome				
		1	2	3	4
IDO: Enhanced smallholder market access					X
Sub-IDO: Improved access to financial and other services	8 million farm households with improved access to capital, with increased benefits for women				X
IDO: Improved diets for poor and vulnerable people		X			
Sub-IDO: Optimized consumption of diverse nutrient-rich foods	14 organizations and institutions in selected countries/states adapting plans and directing investment to optimise consumption of diverse nutrient-rich foods, with all plans and investments examined for their gender implications	X			
IDO: Mitigation and adaptation achieved		X		X	
Sub-IDO: Improved forecasting of impacts of climate change and targeted technology development	50 site-specific targeted CSA technologies/ practices tested, with all options examined for their gender implications		X		
Sub-IDO: Reduced net GHG emissions from agriculture, forests and other forms of land use	10 low emissions plans developed that lead to significant mitigation by 2030, i.e. will contribute to at least 5% GHG reduction or reach at least 10,000 farmers, with all plans examined for their gender implications			X	
IDO: Equity & inclusion achieved		X	X	X	X
Sub-IDO: Gender-equitable control of productive assets and resources	55 organizations adapting their plans and directing investment to increase women's access to, and control over, productive assets and resources (FP1: 20 national/state organizations; FP2: 15 development organizations, with the focus on investments for CSA activities; FP4: 20 development organizations, with a focus on investments in climate services and safety nets)	X	X		X
Sub-IDO: Participation in decision-making	15 organizations adapting their plans or directing investment to increase women's participation in decision-making about LED in agriculture			X	

CRP Table 7. Gender research and the CCAFS hypotheses

Gender hypotheses	Research
H1: Scaling up CSA through improved policies and programs, and increased investments, will influence national/ state organizations and institutions to adapt their plans and direct investment to increase women's access to, and control over, productive assets and resources, as well as enhance food and nutrition security.	<ul style="list-style-type: none"> • CSA for women and other vulnerable groups • How to strengthen roles and opportunities of women in multi-level governance processes for food and nutrition security • Explore and test the best methods for formulating policies and programs that encourage equitable access to and control of resources and productive assets
H2: Context-specific knowledge on the GSI impacts of practices, technologies and information systems on CSA lead to investment and scaled adoption of CSA practices which increase women's control of productive assets at the local level and are scalable.	<ul style="list-style-type: none"> • Indicators on gender-related benefits of CSA benefits • Sex- and age-disaggregated adoption profiles for CSA practices and technologies • Incentive mechanisms to target adoption of CSA by women farmers • Identify practices and portfolios that have positive impacts on the control of productive assets and resources within communities
H3: Improved evidence, incentives, technical capacity, and social mobilization for LED will support governments, the private sector and donors to implement LED policies and programs at large scales that will increase local participation in decision-making and control of productive assets by women and vulnerable groups	<ul style="list-style-type: none"> • Train women scientists and policy makers in global programs such as CLIFF-LAMNET and improvement of the MOT tool • Post-doctoral positions for gender specialists • Women's role in LED of dairy value chains • Identify where gender trade-offs in GHG mitigation can be reduced by identifying enabling conditions to benefit women
H4: Overcoming key gaps in climate information, knowledge and methods to effectively target and implement climate-informed services and interventions, and evidence of their benefits, leads to more effective use of climate information by women farmers and increased input into household decision-making.	<ul style="list-style-type: none"> • Strengthen understanding of how climate services and agricultural insurance can meet the differing needs of women farmers; incorporate this into scale up of climate services and agricultural insurance; • Test gender transformative potential of services by improving control of resources and participation in decision-making. • Synthesize current evidence and generate new knowledge to inform the design and implementation of gender-equitable services
H5: Promoting equitable decision-making in the household will lead to women's increased control of productive resources and increased empowerment.	<ul style="list-style-type: none"> • Analysis of household decision-making methodologies in adaptation and mitigation. Studies will include baseline analyses, surveys of existing research, testing of technologies and practices, and measuring behavioural change.

1.0.5 Youth

Youth will be interwoven into gender and social inclusion (GSI) activities across CCAFS research and will be considered important in scaling up CSA (see Annex 3.4 for the Youth Strategy). CCAFS will also target youth separate from gender-related activities through youth-focused strategic research across FPs and Regions. This will build from Phase I experience with youth in LAM, WA, EA, SA and SEA and will include the following activities: (1) Disaggregation and analysis of data in design, implementation, and reporting of activities (e.g. by sex, age); (2) Strategic research on youth engagement in policy and how this can be improved at global/national policy levels (e.g. through CSOs, social media, youth networks, negotiation processes) and in programming at subnational level (e.g. within adaptation and mitigation research programs); (3) Examining the role of youth along the CSA value chains in CCAFS and priority value chains in AFS-CRPs, including agricultural research, extension services, agriculture input supply, transportation and processing, to develop attractive opportunities for youth beyond the farm; (4) Research on the use of ICT technologies and engagement processes to meet the CSA and climate information needs of youth to strengthen youth entrepreneurship and climate resilience; and (5) Capacity strengthening through participatory learning approaches with youth (e.g. participatory video, theatre, ICTs).

CCAFS will use mechanisms in place for addressing gender across FPs and Regions to design, implement, and report on youth activities (e.g. GSI team, gender focal points at centres, LP on CSA). Research will be shared through CCAFS products and platforms, CG networks, international publications and fora, and global policy processes). CCAFS will collaborate with organizations working on youth, e.g. FAO, IFAD, CARE, YPARD, [the CSA Youth Network](#), and subnational organizations and initiatives, e.g. Ecohabitats. CCAFS will also collaborate with national, regional, and global research and policy bodies to improve youth engagement in policy and programming.

1.0.6 Program structure and flagship projects

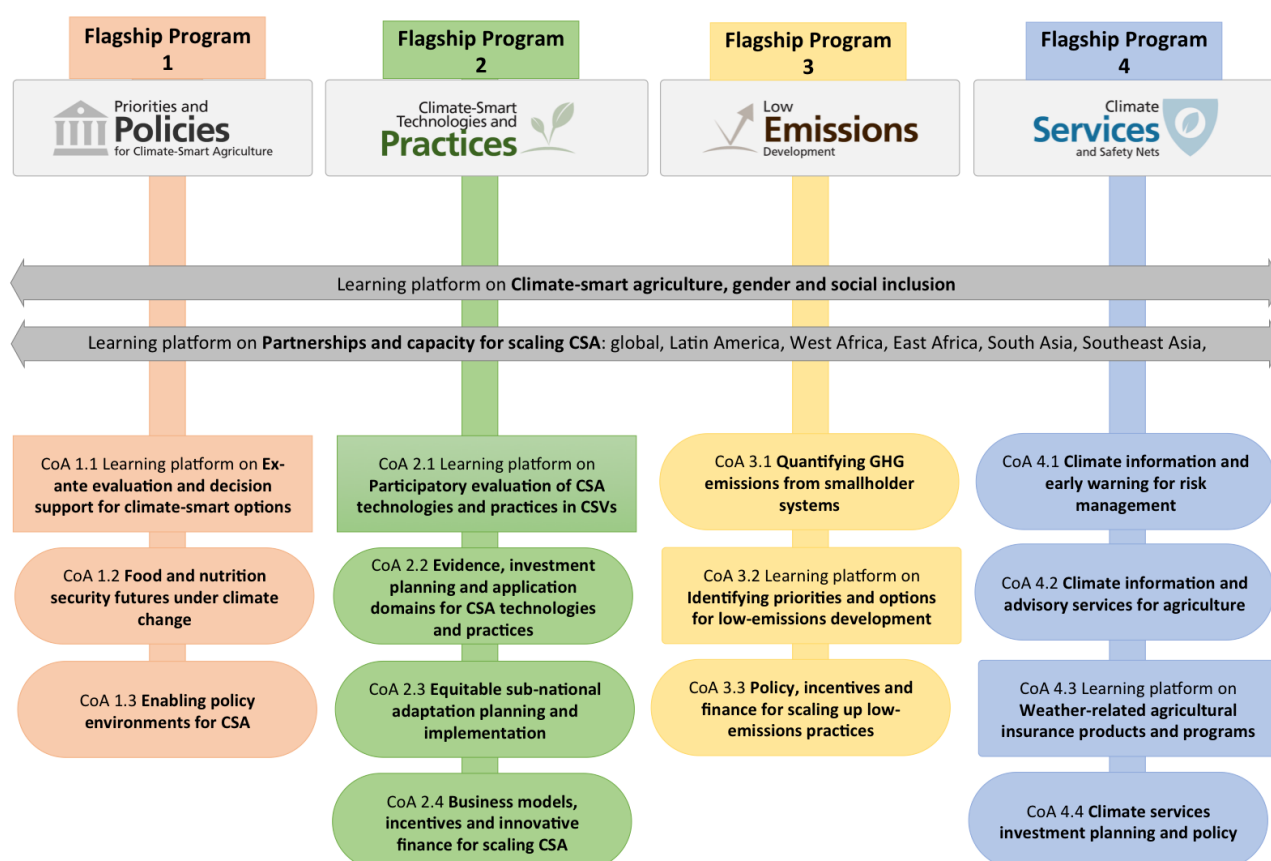
The CCAFS programmatic structure is shown in CRP Figure 6. There are four Flagship Programs. There are also six Learning Platforms that integrate with other CRPs and across CGIAR centres. Four of these are run under FPs and two are run independently, cutting across all FPs. CCAFS operates from farm to global levels, with different FPs having responsibility for different themes in different levels (CRP Figure 7). It is essential that the FPs coordinate their work streams.

FP1: Priorities and Policies for CSA will improve evidence and tools on enabling policy environments and priority-setting for targeted investment to support the scaling of CSA technologies to ultimately contribute to food and nutritional security under climate change. The FPL will be based at ILRI. The FP will include a cross-CRP LP on *Ex-ante evaluation and decision support for climate-smart options (LP1)*.

FP2: Climate-Smart Technologies and Practices will provide the evidence on the synergies and trade-offs among technologies and practices, towards the achievement of the distinct pillars of CSA across a range of agro-ecologies and social contexts. The FPL will be based at CIAT. The FP will include a cross-CRP LP on *Participatory evaluation of CSA technologies and practices in CSVs (LP2)*.

FP 3: Low Emissions Development will test the feasibility of reducing agricultural GHG emissions intensities at large scales while ensuring rural food and nutrition security in low-income and middle-income countries. The FPL will be based at strategic partner University of Vermont. The FP will include a cross-CRP LP on *Identifying priorities and options for low-emissions development (LP3)*.

FP4: Climate Services and Safety Nets will address critical gaps in knowledge, methodology, evidence, and capacity needed to effectively implement a set of scalable interventions that use climate-related information to manage climate-related risk. The FPL will be based at strategic partner IRI. The FP will include a cross-CRP LP on *Weather-related agricultural insurance products and programs (LP4)*.

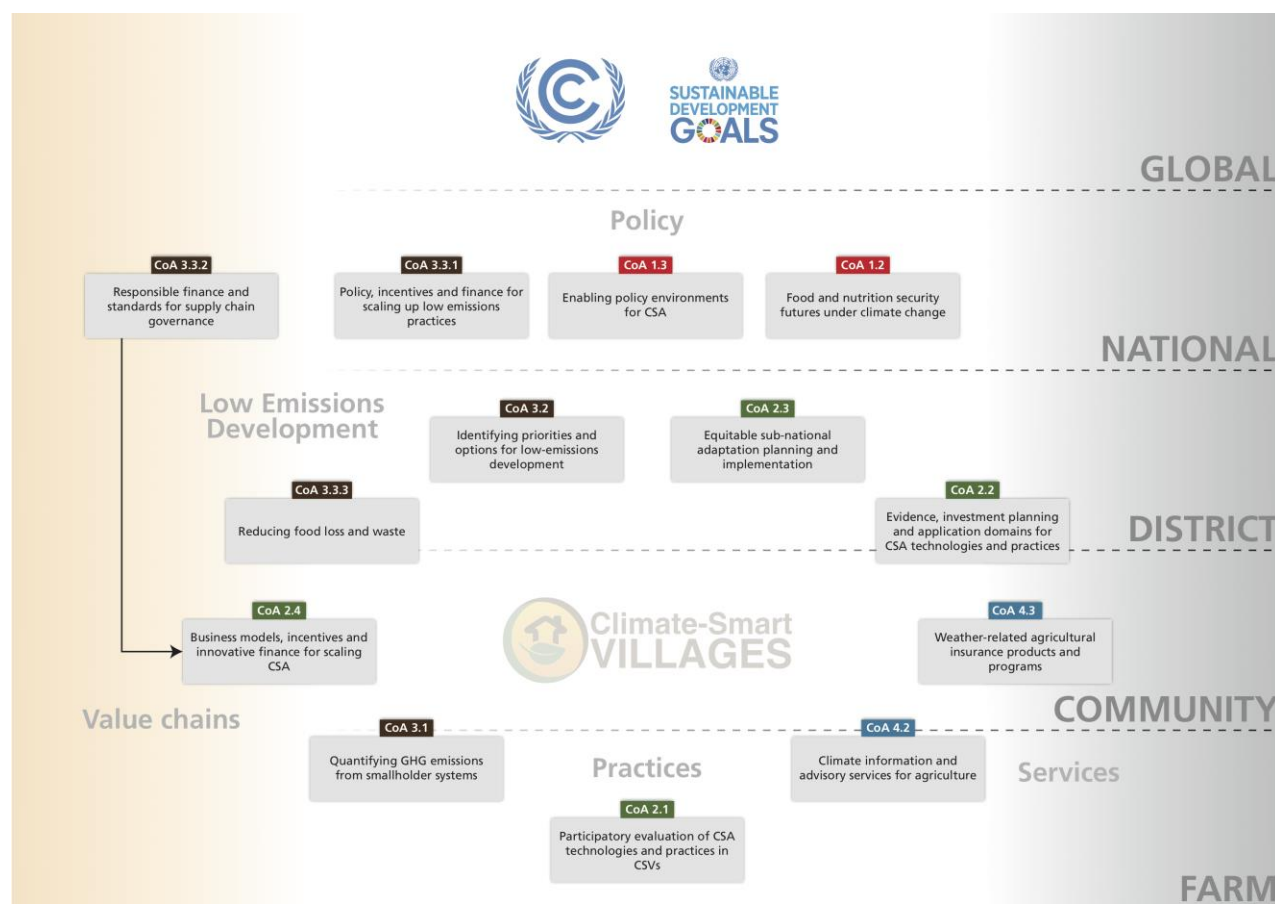


CRP Figure 6. CCAFS programmatic structure (CoAs indicate Clusters of Activity; square boxes show CoAs that function as LPs)

LP5 on CSA, gender and social inclusion will undertake research to inform, catalyse and target CSA solutions to women and other vulnerable groups, increase the control of disadvantaged groups over productive assets and resources, and increase their participation in climate-relevant decision-making. The GSI Research Leader, based at strategic partner WISAT, will lead delivery of this LP in coordination with all FPs and the Partnerships LP, coordinating closely with the CGIAR Gender and Agriculture Network.

LP6 on partnerships and capacity for scaling CSA will position CGIAR as the leading global research organization for developing country food systems and climate change, by managing partnerships and capacity development at global, regional and national levels to deliver impact from research. The Global

Research Leader on Scaling CSA will lead a team of RPLs to deliver this LP in coordination with all FPs and CRPs.



CRP Figure 7. CCAFS works across scales from farm to global levels. Examples of CoA contributing at different levels are shown, but a number of those CoA span more than one level

Rationale for CCAFS structure

Until recently, global negotiation processes on climate change have maintained separate tracks for adaptation and mitigation, based on the concept of common but differentiated responsibilities among UNFCCC parties. The agricultural sector, including CCAFS, has consistently challenged this strict delineation, recognizing the many opportunities for co-benefits between adaptation and mitigation in farming and food systems. The external policy environment for climate change and food security is increasingly integrative across adaptation and mitigation, and across the whole food system. For example, Parties delivered integrated plans for both mitigation and adaptation to the UNFCCC call for INDCs to the post-2015, and the GCF invites funding proposals to deliver simultaneously on both goals. However, separate tracks can be expected to remain to some extent, and for good reason, due to the hierarchy of preference in how society tends to respond to climate change (mitigation, then adaptation, then compensation for loss and damage). Low emissions development in developing country agriculture is essential if we are to achieve globally agreed targets for emissions reductions – and hence needs a dedicated research track. An additional challenge is the mismatch between the multi-decadal

timeframes for long-term adaptation, which involves transformation of entire agricultural and food systems, and the one to five year planning horizons of most governments and development agencies. Over these timeframes, farmers are experiencing climate change mainly as increasing risk associated with less predictable weather, or a growing frequency or intensity of extreme climatic events.

CCAFS is structured around the reality of this external environment. FP1 and FP2 focus on CSA, i.e. the co-achievement of food security, climate change adaptation and reduction of GHG emissions associated with agriculture. FP1 deals with the over-arching policy context, aiming to assess how enabling policy environments and priority-setting for targeted investment can support the scaling of CSA technologies. FP2 addresses the level of technologies and practices, aiming to provide evidence on the synergies and trade-offs of different practices and technologies towards the achievement of the three goals of CSA across a range of agro-ecologies and social contexts. FP3 focuses on how low emissions development pathways can deliver globally significant mitigation outcomes in tandem with gains for adaptation, food security and national development. FP4 tackles current climate variability, aiming to foster the longer-term transition towards CSA in high-risk environments by supporting the development of climate information services and climate-informed safety nets that enable smallholder farmers to adopt more climate-smart production systems.

The CCAFS LP on Partnerships and Capacity for Scaling CSA provides the central mechanism for cohesion across FPs at national, regional and global levels. It provides both synthetic learning functions and pathways to impact at scale, working with partners in each region as well as at the global level. It is designed to deliver these impact pathways for all CCAFS FPs and for the full body of CGIAR research on climate change. The LP on CSA, Gender and Social Inclusion provides for a rigorous treatment of gender and equity, in a climate context. It works across the full CCAFS portfolio. The pathway to impact for CCAFS depends critically on its capacity to integrate the adaptation-led Flagship Programs FP2 and FP4 with low emissions strategies (FP3) and institutional approaches to food systems (FP1), and to align all of these within an informed approach to social inclusion, to increase the CRP's contributions to IDOs, SLOs and SDGs.

1.0.7 Cross CRP collaboration and site integration

While CCAFS has programmatic research content, it also has a major role to integrate climate change across all CRPs, and in fact across a range of partnerships. The CCAFS strategy for achieving a fully integrated CGIAR portfolio, from farmers' fields to global processes, involves five mechanisms, as follows:

(1) Impact pathways. CCAFS established integrated regional impact pathways, involving numerous partners and Centres (including scientists already participating in other CRPs). These will be revisited in relation to ongoing Site Integration planning. An integrated impact pathway focus helps to shape partnerships, cross-CRP collaboration and build common purpose. Annex 3.6 provides an example of the approach.

(2) Learning Platforms (LPs). CCAFS will host six LPs – these will involve a body of research activities within their thematic area, exchange of lessons learnt on methods and tools, events focusing on emerging results, synthesis of results across CRPs, and communication. It is estimated that 44% of the

overall CCAFS budget is allocated to LPs. The six LPs are as follows (each is linked into specific Site Integration plans – see Annex 3.6 for more detailed roles and linkages).

LP1: Ex-ante evaluation and decision support for climate-smart options (including downscaled climate data, regional climate outlook, prioritization frameworks)

LP2: Participatory evaluation of CSA technologies and practices in Climate-Smart Villages (including integrated assessment of CSA options)

LP3: Identifying priorities and options for low-emissions development (including guidelines for GHG measurement, identifying priority mitigation options)

LP4: Weather-related agricultural insurance products and programs (including global analyses to identify constraints and opportunities, lessons from pilots)

LP5: CSA, gender and social inclusion (supporting CSA gender specialists on climate-specific topics)

LP6: Partnerships and capacity for scaling CSA (position CGIAR as leading global research organization for developing country food systems and climate change; manage national to global partnerships for climate change policy impact and scaling CSA)

(3) Climate Change Contact Points. CCAFS has established Contact Points in each Centre. Many Contact Points have roles in other CRPs so will be familiar with the activities in other CRPs. Contact Points will facilitate two-way flow of strategic information between CCAFS and other CRPs in their Centre and identify additional opportunities for collaboration. Specific roles for each Contact Point have been established (Annex 3.6).

(4) Project Activity Planning. Each CCAFS project, and future CCAFS projects, will identify in the “Planning and Reporting System” (MARLO) the linkages with other CRPs, including levels of co-investment. Project collaboration often starts at the concept stage, through interactions between individuals from different CRPs.

(5) Internal Learning. To ensure success in the Cross-CRP collaboration strategy, attention will be given to internal learning. This will consist of two elements. (1) Cross-CRP collaboration will be one element in MELIA (Annex 3.5). For example, annual work plans for each LP will be developed, and will be annually assessed by relevant participants. MELIA will also feed into decisions on which LP to phase out and which to start, as resource limitations preclude a focus on more than the six topics selected. For example, once work on index-based insurance is well advanced (LP4), it may be opportune to shift focus to another topic. (2) The effectiveness of the above mechanisms will depend on the skills of the individuals, e.g. Contact Points, leaders of LPs. All these individuals will have annual appraisal (including 360 degree feedback).

1.0.8 Partnerships and comparative advantage

Partners and the ToC: The Partnership Strategy (Annex 3.1) focuses at the national level as the key route to impact. This Strategy is seen as a crucial element of the ToC. As in Phase I, CCAFS will set a budget target of 25-30% to non-CGIAR partners. At the global level CCAFS will co-invest with 41 Strategic Partners (Tier 1, see Section 1.0.11):

- All 15 CGIAR Centres
- 12 research partners (CATIE, CIRAD, CSIRO, Future Earth, GRA, ICAR, IRI, NUI Galway, Universities of Leeds, Oxford, Vermont, Wageningen)
- 14 development partners – including public sector and inter-governmental partners (FAO, IFAD, IICA, NEPAD, SEARCA and World Bank), private sector partners (several companies under WBCSD) and non-governmental development partners (CARE, CTA, GIZ, IIRR, PAFO, WISAT, World Vision).

Comparative advantage of CGIAR on climate and agriculture: CCAFS and its partners have comparative advantage in (a) science quality, (b) capacity to deliver outcomes at scale and (c) integration across disciplines and agricultural sub-sectors.

In terms of science quality, CCAFS and CGIAR's strongest comparative advantage lies in the following areas (key papers published by CCAFS during Phase I are given in brackets for each area of comparative advantage): *ex-ante* evaluation of CSA options at multiple scales ([Vermeulen et al. 2013](#); [Herrero et al. 2014](#); [Klapwijk et al. 2014](#); [Thornton and Herrero 2015](#)); participatory evaluation of climate-smart portfolios ([Ramirez-Villegas et al. 2011](#); [Bryan et al. 2013](#); [Rippke et al. 2016](#)); identifying priorities and options for low-emissions development ([Rosenstock et al. 2013](#); [Herrero et al. 2013](#); [Mbow et al. 2014](#); [Wollenberg et al. 2015](#)); weather-related agricultural insurance products and programs ([Hansen et al. 2011](#); [Hill and Viceisza 2012](#); [Tadesse et al. 2015](#)); and research on gender and social integration under climate change ([Beuchelt and Badstue 2013](#); [Kristjanson et al. 2014](#); [Jost et al. 2015](#)). CCAFS will lead cross-CRP LPs in each of these areas of comparative advantage. Other unique scientific IPGs generated by the CRP are its tools and databases, such as AgTrials (>35,000 trials with weather data), CCAFS-Climate (portal for downscaled climate model outputs with over 190,000 downloads per annum) and the [Mitigation Options Tool](#).

In terms of delivering outcomes, CCAFS has comparative advantage as a knowledge partner in CSA implementation. This is demonstrated by invited roles such as the ACSAA (NEPAD) and World Bank knowledge partnerships, IFAD Learning Alliance, co-facilitating the Knowledge Action Group of GACSA, and co-chairing the WBCSD initiative on CSA. Through these initiatives CCAFS will contribute to improved livelihoods, food security and climate risk management for 500 million farmers by 2030 (GACSA target) and emissions reductions of 30% in agricultural value chains involving multi-national companies (WBCSD target).

A CRP that integrates across Centre specialities can strongly enhance both research and impact. An integrated climate CRP allows CGIAR to speak with one voice on climate change. CCAFS has demonstrated its ability to raise CGIAR's profile, leverage external skills and funding, increase effectiveness of IPGs in impact pathways, e.g. [joint submissions to UNFCCC](#), and deliver integrated products, e.g. [standardized CSA metrics](#).

Other key AR4D providers in the climate-agriculture space are the global environmental change community (Future Earth), UN agencies (FAO and WFP), and regional bodies like CORAF and APAARI. CCAFS seeks to complement rather than replicate their comparative advantages, through partnership and alignment. For example, CCAFS was established by CGIAR and Future Earth as a partnership to combine CGIAR's comparative advantage on agriculture with advanced research institutions' strengths on global change. As CCAFS and Future Earth both enter new phases of strategy, we will partner on [the Water-Energy-Food Nexus](#).

1.0.9 Evidence of demand and stakeholder commitment

At the global and regional levels, demand comes from the UNFCCC and IPCC processes and from development partners (public, private, civil society) that are implementing CSA programs. At the national level, there is additional demand associated with national climate policy processes, including NAPAs, NAPs, NAMAs and INDCs. Recent evidence of demand for CCAFS research and engagement include:

Peer-reviewed science e.g. CCAFS and CGIAR publications comprising 15% of citations in IPCC AR5 Working Group II chapter on agriculture and food systems (threefold greater than in the past) and 6% of citations in IPCC AR5 Working Group III chapter on land use ([St. Louis et al. 2015](#)).

Policy positions e.g. multiple citations of CCAFS work in parties' 2015 submissions on agriculture to UNFCCC SBSTA (e.g. by EU and by Sudan on behalf of the Africa Group of Negotiators).

Tools e.g. [ICRAF-CCAFS gender toolbox in use by 61 partners in 19 countries](#).

Metrics e.g. FTA-CCAFS emissions factors for peatlands submitted by Indonesian government as baselines in formal UNFCCC accounting processes ([Hergoualc'h & Verchot 2014](#)).

Databases e.g. CCAFS Climate Portal receiving 18,278 total hits in 2014, of which 54.3% were "new"; 41.87 terabytes were shared and 235,236 files downloaded ([CCAFS 2015](#)).

Communications products e.g. over 18,000 downloads of a CCAFS summary of the implications of IPCC AR5 science findings for smallholders ([Vermeulen 2014](#)).

Inputs to national policy – CCAFS science is informing policy in 20 countries on a demand-driven basis e.g. helping to determine the agriculture component of [Colombia's INDC](#).

Inputs to implementation e.g. CCAFS science used to develop finance model [for index-based insurance by Agricultural Insurance Company of India](#), now reaching a million farmers.

Public sector CSA leadership e.g. CCAFS co-facilitating the [Knowledge Action Group](#) of the GACSA, co-launching a CSA portal with World Bank, and co-delivering a Learning Alliance with IFAD.

Private sector CSA leadership e.g. CCAFS a co-chair of the WBCSD Low Carbon Technology Partnership Initiative on CSA, helping to [deliver tracking and measurement of ambitious 2030 targets](#) for mitigation, adaptation and food security.

Capacity development e.g. Contributions of CCAFS data, materials and expertise to postgraduate training programs such as MSc CCAFS at NUI Galway. CCAFS will deliver on at least six areas of the CGIAR CapDev framework, with an emphasis on four.

Commitment by Strategic Partners: Non-CGIAR Strategic Partners have agreed on a set of topics for co-investment, with partners allocating at least USD 8 million for in-kind contributions to joint topics, with this expected to grow through joint fundraising (Annex 3.1; Table 2 under Partnership Strategy). Future Earth has been asked to represent non-CGIAR partners on the CCAFS ISC through one of its steering committee members. CCAFS is a lead participant in Future Earth's Knowledge Action Network on Food-Energy-Water under its new strategy ([Future Earth 2014](#)).

1.0.10 Capacity development

1. CapDev role in impact pathway

Capacity development is pivotal to the climate change community given its focus on enhancing adaptive capacity (Adger et al. 2005; McCarthy 2001). The UNFCCC has a work area on capacity-building. At COP21, Parties agreed to a third review of the implementation of the capacity-building framework, a framework already established in 2001. Given the outcomes targeted by CCAFS, in the UNFCCC context the entirety of CCAFS could be considered capacity development. The CCAFS capacity development strategy (Annex 3.2) is central to the ToC and impact pathways of CCAFS, providing the mechanisms whereby increasing abilities to demand, undertake and utilize research lead to sustainable improvements in capacity to manage climate change. Therefore the CCAFS capacity development strategy addresses the full ToC cycle, from discovery through to scaling, monitoring and evaluation. Many of the hypotheses in the CRP and FP ToCs address capacity development. CCAFS will work at individual, organizational and institutional levels of capacity development, and with both researchers and research users, including organizations and networks. In Phase I CCAFS has undertaken capacity needs assessments at national levels (e.g. CSA country profiles) and at the level of strategic technological and institutional innovations (e.g. index insurance and GHG inventories). For research capacity, CCAFS has established and will continue the CLIFF and LAMNET PhD fellow programs that provide opportunities for early-career research and researchers in the CCAFS regions. CCAFS and NUI Galway have established an MSc and CCAFS expects to develop a similar partnership with CATIE in its new MSc Mitigation and Adaptation to Climate Change. CCAFS will also work to bring curriculum-based capacity development to wider circles, for example with the Government of Nigeria (curriculum for training government staff on CSA) and an open access portal co-hosted with the World Bank ([csa.guide](#)). Wherever possible, the four FPs will coordinate capacity development actions and work with other CRPs. CCAFS is committed to improving its monitoring and evaluation of capacity development outcomes and impacts during Phase II, for example through rigorous ex-post impact

assessments. CCAFS capacity development actions address all nine elements of the CGIAR CapDev framework, but focus most on four elements:

- (2) Learning materials and approaches, e.g. a National Environmental Information System with CTCN partners in Cote d'Ivoire, an online South Asia Drought Monitoring System (FP4 linked to WLE), and trained infomediaries in Rwanda reaching thousands of farmers through seasonal planning workshops, rural radio and a cellphone-based SMS platform.
- (5) Gender-sensitive approaches, e.g. training of women scientists and policy makers to enhance their opportunities for contribute directly to national reporting and decision-making on agricultural GHG emissions (FP3) and measurement of continuous improvement in gender-sensitivity, including National Assessments on Gender and STI (LP on CSA, Gender and Social Inclusion).
- (6) Institutional strengthening, e.g. developing long-term country-level capacity on National Adaptation Plans (NAPs), Nationally Appropriate Mitigation Actions (NAMAs) and Nationally Determined Contributions (INDCs & NDCs) in individual countries and at regional level, working with partners like ASEAN and NEPAD.
- (8) Organizational development, e.g. direct collaboration with meteorological services to secure organizational capacity to provide farmer-friendly climate information services and to reconstruct historical climate records across Africa (FP4) and financing and facilitating NARS scientists to participate in processes such as The African Group of Negotiators Expert Support (LP on Partnerships and Capacity for Scaling CSA). For CCAFS as a whole, 18% of the budget goes to capacity development (see budget narratives for details).

2. Strategic CapDev actions(see CapDev Framework)

<u>Intensity</u> of implementation of chosen elements (Please indicate High, Medium, Low) Note- it is expected that no more than 3-4 elements would be implemented at High intensity		Give an indication of <u>how</u> chosen elements will be implemented (Note: more space available for full plan in Annex)	3. Please indicate any Indicators- from CapDev Indicators document or other - that could be used to track progress and contribution to CapDev Sub-IDs
1. Capacity needs assessment and intervention strategy design	low	Mostly completed in Phase I	

<p>2. Design and delivery of innovative learning materials and approaches</p>	<p>high</p>	<p>CCAFS will invest in innovative content development and knowledge sharing mechanisms to increase the uptake of research outputs at all levels. All materials, trainings and outreach will be grounded in theory and designed in direct consultation with partners and intended end-users. providing environmental data of relevance to national policy-makers. CCAFS will also take advantage of opportunities to increase the uptake and learning value of existing tools and protocols.</p>	<p>CapDev Outputs (CRP/Flagship level): Output 1: Learning materials designed according to context and audience. Indicators: Proportion of learning materials developed for external audiences reviewed with relevant partners; Proportion of learning materials developed in local languages where appropriate Output 2: Learning materials pilot tested with target audience. Indicator: Proportion of learning materials developed for external audiences piloted with representative audiences CapDev Outcomes (CRP/Flagship level): Outcome 1: Learning materials accessible to targeted users. Indicator: Proportion of intended users who rate learning materials as accessible in participant feedback surveys Outcome 2: Users implement the learnings and take decisions based on materials. Indicator: Increase in number of outputs and decisions made by users that demonstrate application of learnings and materials CapDev Outcomes (Boundary partner level): Outcome 1: Partner research and development</p>
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			<p>organizations use learning materials and approaches. Indicator: Number of partner organizations that use materials and approaches Outcome 2: Training/workshops based on learning materials and approaches leads to changes in practice. Indicator: Incidence of new regulations, practices implemented following training or workshops.</p>
3. Develop CRPs and Centers' partnering capacities	medium	The Cross-Cutting Learning Platform on Partnerships and Capacity for Scaling CSA aims to raise CGIAR partnering capacity on climate change issues	
4. Developing future research leaders through fellowships	medium	CCAFS will support visiting researchers and students, including networks (e.g. CLIFF-LAMNET). Post-doctoral positions for gender specialists from developing countries in selected sectors will support more gender-sensitive research.	
5. Gender-sensitive approaches throughout	high	CCAFS will undertake capacity development activities that build on Phase 1 insights into the	<p>CapDev Outputs (CRP/Flagship level): Output 1: Engagement with key partners for</p>

capacity development.		<p>differing needs of women and men with regard to multiple climate-smart options, such as climate information services and adapted crop varieties. Gender sensitivity will be built into the design of capacity development actions. Research will test the degree to which these services can be gender transformative by improving control of resources and participation in decision-making. CCAFS will invest in deliberate and measurable inclusion of local capacity development initiatives led by women. Trade-offs between competing outcomes, such as emissions reductions and gender equity, will be researched and addressed. CCAFS will work with partners to measure continuous improvement in gender-sensitivity at individual, organizational and institutional levels of capacity development, including at the level of national policy.</p>	<p>gender-sensitive approaches, including learning agendas. Indicators: Number of partnerships initiated; Number of learning agendas evaluated and implemented Output 2: Provision of options for capacity development in gender approaches & toolkits. Indicators: Number of gender toolkit (& similar) activities with partners; Funding made available by CRP/Flagship for CapDev activities on gender CapDev Outcomes (CRP/Flagship level): Outcome 1: Enhanced capacity and willingness of CRP staff and partners to understand and embrace gender-sensitive approaches in the design and implementation of projects, programs, and policies. Indicators: Proportion of projects that include gender-sensitive approaches; funding made available for design/review of gender sensitive approaches in the CRP (disaggregated by type of organization). CapDev Outcomes (Boundary partner level): Outcome 1: Conducive agricultural policy environment for gender-sensitive and gender-transformative measures. Indicator: Number of new policies</p>
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			that support gender-sensitive and gender-transformative measures (disaggregated by country)
6. Institutional strengthening	high	Globally and in all regions, CCAFS will provide integrative cross-CGIAR learning platforms on climate change. Building on existing national science-policy platforms led by CCAFS and partners, these will bring together relevant decision-makers to learn from CGIAR climate-related science in a consistent way, to inform key policies and programs such as National Adaptation Plans (NAPs), Nationally Appropriate Mitigation Actions (NAMAs) and submissions to the UNFCCC including INDCs. CCAFS facilitation of these multi-stakeholder platforms will provide direct institutional strengthening with regards to adaptation and mitigation capacity in individual countries, and at regional and higher levels via collaboration with partners such as NEPAD and ASEAN.	CapDev Outputs (CRP/Flagship level): Output 1: CRPs/Flagships support institutional strengthening activities of boundary partners with a focus on policy makers from government agencies. Indicators: Number of policy platforms supported; number of meetings; number of participants (disaggregated to show proportion of policy-makers and diversity of agencies) CapDev Outcomes (CRP/Flagship level): Outcome 1: Strategic plans for institutional strengthening of policy capacity implemented. Indicator: Number of strategic plan recommendations implemented (disaggregated by agency or policy process) CapDev Outcomes (Boundary partner level): Outcome 1: Policy-making capacity of government agencies enhanced. Indicators: Number of policy decisions taken

			(in part) based on engagement and information dissemination by CRPs; Number of policy papers issued using research evidence generated by CRP/Flagships
7. Monitoring and evaluation (M&E) of capacity development	medium	Measurement of CapDev indicators in regular MELIA processes, and assessment of external indicators e.g. National Assessments on Gender and STI	
8. Organizational development	high	CCAFS will work closely both with research partners, especially NARS, and with boundary partners to address the new set of opportunities and challenges under climate change. These include new technical skill sets (e.g. models, future scenarios, greenhouse gas measurement) as well as a strong working knowledge of the many new mechanisms for linking from research to development outcomes (e.g. policy vehicles like the UNFCCC, disaster and risk management, private sector emissions targets). A set of highly focused capacity development actions will enhance the abilities of NARS in specific research	CapDev Outputs (CRP/Flagship level): Output 1: Engagement with NARS and research partners throughout the research cycle Indicator: Proportion of meetings at all stages of CRP cycle that include research partners and NARS (planning, implementation, progress review, evaluation) Output 2: Strengthen NARS and research partner skills related to research cycle Indicators: Number of workshops or trainings provided on research management; Number of participants from NARS and research partner organizations CapDev Outcomes (CRP/Flagship level): Outcome 1: Stronger

		<p>approaches that will enable sustained inputs to national policy and to international science. CCAFS will work directly with NARS in several countries on fundraising for national-level research on climate change solutions in agriculture, for example from the Green Climate Fund.</p>	<p>skills of individuals and organizations in policy engagement for uptake Indicator: Increase in proportion of policy engagement activities (e.g. events, online platforms, networks, policy briefs, public speaking appearances) led by NARS partners Outcome 2: More effective R4D is produced by NARS Indicator: Increase in number of peer-reviewed publications co-authored by NARS CapDev Outcomes (Boundary partner level): Outcome 1: Institutional support at national level for effective R4D Indicator: Increase in funding provided for (a) research and (b) engagement between research and research users Outcome 2: Productive university-industry collaboration Indicator: Increase in number of private sector adoptions of CRP innovations led by NARS</p>
9. Research on capacity development	low	Some research under the FP1 Climate Change and Social Learning initiative	
10. Capacity to innovate	low	CCAFS will support capacity to innovate within AFS-CRPs	

1.0.11 Program management and governance

The CCAFS governance model from Phase I, which has been [favourably reviewed](#) and which follows the recommendations of the IEA Review of CRP Governance, will be maintained with minor modifications (for [roles and responsibilities](#) see [CCAFS website](#)). The Lead Centre is CIAT.

Governance

The Independent Steering Committee (ISC) is the overall advisory body, with CIAT Board taking final decisions on the Program of Work and Budget (POWB) in line with its fiduciary responsibility. The ISC has the following responsibilities: (1) Providing strategic direction to the CRP, including priority setting and the evaluation of results; (2) Approving the POWB developed by the Program Management Committee (PMC), and presenting it to the CIAT Board for final approval; (3) Overseeing external evaluations of CRP activities; (4) Maintaining awareness of stakeholder perspectives; (5) Serving as a programmatic report for the CRP Director; (6) Reporting annually to the Lead Centre Board (through the Board Chair); and (7) Serving as an expert resource to the PMC. The ISC will have: 7 independent members (with gender, geographical and disciplinary diversity, and mixed experience from academia, development agencies and the private sector) and 4 *ex officio* members, namely Lead Centre DG, CRP Director, Future Earth representative (representing non-CGIAR partners), and a DG representing CGIAR partners. It will meet twice per year.

Leadership and management

Feedback from the External Evaluation is positive and thus no change of leadership is envisaged. The *core team* will be: CRP Director, 4 FPLs, 5 RPLs, and 2 cross-cutting leaders (see Annex 3.7). All core team members will be performance-assessed by their organization's line manager, with inputs by the Director. All were selected competitively in previous Phases.

The CRP Director will be responsible for intellectual leadership and representation; sign off on deliverables; facilitating fund raising (see [draft fundraising strategy](#)); ensuring that all CRP strategies are updated and implemented; and have decision-making authority with respect to day-to-day operations. The CRP Director will report administratively to the DG of CIAT and programmatically to the ISC Chair. The Program Management Unit will consist of the Director and administrative, MELIA, data management and communications support (some part time).

The FPLs will be primarily responsible for: Flagship programmatic coherence; facilitating and participating in the delivery of IPGs; technical backstopping for projects in their FPs; facilitating development outcomes through their global partners; and ensuring integration with the other ICRPs, particularly through the LPs. Phase I demonstrated the crucial role of the RPLs, who will be primarily responsible for: the updating of national to regional theories of change linked to ongoing climate change-related processes and the delivery of development outcomes, through coordination, strategic partnerships and capacity development; technical backstopping of projects; integration of work with AFS-CRPs, particularly through two LPs (LP2: Participatory evaluation of CSA technologies and practices in Climate-Smart Villages; LP6: Partnerships and capacity for scaling CSA); and delivery of IPGs. FPs and

Regions will work in a matrix, which a Phase I evaluation ([Ash 2013](#)) has complemented for delivery of both IPGs and outcomes. The two cross-cutting leaders are responsible for delivery of outcomes and IPGs across the program. The GSI Research Leader will ensure that gender and social inclusion are mainstreamed in all activities, and facilitate the delivery of gender-related IPGs. The Global Research Leader on Scaling CSA will facilitate delivery of IDOs and IPGs related to global policy processes and private sector peak bodies (e.g. WBCSD), and research on scaling.

The Program Management Committee (PMC), drawn from the above-mentioned core team, comprises Bruce Campbell (CRP Director, CIAT), Andy Jarvis (FP2 Leader, CIAT), Lini Wollenberg (FP3 Leader, U Vermont), Robert Zougmore (West Africa RPL, ICRISAT), Pramod Aggarwal (South Asia RPL, CIMMYT), Sophia Huyer (GSI Leader, WISAT) and Sonja Vermeulen, Global Research Leader on Scaling CSA, Imperial College). They will meet 11 times per year (mostly virtually). They will have the following responsibilities: ensuring overall strategic focus; ensuring programmatic coherence across Centres, CRPs, FPs, Regions and partners; preparing and implementing all CRP strategies; preparing the annual POWB, annual reports, and inputs to the ISC.

Strategic Partners' roles in governance

All Centres have expressed an interest to be Tier 1 Partners. It is not feasible for CCAFS to reduce this number as climate change is indeed of relevance to all Centres. Centres will have representation on the ISC through an elected CGIAR DG. Similarly, CCAFS has a number of non-CGIAR Strategic Partners – partners that: leverage significant resources for work on a CCAFS-partner jointly defined agenda (e.g. IRI, WUR); lead projects within CCAFS (e.g. CARE, IIRR); lead FPs within CCAFS (e.g. U Vermont); have a global or regional mandate for development (e.g. IFAD, GIZ); peak bodies for various stakeholder groups (e.g. WBCSD, PAFO). These partners will be represented on the ISC through Future Earth (for Strategic Partner roles - Annex 3.1, Annex Table 2).

Each Strategic Partner will have a named Contact Point, with responsibilities tailored to the partner roles. The CGIAR Contact Point responsibilities include: building strategic and operational links between CCAFS and their Centre (including links with other Centre CRP activities); building effective cross-Centre collaboration; contributing to CCAFS strategic development and high-level IPGs. Contact Points report to their line managers with input by the Director.

Given the large number of Strategic Partners, a Partnership Advisory Committee (PAC) will be established comprising Contact Points from Centres and non-CGIAR partners. PAC will meet once per year: to assess CCAFS' mission to deliver on "Clear partnerships and collaborative arrangements built on trust, ownership and joint commitment to vision and impacts" ([Campbell et al. 2006](#)); to discuss CCAFS strategies and possible changes; to review progress and lessons; and to discuss specific partnership issues needing resolution. PAC will feed directly into the ISC through *ex officio* representatives. To reduce transaction costs, PAC will convene on the sidelines of other global conferences.

Internal learning and results-based management (RBM)

One of the ten principles in the ToC is that internal learning is crucial ([Vermeulen and Campbell 2015](#)). We propose that an effective AR4D program includes processes to review the ToC, re-align the strategy, and seize emerging opportunities in the dynamic policy spaces of climate and agriculture. Much useful internal learning can be informal, but more formal components provide a strong framework for institutional learning, adaptive management and change. These include formal online planning and reporting systems (MARLO), results-based management (RBM), risk analysis, external evaluation of potentially problematic areas, longer-cycle learning utilizing baselines and ex-post Impact Assessment and ISC oversight. The CCAFS RBM system now incorporates the sub-IDOs to evaluate progress against impact pathways. Indicators are additive from projects to Regions to FPs and link to the targets in the Performance Indicator Matrix. Each project will establish baseline and MELIA indicators, using standardized procedures across the CRP. Where there are economies of scale across several projects, and for specific indicators, CRP-wide baselines and MELIA will be established. CCAFS has good experience in this area, having undertaken household, village and organization baseline surveys ([Förch et al. 2014](#); [Perez et al. 2015](#)).

1.0.12 Intellectual asset management

CCAFS is in compliance with the CGIAR Principles on IAs (see Annex 3.9). CCAFS IAs include knowledge, databases, publications and other information products; they do not include improved germplasm, plant variety rights and patents. All products produced by CCAFS are, wherever possible, disseminated using open access principles, with clear branding to acknowledge authorship. When working with private sector, CCAFS clarifies its commitment to open access, negotiates on this basis to achieve the broadest possible dissemination of products, and abides by any rules that are placed on the partnership, but final products are made public in accordance with agreements.

CCAFS recognises the role of farmers regarding traditional knowledge and sees such knowledge as a starting point for discussions about climate change adaptation and mitigation. CCAFS seeks to be respectful of national regulations on farmers' rights and the principle of prior informed consent. Publications referring to traditional knowledge give appropriate credit to the providers of such knowledge, though maintaining confidentiality when appropriate. While household information collected from farmers may be included in open-access databases, care is taken to protect confidentiality by taking out all specific information that may identify an individual (following CIAT's Policy on Protection of Human Subjects of Research). CCAFS is committed to participatory research, as discussed in the ToC – this includes sharing results with the participating parties.

Mechanisms to assure compliance with IA principles, include: (a) ensuring that partners comply with contracts; (b) maintaining a regularly updated IP portfolio (which in CCAFS case are lists of publications and databases); (c) checking that partners pay attention to prior informed consent principles; (d) ensuring that traditional knowledge is appropriately acknowledged; and (e) ensuring confidentiality where appropriate. The PMC have delegated IA oversight to CIAT's General Counsel (IP focal point), with guidelines for implementation to be approved by the PMC. Resources needed for the tasks are budgeted under other CCAFS functions (in particular under data management and communications), and include 8% FTE for CIAT's General Counsel. [Link to full strategy](#).

1.0.13 Open access management

In keeping with the [CGIAR Open Access and Data Management Policy](#) (OADM), research data, tools, and associated information generated under CCAFS will be made available for indexing and interlinking, so that research outputs are open via FAIR principles (Findable, Accessible, Interoperable, Re-usable) to enhance innovation, impact, and uptake. The OADMP complements the CGIAR Principles on the Management of Intellectual Assets.

In Phase I CCAFS developed a [data management strategy](#) and a set of [user-support materials](#), and piloted its implementation in relation to reporting, collating outputs, and quality assessment of archived data. CCAFS designed and implemented an online Planning & Reporting system (“P&R”) that has been used for three cycles of project planning and reporting to date. The online platform is a key component of CCAFS open access management in Phase II, setting out workflows and procedures for planning, reporting, and learning, including evaluation of data and tool outputs along with appropriate metadata (see Annex 3.8 for details). The CCAFS P&R will be modified to fit the requirements for Phase II, while the four ICRPs: A4NH, CCAFS, PIM and WLE have agreed on moving forward jointly on the design and implementation of a single, integrated online ICT platform, called MARLO.

Open access management at CRP level includes setting policies and providing the overall framework, systems and structure. This is operationalized at flagship, region and project levels, where research outputs will follow CGIAR requirements and will primarily be hosted within the existing platforms CGIAR or CCAFS hosts (e.g. [CGspace](#), [Dataverse](#), [CCAFS climate](#)). [Link to full strategy](#).

1.0.14 Communication strategy

Strategic communications offers a set of powerful tools and approaches that can contribute to CCAFS outcomes and CGIAR’s SRF, and generate positive change. The CCAFS communications strategy (Annex 3.10) builds on five years of successful communications in Phase I (see strategy for examples).

In Phase II, communications continues to strongly align with the program’s impact pathways. In Phase I all communication staff took up impact pathway thinking and MELIA, so that communications rose to the challenge of being an essential component of the ToC. Communication activities are thus designed to deliver on the program’s overall goals as well as on measurable objectives that promote CCAFS science, inform major initiatives and policies on climate change, agriculture and food security, make knowledge open access, and encourage learning and sharing of information across the program and with partners.

Phase II communications will employ well-established tools and approaches to deliver tailored messages to program partners and next users, who can help produce development impacts. Systematic monitoring and evaluation of communications activities will continue, to ensure that Phase II communications benefits from previous successes and lessons learned, and continues to learn and adjust as the program evolves.

Communications is a shared responsibility by all program partners, and collective action and collaboration will be essential to deliver impact under CCAFS Phase II. Phase I demonstrated the benefits of strong central coordination of communication activities, coupled with contextualized communication in the regions.

Communications will be supported through budget allocations and staff time including: a Global Communications and Knowledge Manager to lead program communication, working under the Global Research Leader for Scaling CSA; flagship communicators based in the regions; and dedicated communicators in CCAFS projects. [Link to full strategy](#).

1.0.15 Risk management

Throughout Phase I, CCAFS maintained a risk catalogue that was updated at least once per year by the full PMC. The risk catalogue includes details on each of the risks, their likelihood and impact, mitigating measures and a risk owner. The results of the risk assessment were reported once per year to the ISP and to the CIAT Board, and included discussions each year between the CCAFS Director and the Chair of the CIAT Audit and Risk Committee of the Board, a specialist in risk management. These practices will be maintained in Phase II.

Key risks that were dealt with in Phase I included budget stability and its implications for efficient management (this also forms one of the recommendations to CGIAR in the CCAFS External Evaluation), morale issues (in terms of Centre scientists and the change processes), problem with bilateral funding (e.g. insufficient being allocated to CCAFS themes on the one hand and the challenge of maintain a coherent strategy on the other).

1.1 CRP Budget Narrative

1.1.1 General Information

CRP Lead Center: CIAT

1.1.2 Summary

Flagship Name	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total
FP1: Priorities and Policies for CSA	13,249,344	13,230,138	13,160,208	12,986,703	12,822,320	12,968,831	78,417,544
FP2: Climate Smart Technologies and Practices	21,337,814	23,994,093	27,269,843	30,314,147	33,254,848	36,136,298	172,307,042
FP3-Low Emissions Development	10,239,909	10,248,213	9,759,528	9,809,482	10,068,076	10,150,106	60,275,314
FP4: Climate services and safety nets	9,892,273	9,982,954	10,135,482	10,227,275	10,363,780	10,575,142	61,176,906
Management & Support Cost	2,360,008	2,478,008	2,601,909	2,732,004	2,868,604	3,012,034	16,052,567
Strategic Competitive Research Grant	-	-	-	-	-	-	-
Total	57,079,348	59,933,406	62,926,970	66,069,611	69,377,628	72,842,411	388,229,373

Major assumptions

We have followed the 2nd Call Guidance as to the overall budget allocation, namely USD 21 million W1/W2 in 2017 and USD 57 million total budget in 2017, and 5% increase in budget per annum. In getting submissions from Centers, Centers have suggested that the W3/Bilateral funding level assumed in the current budget can be exceeded. If this is the case it will be dealt with through the Uplift budget.

Flagship budgets

W1/W2 allocations to Flagships represent strategic choices by the Program Management Committee (PMC) and Independent Science Panel (ISP) (see Section 4 below for allocation processes), while W3/Bilateral allocations are largely based on Centre fundraising initiatives and opportunities, with oversight by PMC (see Section 2 below).

A major share of the overall budget goes to FP2 (44%). This represents the heartland of the CGIAR (e.g. CSA technologies and practices in climate-smart villages). The amount is particularly high because of the large amount of bilateral that has been allocated here by Centers. Considering only W1/W2 funds, the allocation to FP2 is significantly lower – FP2 gets 31% of total W1/W2. Roughly equal levels of W1/W2 funding go to CSA policy-related work (FP1, 20%), the technical and institutional options for low emissions development (FP3, 21%), and climate services and safety nets (FP4, 19%). FP2 will deliver outcomes on the ground (which are nonetheless dependent on an enabling environment provided by FP1 and FP4, and on technical inputs provided for emissions reduction and LED by FP3. When the overall budget is considered, because of the allocations of W3/Bilateral, FP3 and FP4 become the

smallest Flagships (16% and 16% of total budget), with FP1 slightly larger (20%). We hypothesize that the global community and developing countries will devote more attention to (a) climate extremes, risk management, early warning and safety nets in the coming years as extreme events intensify (FP4 issues) and to (b) emissions and mitigation in agriculture as the global community gears up to prevent temperatures rising further (FP3 issues). This is likely to increase the demand for research on these topics and make fundraising for them easier. Fundraising priorities will center on the smaller Flagships, and if there are shifts in W1/W2 over time they would be away from FP2 (see Section 4 on dealing with variances).

W1/W2 funds will go to strategic research related to the CCAFS research and engagement strategy. Examples of such work are included in the budget narratives of Flagships.

Center budgets

The budgets amounts vary significantly amongst Centers, with the six largest budget holders being Bioversity, CIAT, CIMMYT, ICRAF, ICRISAT and ILRI. It should be noted that CIAT, as Lead Center holds funds for a number of Strategic Partners that are allocated through the partnership budget line or are held by CIAT to administer on behalf of the Strategic Partner (some partners are unwilling to deal with CGIAR financial situation, e.g. the need for pre-financing). The six smallest Centers are AfricaRice, CIFOR, CIP, ICARDA, IRRI and WORLD FISH. Overall budget allocation is determined by the W1/W2 allocation process (see Section 4), success in raising W3/Bilateral funds and whether or not the Center hosts a Flagship Leader or Regional Program Leader.

Strategic Competitive Research Grant

CCAFS has not allocated funds to a competitive grant budget line, for as explained in Section 4 below, a major portion of the budget has indeed been allocated through competitive processes.

Allocation to natural classification categories

Personnel. Of the total budget 32% goes to personnel. This reflects the considerable staff inputs into the program.

Travel. Of the total budget, 7% goes to travel. Given the program is globally distributed, there is a significant amount of travel, including South-South exchange. However, through virtual meetings there is also a significant budget reduction (e.g. the management team only meets once or twice per year face-to-face in association with other travel commitments, the monthly meetings being conducted via video-conferencing).

Capital equipment. This is a very small percentage (0.3%) of the total costs, as CCAFS-related research is not dependent on high-cost equipment. Measuring GHGs can be very expensive, but because of this expense, CCAFS has strategized to form partnerships with Universities where such equipment is common.

Other Supplies and Services. 21% of the budget goes to supplies and services. Costs here relate to Centres' Full Cost Recovery units such as IT, Facilities, Public Space, Research and Technical Support, as well as funds for workshops and operational services. This category also includes funds that are allocated for the external evaluations of the MELIA strategy. The full list of evaluations is shown in Annex Table 5, and includes CCEs for each of the Flagships, as well as various external reviews of key topics (regional focus, effectiveness of Learning Platforms, gender and partnership strategy implementation, review of data and tools, effectiveness of how well ICRPs are collaborating). Also included under MELIA are budgets for ex-post Impact Assessments conducted by external evaluators.

CGIAR Collaborations. 2% of the total budget goes to Collaborations among CGIAR Centres but only with W3 and Bilateral funds as all W1/W2 budget are sent directly from CIAT Lead Centre to Participating Centres via Program Participant Agreements (PPAs).

Non-CGIAR collaboration. Partnerships for research and development outcomes are a crucial component of the ToC. Thus CCAFS strives to allocate 25-30% of its budget to partners. This amount is expected to leverage own-resources from within partners at 2-3 times that level. In the current budget 24% of the budget has been allocated to partners. The fundraising strategy places emphasis on increasing this level.

Indirect costs. 15% is the average Indirect Cost rate that comes from the different rates among CGIAR Centers defined on estimated income.

Performance Indicator Matrix (PIM) – budget in relation to outcomes

Setting PIM targets

The outcome targets in PIM (see also CRP Table 2; CRP Table 3) are based on experience of outcome delivery in Phase I, collaborative planning with project teams, and analysis of scientific evidence. With respect to outcome delivery, for example, after three seasons of work in Senegal, climate advisories were distributed to [7 million farmers](#). After a few seasons of work in India, new [weather-based insurance products reached more than a million farmers by the end of 2015](#). An ex-post impact assessment on Laser Land Levelling indicated that 0.5 million hectares were covered by this technology, with benefits for food production, adaptation and mitigation ([Gill 2014](#)). In all five CCAFS targeted Regions, multi-stakeholder scenario building with associated quantitative modelling (IMPACT and GLOBIOM) was the entry point for national engagement in about 15 countries and policy outcomes, providing further evidence of what can be achieved ([Vervoort et al. 2014](#); [Palazzo et al. 2014](#)). Projects and regional programs have identified concrete opportunities in the public and private sector for the delivery of research-informed outcomes (e.g. as a key partner to the NEPAD project to deliver on CSA for 6 million farmers; as a partner with WBSCD to establish and implement CSA targets for major multi-nationals). Engagement strategies are in place or are being put in place to increase the likelihood of success. The CCAFS core team and partners are highly attuned to identifying opportunities for engagement with stakeholders that can deliver outcomes, one of the principles underlying the CCAFS ToC ([Vermeulen and Campbell 2015](#)).

Based on such experience, Regional Program Leaders estimated outcome targets for each of the countries with CCAFS projects and engagement strategies. For outcomes related to organisational and

institutional change, this included listing specific organisations that the CCAFS ToC will target and estimating the likelihood of achieving change. Similarly, for countries, examining the likely countries where specific Flagships would achieve a specified outcome. For the outcomes “20 countries/states where CCAFS priority setting used to target and implement interventions to improve food and nutrition security under a changing climate” these could come from countries other than the CCAFS targeted countries, because the Learning Platform in FP1 works with partners (and other CRPs) that focus on countries which are not the prime focus for CCAFS.

Numbers were also checked against the literature and various databases. For example, farm household data of [Lowder et al. 2014](#) were collated for all the CCAFS target countries and compared with outcome estimates for farm households, to check for outlying cases. The literature shows that adoption rates of even a highly profitable technology in developing countries is rarely >1% per year. It also shows that a considerable proportion of adopters will tend to be those with more assets (i.e., above the poverty line). In most CCAFS target countries, rural poverty headcount rates are 30-40%. There is some evidence relating technology adoption to poverty reduction (e.g. [Asfaw et al 2011](#), found 33% adoption of pigeon pea in a random sample in Tanzania and a 10% change in the poverty headcount ratio between adopters and non-adopters). Based on these kinds of studies, we believe our estimates for farm households and poverty reductions are credible. The nutrition target was set in discussion with A4NH.

The target for GHG emissions reduction was set using estimates of mitigation potential from Smith et al. (2008; 2013). Smith calculated regional mitigation potentials for 2030; we assumed 40% of these potentials to be achievable by 2022 and downscaled to the country level proportional to current emissions (for N₂O and CH₄) or area of cropland and grassland (for soil C sequestration). These potentials were then further scaled in consultation with Regional Program Leaders and project leaders according to CCAFS’ current and foreseen level of involvement in each country, and checked against countries’ prioritization of agricultural mitigation in their INDCs.

The outcome target for forest area saved from deforestation was based on estimates of annual agriculturally-driven deforestation by Carter et al. (2015); 29 million ha of forest are lost annually to agriculture in Brazil and 3.5 million ha in Indonesia. We assumed that it would be economically feasible to halve these figures by 2022, and that CCAFS could contribute 5% of this mitigation potential per country. This target was derived through discussions with FTA staff. The target for GHG emissions reduction reflects the GHG mitigation implications of the deforestation target, calculated based on estimates of forest carbon stocks from Baccini et al. (2012) and Saatchi et al. (2011).

Value for money

Calculations on value for money, using data in PIM Table A, indicate that over the 6-year period CCAFS will budget USD 12 per farm household to achieve CSA adoption, USD 10 per person for poverty alleviation and USD 19 per person to remove deficiencies of one or more essential micronutrients. For the natural resources SLO, USD 0.03 is allocated per tonne of carbon dioxide emissions reduced, and USD 20 per ha of forest saved from deforestation (equal to USD 0.03/t CO₂e).

For Flagships, some examples for value for money are as follows (based on PIM Table B), with differences amongst Flagships related to relative effort needed, and the degree to which external stakeholders are able to facilitate particular outcomes. CCAFS believes that it will reach high targets for

investments in CSA (that have been informed by CCAFS science), with research costs of USD 1 informing over 20 times as much CSA investments for FP1, and also over 20 times as much for investments in climate information services and safety nets for FP4. USD 7 per farm household is needed to bring incentives (training, financial, programmatic, policy-related) to farm household for adopting CSA-related practices and technologies that potentially reduce production risks. An example from FP3 is that c. USD 400,000 is needed to facilitate an organisation adapting their plans or directing investment to increase women's participation in decision-making about LED in agriculture.

Co-investment with other CRPs

Of its total budget, CCAFS will allocate c. 44% to research and engagement in Learning Platforms, indicating the degree to which CCAFS plans to play a role in systematic CGIAR-wide integration through Learning Platforms. This kind of investment will be crucial if the CGIAR is to achieve a coherent portfolio across CRPs/Centers. Each LP bears a portion of these costs. Some of this co-investment is allocated to specific Site Integration plans, e.g. (i) climate-smart villages as sites where multiple CRPs can test innovations in a participatory mode with farmers; (ii) CSA science-policy platforms. One of the evaluations planned in CCAFS (Annex Table 5) will examine the degree to which the Learning Platforms are functioning effectively.

Risks

There are no particular risks to spending as planned. However, as noted in Section 1.0.15 (Risk management) it is crucial for the CGIAR to work towards more stable funding. Late budget additions and cuts in the past have made management difficult.

1.1.3 CRP Funding Plan

Funding Needed	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total
W1+W2	21,000,000	22,050,000	23,152,500	24,310,125	25,525,631	26,801,913	142,840,169
W3	-	-	-	-	-	-	-
Bilateral	36,079,347	37,883,407	39,774,469	41,759,485	43,851,997	46,040,500	245,389,204
Other Sources	-	-	-	-	-	-	-
Total	57,079,347	59,933,407	62,926,969	66,069,610	69,377,628	72,842,413	388,229,373

Funding Secured	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total
W1+W2(Assumed Secured)	21,000,000	22,050,000	23,152,500	24,310,125	25,525,631	26,801,913	142,840,169
W3	-	-	-	-	-	-	-
Bilateral	25,255,543	20,835,874	7,954,894	3,758,354	-	-	57,804,664
Other Sources	-	-	-	-	-	-	-
Total	46,255,543	42,885,874	31,107,394	28,068,478	25,525,631	26,801,913	200,644,833

Funding Gap	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total
W1+W2	-	-	-	-	-	-	-
W3	-	-	-	-	-	-	-
Bilateral	(10,823,804)	(17,047,533)	(31,819,575)	(38,001,132)	(43,851,997)	(46,040,500)	(187,584,540)
Other Sources	-	-	-	-	-	-	-
Total	(10,823,804)	(17,047,533)	(31,819,575)	(38,001,132)	(43,851,997)	(46,040,500)	(187,584,540)

W3 and Bilateral already secured

Relative proportions of W3 and Bilateral are unknown, and thus we have used a single category of Bilateral to capture both W3 and Bilateral. 70% of W3/Bilateral is secured for 2017. However, Centres have predicted, through their budget submissions, that the budget for W3 and Bilateral will likely be exceeded for 2017. If additional funds are secured these will be dealt with through the Uplift budget.

CCAFS has put in place a [fundraising strategy](#) for Phase II to make sure that funding gaps do not occur.

Flagship allocation process for W3/bilateral Funds

Past allocations of W3/bilateral funds to CCAFS have been checked for coherence to the CCAFS strategic directions by the PMC. This will continue into the future. CCAFS PMC posits that a strong strategic focus is better than a large portfolio of dispersed activities driven by bilateral funding. The relative amounts going to different Flagships are less under the control of the CCAFS management team, as this is largely determined by partner success in fundraising (see discussion in Section 1 above).

Because of the allocation processes conducted by CCAFS, for both W1/W2 funds (see Section 4 below) and W3/bilateral funds, in particular the need to maintain coherence and strategic orientation, the ratio of W1/W2 funding to W3/bilateral funding will likely be relatively low in 2017 (but close to the level in the 2nd Call Guidance), but is likely to grow over time. We have nonetheless kept the overall ratio in the budget as 1:1.7 as per the Guidance, and will deal with deviations from this through the uplift budget.

1.1.4 CRP Management and Support Costs

Management and Support costs are 4% of the overall CCAFS budget. This covers the work of the Program Management Unit (PMU), as well as several cross cutting components. The Table below contains the budget details:

COST COMPONENT	Amount Budgeted (USD)	
	2017	6-year Total
A. Total Basic components as defined in the guidance document	1,246,821	8,404,350
A.1 Management fee charged by the Lead Center to handle CRP Finance and Administrative matters (Finance, accounting, reporting, contracts management, legal, HR, IT, communication-if handled by Lead Center)	700,000	4,200,000
A.2 CRP director including related cost – benefits and on-cost if customary (computer, vehicle lease and office space) based on percentage time allocation	300,125	2,434,879
A.3 Infrastructure and general and administrative charges if CRP leader is not located at the Lead Center	18,025	122,604
A.4 Flagship leader and regional coordinators only if a significant percentage time (>50%) is dedicated to managerial activities.	-	-
A.5 Financial and administrative support based on time allocation	72,800	533,192
A.6 CRP Management Committee and related costs	35,000	285,000
A.7 Independent Steering Committee (or Science Committee) and related costs	70,000	495,000
A.8 Communication activity related specifically to CRP communication and webpage (not if handled by Lead Center)	25,871	175,972
A.9 CRP internal audit by the CGIAR Internal Audit Unit, or its future equivalent in the new System governance structure	-	-
A.10 CRP internal and external reviews (e.g. CCEEs and other evaluations and reviews), as well as impact assessments (3)	25,000	157,703
B. Total CRP-level cross-cutting components not mentioned in the guidance document	693,180	4,791,361
B.1 CRP special events (e.g. CRP-wide program meetings)	70,000	476,134
B.2 CRP leadership meetings (e.g. country coordinators, flagship leaders, cross-cutting coordinators)(2)	N/A	-

B.3 CRP M&E coordination and systems (not including external evaluations and impact assessments)	167,145	1,136,906
B.4 CRP communications, open access, IP assets, KMIS (including Lead Centre staff budgeted as direct costs not allowed under A.8 above)	341,035	2,319,687
B.5 CRP capdev coordination	15,000	127,500
B.6 CRP gender and youth coordination	30,000	255,000
B.7 CRP site integration support	70,000	476,134
B.8 Other: (specify)		-
C. Total Funding source: MSC budget is assumed funded from W1/2. Some CRPs have been successful in mobilizing W3/bilateral funding to support CRP-level cross-cutting initiatives. These are listed below (1):	420,008	2,856,856
C.1 Grant: (IFAD, Shared learning between CGIAR & IFAD ASAP program)	294,005	1,999,799
C.2 Grant: (Other CRP Leaders; MARLO agreements with other CRPs)	126,002	857,057
TOTAL Management & Support Costs	2,360,008	16,052,567

Notes:

- (1) This budget is largely funded through W1 and W2 but with a share from bilateral for special projects (e.g. for Knowledge and Data Sharing Coordination)
- (2) Component B.2 does not contain any figures as it is cover under component A.6
- (3) Funds under component A.10 are in addition to the Impact Assessment budget of each flagship.

1.1.5 CRP Financial management principles

Flagship allocation process for W1/W2

CCAFS has conducted top-down and bottom-up analyses of strategic priorities in relation to budget allocation that have determined the allocation of W1/W2 funds to Flagships. Top-down has included an analysis of the likely content of each Flagship and its relative priority for funding. This included Delphi-scoring exercises amongst the core team to determine relative priority of different Flagships. Bottom-up included calls for concept notes within each Flagship. During 2014, in preparation for the Extension Phase and specifically considering the needs for Phase II, a new portfolio of activities was developed linked to regional priorities and impact pathways, and to global challenges. This was accomplished

through competitive selection of R4D concept notes followed by integrated planning at regional level (involving in all 140 scientists and practitioners, 45% non-CGIAR partners) where concept note ideas were modified and/or combined to establish a portfolio of inter-linked projects, many involving multiple Centres. Research and engagement gaps were identified and filled; and global engagement strategies and the delivery of key IPGs were planned. This planning remains relevant to Phase II, but with greater emphasis now placed on cross-CRP linkages. Final selection of the portfolio was based on a combination of the overall vision of priorities amongst Flagships (i.e. an “ideal” budget allocation amongst Flagships), the realities of what projects were likely to be the highest impact R4D activities, and a vision of achieving integrated, coherent and excellent R4D portfolios for the matrix of Regions and Flagships (criteria for final selection of activities included consideration of gender, partnerships and degree of external support, i.e. bilateral funding or leverage of non-CGIAR funding). The Program Management Committee developed the final portfolio and submitted it to the Independent Science Panel which had discussions and recommendations about the final results. Subsequent to these exercises CCAFS had various budget cuts and the portfolio had to be trimmed. The cuts proposed were based on a number of criteria, including performance to date, likelihood of a significant outcome, degree to which innovative science was likely to be delivered, and degree to which particular activities were crucial for delivering on a regionally and globally coherent R4D portfolio. Cuts were applied by the core team, with oversight by the Independent Science Panel.

Level of budget ownership by Flagship Leaders (inc. performance management)

Full budget ownership is delegated to Flagship Leaders, though individual Flagship decisions about changes in directions and budget reallocations greater than 10% must be tabled for the attention of the Program Management Committee (PMC) and the Independent Scientific Committee (ISC). Through the Planning & Reporting system (MARLO) all facets of implementation can be tracked, and the MARLO provides the basic data for reporting. The Finance Manager will provide quarterly financial reports to Flagship Leaders.

All Flagship Leaders will participate in annual performance management, whereby all major activities are assessed for progress (Annex 3.5). This will be a formal process involving scoring projects, Regions and Flagships on a range of criteria (drawing on the lessons learned in Phase I performance management). Results are fed into PMC decisions about budget cuts, budget additions and performance bonuses.

Rules and expectations around annual variances for flagship and participating partners budgets

The PMC with oversight by the ISC will be responsible for making budget adjustments in W1/W2 funds, based on the funding available and performance (for performance management, see above). Targets for budgets will be communicated to all participants, and include a CCAFS-wide target for budget allocations to partners (25-30%), targets for the ratio of W1/W2 funds to W3/bilateral funds, and targets for gender research and capacity development. Indirect cost rates on W1/W2 are expected to be below 20% and follow the previous year’s financial statements. Shifts of no more than 10% W1/W2 amongst budget lines are allowed without prior authorization.

Major capital equipment

As explained in Section 1, major capital equipment is not a priority for CCAFS. All major capital investments (>\$25,000) require authorization based on detailed justification.

1.1.6 Budgeted Costs for certain Key Activities

Key Activity	Estimate Annual Average Cost
Gender	\$12,300,000.00
Youth	\$1,860,000.00
Capacity development	\$11,200,000.00
Impact assessment	\$300,000.00
Intellectual asset management	\$35,000.00
Open access and data management	\$851,000.00
Communication	\$3,300,000.00

1.1.7 Other

Uplift

The priorities for the uplift budget are drawn from topics that have been cut entirely from CCAFS during 2016 as a result of budget cuts, or have experienced very deep cuts and have had their scope significantly reduced. Most of these topics were prioritized based on regional and national impact pathways and research novelty, were competitively selected based on concept notes, and had included deep stakeholder engagement in their definition and start-up. Depending on the level of uplift received, further prioritization may be needed. Given the current budget distribution of W3/bilateral funds, the priorities for uplift and the Flagship level are FP3 and FP4, followed by FP1, followed by FP2. Uplift will be based on performance management and strategic considerations, as described in Section 4.

Budget notes on key activities

Gender. Gender research will comprise 20% of the overall budget (USD 12,300 million annually allocated to gender across all budget categories), a slight rise from what was allocated in Phase I. This covers the activities outlined in the gender strategy (Annex 3.3) and the Flagship Programs. Gender and social inclusion is key to delivery of impact by CCAFS. CCAFS will build on research to date including the Gender Household Survey to co-deliver with partners on gender equitable control of productive assets, and participation of women and youth in decision-making outcomes. This will include development of enabling mechanisms, tools and frameworks for gender in CSA, along with strategies for scaling up and measurement frameworks; assessment of household decision making methodologies; support to capacity development across the CRP; synthesis of Flagship Program gender research to date; inputs to

global climate policy processes and climate finance instruments and value chain research. Each Flagship Program includes GSI activities and outcomes with accompanying budget allocations that range from 17-21% of the total Flagship Program budget.

Youth. Youth research will comprise 3% of the overall budget (USD 1,860 million annually allocated to youth across all budget categories). This covers the activities outlined in the youth strategy (Annex 3.4). Youth are taking increasing importance in the delivery of impact by CCAFS; the level of activity is expected to increase during Phase II. This covers the activities outlined in the youth strategy and the Flagship Programs. The youth strategy builds on the work in Phase I to co-deliver with partners in Phase II on a) disaggregation and analysis of data by sex and age in the design, implementation, and reporting of activities; b) Strategic research on youth engagement in policy and programming at global to local levels; c) Identifying CSA options and incentives for young farmers d) use of ICT technologies and engagement processes to strengthen youth entrepreneurship and climate resilience; and e) capacity strengthening including through participatory learning and social media approaches. Each Flagship Program includes capacity development activities and outcomes with accompanying budget allocations that range from 2% to 4% of the total Flagship Program budget.

Capacity development. The budget for CapDev is 18% of the overall CRP budget, USD 11,200 million annually, some allocated through the partnership budget and the remainder accruing from CGIAR staff costs and operational expenses. Capacity development is key to delivery of impact by CCAFS. CCAFS will build on needs assessments conducted in Phase I to co-deliver with partners in Phase II capacity development for researchers and research users with a focus on the areas of (a) Learning materials and approaches, (b) Gender-sensitive approaches, (c) Institutional strengthening, and (d) Organizational development. Each Flagship Program includes capacity development activities and outcomes with accompanying budget allocations that range from 17 to 21% of the total Flagship Program budget.

Impact assessment. 2.2% of the CCAFS budget is allocated to the broader category of MELIA (USD 1,030 million estimated), funds allocated to this being under Flagships and under Management and Support costs. For evaluations alone, on average USD 300,000 per annum is allocated (see Annex Table 5 for a provisional list of evaluations). For impact assessments specifically, funds will be set aside from 2018 and beyond, at USD 100,000-300,000 per annum.

Intellectual asset management. The budget for this is USD 35,000 per year. Funds will be used to ensure that all program participants pay attention to IA policies, and to maintain a regularly updated intellectual property portfolio. Many activities are dealt with under Open access and Communications areas of work.

Open access and data management. The budget for this is USD 851,000 per year, much of it allocated by projects and Center activities within Flagships. CCAFS has also dedicated some resources and capacity for the implementation of OADM within the Program Management Unit (see Section 3). As well as human resources, appropriate IT infrastructure is key for good data management. CCAFS has put in place, and relies on, a mixture of data servers and cloud space for its IT infrastructure.

Communication. The budget for communication is USD 3.3 million per year. A small portion (USD 73,000 per year) is allocated from the CRP management and support cost budget line, with the rest allocated from each of the four FPs, and through projects. Each FP includes communications activities with accompanying budget allocations that range from 5.1-5.3% of total FP budgets. Funds will ensure

delivery of activities that contribute to program level and flagship outcomes. At the **program level**, activities include a) engagement with global climate partnerships and policy processes (including policy briefings, events and webinars, discussion blogs and media engagement); b) marketing, synthesis and dissemination of results through open access publications and platforms, and social media channels; and c) facilitating learning, sharing, monitoring and evaluation of communications across the program. At the **flagship level**, communications activities include a) engagement, dialogue, and outreach campaigns with key stakeholders in sites, regions, at the national level, and thematic communities of practice; b) producing and disseminating knowledge products relevant to next users; c) supporting country Site Integration through sharing knowledge, tools and resources with CGIAR centers and partners working in sites; and d) contributing to program communications through globally relevant messages and cases.

2. Flagship Projects

2.1. FP1: Priorities and Policies for CSA

2.1.1 Flagship Project Narrative

2.1.1.1 Rationale, scope

The vision. The vision of FP1 is that organizations and institutions at multiple scales are transforming the enabling policy environment to accelerate food and nutrition security and poverty reduction in a changing climate. Planned 2022 outcomes are: (a) 14 organizations and institutions in selected countries/states adapting plans and directing investment to optimize consumption of diverse nutrient-rich foods, with all plans and investments examined for their gender implications; (b) 20 countries/states where CCAFS priority setting used to target and implement interventions to improve food and nutrition security under a changing climate; (c) USD 450 million of new investments by state, national, regional and global agencies, informed by CCAFS science and engagement; (d) 20 national/state organizations and institutions adapting their plans and directing investment to increase women's access to, and control over, productive assets and resources; and (e) 11 policy decisions taken (in part) based on engagement and information dissemination by CCAFS (FP1 Table 1).

The challenge. The impacts of climate change will disproportionately affect food insecure and marginalized groups dependent on agricultural livelihoods and with low adaptive capacity ([Nelson et al. 2009](#)). It will also cause greater competition for scarce resources in climate-vulnerable areas and aggravate the shocks that can contribute to forced migration ([Black et al. 2011](#)). Responses to these challenges will require major behavioural shifts to help communities increase their adaptive capacity. FP1 is based on research and partnerships to understand the mechanisms for improving enabling environments to address food security and poverty reduction under climate change and foster institutional change ([Lipper et al. 2014](#)). Good progress has been made on including formal discussions on agriculture under SBSTA in UNFCCC, partly due to CCAFS work. There is much country-level activity on climate policies and adaptation strategies. Climate finance specifically targeted to agriculture is becoming a reality, and this needs to be directed to address country adaptation priorities. In the wake of COP21 and the Paris Agreement, countries' priorities, as expressed in their Intended Nationally Determined Contributions (INDCs), may become key policy-planning instruments in adapting to climate change. Many countries have already included agriculture adaptation and mitigation targets, reaffirming the importance of climate change and agriculture ([Richards et al. 2015a,b](#)).

Scientific and strategic rationale. FP1 will generate and use research results, coupled with well-established partnerships, to engage with stakeholders to support increasing the resilience and food security of vulnerable people. Research questions on how best to facilitate adaptation, mitigation and scaling include how best to set priorities and target interventions under future uncertainty, and what are innovative means of engagement ([ISPC 2013](#); [Kristjanson et al. 2014](#)). FP1 will target the evaluation, development and implementation of policies and other mechanisms informed using knowledge and tools derived from the science of CCAFS and partners that take into account social inclusion. International climate finance and investment in future food security could help to overcome constraints to scaling, provided that countries' priorities are taken into account and investments channelled

appropriately. It could provide new opportunities to mobilize resources, addressing financial constraints in agriculture and achieving positive climate outcomes.

Hypotheses and scope. Research to achieve FP1 outcomes will target two hypotheses: *H1*: CCAFS projections, scenarios methods and priority setting tools will help decision makers target and implement policies and programs at various scales that improve food and nutrition security and reduce poverty. *H2*: Improved policies and programs, and increased investments can facilitate the scaling of CSA, which will contribute to food and nutritional security and reduced poverty under a changing climate.

FP1 will bring CCAFS and partner science to decision-making at national, regional and global scales. Climate science, policy and environmental research, and agricultural modelling will be linked with food systems research and socio-economic scenarios to integrate climate concerns into food security and poverty reduction planning. Comparative analyses of scaling mechanisms, climate finance and science-policy linkages will support research focusing on adaptation planning, including stakeholder engagement and social inclusion. Priority setting work, while evaluating different technology and policy alternatives, will also integrate climate change issues into breeding strategies to improve intervention targeting to the most climate-vulnerable. FP1 will continue its pragmatic identification of entry points in national policy processes, particularly related to INDCs. It will build on existing climate downscaling, crop/livestock and economic modelling, and vulnerability analysis to assess where loss and damage are occurring in agriculture and where compensation or transfer of risk may be warranted.

CRP links. To help coordinate climate change work across CRPs, CoA 1.1 will be a Learning Platform (LP), addressing the ex-ante evaluation of climate-smart options, linking with all AFS-CRPs and ICRPs, particularly PIM CoA 1.1 on foresight modelling, to help set CSA targets. In CoA 1.2, scenarios work will contribute to understanding the trade-offs and synergies implicit in the nutritional and environmental challenges posed by “sustainable diets” with A4NH and PIM. To address the grand challenges of food system policies, FP1 will connect with IFPRI and other Centres, PIM, A4NH and the Genebank Platform via joint case studies and economic analysis in CoA 1.3. Centre partners in FP1 include ILRI, CIAT, Bioversity, IFPRI, IITA, IRRI, ICRISAT, CIMMYT and WorldFish.

2.1.1.2 Objectives and target

Objectives. FP1’s aim is to assess how enabling policy environments and priority setting for targeted investment can support the scaling of interventions, contributing to food and nutritional security and poverty reduction under climate change. Objectives are: (a) improved priority setting, trade-off analyses, and foresight; (b) improved understanding of effective enabling policy environments; (c) more evidence as to how CSA at scale can contribute to food security; and (d) effectively informed investment decisions. Primary target beneficiaries are climate-vulnerable and food insecure groups, including smallholder men and women, and (via national to global policy influence) the urban poor and broader populations in target countries.

Strategic relevance to CGIAR objectives and targets: The main focus of FP1 is the improved food and nutrition security for health SLO (FP1 Figure 1; FP1 Table 1), but through cross-cutting IDOs it also contributes to the reduced poverty SLO. FP1 aims by 2022 to contribute to 6 million more people, of which 50% are women, without deficiencies of one or more essential micronutrients; and to 9 million

people, of which 50% are women, assisted to exit poverty. FP1 targets four IDOs (**bold**) and five sub-IDOs (*italics*):

- **Mitigation and adaptation achieved;** via *improved forecasting of impacts of climate change and targeted technology development*, through priority setting, downscaling climate information and decision support tools; via *enabled environment for climate resilience*, through state, national, regional and global organizations using CCAFS science to enhance food security under climate change.
- **Improved diets for poor and vulnerable people;** via *optimized consumption of diverse nutrient-rich foods*, through organizations at multiple scales that enact plans and increase investment toward improved access to diverse and locally acceptable diets.
- **Equity and inclusion achieved;** via *gender-equitable control of productive assets and resources*, through institutional actions and investments that empower women and marginalized groups.
- **National partners and beneficiaries enabled;** via *increased capacity for innovation in partner development organizations and in poor and vulnerable communities*, through dissemination of good practice guidelines, training materials, workshops.

Mitigation and adaptation achieved: CoA 1.1, a LP, addresses ex-ante evaluation and priority setting for climate-smart options with the AFS-CRPs, PIM and A4NH. It contributes to improved forecasting of climate change impacts and targeted technology development; by 2022, 20 countries/states are using CCAFS priority setting to target and implement interventions to improve food security under climate change. Assumptions include advances in climate downscaling capabilities, strengthened national capacity to use decision support tools, increased availability of CSA technologies and farmer demand, and improved institutional capacity for evidence-based decision-making. Outputs include enhanced data portals and decision support tools (2018), tools for cross-level analyses of alternatives and training materials (2019), and virtual crop ideotypes with high adaptive capacity (2019-2021). CoA 1.3 focuses on enabling policy environments for CSA; by 2022, USD 450 million of new investments by state, national, regional and global agencies are informed by CCAFS science. Assumptions include relevant evidence generated and used, and international climate finance and investment (public and private) prioritized for CSA. Outputs include case study syntheses of enabling policies and GSI-focused policy guidance (2018), improved methods for evaluating CSA scaling effectiveness (2019-2020), and ICT-based tools to support accountability mechanisms (2020-2022).

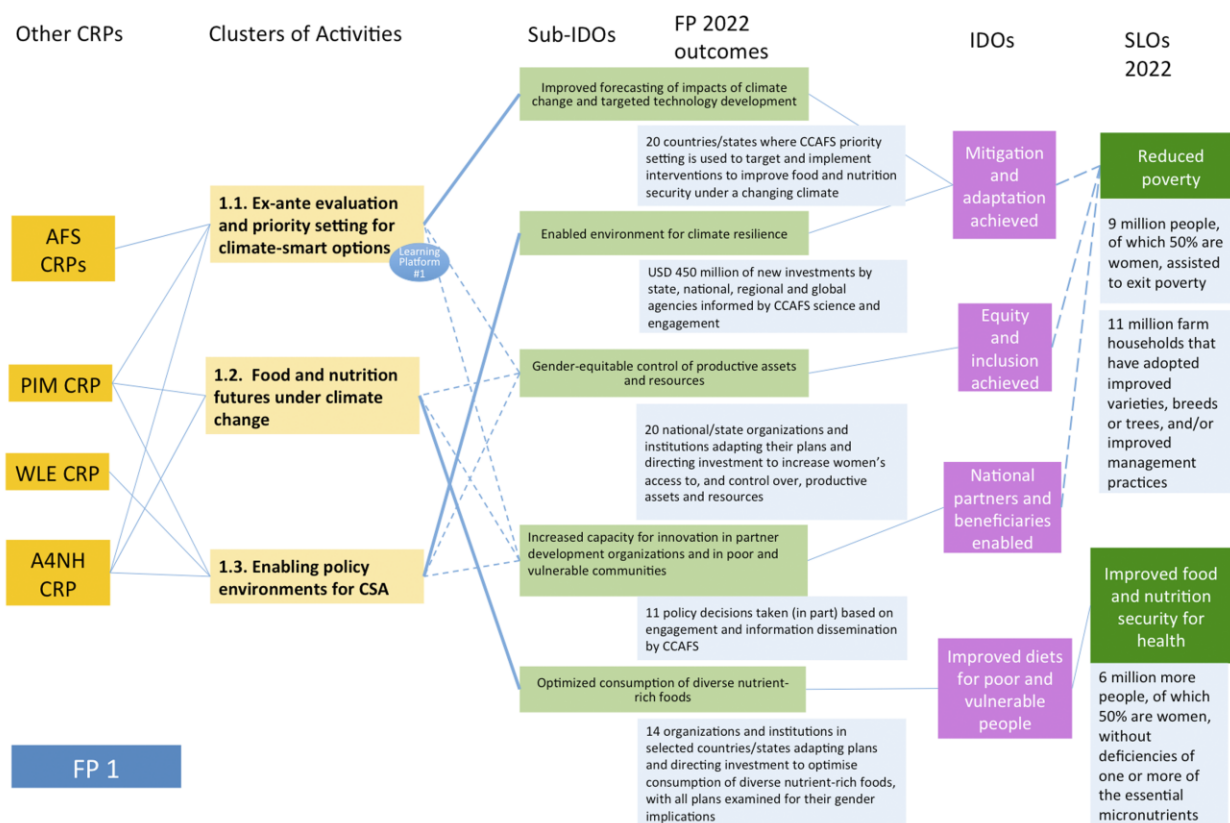
Improved diets for poor and vulnerable people: CoA 1.2, food and nutrition futures, works on scenarios with PIM CoA 1.1 and A4NH CoA 1.1. It contributes to optimized consumption of diverse nutrient-rich foods; by 2022, 14 organizations in selected countries/states are adapting plans and directing investment to optimize consumption of diverse nutrient-rich food, with all plans and investments examined for gender implications. This policy work will contribute to A4NH targets in selected countries. Assumptions include sufficient evidence for food security via CSA and political will and private sector buy-in, food security as a component of migration and population growth agendas, and political stability. Outputs include climate-food security scenarios for policy guidance (2017-2019) and appropriate innovative MELIA systems on policy effectiveness in place (2018-2019), comprehensive multi-level, multi-stakeholder modelling tools (2019), and scenario-guided devolved policy implementation frameworks (2021-2022).

Equity & inclusion achieved: All CoAs contribute to a 2022 target of 20 organizations in selected countries/states adapting their plans and directing investments to increase women's access to, and control over, productive assets and resources to improve food security under a changing climate. Assumptions include political will to involve women in decision-making and investment priorities that recognize women's central role in food security. Outputs include GSI-focused modules in CSA priority setting (2017-2018), gender- and youth-focused policy guidance for CSA and novel youth engagement approaches (2019-2020), and GSI-focused analyses of CSA synergies and trade-offs (2021-2022).

National partners and beneficiaries enabled: All CoAs contribute to increased capacity for innovation in partner organizations and in poor and vulnerable communities; by 2022, 11 policy decisions are taken based in part on engagement and information dissemination by CCAFS. Assumptions include capacity development as a continued R4D priority. Outputs include training materials and workshops to strengthen capacity for priority setting in country organizations (2017-2018), scenario-based strategic planning (2018-2019), and guidance on institutional capacity for scaling CSA (2020-2022).

FP1 Table 1. FP1 outcomes and their targeted delivery over time

SLOs, IDOs, and sub-IDOs	2022 Outcome Description	Target					
		2017	2018	2019	2020	2021	2022
SLO: Improved food and nutrition security for health							
IDO: Improved diets for poor and vulnerable people							
Sub-IDO: Optimized consumption of diverse-rich foods	14 organizations and institutions in selected countries/states adapting plans and directing investment to optimize consumption of diverse nutrient-rich foods, with all plans and investments examined for their gender implications	0	1	2	4	7	14
Crosscutting IDO on Mitigation and adaptation achieved (directed at poverty SLO and food and nutritional security SLO)							
Sub-IDO: Improved forecasting of impacts of climate change and targeted technology development	20 countries/states where CCAFS priority setting is used to target and implement interventions to improve food and nutrition security under climate change	3	6	9	13	16	20
Sub-IDO: Enabled environment for climate resilience	USD 450 million of new investments by state, national, regional and global agencies informed by CCAFS science	50	100	150	250	350	450
Crosscutting IDO on Equity & inclusion achieved (directed at poverty SLO and food and nutritional security SLO)							
Sub-IDO: Gender-equitable control of productive assets and resources	20 organizations and institutions in selected countries/states adapting their plans and directing investments to increase women's access to, and control over, productive assets and resources to improve food and nutrition security under climate change	1	2	3	6	10	20
Crosscutting IDO: National partners and beneficiaries enabled (directed at poverty SLO and food and nutritional security SLO)							
Sub-IDO: Increased capacity for innovation in partner development organizations and in poor and vulnerable communities	11 policy decisions taken (in part) based on engagement and information dissemination by CCAFS	1	2	3	5	8	11



FP1 Figure 1. FP1 Impact Pathway. Under each CoA there will be several research outputs (see Section 2.1.1.6). This FP contributes to the SLO targets (with other CCAFS FPs) but is accountable for delivery, with external partners, of the sub-IDO outcome targets.

2.1.1.3 Impact pathway and theory of change (for each individual FP)

FP1's impact pathway is shown in FP1 Figure 1 and the FP's ToC is explained by the assumptions and strategy below. Partnership is critical to the ToC, including working with other CRPs and drawing on other CCAFS FPs to deliver on outcomes. Developing the capacity of key actors in the impact pathway from high-level investment to local institutions is central to envisaged change (see Section 2.1.1.10). The CCAFS LP on partnerships and capacity for scaling CSA will be a key route to achieve impact via engagement with public policy and business strategy at national to global levels. The FP1 ToC is aligned to the CRP ToC.

FP1's ToC is that by improving enabling policy environments and catalyzing the increase of targeted investments across scales, food security can be improved in a changing climate. Research results will be used to engage with stakeholders: global actors directing finance to developing countries and national governments investing to help overcome constraints to scaling. Ample evidence exists of the links between improved nutrition and poverty reduction via increased productivity, capacity to participate in the economy, and cognitive development ([World Bank 2006](#); [IFPRI 2015](#)). Achieving food security is recognized as a parallel process with development and poverty reduction ([Misselhorn et al. 2012](#)). While

national policies are key, the FP1 ToC hinges on engaging with civil society, the private sector, and other actors at multiple levels. Evidence for successful engagement with stakeholders leading to policy revision comes from recent CCAFS' work with scenarios ([CCAFS 2015](#); [Vervoort et al. 2014](#)).

FP1 will contribute to creating enabling policy environments ("combination[s] of contextual elements allowing progress to be made towards a clearly defined goal"; [Akhtar-Schuster et al. 2011](#), p.299), through direct, sustained engagement between scientists and decision makers. CCAFS research on existing science-policy platforms will help bridge the divide. This includes robust analyses of the likely impacts of climate change on food security, "good enough" governance mechanisms (standards of governance that are adequate, rather than optimal, for specific outcomes; [Grindle 2007](#); [Purdon 2014](#)) to support scaling CSA interventions, and priorities set for investment decisions via multi-dimensional scenarios.

The FP will make use of tailored communications tools and approaches for engaging and informing next users to achieve its ToC, building on successes in Phase I. This includes learning events such as webinars, personal briefings with policy makers, media outreach at the national and global level to share critical results, and developing engaging training materials relevant to partner needs.

A principle of contribution, not attribution, underlies FP1's ToC. Success along the impact pathway is interdependent with other actors and will only be achieved through cultivating and maintaining strong partnerships. Continued engagement with decision makers, co-production of knowledge, and building of trust are key enablers to the uptake of science into decision-making ([Jones et al. 2015](#)). FP1 will engage with partners all along the impact pathway: next-users of research outputs such as public planners and implementers; international NGOs and networks; bilateral partners for scaling out; climate finance institutions where CCAFS science may influence investment priorities; and the private sector to help reduce barriers to CSA uptake at scale. Much of this engagement will be done via the Partnerships and Capacity for Scaling CSA LP.

FP1's ToC is based on several assumptions. One is that scientific knowledge is a desired input into decision-making and that decision makers recognize the need for both evidence and soft skills to use the former effectively. We assume that innovative tools / mechanisms can support national decision-making processes and women's participation in them, when scaled up through meaningful engagement with farmers, community organizations, policy makers, and ministry staff. We assume that it is possible to work with decision makers who have competing interests and priorities for investments. We assume that investment decisions can be moulded by learning from research on enabling policy environments and not only by providing technological solutions for CSA. A major assumption is that countries' adaptation needs (and mitigation targets) will attract climate finance, with mechanisms in place that allow CCAFS to inform donor decisions and strengthen country capacity to successfully compete for funding.

Several **cross-cutting issues** are critical to the ToC. Regarding **gender**, women play a key role in achieving household food and nutrition security. FP1 will support women in adopting CSA interventions and strengthening food security primarily via identifying key policies governing ownership and control over assets such as land and agricultural inputs, and utilizing gender transformative approaches within scenarios engagement (and other) processes to attempt to alter the balance of power and empower women. There is evidence that shifting control over productive resources to women improves food

security ([Sraboni et al. 2014](#)), and FP1 will work with partners to address this using a climate change lens.

FP1 will compare approaches to **youth engagement** at national to global levels, as well as locally. Different methods of actively engaging youth will be tested, including communications through social channels, mobile telephony, radio, television, and citizen science. This will help inform the creation and refinement of food security futures under climate change in CoA 1.2, where gaming and other forms of innovative engagement will aim to empower youth to take centre stage in their development. **Capacity development** will focus on national research agencies, where staff will be enabled to run model-based analyses in-house to feed directly into decision-making.

2.1.1.4 Science quality

State of evidence. Gaps exist in our understanding of the synergies and trade-offs that occur in developing country agricultural systems, many of which involve women ([FAO 2013](#); [Thornton and Herrero 2015](#); [Rosenstock et al. 2016](#)). Many tools can be used to evaluate impacts of policies and practices on development outcomes ([Dumollard et al. 2013](#)) but improvements in model scope, sensitivity, and detail would allow for more comprehensive ex ante evaluations ([Nelson et al. 2014](#); [Klapwijk et al. 2014](#); [Thornton and Herrero 2015](#)). While progress has been made in global and regional databases that can be used for priority setting and evaluation ([Sebastian 2014](#)), critical gaps remain ([Sachs et al. 2010](#)). As climate science develops, global climate databases need to be up-to-date to maintain the relevance of ex-ante studies. Major issues to be addressed include methods to evaluate the quality of large-scale datasets, to robustly link scales of analysis, taking into account GSI, and to improve climate change impacts work regarding changes in climate variability over shorter time horizons ([ISPC 2012](#); [Thornton et al. 2014](#)). Remote sensing, mobile telephony, citizen science, crowdsourcing, and Big Data offer considerable scope for overcoming some of the challenges ([Fritz et al. 2015](#)).

CCAFS has demonstrated the value of using scenarios for addressing future uncertainties in different contexts, and these participatory processes have already delivered concrete policy impacts in several countries ([Vervoort et al. 2014](#); [Vermeulen et al. 2013](#); [Vervoort et al. 2015](#); [Palazzo et al. 2014](#)). The link between foresight and planning has not always been clear ([Bourgeois et al. 2012](#); [Wilkinson and Mangalagiu 2012](#)), though CCAFS work with the collaborative use of explorative scenarios for policy development is providing examples of good practice ([Chaudhury et al. 2013](#)). Research will continue on developing multi-level scenario and modelling approaches that can be linked with state-of-the-art global climate and socio-economic scenarios ([Palazzo et al. 2014](#); [Kriegler et al. 2012](#); [Nelson et al. 2013](#); [O'Neill et al. 2014](#); [Herrero et al. 2014](#); [Wiebe et al. 2015](#)). This work can also facilitate collaboration with the private sector and civil society, facilitating their participation in policy development ([Chaudhury et al. 2013](#); [Carey 2014](#)).

The scale of the climate change-nutrition challenge is clear; WHO ([2014](#)) estimates 250,000 additional deaths attributable to climate change by 2030, 38% of them caused by child undernutrition. The relationship between uptake of CSA and food security is not clear ([GLOPAN 2014](#)). The links are being explored (e.g., [Beuchelt and Badstue 2013](#); [McKune et al. 2015](#)), but more research is needed to elucidate the synergies and trade-offs involved in moving towards potential “four-way” wins (adaptation, mitigation, food security, and nutritional security) and more vibrant, diversified rural economies, especially in the face of increasing food price volatility ([Watts et al. 2015](#); [Webb 2014](#)) and

possible impacts on migration ([Warner et al. 2013](#)). Better understanding is needed of the enabling policy environments within which CSA can be taken to scale ([Bizikova et al. 2014](#); [Purdon 2014](#); [Westermann et al. 2015](#)). There are knowledge gaps as to what characterizes "good enough" governance ([Grindle 2007](#)), the influence of CSA and competing discourses on decision-making, and how the transformations that may be needed under climate change might be brought about.

Development of research priorities. FP1's research agenda builds on that of the CCAFS Extension Phase and aims to extend the outcomes achieved in priority setting, scenarios work and policy and governance research. During Phase I, the orientation of the FP was modified in response to recommendations of the CCAFS ISP. In response to recommendations of the External Evaluation of CCAFS and to the ISPC's evaluation of the FP1 pre-proposal for Phase II, other changes have been made to scope and focus, including the creation of a LP for priority setting that adds a climate change lens to ex-ante evaluation, and a strengthened focus on food security under climate change, enabling policy environments, and investment that take GSI into account.

How FP1 will advance the science. FP1 will work on ex-ante priority setting methods linked at multiple scales, utilizing enhanced crop, livestock, agricultural system, agricultural sector, economy-wide and household models (including IFPRI's IMPACT, IIASA's GLOBIOM, LEI WUR's MAGNET) that can evaluate land-use change, environmental impacts and socioeconomic drivers of food security under a changing climate, from global level to the field and household level. Simpler tools will be developed for priority setting and evaluating projects through a climate change lens, based on data reduction techniques and novel global and regional datasets. For example, large household datasets are being developed by FAO and CSIRO, and FP1 will link with these partners to develop novel techniques to analyse and include them in the household dimension of the economy-wide model MAGNET (van Vuuren et al. in press; [Woltjer et al. 2014](#)).

Development and curation will continue on a portal with state-of-the-art GCM data outputs and novel methods of downscaling through space and time. Cutting-edge participatory scenarios approaches will be extended to address food security at national and subnational levels, and novel ways developed to downscale scenarios and results to the local level.

With partners, FP1 will develop new analyses of the synergies and trade-offs in CSA interventions and policies at different scales, including public and private costs and benefits of different alternatives, particularly in relation to women and other disadvantaged groups. Low-cost methods will be developed and applied to monitor the adaptive capacity of local populations using telephony and citizen science. Novel scientific methods of linking technical and policy research and engaging with decision makers at different scales will be developed and compared.

Managing for science quality. Most work in FP1 was identified using competitive processes, based on independent peer review of project concept notes and proposals. Other projects have been commissioned directly to trusted performers. These mechanisms will continue. Several elements of FP1 will be reviewed and evaluated during Phase II (see Annex Table 5). The FP trialled a process of project-level results-based management (RBM) in 2014, and this has been extended to all projects as part of CCAFS's MELIA mechanism ([Schuetz et al. 2015](#)). Agreed criteria are used to evaluate projects annually (including contribution to the peer-reviewed literature and to impact pathways). Projects use these evaluations to help plan future activities, and cases of better or poorer performance may be linked to shifts in budget allocations. CCAFS's expanded online planning and reporting system gives projects the

opportunity to modify their impact pathways and to document self-reflection and learning, including from ex-post impact assessments. This will be built on through annual strategic science reflection events with Project Leaders and science partners.

Research team qualifications. The FP1 team and science partners have a range of multidisciplinary and scientific skills, including agricultural systems and environmental modelling science, economics, policy research, vulnerability science, scenario analysis, climate science, and social science. Recent high-impact work includes substantial contributions to the IPCC's Fifth Assessment Report ([IPCC 2014a; b](#)) and IPCC emissions guidelines, analysis of countries' commitments (INDCs) to agricultural adaptation and mitigation for COP21 ([Richards et al. 2015a,b](#)), and reviews on adaptation in crop-livestock systems of the developing world ([Thornton and Herrero 2015](#)), and global change, livestock and the environment ([Herrero et al. 2015](#)).

2.1.1.5 Lessons learnt and unintended consequences

FP1 has evolved from three related sub-themes in Phase I to one integrated FP. One sub-theme, research on knowledge into action, has been mainstreamed in all CCAFS FPs. The CoAs reflect several shifts: from understanding impacts of climate change on agriculture to evaluating trade-offs and synergies in bundles of practices at different scales; and to a greater food security focus beyond the production component, recognizing that climate change and other grand challenges will have impacts on many if not all spheres of human activity. Emphasis is being placed on enabling policy environments for scaling CSA and other food security-related interventions. All activities have an outcome orientation to R4D, underscoring the importance of new partnerships and skills in research teams.

The uncertainties associated with climate change could have unintended consequences on SLOs that are not the primary focus of FP1, through underestimating its effects on downside risk at local and national levels. Strategies that strengthen adaptive capacity in the short-term for some groups may lead to maladaptation in the long-term or to increased vulnerability of other groups. Focusing on CSA may ignore other components of food security such as access, utilization, and stability. Research on how GSI could be improved to strengthen gender-equitable control of productive assets and resources may challenge intra-household and intra-community decision-making and access to political (and other) capitals. A problem-orientated approach ([Vermeulen et al. 2013](#)) that relies on engagement and capacity strengthening and analysis of power relations may help here. Key next-users of FP1 science products will be engaged through a looped learning approach to ensure science relevance ([Kristjanson et al. 2014](#)). Adaptive management can be used to help maintain flexibility so that if negative consequences begin to appear, activities can be altered.

In response to the ISPC comments on the CCAFS pre-proposal, changes have been made to the scope and focus of FP1. The CoAs have been reduced from four to three, removing the governance-focused cluster (and integrating some pieces into a new CoA 1.3 on enabling policy environments for CSA). Global policy engagement, which plays a critical role in the CCAFS ToC but is not core research, has been removed from FP1, thereby creating a LP. CoA 1.1 is reliant on availability and quality of data, issues that will be addressed as a LP across CRPs. Access to and better packaging of scientific information by themselves are not sufficient to inform policy decisions or change decision makers' behaviour. Better understanding is needed of science-policy linkages so as to more effectively support science-based policy making. In CoA 1.3 emphasis is shifted towards a focus on enabling policy environments, including

a deeper articulation of policy and other governance mechanisms and of institutional change in specific contexts. CoA 1.1 is being strengthened to include breeding strategies under future climates in its portfolio.

In response to recommendations from CCAFS's External Evaluation, we have modified and strengthened the focus of key FP1 components such as food security under climate change (rather than climate smart food systems), enabling policy environments (rather than governance and institutions) and investments that take GSI into account (rather than equitable institutional investments). These elements will be strengthened in Phase II and better integrated through the CCAFS LPs, as non-technological factors influencing the adoption of CSA remain critical barriers to its scaling up ([Westermann et al. 2015](#)).

Achieving FP1's target contributions to the IDOs and SLOs will depend in part on maintaining highly effective partnerships. Building on experience gained in Phase I, substantial efforts will be made to maintain and develop the strategic partnerships needed.

2.1.1.6 Clusters of activity (CoA)

FP1 will work in three CoAs, bringing the science undertaken by CCAFS and partners to decision makers at different scales: CoA 1.1 Ex-ante evaluation and priority setting, CoA 1.2 Food and nutrition security futures under climate change, and CoA 1.3 Enabling policy environments for CSA. These clusters are complementary but make their own contributions to the ToC (see Section 2.1.1.3). Climate science and agricultural, environmental and economic modelling work (CoA 1.1) will be linked to food security futures under climate change (CoA 1.2) to integrate climate concerns into mainstream policies related to food security, poverty, development and the environment. Research on enabling policy environments for CSA (CoA 1.3) focuses on multi-scale adaptation planning, including research on effective stakeholder engagement and social inclusion, as well as evaluation of different policy alternatives, comparative analyses of institutional environments for scaling up CSA, governance mechanisms and climate finance.

CoA 1.1 Ex-ante evaluation and priority setting for climate-smart options (Learning Platform - LP1)

This CoA is a LP, convening a space in which other CRPs can collaborate with CCAFS and each other to conduct joint ex-ante evaluations of CSA practices, technologies, and policies. Research activities will address ex-ante evaluation of CSA options, synergies and trade-offs at multiple scales ([FAO 2013](#)). It will target practices and beneficiaries in relation to what works where and under what conditions and address the application of decision support tools and ICTs for targeting policy development and making investment choices at national levels for improving food and nutrition security under climate change. Another focus will be the development and maintenance of critical datasets such as downscaled climate data from continued improvements in climate models. FP1 may also be positioned as a platform where loss and damage in relation to agriculture can be better understood, quantified, and integrated into resilience policies and programs.

Certain practices may be climate-smart in particular circumstances, but context largely determines the trade-offs and synergies for specific target groups and in differing enabling environments. Because of

the mismatch between local (or sub-sectoral) and national objectives, analyses that consider the aggregate effects of local choices vis-à-vis national objectives are essential. Similarly, the effects of national policies on local realities will be investigated so that their feasibility can be assessed. Research undertaken in CoA 1.1 will help create tools that provide such analyses.

As a LP, the cluster will interface with AFS-CRP breeding programs and PIM foresight modelling. It will provide support on integrating climate in breeding strategies so the next generations of crops, livestock, and fish contain the abiotic, biotic and nutritional quality traits required to make agriculture climate-smarter. Significant global investment is targeted on technology improvement within CGIAR and across national programs and private sector. These technologies need to be designed so that sensitivity to climate variability and change is reduced at local scales. As the climate signal leads to the appearance of novel environments, breeding practice has to adapt at rates above what current programs typically achieve ([Araujo et al. 2015](#); [Burke et al. 2009](#)).

This CoA will address the following research questions: What are appropriate methods to carry out ex-ante evaluations, aimed at better targeting investments, across multiple scales? How can changes in climate variability be incorporated into impact studies and decision support tools? How should the climate resilience of large populations be tracked and measured, so that policies and programs are supporting appropriate activities and targeting the right people, particularly women? How can genotypic responses to climate be better understood and predicted through use of current and future crop, livestock and fish modelling tools and climate databases? What are the predictable aspects of climate that need to be taken into account when breeding for future climates (e.g. heat tolerance in maize in lowland SSA, [Cairns et al. 2013](#))?

Research will be undertaken in collaboration with the other three CCAFS FPs and the AFS-CRPs, the CoA acting as an entry point and platform for undertaking ex-ante evaluations with a climate change lens. These evaluations will make use of analogue tools to help select sites and environments and guide breeding strategies (e.g. with RICE FP3), spatial data analysis, climate data, crop-livestock-household models, integrated assessment models, and ex-ante economic impact assessment methods.

Research outputs will include:

- Data maintained on CCAFS and partner websites, including up-to-date downscaled climate information that builds on current data portals (e.g. ccafs-climate.org)
- Decision support tools developed and curated by CCAFS and partners for helping to set priorities and target policy development for CSA, particularly analysing trade-offs to inform investment choices.
- Training materials developed and archived in the public domain, to strengthen the capacity of partners in applying decision tools in targeting, policy, and investment decision-making.
- Tools for cross-level analyses of policy alternatives in different contexts.
- Modelling of impacts on specific crop, fish and livestock species and quantification of uncertainties, in part fuelled by next generation G×E×M analyses and empirical/big data approaches to understand relevant abiotic constraints across climate gradients.
- Ideotypes identified that have climate-adaptive capacity using new and historical genetic, environmental, physiological and agronomic information.

CoA 1.2 Food and nutrition security futures under climate change

This CoA focuses on the scenario-guided formulation and implementation of policies and action plans relevant to food security under climate change. The work will be based on state-of-the-art, multi-level modelling (IFPRI's IMPACT, LEI WUR's MAGNET, IIASA's GLOBIOM) linked with PIM CoA 1.1, enabling a detailed exploration of food security, with a focus on food and nutrition security, poverty, and diversity in household choices in consumption and production. Modelling multidimensional food system outcomes still needs data and model improvement ([Rutten 2013](#)). Such modelling will support scenario-guided policy processes, building on widespread past successes in the collaborative guiding of national plans in several countries in five regions. The CoA will address food and nutrition security, engaging with national strategic processes that may not otherwise focus on climate resilience. This will allow for stronger collaboration with the private sector, in which scenario-guided planning has a long history. Harnessing insights from successful processes, uniquely multi-level collaborative approaches will be used that will allow for a greater level of inclusion of women and young people, as well as of subnational perspectives. The CoA will respond to commonly-expressed requests for further capacity development through hands-on training using real-life processes that combine learning and plan development. Co-investment with CCAFS Regions, A4NH FP1/FP4 and PIM FP1 will extend cutting-edge food and nutrition security scenario research through a greater focus on climate impacts and GSI. Collaboration with A4NH, PIM and regions can be established through overlap in both scenario science, methods, results, and policy guidance processes. While the focus is largely on climate resilience, collaboration with FP3 ensures that climate mitigation and low emissions development is also part of the activity.

This CoA will address these research questions in relation to scenario development and analysis: How can macro-level modelling tools be complemented with micro-modelling of consumer behaviour to assess and project food security futures at multiple scales and across sectors (health, environmental sustainability, economic viability), as well as be responsive to stakeholders' elicitation of established and understudied drivers of food security, such as gender, education and governance? How can scenario results be analysed to help understand key trade-offs? We will focus on the following research questions in relation to scenario-based guidance of policies, plans and investments: How can policies, private sector strategies, and other agendas affecting food security become more climate-smart through the use of scenario-based planning? What are the most successful approaches for creating multi-dimensional and multi-level scenarios of climate impacts (including extreme weather events) on food security, and why are they successful in comparison with other processes? How can scenario-guided planning processes assist in integrating policy across levels, to make them more gender-inclusive and impactful, helping to ensure implementation?

The CoA will involve the development and application of multi-level participatory scenario approaches and modelling, using a mixture of quantitative and qualitative tools. Outputs will include the following:

- A toolbox of state-of-the art micro-level models of nutrition behaviour of individual consumers and macro-level models of natural resource use, food system activity, consumption and nutrition, with long-term time horizons and opportunities, for the quantification of future scenarios and the exploration of levers for innovation and policy reform.
- Cutting-edge scenario development methodology for incorporating many drivers of change and exploring multi-dimensional scenario possibility spaces in a structured process, beyond the limits of current methods.

- Innovative methodology developed for the analysis of composite scenario results, which supports the investigation of key trade-offs in mainstreaming climate adaptation in broader policy contexts and across food systems.
- Strategy documents, with a focus on implementation plans, informed by inclusive, multi-level scenario processes in several countries.
- Combined climate and food security scenarios developed across regional, national and subnational levels, with a link to global level scenarios, focusing on policy implementation across levels.
- Reports on scenario-guided investments by private sector partners in each focus region
- Capacity for scenario-based strategic planning strengthened in national, regional, and global partners, emphasizing implementable and tractable plans.

CoA 1.3 Enabling policy environments for CSA

This CoA seeks to address issues around the effectiveness of enabling policy environments for CSA, by developing innovative approaches and conducting comparative analyses of the enabling conditions required for CSA adoption at scale. It seeks to help bridge the gap between science and policy and to mainstream climate change information into, and link policies for food security with, national agricultural implementation processes. Results and case studies from FP2's work in CSVs will be utilized, along with FP4's activities in climate risk management, in communicating benefits with decision makers. Research and engagement activities will address the evaluation and development of policies that can encourage farmers to adopt CSA at scale, aimed at enhancing the food security of target beneficiaries; and increase understanding of the enabling conditions that govern the transformative changes that may be required in future.

The CoA takes a broad view of enabling policy environments, including structures, mechanisms and rules that govern social interactions and behaviour (i.e. institutions) and processes and mechanisms that produce and maintain frameworks, rules and actions (i.e. governance). The research will focus on adaptation and food security plans that incorporate suitable climate-smart technologies and practices, national implementation of global treaties on the availability and use of genetic resources for CSA, and gender action plans that evaluate the potential of policies, practices, and technologies in overcoming gender disparities ([Holvoet and Inberg 2013](#); [Nelson and Stathers 2009](#)). The CoA will seek to better understand the broader enabling environment in which climate-smart food and nutrition security policies can be taken to scale, so planning and investments can be targeted effectively towards specific stakeholder groups, information flows fostered between national, regional and global actors, and local voices appropriately taken into consideration in regional and global fora. Work in this CoA complements research on scaling processes, finance and policies in FP2 (CoA 2.2, 2.3 and 2.4), FP3 (CoA 3.3) and FP4 (CoA 4.4), all of which are brought together in an integrated whole by the LP on partnerships and capacity for scaling CSA.

The CoA will address the improvement of enabling policy environments at the national/state level, through research on engagement with decision makers (public and private) via stakeholder platforms, science-policy dialogues, and other mechanisms, and analyses of these processes. Activities will assess methods for policy analysis, policy change and transformation, and co-development of knowledge depending on context. Researchers will engage with stakeholders to ensure that high-quality

information about the impacts of climate change and effective enabling environments is available for use in the design and implementation of policies that can lead to enhanced and climate-resilient food security at scale. Different methods of engagement will be evaluated and findings synthesized to inform science uptake in other settings.

This CoA addresses several research questions: How is scientific information about climate change and its likely impacts on agriculture, food security, and livelihoods best co-designed with, packaged for and communicated to different stakeholders for integration into decision-making? What are strengths and weaknesses of emerging food security policies in relation to climate change and effects on different beneficiaries? How can subnational contexts be incorporated into policy design to ensure local voices are empowered to contribute to national decision-making? Which tools are effective in bridging the climate change science-policy divide, with respect to novel decision-making tools, cross-scale methodologies, engagement, and capacity enhancement? How are global treaties effectively implemented in different national contexts?

The CoA will utilize a range of methods, including case study syntheses, monitoring and evaluation of different policy processes, and economic evaluation of different policy alternatives using appropriate models and tools. CoA outputs will include:

- Syntheses of case studies of selected regional and global bodies and comparative analyses of current and emerging climate-related food security policies and “good practice” guidelines on engagement with national planners, and relevant international institutions, in different sectors.
- Monitoring and evaluation and impact assessment of climate and food security policy processes and their effectiveness.
- Capacity strengthening for formulating local and national priorities in regional and global fora.
- Novel analytical tools, indicators, and metrics for evaluating the effectiveness and impact of enabling environments to support the scaling of CSA.
- Global syntheses and evidence of conditions that support scaling and learning under climate uncertainty, including those that are needed to facilitate transformative change.
- Innovative ICT-based tools and gaming to support accountability mechanisms in institutions at multiple scales and to engage youth in decision-making.

2.1.1.7 Partnerships

Achieving the FP1 vision requires engagement with partners all along the impact pathway, primarily through the LP on partnerships and capacity for scaling CSA, which includes Regional and Global Programs. With the Regional Programs, FP1 has gone through several processes for selecting upstream research partners. Regional research priorities workshops were held in Phase I that built on the science-policy platforms developed by CCAFS. These have included network analyses to analyse gaps and overlaps in specific regions to identify partner synergies, where appropriate. Similar processes will be used in future for selecting partners, linked to CCAFS, FP, and regional impact pathways.

FP1 works with several key partners for research. Oxford University's ECI adds value through their work on food systems and their expertise on scenarios for policy guidance. Strategic research partner IIASA is a world leader in integrated assessment modelling, complementing CGIAR expertise with additional capacity in land-use and environmental modelling. CSIRO adds value in systems modelling at multiple scales. LEI WUR adds value in multisectoral economy-wide modelling of food system outcomes at different scales. FP1 has strong links with Future Earth's Earth System Governance project and other partners (Universities of Pretoria, Osnabrück, Indiana), who bring expertise in political economy and behavioural decision-making. Links with universities (Reading, Cape Town, Leeds, UCI) and IRI bring cutting-edge climate science to bear. IDS, IIED, ODI, IISD, and Stockholm Resilience Centre bring strong skills in R4D and policy analysis.

Key partners at the proof of concept and scaling out levels include regional organizations such as NEPAD, ECOWAS, COMESA, AGN, IGAD, ASEAN, CAC, ECLAC, FLAR, and ASARECA, and international NGOs and networks such as CARE, CTA, GACSA, WEF, and WBCSD. International and bilateral partners for scaling out include FAO, IFAD, GIZ, World Bank, and in future, international investment and climate finance institutions such as GCF, where CCAFS and partner-produced science may influence investment priorities in target countries. Other key proof of concept and scaling out partners include national ministries and development agencies involved in policy planning and implementation, such as FANRPAN and ACCRA, meteorological services and climate change units in several countries in LAM, WA and EA, and existing climate change and agriculture platforms, e.g. in [Senegal](#). Such partners are next-users of CCAFS's outputs. Communications for development partners such as [Mediae](#) will be increasingly important for scaling out, as they offer opportunities to reach millions of rural households.

Links with the private sector are crucial to foster uptake of CSA at scale. The scenarios work has built several downstream partnerships: commercial farmers' organizations, agribusinesses, traders and commercial investment banks. Increasing opportunities exist to guide private sector investment. Initiatives such as SUSFANS, TRANSMANGO and CIMSANS that involve FP1 partners at ECI, WUR and CSIRO already have food industry partners (Unilever, Nestle, Mars).

Comparative advantage of the CGIAR. Because of its reach and capacity to work in multiple locations at multiple scales, CGIAR is well positioned to generate scientific evidence and learning in different contexts, built around linkages to and among partners with different skills and expertise in all regions. The integrative nature of most of the work planned in FP1 needs a systems' perspective in a multi-disciplinary setting. In Phase I, FP1 demonstrated not only research success (production of IPGs, high-impact publications, outcomes) but also an important convening role in bringing diverse partners together, including key research and scaling out expertise (see above) that enhances FP1's comparative advantage. This combination of high-quality science and outcome orientation is not readily found outside CGIAR. Work in Phase II can build on a solid foundation of success in Phase I.

2.1.1.8 Climate change

FP1 will help to address the global challenge of climate change via several channels. For example, CCAFS curates future climate data and tools (ccafs-climate.org). Several Centres contribute to this portal, and it is being used by many CRPs and Centres, helping to reduce duplication of effort in making the outputs from climate models used in the IPCC Working Groups available and accessible. CGIAR, led by work at IFPRI and PIM and involving several Centres, has become a global player in ex-ante analysis using

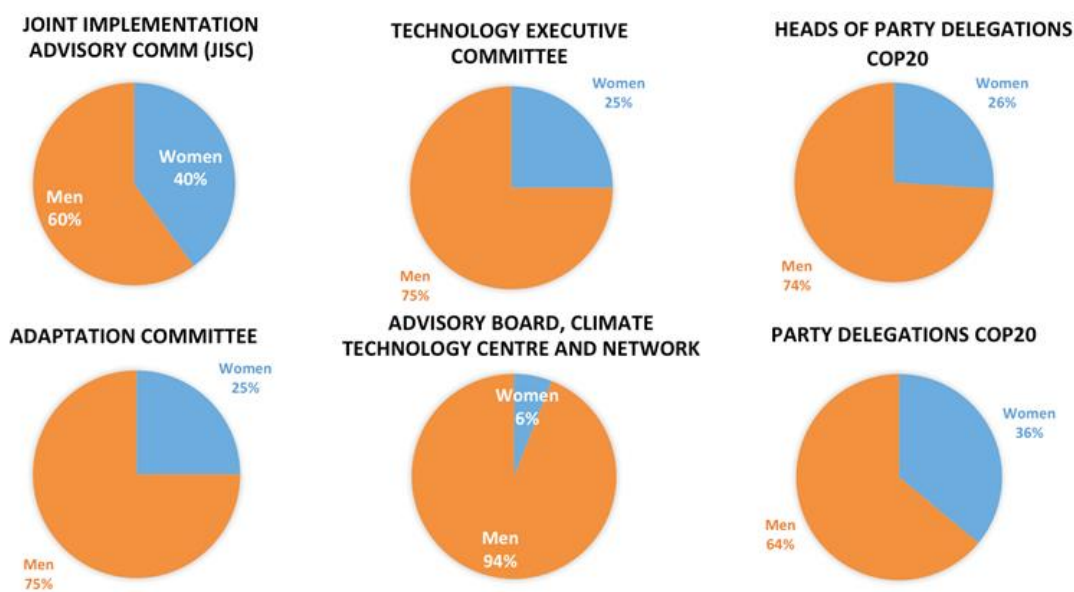
integrated modelling at different scales, and FP1 is able to leverage (and contribute to) this work. The LP on ex-ante evaluation and priority setting for climate-smart options will play a particularly important role in setting global to national priorities on climate change actions. FP1 has successfully undertaken multi- and cross-Centre policy research during Phase I, and this will be built on in Phase II.

These successes can be amplified with other, non-CGIAR partners. For example, the CCAFS climate data portal has tens of thousands of non-CGIAR users, from some 2200 organizations in 185 countries; to date, more than 300 refereed publications acknowledge use of the portal. Key partners include the Universities of Leeds and Reading, Future Earth, AgMIP, PIK, and ISI-MIP. The FP1 scenarios work led by ECI has attracted a broad range of non-CGIAR partners, including WUR, FAO and the World Bank. FP1 will contribute to a Future Earth Working Group, along with strategic partner CSIRO, on metrics for Goals 2 and 13 of the SDGs. FP1 is also linking with non-CGIAR partners including the Earth Systems Governance project of Future Earth, Indiana University, University of Osnabrück, and IDS, to strengthen research on climate change policy and governance and institutions issues.

2.1.1.9 Gender

FP1 will contribute to the sub-IDO *Gender equitable control of productive assets and resources*. Women smallholders have less access to productive resources and to decision-making processes at local to global levels ([FAO 2011](#); [Holvoet and Inberg 2013](#); [World Bank 2012](#)), and gender is not well integrated into climate change policy ([Gumucio and Tafur 2015](#); [Huyer 2016](#)). Men and women also play different roles within their communities and households in attaining food security ([Karl 2009](#)). Institutions that increase women's abilities to control and make decisions around the use of resources can contribute to improving child health and nutrition, enhancing food security, and increasing expenditure on education, all of which contribute to poverty reduction ([Meinzen-Dick et al. 2012](#)). FP1 will highlight the need for GSI considerations when engaging with partners. In the past, a lack of sex-disaggregated data has resulted in underestimation of women's contributions to livelihoods, health, and food security, leading to gender-blind national policy making ([Huyer 2014](#)). Policies and programs need to be based on gender and equity assessments so that existing inequalities are not exacerbated ([EIGE 2012](#)). Sex-disaggregated data collected during CCAFS Phase I will be used to help understand the implications of CSA interventions on men, women, youth, and marginalized groups.

FP1 will build on research that informs and targets CSA for women and other vulnerable groups ([Jost et al. 2015](#); [Kristjanson et al. 2012](#)). This will include disseminating CCAFS GSI research outputs and examining whether and how the information is used by decision makers, with the aim of better integrating gender into climate change policy and investment decisions (see gender-related hypothesis in Section 1.0.4). Baselines have been carried out that describe the current status of GSI in national policy environments in target countries, changes will be monitored through time, and outcomes evaluated at core sites along with FP2 and FP4. FP1 will also investigate the ways in which women and the youth can engage with climate change at different levels, with a view to more effective representation and engagement than present (FP1 Figure 2).



FP1 Figure 2. Representation of women on selected UNFCCC bodies

Source: UNFCCC, September 2015

2.1.1.10 Capacity development

FP1 will continue to enhance the capacity of partners to catalyse institutional change and improve R4D processes, which will result in greater uptake of CCAFS research findings and scaling out of CSA practices. FP1 will focus on five elements of the CapDev Framework. (1) **Innovative learning materials and approaches:** Examples include training materials on smallholders' use of climate information ([Dorward et al. 2015](#)) and the Climate Change and Social Learning initiative that promotes learning-based approaches to R4D ([Kristjanson et al. 2014](#)). FP1, FP2 and partners will continue to expand CCAFS web portals and priority-setting tools and data, along with documentation on how to use them. (2) **Gender-sensitive approaches:** Achieving FP1's target of organizations adapting plans and directing investments to increase women's access to, and control over, productive assets and resources will require a significant focus on building capacity for targeting, priority setting and regional science-policy dialogues (making use of the [Gender & Inclusion Toolbox](#), for example), working closely with the LP on GSI. (3) **Institutional strengthening:** FP1 will work with the East and West Africa regions in the LP on Partnerships and Capacity for Scaling CSA to strengthen the negotiating capacity of AGN and other groups in UNFCCC. FP1 will also work to develop in-country capacity for integrated assessment of adaptation and mitigation. (4) **Organizational development:** The scenarios work is one vehicle by which decision makers engage with uncertainty, multi-disciplinary perspectives, and diverse societal voices. Scenario-guided policy processes will be combined with training of subnational planners to address local decision-making needs. (5) **Research on capacity development**, i.e. what works best in building the capacity of partners to create more enabling environments, and what are the most successful strategies for engaging with decision makers.

2.1.1.11 Intellectual asset and open access management

FP1 is in compliance with the CGIAR Principles on the Management of Intellectual Assets regarding the dissemination of intellectual assets for maximizing global accessibility and impact (see Section 1.0.12). As far as possible, FP1 products are disseminated using open access principles, with clear recognition to those responsible. This includes situations in which farmers' traditional knowledge is utilized as a key ingredient of the research, and where confidentiality needs to be maintained, even in open-access databases. In keeping with the CGIAR Open Access and Data Management Policy, research data, tools, and associated information generated will be made available for indexing and interlinking according to FAIR principles.

In Phase I, the FP, on behalf of the program, developed a data management strategy and user-support materials, and piloted its implementation in relation to reporting, collating outputs, and quality assessment of archived data, and this has now been mainstreamed throughout CCAFS. The FP oversaw the design and implementation of an on-line "Planning & Reporting" system that has been used for three project cycles. The online platform sets out workflows and procedures for planning, reporting, and learning, including evaluation of data and tool outputs along with appropriate metadata. Several open-access databases will be maintained and expanded in Phase II, including:

- Jointly with FP2, CCAFS-climate.org, a repository of future climate data and tools that makes the climate model outputs available and accessible to many thousands of users;
- In collaboration with FP2, FP3, FP4 and the Regional Programs, baseline data collected from 3,000 households and 140 villages spread over 21 sites in 17 countries in all CCAFS target regions, that will be used for evaluation and impact assessment in future ([Förch et al. 2014](#)). All survey instruments, training material and data are archived on the [CCAFS website](#) and [Dataverse](#).

2.1.1.12 FP management

ILRI will host FP1, continuing the relationship started in 2010, and FP1 will report into the CCAFS management system. ILRI is well placed to host FP1, with a long history of expertise in systems analysis, priority setting and impact assessment, as well as research groups on policy research and environmental issues. Given the predominance of mixed crop-livestock systems in the developing world (and their importance for future food security), the scope of ILRI's work is very wide. ILRI also has expertise in food security research, with strong linkages to non-CGIAR organizations working in this arena, and expertise in nutrition and zoonoses research.

Philip Thornton will continue as FPL. He was competitively selected in Phase I in 2010. His Google H index is 50; his publications span a wide range of research, including impact assessment. He has contributed to the IPCC's AR4 and AR5, to the UNFCCC SBSTA, and published highly-cited papers in high-impact journals ([examples here](#)). As FPL, he has fostered projects in all CCAFS regions with seven Centres, several of which have documented outcomes in the policy arena in the last two years. The RPLs will continue to be instrumental, through the LP on partnerships and capacity.

ECI (Oxford University) and LEI WUR will co-lead CoA 1.2 on scenarios. ECI will be building on their leadership of successful scenarios processes in Phase I, while LEI WUR brings new tools and expertise related to food systems modelling at different scales. CoA 1.3 will be led by the FPL, with strong links to the policy flagship of A4NH (SPEAR), PIM and IFPRI, which hosts a FP1 staff member seconded to the World Bank (Global Practice for Agriculture).

CCAFS Contact Points in the Centres will continue their critical role in linking FP1 with other research activities. Learning and self-reflection workshops will be organized periodically, and these will also be used to identify possible future projects to add to the FP1 portfolio.

2.1.2 Flagship Budget Narrative

2.1.2.1 General Information

CRP Lead Center's Name : CIAT

Center Location of Flagship Leader : ILRI

2.1.2.2 Summary

Total Flagship budget summary by sources of funding (USD)

Funding Needed	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total
W1+W2	4,287,606	4,501,986	4,727,086	4,963,440	5,211,612	5,472,192	29,163,922
W3	-	-	-	-	-	-	-
Bilateral	8,961,738	8,728,152	8,433,123	8,023,264	7,610,708	7,496,638	49,253,622
Other Sources	-	-	-	-	-	-	-
Total	13,249,344	13,230,138	13,160,208	12,986,703	12,822,320	12,968,831	78,417,544

Funding Secured	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total
W1+W2 (Assumed Secured)	4,287,606	4,501,986	4,727,086	4,963,440	5,211,612	5,472,192	29,163,922
W3	-	-	-	-	-	-	-
Bilateral	6,273,216	4,800,483	1,686,625	722,094	-	-	13,482,418
Other Sources	-	-	-	-	-	-	-
Total	10,560,822	9,302,470	6,413,710	5,685,534	5,211,612	5,472,192	42,646,340

Funding Gap	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total
W1+W2 (Required from SO)	-	-	-	-	-	-	-
W3 (Required from FC Members)	-	-	-	-	-	-	-
Bilateral (Fundraising)	(2,688,521)	(3,927,668)	(6,746,498)	(7,301,170)	(7,610,708)	(7,496,638)	(35,771,204)
Other Sources (Fundraising)	-	-	-	-	-	-	-
Total	(2,688,521)	(3,927,668)	(6,746,498)	(7,301,170)	(7,610,708)	(7,496,638)	(35,771,204)

Total Flagship budget by Natural Classifications (USD)

	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total
Personnel	4,235,836	4,257,209	4,299,465	4,329,999	4,337,066	4,431,947	25,891,522
Travel	1,027,308	1,091,971	1,101,592	1,125,180	1,129,684	1,143,678	6,619,412
Capital Equipment	38,725	38,725	38,725	38,725	38,725	38,725	232,350
Other Supplies and Services	3,130,283	3,148,769	3,151,815	3,107,629	2,940,316	2,944,519	18,423,330
CGIAR collaborations	43,620	43,620	43,620	43,620	43,620	43,620	261,720
Non CGIAR Collaborations	3,109,132	2,988,536	2,873,921	2,714,937	2,729,112	2,743,713	17,159,351
Indirect Cost	1,664,440	1,661,307	1,651,071	1,626,614	1,603,797	1,622,630	9,829,858
Total	13,249,344	13,230,138	13,160,208	12,986,703	12,822,320	12,968,831	78,417,544

Total Flagship budget by participating partners (signed PPAs) (USD)

	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total
CIAT	2,528,360	2,548,026	2,568,445	2,589,645	2,611,660	2,634,523	15,480,658
AFRICARICE	0	0	0	0	0	0	0
BIOVERSITY	1,842,814	1,899,031	1,956,935	2,016,576	2,078,007	2,141,280	11,934,643
CIFOR	15,000	15,648	16,328	17,042	17,791	18,578	100,387
CIMMYT	164,601	179,795	183,599	187,518	191,554	195,711	1,102,777
CIP	0	0	0	0	0	0	0
ICARDA	0	0	0	0	0	0	0
ICRAF	967,978	929,937	974,584	990,958	996,323	1,013,694	5,873,473
ICRISAT	1,394,232	1,394,232	1,394,232	1,394,232	1,394,232	1,394,232	8,365,392
IFPRI	1,612,388	1,612,474	1,612,387	1,612,393	1,612,353	1,612,502	9,674,497
IITA	755,413	762,917	770,646	760,816	769,015	777,461	4,596,268
ILRI	2,161,001	2,186,230	2,212,215	2,238,980	2,266,547	2,294,942	13,359,915
IRRI	311,879	311,880	311,879	311,881	311,880	311,880	1,871,280
IWMI	0	0	0	0	0	0	0
WORLD FISH	1,203,178	1,097,468	866,459	574,164	280,458	281,527	4,303,254
Copenhagen University	170,000	170,000	170,000	170,000	170,000	170,000	1,020,000
CIAT-Gender & Social Inclusion Leader	122,500	122,500	122,500	122,500	122,500	122,500	735,000
Total	13,249,344	13,230,138	13,160,208	12,986,704	12,822,320	12,968,831	78,417,544

Explanations of these costs in relation to the planned 2022 outcomes:

(Outcome numbers as in PIM Table B)

In Flagship 1, the largest proportion of the budget goes to research contributing towards **Outcome 1.2** (20 countries/states where CCAFS priority setting used to target and implement interventions to improve food and nutrition security under a changing climate) and to **Outcome 1.3** (USD 450 million new investments by state, national, regional and global agencies, informed by CCAFS science and engagement). Each outcome receives 24% of the total Flagship budget. These outcomes are central to the FP1 research agenda. **Outcome 1.2** relates to CoA 1.1. on ex-ante evaluation of climate-smart options and its integrated learning platform on ex-ante downscaling across CCAFS and all CRPs, playing a critical role in bringing the climate change lens to priority setting work. **Outcome 1.3** is similarly important as it relates to CoA 1.3 on enabling policy environments for CSA because it complements research findings on priority setting and future scenarios (cluster 1.3) with research on enabling policy

environments that are required to take CSA to scale. CoA 1.3 is instrumental in understanding the conditions for scaling and the conditions needed to facilitate and inform climate investment into agriculture and related sectors. Both clusters operate in all five CCAFS target regions. An additional 22% of the overall Flagship budgets goes to **Outcome 1.1** (*14 organizations and institutions in selected countries adapting plans and directing investment to optimize consumption of diverse nutrient-rich foods, with all plans examined for their gender implications*) because foresight under climate change is critical and CoA 1.2 will be central in shaping cutting edge research on scenarios for food and nutrition security under climate change, in close collaboration with a number of other CRPs and Centers. In relation to gender research and capacity development, 15% of the Flagship budget goes to **Outcome 1.4** (*20 national/state organizations and institutions adapting their plans and directing investment to increase women's access to, and control over, productive assets and resources*) and 15% to **Outcome 1.5** (*11 policy decisions taken (in part) based on engagement and information dissemination by CCAFS*), respectively. In total, some 40% of FP1's budget goes to partners.

The major budget share will support **Outcomes 1.2 and 1.3**. Under **Outcome 1.2**, modified versions of global, regional and local models will be developed and applied in specific countries to evaluate climate smart practices and technologies and the related trade-offs and synergies for CSA, as well as facilitate cross-level, cross-sectoral analyses in collaboration with AFS CRPs. New sets of integrated assessment model outputs will be produced that utilize next generational climate model outputs and, along with prioritized breeding strategies, will be used to prioritize the next generation of CGIAR priority investments on climate change adaptation and mitigation. Research activities will support cross-CRP ex ante analyses and data sharing through the Learning Platform, producing country- and state-level recommendations for policy alternatives that identify robust climate smart strategies within food and nutrition security policies. Under **Outcome 1.3**, novel analytical frameworks, new economic analyses, indicators and metrics will be developed to evaluate the effectiveness of enabling policy environments to support adaptation options and the scaling of CSA. This work will include comparative analyses of different engagement mechanisms that support climate smart outcomes and gender equity, and of different frameworks and tools to track climate and food and nutrition security policy implementation, and global syntheses of mechanisms that can support scaling and learning. With 22% of Flagship funds, the portfolio of projects for **Outcome 1.1** will develop new methodology for multi-level multi-driver scenarios modeling with a focus on food and nutrition security and gender and social inclusion. These methods will allow the downscaling of scenarios to sub-national levels and targeted upscaling of local information to national decision-making levels, along with novel gaming approaches for youth engagement. These outputs will be used for multi-level policy development and implementation in selected countries and states focusing on climate and food and nutrition security policies. Fifteen percent of FP1 funding will be allocated to research activities focused on gender and social inclusion (**Outcome 1.4**), by integrating these components into CSA priority setting frameworks and by developing improved modules for gender and sex-disaggregated output data from integrated assessment models. This work will be complemented with bottom-up analyses to add gender dimensions to policy and investment recommendations. Global syntheses will be produced of gender and social inclusion in national plans and climate finance investment decisions. The outputs will inform gender- and youth-focused policy guidance for CSA, in relation to process participation, empowerment and equity in resulting policies and investment plans through policy briefs, guidelines and training materials. The remaining fifteen percent of the budget goes towards **Outcome 1.5** as training materials are developed and workshops held to strengthen the capacity of national partners in applying decision support tools in targeting, priority setting, policy and investment decision making, as well as in articulating national priorities in global fora and implementing scenario-based strategic planning. FP1 capacity building will

support national/state level planners in designing and monitoring climate smart food and nutrition security portfolios that meet the criteria for climate finance, CSA and sustainable development.

In FP1, W1 W2 funding will be allocated to strategic research activities, with consideration of regional spread and center participation. In particular, W1 W2 funding is also used to support strategic flagship research that is innovative and new and therefore often hard to attract significant bilateral funds - for instance, research on science-policy-practice linkages and on enabling policy conditions for scaling CSA and facilitating transformative change in food systems, both led by ILRI, as well as global comparative analyses and syntheses of FP1 research across the portfolio. In Latin America, CIAT leads a project on climate change research embedded in national and regional decision making to influence policies in the region. In West and East Africa, two projects led by ICRISAT and IITA respectively are developing and testing science-policy exchange platforms at national and sub-national levels to mainstream climate change into national food security policies and bring local priorities to national decision making processes. In Southeast Asia, IRRI is implementing a project that combines food security, adaptation and gender research in priority setting for enhanced policy making in the region. In South Asia, IFPRI leads a research portfolio to understand enabling policy environments for scaling CSA. These projects were initiated with W1 W2 funding to support strategic research in CoA 1.1. and 1.3. and W3 funding is providing opportunity to expand activities. FP1 leadership aims to ensure that W1 W2 funding in these co-funded projects is not being used to co-finance W3 activities by ensuring that closely linked activities define separate sets of outputs. Co-funded projects, however, show joint contribution to FP1 outcomes. At the global level, FP1 projects contribute significant W3 funded activities to the portfolio, including the enhancement of modelling tools and policy engagement led by IFPRI and global policy support for biologically diverse, climate resilient agriculture led by Bioversity. Both projects exemplify strong W3 projects that receive strategic W1 W2 funding to ensure specific climate change and gender and social inclusion elements are included in the projects. Other strategic research activities that will be supported with W1 W2 funding include the scenarios work that is instrumental to CoA 1.2. due its high likelihood to produce ground-breaking scenarios methodologies while at the same time informing policy decisions in a range of countries; as well as strategic funding for gender and youth research that contributes to those milestones.

The main center involved in FP1 is ILRI, partly due to its hosting funds for the FP1 leader. FP1 leader funds are primarily used to maintain strategic flagship functional capacities. Other centers with substantial funding include those that receive W1 W2 funds for strategic research, including IFPRI, ICRISAT, CIAT, IRRI, Bioversity and IITA. Substantial W3 funds are mapped into FP1, which help to deliver on FP1 outcome targets in the long term. A good example of this is WorldFish; that Centre is mapping priority setting and ex ante evaluation targeting of climate smart activities in the Pacific into FP1 so as to be able to deliver on key outcomes in the region.

FP1 has allocated 2% of its budget to MELIA. Of this USD 185,000 over the six-year period is allocated to external assessments. These are shown in Annex Table 5. FP1 will allocate funds to a CCEE for FP1, and contribute to gender, regional and Learning Platform external reviews.

Costs in relation to the natural classification

Personnel. Some 33% of the total Flagship budget goes to personnel, reflecting the considerable staff inputs that are made into the Flagship.

Travel. Of the total budget 8% goes to travel. Because the Flagship has activities in all the CCAFS regions, a significant amount of travel is involved. The Flagship utilises ICT as much as possible, such as holding virtual meetings using skype and video-conferencing. Face-to-face meetings are usually piggy-backed on other meetings (such as key international conferences) to reduce the overall costs of travel.

Capital equipment. This is a very small percentage (0.3%) of the total costs, as Flagship-related research is not dependent on high-cost equipment. A small amount of budget will be allocated to ICT equipment such as tablets and smart phones for communications and engagement activities.

Other Supplies and Services. See below in Section 2.

CGIAR Collaborations. 0.3% of the total budget goes to Collaborations among CGIAR Centres but only with W3 and Bilateral funds as all W1/W2 budget are sent directly from CIAT Lead Centre to Participating Centres via Program Participant Agreements (PPAs).

Non-CGIAR collaboration. Partnerships for research and development outcomes are a crucial component of the Flagship's ToC. The Flagship thus will allocate 20-30% of its budget to partners. This amount is expected to leverage own-resources from within partners at 2-3 times that level. In the current budget 22% of funds has been allocated to partners. The fundraising strategy will try to increase this level.

Indirect costs. 15% is the average Indirect Cost rate that comes from the different rates among CGIAR Centres defined on estimated income.

2.1.2.3 Additional explanations for certain accounting categories

Benefits:

Using CIAT as point of reference, we assumed most of CGIAR Centers follow the following differentiation of benefits among National and International Staff:

National Research Staff (NRS): Fringe benefits for national staff (costs for all benefits are added to the base salary to provide the total cost of the position) are comprised of legal benefits (local mandatory) and extralegal benefits (CIAT mandatory) and the provisions to cover local legal requirements such as: Pension - social security, training and development, occupational health, transportation costs and subsidies, work clothes and personnel protection requirement, and food subsidy.

International Research Staff (IRS): Fringe benefits for international staff (costs for all benefits are added to the base salary to provide the total cost of the position) are comprised of housing allowance, education allowance, car allowance, Cost Of Living Allowance (COLA), hardship, home leave tickets, insurance, retirement contribution, occupational health, training and development, repatriation and relocation provisions.

Other Supplies and Services:

Of the total budget 24% goes to other supplies and services. Because Flagship 1 has a wide array of non-CGIAR partners, this implies a certain level of consultancy costs in bringing to bear specific expertise, particularly expertise related to climate science, for example. Other costs here relate to Centres' Full Cost Recovery units such as IT, Facilities, Public Space, Research and Technical Support, as well as funds for workshops and operational services.

2.1.2.4 Other Sources of Funding for this Project

Relative proportions of W3 and Bilateral are unknown, and thus we have used a single category of Bilateral to capture both W3 and Bilateral.

The Centres participating in FP1 are committing to raising 63% of total Flagship funds through Window 3 and bilateral contributions from 2017 onwards. At the same time, considerable effort will be made to jointly source and tap into bilateral funding for the Flagship with Centre partners and non-CGIAR partners alike. FP1 already has good linkages with national and international partners, with prospects of tapping into international finance (such as the GCF) for supporting activities revolving around countries' NDCs.

Among FP1's partners, CSIRO bring expertise on downscaling climate change impacts, including incorporating variability, multi-scale livelihoods modelling in relation to climate smartness across scales, and a long track record on transformational processes and adaptation pathways (approximately USD 400k per year). ECI at the University of Oxford, in addition to co-hosting the scenarios team, will bring expertise on a range of different perspectives around food and nutrition security under climate change (USD 400k per year). LEI WUR adds value to FP1 through expertise in multisectoral economy-wide modelling of food system outcomes at different scales (USD 150k per year). IIASA brings world-class integrated assessment modelling with particular strengths and capacity in land-use and environmental modelling (USD 150k per year). GIZ will strengthen links between research and development initiatives involving FP1 and contribute to scaling out work (USD 150k per year, possibly including a Technical Expert). The World Bank will continue to host a FP1 staff member to strengthen and maintain research-to-practice links, including collaboration on CSA metrics and joint work on gender and social inclusion and capacity development.

2.1.2.5 Budgeted Costs for certain Key Activities

	Estimate annual average cost (USD)	Please describe main key activities for the applicable categories below, as described in the guidance for full proposal
Gender	2700000	Gender research for this Flagship is USD 2.7 million per year (20% of the FP budget). It covers dissemination of CCAFS GSI research outputs and examining whether and how the information is used by decision makers, with the aim of better integrating gender into climate change policy and investment. FP1 will also investigate the ways in which women and the youth can engage with climate change at different levels, with a view to more effective representation and engagement.
Youth (only for those who have relevant set of activities in this area)	400000	Youth research for this Flagship is USD 400,000 per year (3% of the FP budget). It covers the comparison of approaches to youth engagement at national to global levels, as well as locally. Different methods of actively engaging youth will be tested, including communications through social channels, mobile telephony, radio, television, and citizen science to inform the creation and refinement of food security futures under climate change. Gaming and other forms of innovative engagement will aim to empower youth to take centre stage in their development.
Capacity development	2900000	Capacity Development has a budget of USD 2.9 million per year (22%) in the Flagship. It covers the development and dissemination of training materials (including on-line) and workshops to strengthen the capacity of national partners in applying decision support tools in targeting, priority setting, policy and investment decision making. The scenario-based strategic planning done under FP1 will support planners in designing and monitoring climate smart food and nutrition security portfolios that meet the criteria for climate finance, CSA and sustainable development. Some resources are allocated through the partnership budget but others come from CGIAR staff and operating budgets.
Impact assessment	80000	Several impact assessments (reviews and evaluations) related to FP1's activities are planned; in the period to 2019, these will include evaluations on data and tools, on MARLO, and on the effectiveness of the CoA 1.1 Learning Platform. In addition to these activities, in Phase II the Flagship will allocate USD 200,000 over the six-year

		period for a series of impact assessment studies designed to quantify the impacts of Flagship research. These studies will be selected in relation to the ongoing project portfolio, with a view to generating quantitative impact information that addresses a broad range of FP1 research activity (priority setting, scenario-guided planning, policy research) and geographic spread across CCAFS target regions.
Intellectual asset management	8000	The budget for this is USD 8,000 per year (see also the paragraphs below on open access and data management, and communication). Flagship teams will contribute to implementing the CCAFS Intellectual Asset policy and ensuring that all knowledge products (primarily publications and databases) are, wherever possible, disseminated using open access principles, with clear branding to acknowledge authorship.
Open access and data management	132000	FP1 will dedicate a budget of USD 132,000 per year. The Flagship will maintain and expand the downscaled climate data portal CCAFS-climate.org (jointly with FP2) and the CCAFS-wide repository of baseline data that is being collected in target regions and documented and archived using Dataverse.
Communication	690000	The budget for communications is approximately USD 690,000 per year. Flagship communications activities will contribute to delivery of outcomes through engagement with key stakeholders in sites, regions, at the national level, as well as in relevant communities of practice. Budget is allocated for partial salary of regional communications specialists (1 in each region, with responsibility for all flagships) and staff time for communications activities at project level. The budget covers delivery of communications products and initiatives through events, media engagement, field visits, training journalists, producing/disseminating publications, multimedia production, and staff travel.

2.1.2.6 Other

Uplift

Most of the topics selected for uplift are those downsized or cut completely from the CCAFS portfolio as a result of budget reductions, but which are considered to be a crucial part of the science and outcome agenda. These are listed below (with CCAFS project numbers shown).

- [Governance and institutions for climate resilient food systems](#) (P100, numbers refer to descriptions on the CCAFS Planning and Reporting System), Climate Change and Social Learning

(CCSL) [Initiative: Community of Practice and Evidence Base of social learning to up-scale outcomes](#) (P62) and [Macro-scale governance and institutions analysis through three country case studies](#) (P193) (ILRI, IFPRI, IIED, CSIRO, U Osnabrueck, U Indiana, IDS, U Reading).

- [CCAFS scenario-guided policy and investment planning](#) (P63) (ILRI, U Oxford, regional and national organisations in all target countries).
- [Household opportunities under future climates in the framework of CCAFS regional development](#) (P68) (ILRI, IFPRI, IIASA).
- [Priority-setting for building resilience and strengthening climate change adaptation in the Pacific](#) (P67) (WorldFish, ILRI, U Oxford, IIASA).
- [Climate science and policy engagement with national and regional meteorological organisations](#) (P69) (ILRI, IFPRI, U Reading, Waen Associates, IRI).
- [Analyzing the science-policy-practice interface in climate change adaptation in East and West Africa](#) (P7) (ILRI, partners in Senegal and Ethiopia).
- [Capacitating science-policy exchange platforms to mainstream climate change into national agricultural and food security policy plans](#) (P1) (ICRISAT, AgMIP, CSIR).
- [Relevant Climate Change Information meets Decision-Making to influence Policy and Institutions for Climate Resilient Food Systems](#) (P2) (CIAT, Bioversity, CIP, MADR, ONF-Andina, DNP, U Florida, CATIE, MAG, CAC, ICAFE).
- [Influencing and linking national and local level policies and institutions to adopt climate-resilient food systems](#) (P6) (IITA, CIAT, ICRISAT, ILRI, many partners in Uganda and Tanzania).
- [Policy Information and Response Platform on Climate Change and Rice in ASEAN and its Member Countries](#) (P8) (IRRI, IPSARD, Yezin Ag U, RIMES, Cantho U, CLRRRI).
- [Global policy support for biologically diverse, climate resilient agriculture](#) (P66) (Bioversity, CBD, ITPGRFA, FAO, COMESA, AU, GIZ, and others).

In addition, to the above topics some new ones have been proposed during discussions with partners in the development of the phase II proposal. These include:

- A4NH / SPEAR: research on nutrition and policy / enabling environments, an additional case study in a new country of mutual interest and history of CGIAR engagement (Ethiopia, for example).
- WHEAT, MAIZE: Climate model downscaling, identification of future climate hotspots, and ex ante impact modelling of GxExM interactions and new climate-proof genes / traits (linked to FP2 on testing).
- Bioversity: ex ante analysis of diversification and crop introduction and its potential impact on resilience, nutrition and income, to assist countries to set up their own R&D policy on strategically chosen sets of crops that address diversification in national adaptation strategies.

2.1.3 Flagship Uplift Budget

Outcome Description	Amount Needed	W1 + W2 (%)	W3 (%)	Bilateral (%)	Other (%)
FP1.1: 7 organisations and institutions in selected countries/states adapting plans and directing investment to optimise consumption of diverse nutrient-rich foods, with all plans and investments examined for their gender implications	10,075,086	30	-	70	-
FP1.2: 10 additional countries/states where CCAFS priority setting used to target and implement interventions to improve food and nutrition security under a changing climate.	10,991,003	30	-	70	-
FP1.3: USD 250 million of new investments by state, national, regional and global agencies, informed by CCAFS science and engagement.	10,991,003	30	-	70	-
FP1.4: 10 national/state organisations and institutions adapting their plans and directing investment to increase women's access to, and control over, productive assets and resources.	6,869,377	30	-	70	-
FP1.5: 5 policy decisions taken (in part) based on engagement and information dissemination by CCAFS	6,869,377	34	-	66	-

2.2. FP2: Climate Smart Technologies and Practices

2.2.1 Flagship Project Narrative

2.2.1.1 Rationale, scope

The vision. The FP2 vision is that all farmers and livestock keepers, including women and marginalized groups, are resilient and food secure despite a variable and changing climate. FP2's key 2022 outcomes include: (a) 6 million farm households receiving incentives (training, financial, programmatic, policy-related) for adopting CSA related practices and technologies that potentially reduce production risks; (b) 15 subnational public/private initiatives providing access to novel financial services and supporting innovative CSA business models; (c) 50 site-specific targeted CSA technologies/practices tested, with all options examined for their gender implications; (d) 15 development organizations adapting their plans and directing investment to increase women's access to, and control over, productive assets and resources; (e) 10 policy decisions taken (in part) based on engagement and information dissemination by CCAFS (FP2 Table 1).

The challenge. Agriculture and climate function hand in hand; they also dysfunction hand in hand. Today, 32-39% of global crop yield variability is explained by climate, translating into annual production fluctuations of ~2 to ~22 million tonne, for major crops such as maize, rice, wheat and soybean ([Ray et al. 2015](#)), whilst at the same time agriculture and livestock contribute 19-29% of global greenhouse gas emissions ([Vermeulen et al. 2012](#)). By 2050, FAO state that we need to deliver 60% more food for a growing global population with shifting consumption patterns ([Alexandratos and Bruinsma 2012](#)). And all this in a harsher climate - the IPCC, through a global meta-analysis published by CCAFS Phase I researchers ([Porter et al. 2014](#); [Challinor et al. 2014](#)), reported that decreases of ~5% in crop productivity are expected for every 1°C warming above historical levels. These global drivers and trends represent a truly grand challenge that requires concerted action.

GACSA has the goal of reaching 500 million farmers with climate-smart agriculture practices, technologies and programs by 2030. This constitutes a challenge in scale of the likes rarely before seen in development. Farmers will require diverse and site-specific interventions and support to match their unique but changing growing conditions, socio-economic context, and markets. Meeting this objective will require demonstrating the maturity of CSA interventions in diverse contexts, encouraging adoption and investment by the myriad of actors required to take the concept to scale, particularly among women and the private sector. While the challenge is grand, the political and financial will is finally keeping pace. CSA options are in high demand by a host of development actors. Developing countries are looking to CSA to provide them with viable options for delivering on the INDCs ([Richards et al. 2015](#)) and SDGs in which all parties – developed and developing – will be asked to participate. Furthermore, major climate finance actors are aligning to CSA as a means of delivering sustained climate adaptation and mitigation for the agricultural sector.

Scientific and strategic rationale. Numerous studies have shown that climate change can be a significant threat to food availability and stability by reducing agricultural productivity and increasing inter-annual variations in yields ([Wheeler and von Braun 2013](#)). A CSA approach is proposed as a solution to transform and reorient agricultural systems to support food security under the new realities of climate change. CSA consists of co-achieving three objectives, or pillars, defined by the [FAO \(2013\)](#) as 1) sustainably increasing agricultural productivity to support equitable increases in incomes, food security

and development; 2) adapting and building resilience to climate change from the farm to national levels; and 3) reducing or removing GHG emissions where possible.⁴

Despite the significant global action and investment now being oriented towards CSA, the science is immature. There is scant evidence on the synergies and trade-offs among the distinct pillars of CSA of different practices and technologies across a range of agro-ecologies and social contexts. This FP focuses on supporting major players in the CSA space, including GACSA and its members, with research-informed knowledge to bring CSA to scale effectively.

Hypotheses and scope. Research to achieve outcomes will target two hypotheses:

H1: Context-specific knowledge on the impacts of practices, technologies, business models and information systems on CSA-related outcomes as well as on their cost-effectiveness advantages compared to current practice, leads to adoption of CSA at the local level.

H2: Improving and applying knowledge on socio-economic, technical, financial and political barriers to incentives for investment in and adoption of CSA technologies and practices will lead to adoption of CSA at scale.

CRP links. This FP will closely align with other CRPs around the evaluation and testing of emerging CSA practices and technologies under the LP of CoA 2.1 that will build the evidence base across time-scales and geographies, primarily in CSVs, in collaboration with FP3 and AFS-CRPs. Details of other specific collaborations are given under the Clusters of Activities (Section 2.2.1.6). All CGIAR Centres will participate in this broad integrative FP, via direct programmatic research involvement (Centres with the largest budget share in FP2 are CIAT, ICRAF, CIMMYT, and IWMI), or co-investment in the LPs, or both.

2.2.1.2 Objectives and targets

Objectives. To address the challenge of how to transition to CSA at scale, FP2 will work with partners to test, evaluate, promote and scale up CSA technologies and practices that meet the needs of farmers – including women and marginalized groups. Its purpose is to build adaptive capacity and resilience to climate variability and change, while increasing food availability and generating mitigation co-benefits. This will be achieved by integrating and applying the best and most promising methods, tools and approaches for equitable local adaptation planning and governance, and developing innovative incentives and mechanisms for scaling up. The primary target beneficiaries of FP2 are climate-vulnerable, food insecure and poor groups (smallholder farmers and women in particular). Research will also benefit development agencies working from grassroots through to national scales, as well as local and subnational institutions involved in agricultural planning, and the private sector that can support scaling up.

⁴ Climate-smart agriculture (CSA) an approach to developing the technical, policy and investment conditions to achieve three main objectives: sustainably increasing agricultural productivity and incomes, adapting and building resilience to climate change, and reducing and/or removing greenhouse gases emissions, where possible.

Strategic relevance to CGIAR objectives and targets. FP2 is designed to make a significant contribution to the poverty SLO, which for CCAFS as a whole targets 11 million farm households with improved practices, and 9 million people for poverty reduction by 2022 (FP2 Figure 1; FP2 Table 1). FP2 targets 6 million farmers for adopting climate-smart technologies and practices by 2022. Through the cross-cutting IDOs it will also contribute to the food and nutrition security SLO. FP2 targets 5 IDOs (bold) and five sub-IDOs (italics):

- **Increased resilience of the poor to climate change and other shocks;** via *reduced production risk* to farm households as a result of adoption of CSA technologies and practices.
- **Enhanced smallholder market access;** via smallholder farmers' *subnational public/private initiatives providing access to novel financial services and supporting innovative CSA business models*.
- **Mitigation and adaptation achieved;** via *improved forecasting of impacts of climate change and targeted technology development*, through site-specific targeted CSA technologies/practices tested, with all options examined for their gender implications
- **Equity & inclusion achieved;** via farm households with *gender-equitable control of productive assets and resources*, enabled through organizations adapting their plans and directing investments to increase women's access to, and control over, productive assets and resources that enable CSA
- **National partners and beneficiaries enabled;** via *increased capacity for innovation in partner development organizations and in poor and vulnerable communities*, through policy decisions taken (in part) based on engagement and information dissemination by CCAFS.

Increased resilience of the poor to climate change and other shocks: CoA 2.1 as Learning Platform (LP2), and CoA 2.2 are addressing the evaluation of CSA technologies and practices and will generate sound evidence for effective investment planning and application domains with AFS-CRPs and ICRPs. Outputs: scalable context-specific CSA options evaluated, compendium of CSA practices and technologies, CSA options simulations under different climate/socio-economic scenarios (with FP1), cost-benefit and big-data analysis.

Enhanced smallholder market access: A key enabler for CSA adoption is the existence of finance incentives. CSA provides an opportunity to tap into climate finance streams to complement agricultural development investment. FP2 targets 15 subnational initiatives providing access to financial services and supporting innovative CSA business models. CoA 2.3 and 2.4 promote equitable subnational adaptation planning, macro- to micro- level innovative finance instruments and incentives for CSA implementation. Outputs: institutional arrangements for CSA, evaluation of LAPAs efficacy in promoting gender-equitable CSA adoption, assessment of market access risks and overcoming strategies, public-private partnerships with value chain actors, evidence based certification schemes, research on efficacy of impact investment, capacity building to support subnational entities access climate funds at multiple levels.

Mitigation and adaptation achieved: The adaptation benefits of a range of CSA practices will be quantified across time-scales and geographies through simulation modelling, and mitigation benefits quantified in collaboration with FP3. FP2 targets the evaluation of 50 site-specific technologies and practices. CoA 2.1 is focused on quantifying and building the evidence base across time-scales and

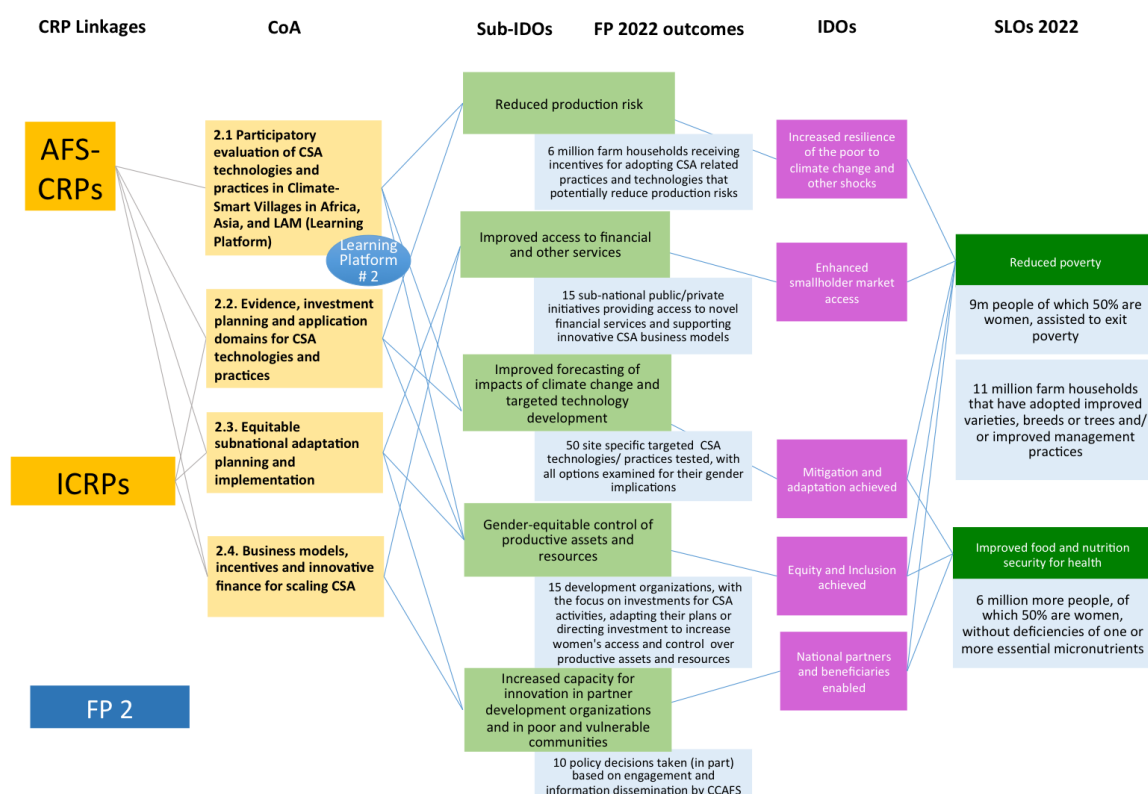
geographies of adaptation benefits of a range of CSA practices in collaboration with FP3 and AFS-CRPs. CoA 2.2 will contribute to improved forecasting of impacts of climate change and targeted technology development. Outputs: farm testing and trade-off evaluation of specific adaptation and mitigation options, decision support tools for guiding prioritization and investments.

Equity & inclusion achieved: This work will generate evidence on the gender and youth related motivations, opportunities, challenges, and associated benefits related to specific technologies and practices. It targets 15 organizations adapting their plans or directing investment to increase women's access and control over productive assets and resources. Outputs: specific gender related indicators associated with targeted CSA options, socially differentiated CSA adoption profiles, gender focused CSA value chain and financial incentive mechanisms.

National partners and beneficiaries enabled: CoA 2.3 and CoA 2.4 contribute to increased capacity for innovation in partner development organizations and vulnerable communities with a target of 10 policy decisions taken (in part) based on engagement and information dissemination by CCAFS. Outputs: CSA prioritization and decision support tools co-developed, context specific knowledge and outreach products, capacity building to better manage, analyse, target, design and implement CSA interventions.

FP2 Table 1. FP2 outcomes, and their targeted delivery over time

SLOs, IDOs, and sub-IDOs	2022 Outcome Description	Target					
		2017	2018	2019	2020	2021	2022
SLO: Reduced poverty							
IDO: Increased resilience of the poor to climate change and other shocks							
Sub-IDO: Reduced production risk	6 million farm households receiving incentives (training, financial, programmatic, policy-related) for adopting CSA related practices and technologies that potentially reduce production risks with increased benefits for women	0.5	1	2	3	5	6
IDO: Enhanced smallholder market access							
Sub-IDO: Improved access to financial and other services	15 subnational public/private initiatives providing access to novel financial services and supporting innovative CSA business models	2	4	6	8	10	15
Crosscutting IDO on Mitigation and adaptation achieved (directed at poverty SLO and food and nutrition security SLO)							
Sub-IDO: Improved forecasting of impacts of climate change and targeted technology development	50 site-specific targeted CSA technologies/ practices tested, with all options examined for their gender implications	10	15	22	30	40	50
Crosscutting IDO on Equity and inclusion achieved (directed at poverty SLO and food and nutrition security SLO)							
Sub-IDO: Gender-equitable control of productive assets and resources	15 development organizations adapting their plans and directing investment to increase women's access to, and control over, productive assets and resources	2	4	6	8	10	15
Crosscutting IDO: National partners and beneficiaries enabled (directed at poverty SLO and food and nutrition security SLO)							
Sub-IDO: Increased capacity for innovation in partner development organizations and in poor and vulnerable communities.	10 policy decisions taken (in part) based on engagement and information dissemination by CCAFS	1	2	5	7	9	10



FP2 Figure 1. FP2 Impact Pathway. Under each CoA there will be several research outputs (see Section 2.2.1.6). This FP contributes to the SLO targets (with other CCAFS FPs) but is accountable for delivery, with external partners, of the sub-IDO outcome targets.

2.2.1.3. Impact pathway and theory of change (for each individual FP)

The impact pathway for FP2 is shown in FP2 Figure 1. The primary outcome for FP2 is to provide incentives (financial, technical and policy) to support 6 million farmers to adopt climate-smart practices and technologies, which explicitly contribute to increased resilience to climate shocks across a range of time-scales. This is to be achieved through engagement with key donors, governments and local institutions to invest in projects and programs that incentivize adoption. FP2 will produce and appropriately disseminate evidence and information to support these investments, making the business case for the best-bet CSA options for target geographies and beneficiaries.

In developing the FP2 ToC with partners, some key knowledge gaps were identified to achieve the targets proposed, and the CoAs have been constructed around the knowledge gaps. Research in Phase I and the Extension phase demonstrated that agricultural research has not taken a CSA lens to evaluate the benefits, cost and trade-offs of a particular agricultural technology or practice (also see [Branca et al. 2011](#)), with fewer than 1% of studies examining all three CSA pillars ([Rosenstock et al. 2015](#)).

Notably, in the context of developing economies where adaptation is a priority, little is known about the mitigation effects of different adaptation strategies and vice versa (see e.g. [Müller et al. 2015](#); [Lobell et al. 2013](#)). Even less knowledge is available on targeted, gender-responsive impacts on women's labour, gendered barriers to control of productive resources, and lack of access to information services ([Twyman et al. 2014](#); [Jost et al. 2015](#)) and cross-commodity CSA portfolios (combinations of

technologies, practices, and social/institutional innovations) at local levels. Greater evidence is needed to guide investments in CSA options and provide actionable information that addresses capacity gaps and facilitates scaled adoption of CSA portfolios to enhance food security in a changing climate and contribute to long-term mitigation targets.

Evidence is needed on which practices and technologies generate CSA-related outcomes, where these practices should be targeted, the costs involved and their expected co-benefits or dis-benefits (including gender and labour aspects). This context-specific knowledge leads to local CSA adoption in action research sites. Development of a field-based evidence base can then lead to better understanding of instruments for achieving impact at scale, including enabling multi-level policy environments (sub-national to national), private sector involvement, new CSA business models and novel financing and incentive systems for CSA (including both climate- and development finance). CCAFS will assess the evidence of what works where and why for farmers and their supporting organizations and institutions (public, private and non-governmental actors). This knowledge will be shared with CCAFS downstream partners to support them to overcome barriers to investment and further adoption outside of CCAFS action sites delivers CSA at scale.

Crucial components of the ToC include working with partners and AFS-CRPs to deliver on outcomes, action research grounded in local realities in partnership with downstream development actors, and building the capacity of key actors in the impact pathways from high-level investment to local institutions (see Section 2.2.1.10). Furthermore, the FP will make use of tailored communications tools and approaches for engaging and informing next users, building on successes in Phase I. This includes infographic-rich briefing materials, personal briefings with policy makers, media outreach at the national and global level to share high-profile results, and user-friendly websites and platform such as the CSA 101 guide. As per the FP2 ToC, achievement of the impact targets will largely be achieved through ensuring that CCAFS science is incorporated into the programming of large CSA investment programs and projects, hence downstream impact partners will be those with the greatest ambition and scope for CSA-related programming. Truly scaled impacts for this FP can only be achieved if viable business models are identified which incentivize autonomous adoption by farmers, and/or private sector actors to promote CSA as a component of sustainable business. Research under FP2 will contribute to knowledge on business models and the kinds of business relationships needed to lead to major private sector investment in making CSA happen across target geographies.

Several assumptions underline this ToC. The FP2 ToC assumes that CSA differs from “business-as-usual” approaches by emphasizing the capacity to implement flexible, context-specific solutions, supported by innovative policy and financing actions ([Lipper et al. 2014](#)). The ToC also assumes that better information and evidence, packaged and communicated through appropriate channels, will not only increase investment, but also increase the quality of that investment towards the delivery of CSA related outcomes. This will be explored under CoA2.4. Additionally, this ToC assumes that CSA practices and technologies will be attractive to young people, and have the potential for gendered impacts above and beyond a “business as usual” approach. This is by no means guaranteed (e.g. when it requires increased labour inputs), hence the research will test this assumption through CoA 2.1.

A risk in this ToC is that CSA continues to be a concept that is attractive to international and national agricultural development agencies. There is significant buy-in for the concept currently, but some regions and countries prefer not to use the term. Nevertheless, the work of this FP is not tied the term

itself, but rather the principal of building crop and livestock systems that are productive, resilient and environmentally sustainable. FP2 will nevertheless manage the political risk of the term “CSA” carefully.

2.2.1.4. Science quality

State of evidence. Adaptation will be required if food production is to be increased in both quantity and stability in order to meet food security needs during the 21st century ([Piontek et al. 2014](#)). Research that informs action is needed to address the urgent climate risks to food systems and the global challenge of reducing GHG emissions from all sectors, including agriculture. Yet CSA science is in its infancy. Yield gains from adaptation through crop management and varietal substitution can play an important role, but are likely limited to moderate or low (< +3 °C) levels of warming ([Porter et al. 2014](#)). Research should therefore address both incremental changes in production as well as transformative changes such as exiting from agricultural livelihoods ([Rippke et al. 2016](#)), changing diets ([Tilman and Clark 2014](#)), new trade regimes ([Baldos and Hertel 2015](#)), and the implementation of PES and carbon markets ([Newell et al. 2014](#)).

Complexity and uncertainty around CSA stand in the way of efficient and effective action. Complexity in CSA stems from the existence of diverse (1) interventions (ranging from field level management practices to national and regional policies), (2) site-specific farming systems and households (from pastoralists to market-oriented smallholders), (3) potential outcomes of success (from soil carbon to maternal dietary diversity) ([Bryan et al. 2013](#); [Wise et al. 2014](#); [Rosenstock et al. 2016](#)). [Arslan et al. \(2015\)](#) report that the positive impacts of inputs on maize yields in Zambia are conditioned by climatic conditions, whereas [Below et al. \(2012\)](#) report a marked dependency of farmer adaptation on socio-economic status. Uncertainty in CSA is the consequence of a lack of information and data about the risks farming families face, and the efficacy of any specific CSA intervention in a given location.

Whilst potential adaptation options may be myriad (e.g. [Below et al. 2012](#); [Bryan et al. 2013](#)), understanding CSA in specific contexts and at scale requires changing the way we assess farming system responses under climate change, including the science outputs we produce. Areas where research can enable action include improving the mismatch between frequently modeled ([Challinor et al. 2014](#)), field-tested ([Rosenstock et al. 2016](#)), and/or perceived ([CIAT 2014](#)) potential CSA options; understanding CSA option dependency on climate and socio-economic contexts; the development and validation of decision support tools to aid ex-ante assessment of CSA options; the study of mixed farming systems and minor crops that are prevalent across the tropics ([Thornton and Herrero 2015](#)); research on extreme events, nutritional outcomes and pests and diseases ([Lesk et al. 2016](#); [Wheeler & von Braun 2013](#)); and the understanding of relevant climate impacts predictability limits ([Challinor et al. in press](#)).

Development of research priorities. The CCAFS External Evaluation validated the CSV approach as an effective means of testing and evaluating CSA technologies and practices and in building an evidence base for CSA scale-out. Hence CSVs continue to be central to the FP2 strategy. Calls for more adaptation science rather than impact science from the IPCC, coupled with reduced demand from national and local institutions on vulnerability assessment and stand-alone impact studies, has led to reductions in that area of work. Demand from donors and the private sector for more evidence on effective business models for CSA scaling means that this work will grow.

How FP2 will advance the science. Recognizing that agricultural research has not been developed with a CSA lens, the novel scientific approach under FP2 will be centred on generating greater understanding of the role of climate in determining whether a specific practice or technology is appropriate or not for a given context. Research will focus on two aspects of this; 1) How can we better understand the CSA related benefits of a given technology/practice over space and time, and 2) Given that knowledge, how can it be transformed in a way that supports developing country farmers and their supporting institutions to make better decisions to confront climate challenges?

Action research testing of emerging CSA practices and technologies will be combined with the development of models and approaches to understand the likely production, adaptation and mitigation (with FP3) benefits of a given technology or practice across heterogeneous geographies, and seamlessly over time. The adaptation lens must examine how a specific CSA option behaves under a range of climate stressors and risks, from extreme events, through to climate variability (including ENSO cycles), to transient climate state changes expected throughout the century. In some cases the models to do this exist, but the novel science will be in the application of these models to answer new problems. An example of this is the ongoing Risks-Households-Options (RHO) approach being developed by ICRAF, CIAT and ILRI, whereby crop-climate models and a large compendium of CSA practices are used to assess risks and CSA options that are fed into a simple household-level option that allows assessing food security impacts ([Lamanna et al. 2015](#)). Tools and methods like niche-based and climate analogues modeling techniques to assess CSA practice and farm system suitability (e.g. [Ramirez-Villegas et al. 2011](#); [Rippke et al. 2016](#)), [CSA practice modeling](#), the CSA Compendium ([Rosenstock et al. 2016](#)), and crop-model-based environmental grouping methods (e.g. [Heinemann et al. 2015](#)) will provide the basis to assess CSA options.

Social science at local scales will understand farmer behavior with respect to climate stressors across timescales, and identify the constraints and barriers that hold back adoption. Biophysical modeling of CSA practices and technologies benefits across space and time is combined with social science insights on farmer behavior, acceptance and constraints/barriers to adoption of agricultural technologies and research on appropriate enabling environments at local and regional scale. The knowledge generated can reduce risk and increase the business case for CSA investment which through the ToC will generate CSA adoption outcomes.

Managing for science quality. Research within FP2 is comprised of projects developed through a rigorous process. In 2014 FP2 engaged in a process that included: developing FP2's targets; soliciting concept notes; internal and external review of the notes; regional workshops to revise notes and impact pathways with Centres and regional stakeholders; and ISP approval. FP2 reviews annual plans for their clarity, completeness and provides feedback on how to improve impacts. Mid-year consultations indicate the state of progress and where adjustments are needed to reach goals. End-of-year reports and bibliometric reviews inform evaluation of scientific merit and impacts of the project for the allocation of resources the following year. In addition to periodic oversight on science quality and development relevance by ISP, formal reviews and evaluation for FP2 will consist of: the CSV strategic approach reviewed in 2017; evaluation of CSA effectiveness for improving the food security of the climate vulnerable in Africa in 2020. H1 will be tested through ePIA in 2019 based on results of the baseline survey revisit in 2018.

Research team qualifications. The FPL, CoA leaders and project leaders within FP2 bring highly complementary expertise. Andy Jarvis as FPL is a proven research manager and creative thinker for

driving direction of the FP and connecting it with global initiatives. Annemarie Groot (WUR) and Andy Challinor (U. Leeds) bring complementary expertise on business models, financial incentives and local institutions, and agricultural modelling respectively. Combined, they have a list of publications that numbers more than 250. Specific projects within the FP are led by reputable scientists from ICRAF, Bioversity, CIAT, IIRR, and CIMMYT.

2.2.1.5. Lessons learnt and unintended consequences

The work in early years of Phase I was scattered and often non-strategic having been inherited from the pre-CRP period. A large volume of research evaluated individual CSA practices and technologies using different analytical frameworks and often with limited economic analysis of cost effectiveness. Through a major planning phase in 2014, non-strategic activities were trimmed and a new portfolio of projects was established for the Extension Phase, many of which are proposed to continue. In Phase II, FP2 will ensure greater co-location of activities in CSVs (but not exclusive to them), and ensure common analytical frameworks for evaluating benefits on productivity, adaptation and mitigation (with FP3) to get to grips with cost-effectiveness of CSA. Research will be embedded in local participatory platforms for understanding the social, gender and biophysical constraints and enablers for adoption. Much greater integration with AFS-CRPs will also ensure that CSA technologies and practices emerging from the CGIAR are systematically assessed for CSA outcomes.

Phase I paid little attention to youth. In Phase II, some specific efforts in South Asia and Latin America address youth particularly, by introducing novel ICT tools to better manage climate related risks, integrated within CSA practice and technology adoption programs. ICTs have been identified as an instrument to attract and thus increase participation of youth in agriculture ([IICD 2013](#)), and these activities will be designed in a way that it stimulates younger ages to benefit from these innovations particularly.

In response to the ISPC commentary various improvements in FP1 have been made. Greater articulation of the [CSV concept](#) and its role on the ToC has been provided in Section 2.2.1.6. Greater articulation between CoA2.2 and CoA2.1 is also provided to show how robust *ex ante* assessment of CSA options feeds into the selection of CSA technologies and practices for evaluation in CSVs. During [Phase I, baselines were taken in all CSVs](#), and these will be revisited during Phase II to explore and understand changes using ex-post impact assessment approaches. The co-location of CSVs in 5 of 6 high priority Site Integration countries provides additional opportunities for integrative research and supports continuation in these countries. Emerging recommendations from the CCAFS evaluation have also been incorporated into the CSV concept.

Some unintended consequence are that CSA is inherently context specific so efforts must be made to guard against the indiscriminant transfer of CSA technologies between different biophysical, socio-economic, 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 mal-adaption 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 ([Noble et al. 2014](#)). Effort must also be made to ensure the profit-signals driving private

sector investment in CSA are not at odds with the FPs' efforts to reach truly vulnerable farmers, especially women. The private sector can deliver CSA at scale to a large number of actors, but it is historically biased towards actors capable of producing immediate financial return. This, in many cases, does not include marginalized groups.

As identified by the ISPC, the key to success in Phase II of FP2 is effectively putting the CGIAR as a research and knowledge broker with a strong downstream partner strategy and significant effort will be invested to make sure that happens.

2.2.1.6. Clusters of activity (CoA)

This FP is organized around four CoAs to deliver IPGs and downstream impact targets. The first, and largest, CoA covers the testing of technologies and practices in Africa, Asia and Latin America (CoA 2.1). These multi-stakeholder LPs are situated within opportunities for scaling up, thus other CoAs focus on scaling through tools for making investment choices (2.2), subnational adaptation planning processes (2.3) and business models, finance and incentives (2.4). The FP contains a Learning Platform (LP2) on participatory evaluation of CSA technologies and practices in CSVs. Some of the CSVs are already test-beds for up to 5 Centres. In Phase II CoA 2.1 will constitute LP2 with AFS-CRPs and ICRPs. WISAT, IIRR, CARE, CIRAD, CATIE and GIZ will be Strategic Partners in LP2.

CoA 2.1 Participatory evaluation of CSA technologies and practices in Climate-Smart Villages (Learning Platform - LP2)

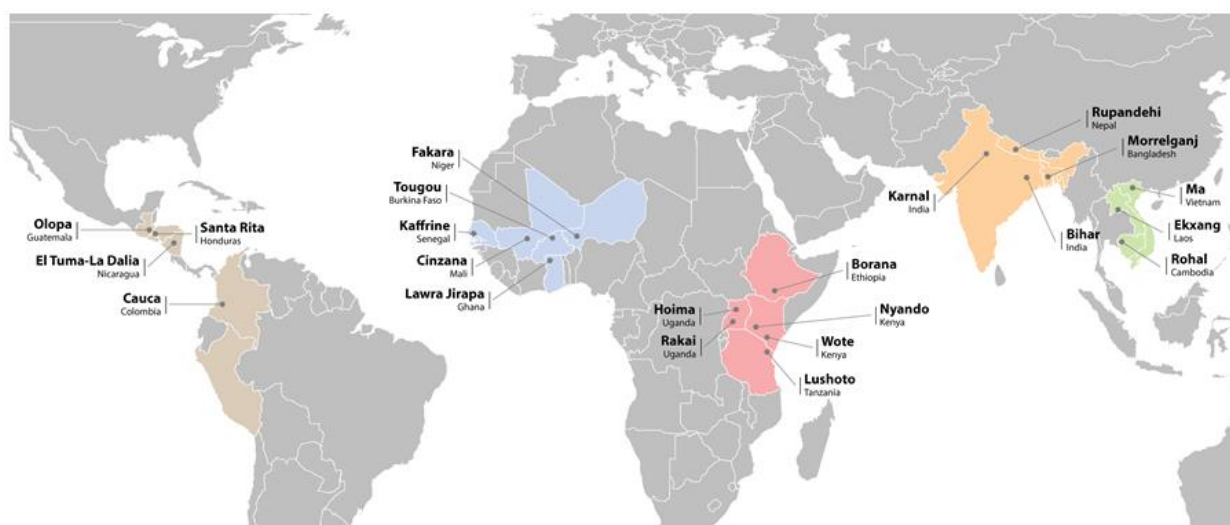
Through Phase I, a key success has been the establishment of 19 CSVs across the original CCAFS target countries (FP2 Figure 2). These were selected in CCAFS priority countries based on a) governmental priorities, b) vulnerability, c) institutional capacities (CGIAR and non-CGIAR), d) representativity for CCAFS and e) potential for effective scale-out of success cases. In Phase II work will continue in the same CSVs where significant investment in the participatory research platform exists, and where local institutions are primed to deliver the expected results for this CoA.

In late 2015, a multi-stakeholder workshop consisting of participants from all 5 CCAFS regions developed a common vision for CSVs moving forward, and identified a number of means of bolstering their learning potential and subsequent strategies for scaling. The emergent vision of a CSV is:

- A CSV is a test-bed for generating greater evidence of CSA effectiveness in a real-life setting (including technological, social, institutional, financial, value-chain and policy innovations), eventually leading to prioritization of the best and practical adaptation options for particular geographic areas aiming to improve food security, livelihoods, nutrition and resilience
- A CSV is founded on participatory action research for grounding research on appropriate and location/context specific enabling conditions and generating R4D methodological innovations
- The CSV plays the role of a platform for multi stakeholder collaborative work and co-development of scaling mechanisms towards landscapes, sub national and national levels.

- In establishing CSVs and in selecting particular activities, the vision must always be on scaling up, with partners engaged and processes implemented from the start to realize the vision. CSV successes and policy constraints should feed into FP1 (CoA 1.3) to build enabling environments for scaling.

In other words, CSVs are “lighthouses” to show where communities test, co- develop and adopt CSA, providing evidence and demonstration of best-bet CSA options that are deserving of investment for scaling up. CSVs can be considered clusters of villages or landscapes that focus on climate change hotspots across a wide range of agro ecological zones with different farmer’s typologies, climate risks and vulnerabilities. A key approach is to evaluate portfolios of options in addition to individual CSA options, and have robust action research to i) understand the effectiveness of options and ii) develop (no regrets) solutions in anticipation of future climate change impacts. CSVs promote local and incremental adaptation and build local capacities to continue to innovate, experiment, and adapt.



FP2 Figure 2. Location of Climate-Smart Villages (CSVs). This shows the CCAFS-facilitated CSVs – there are also partner-facilitated CSVs, numbering in their hundreds, where partners bring together various climate-change solutions.

Close integration with AFS-CRPs is envisioned to identify technologies and practices. For example, FP2 CoA 2.1 will perform on the ground testing of model outputs including socioeconomics, crop management and germplasm deployment from MAIZE and WHEAT CRPs. Similar agreements with other agri-food CRPs exist. Additionally, local institutions and communities themselves also select CSA options that they would like evaluated, and CSA development programs can also incorporate learning in their operations by co-locating CSA options in CSVs.

The CoAs will draw on the successes of Phase I in 9 sites in Africa, 7 sites in Asia and 3 sites in Latin America. The CSV concept is now being taken up by other agencies (e.g. Maharashtra State government adopting the concept and investing in their establishment across the region) and CCAFS will contribute with information and advice in these other sites.

The rationale is that significant investment is becoming available for scaling CSA, and a pipeline of tested CSA options, that can be adapted to different site-specific conditions, needs to be developed to maximize value for money of CSA-related finance. CSVs will generate evidence of CSA effectiveness at

local scales (H1 – see 2.2.1.1) and inform appropriate incentives and scale-out strategies to generate greater CSA investment and outcomes (H2). Revisiting the baseline survey in CSVs in 2018 will form the basis for ePIA testing of H1.

Key research questions are: What are the relative synergies and trade-offs of different CSA portfolios in terms of productivity, adaptation and mitigation outcomes and their context-dependencies? What are the gender-, social-, health- and nutrition- dimensions of promising CSA options? How does a development agency target and adapt CSA practices (specific or combinations) for increased synergies and improved adoption? What are the appropriate local-level enabling environment conditions required to increase CSA investment and enhance adoption of technologies and practices, and how might policy, finance and institutional innovations be designed to out-scale effectively? How do we know if CSA is effective and for whom?

This CoA will develop, use and adapt a range of qualitative and quantitative research methods across a broad set of CSVs and other sites in different biophysical, economic and social contexts to fill gaps in evidence on CSA best bets. Research outputs include:

- On-farm tested, and evaluated and up-scalable gender sensitive and specific CSA options (e.g. climate-adapted germplasm, conservation agriculture, agroforestry, aquaculture, water harvesting, soil and water management options, livestock nutrition), including transformative options, and models of integrated crop-livestock-tree systems for increasing resilience.
- Improved understanding of farmer's and stakeholders perceptions along the value chain of CSA options, and assessments of the conditions for success and failure of interventions.
- Simulation of CSA options under different climate and socio-economic scenarios for informed decision-making (together with FP1)
- Empirical and big data analysis of climate-specific management options, generating climate sensitive extension schemes and climate-site-specific advisory systems (including precision agriculture) for farmers.
- A farmer citizen science approach for adapting CSA options to the local context and scaling up.

CoA 2.2 Evidence, investment planning and application domains for CSA technologies and practices

This CoA will develop a range of tools, databases and knowledge products to help CSA investments make the best choices for delivering scaled impact. Significant CSA investment is in the pipeline (from both traditional agricultural development donors through climate finance agencies such as the Green Climate Fund), and donors, multilateral agencies and government agencies are asking what the best-bet CSA options are for different types of farmers under a given context. The primary outcome of this CoA will be more effective CSA programming, which will ultimately increase CSA adoption by farmers and return on CSA investments by donors. Decision support tools are therefore needed to evaluate cost effectiveness of a range of CSA options, and support decision makers through the process of identifying priorities at a range of scales, from local- to national- levels. Methodologies for application domain analyses are also needed. This CoA contributes to hypothesis 2 by linking local-scale research on CSA technologies and practices and their impacts with larger-scale databases and decision support tools.

Collaboration between CoA2.2 in RICE and CoA 2.2 of this FP will focus on exploring target domains for climate-smart technologies through state-of-the-art crop-climate modelling in Africa. This collaboration will use the climate change scenarios and climate impacts methodologies that are developed as part of this FP and its partners (specifically, the University of Leeds), and data collected through current RICE. FP2 CoA 2.2 will also contribute to understand household adoption of CSA practices and technologies in RTB-based intercropped coffee and cocoa systems in West Africa through collaboration with RTB.

Key research questions are: What is the value proposition of different CSA technologies and practices in terms of the three pillars of CSA, and what are the relative cost-benefits across a range of contexts, timescales and development scenarios? What decision support tools will improve the value for money of CSA programming now and into the future and how can they best be applied to support that goal? Where and when can a particular CSA option be considered climate smart, and how do the trade-offs between pillars vary in space and time?

A suite of tools for different purposes and contexts will be developed and applied to support donors, governments and investors make better choices for CSA-related programming. These will draw from ground-truthed data from CoA 2.1 and transform into information relevant for decision-making. This will increase the relevance and likely impact towards the achievement of CSA-related outcomes at scale. Research outputs include:

- Further development of a compendium of CSA practices and technologies, with information on the associated costs, benefits and adoption constraints, including indicators on gender impacts.
- Understanding farming systems diversity and prioritization and decision support tools for guiding CSA investments, including spatial models to understand application domains in space and time of promising CSA options.
- Information notes on the benefits of a particular CSA practice or technology, with associated information on trade-offs, application domains and evidence of gender related impacts
- Country and county climate-smart profiles that help identify priority CSA practices and technologies within a given country/region

CoA 2.3 Equitable subnational adaptation planning and implementation

Wide-scale adoption of CSA technologies and practices will require an enabling environment which includes local, institutional, national and regional level plans and policies. This CoA will explore appropriate plans and policies at subnational levels (national policy is covered under FP1) that can provide incentives for CSA scale-out. This may include both public-sector policies and programs, as well as strategies from private sector or civil society. The rationale is that local level enablers for adaptation are needed for farmers to access credit, extension, technologies amongst other resources that will increase adoption rates of CSA technologies and practices. Yet there is limited knowledge on how subnational policies and programs can deliver incentives for farmers to adopt tried and tested CSA technologies and practices (hypothesis 2).

Key research questions are: What are the most appropriate subnational policies and how might local CSA programs be best designed to promote CSA adoption? What is the role of local institutions in

providing supporting services to farmers that increases CSA adoption levels, and promotes gender-equitable outcomes?

This CoA is particularly focused on Asia (but not exclusively) where significant local adaptation planning takes place (e.g. LAPAs in Nepal), with the objective of research contributing to improvement of these adaptation plans. Equitable and effective adaptation plans are a key scale out strategy to provide incentives for CSA adoption and reach programmatic targets and support CSA investment. Research outputs include:

- Research on institutional arrangements for CSA promotion in and around CSVs.
- Evaluation of LAPAs in South Asia and their efficacy in promoting adaptation and gender-equitable CSA adoption.
- Evaluation of scaling up strategies and their efficacy across a range of contexts and regions

CoA 2.4 Business models, incentives and innovative finance for scaling CSA

This CoA will develop new business models for CSA at local levels, explore innovative value-chain based incentive mechanisms for CSA adoption, and explore emerging innovative finance instruments that will support CSA scaling up. The rationale is that technical knowledge and availability of CSA technologies and practices are not sufficient to achieve the ambitious goals of mass CSA adoption of global and regional initiatives aligned to GACSA. Business models, financial and other incentives need to be understood and leveraged to boost adoption levels and deliver scale out strategies that have the capacity to reach millions of farmers, including those that are marginalized. New business models can be explored that promote 1) scaling of promising CSA technologies /practices (linked to a technology push approach to business development) or 2) scaling of CSA (which is broader, allows for a value chain perspective and a demand driven approach to business development).

CSA has opened new opportunities for novel financial instruments to promote agricultural technology adoption, including from climate finance. This opens up questions about how new finance streams, and value-chain innovations might be best harnessed to deliver benefits to smallholder farmers and deliver on the outcomes of CSA (hypothesis 2).

Key research questions are: What motivates the private sector to take up and promote CSA? Which business models work for whom and when to support scaling up? What is the potential of impact investment to incentivize equitable adoption of CSA technologies and practices at local levels through a value chain approach? : Is certification of climate-smartness a viable and marketable business model that delivers equitable benefits to farmers, and in so doing, promote adoption of CSA technologies and practices? What other existing and innovative finance instruments exist (e.g. payment for ecosystem services) that will provide incentives to farmers to access, adopt and promote CSA practices and technologies, and what are their efficacy in reaching and positively impacting on those most marginalized (including women and youth)? What risks arise from market access for smallholder farmers and what are effective strategies to mitigate these risks?

This CoA is crucial to the impact pathway in that it frames many of the strategies for scaling up CSA in support of ambitious national, regional and global goals. Insights generated from this research will

inform CSA investment and increase the value for money of CSA investment by using appropriate gender-sensitive incentive mechanisms for adoption. Research outputs include:

- Synthesis of research on business models and approaches to business modelling across different biophysical and socio-economic contexts to find out which models and approaches are most useful for whom and under which conditions
- Establishment of public-private-partnerships with value chain actors to develop evidence based certification schemes that facilitate entry points for CSA investment through commodity chains
- Research on CSA certification feasibility in West Africa and Central America in coffee and cocoa value chains, and in SE Asia in the rice sector
- Research on the reach and efficacy of impact investment and other novel financial instruments, including those originating from climate finance
- Awareness raising on and preparation for innovative climate funds at multiple levels

2.2.1.7. Partnerships

The FP2 ToC hinges on effective partnership. The CSV approach – essentially a multi-stakeholder LP at key sites – will be used to trial options with partners. Each CSV is established with its own ToC, or linked into a national ToC to ensure that case study work builds into plans for scaling up. Many local partners from Phase I in the well-established CSVs will continue in Phase II. These partners were selected through robust analysis of institutional capacities, mandates and commitments to long-term place-based action research. Continuity is a key criterion to ensure that the participatory platforms in CSVs deliver. Local NARES are a key partner in most CSVs. These partners receive long-term partner agreements with funding to cover their implementation costs. Local private sector actors will continue to be involved in CSVs in Phase II.

Key non-CGIAR upstream research partners include Vietnamese Academy of Agricultural Sciences, Indian Council of Agricultural Research, Central Soil Salinity Research Institute, Nepal Agricultural Research Council, Bangladesh Agricultural Research Institute, Institut de l'Environnement et de Recherches Agricoles (INERA), L'Institut National de la Recherche Agronomique du Niger (INRA), Institut Senegalais de Recherche Agricole (ISRA), Savannah Agricultural Research Institute and Agrhymet Regional Centre. Other key skills that FP2 will bring in through partnership are *Climate modelling, agricultural impact analyses, GxE approaches* (Future Earth partners, University of Leeds, AgMIP, University of Florida); *household modeling* (WUR and CSIRO), *data analytics* (Penn State, HEIG-VD, Virginia Tech, plus partners involved in the Big Data Platform proposal) and *Social sciences* (IIRR, Institut d'Economie Rural (IER), National University of Ireland Galway and CATIE).

For proof-of-concept and scaling up, FP2 will collaborate with the major multilateral and bilateral agencies facilitating CSA investment and implementation, including GACSA and its members, Alliance for CSA in Africa, FAO, World Bank, IFAD, DFID, USAID, GIZ, Gates Foundation, Climate-Smart Agriculture Programme (CSAP) and CTA, to develop the tools needed to prioritize, plan and bring CSA practices to scale. Regional bodies involved in CSA implementation are also involved, (e.g. Africa Union, NEPAD, ECOWAS, COMESA, APAN, CAC, ECLAC and IICA). A host of partners at national level (incl. government, private sector and civil society) will complement these efforts and ground the research in national

realities. Impact partners are generally involved as self-funded collaborators and may leverage significant funding for the FP.

Global and regional private sector partners are also crucial for the FP2 ToC, being heavily involved in the CoA related to innovative finance and CSA incentive instruments, including certification organizations (e.g. Rainforest Alliance), social impact investors (e.g. Root Capital), and major agri-food companies involved through the World Business Council for Sustainable Development (WBCSD) and the Sustainable Agriculture Initiative Platform (SAI-Platform).

Comparative advantage of the CGIAR

CCAFS has been a lead agency in the development of the CSA approach and through Phase I has demonstrated its capacity to lead CSA related research, interfacing between academic institutions and development actors at multiple scales. CGIAR research is embedded in agricultural practice in a way that the Future Earth community, which focuses on modeling whole-earth systems such as the carbon cycle, is not. Developing of the evidence base for CSA is one key area in which CGIAR can synthesize the science across many agro-ecological and socio-economic contexts to complement Future Earth at the global level.

2.2.1.8. Climate change

FP2 can play a major role in addressing the global challenge of climate change. Climate finance and the key institutions behind CSA investment have a broad range of interests that go beyond specific crops, livestock systems or cropping systems. Thus, collaboration across the CGIAR is needed to support investors identify the best-bet options across a range of geographies and agricultural and social contexts. Hence, this FP is entirely focused on enabling the CGIAR to provide comprehensive guidance on CSA options, and through ambitious partnerships ensure that a two-way conversation occurs around when (and when not) CSA is a viable option for climate finance and mainstream agricultural investment. This holistic approach, rather than a crop or livestock specific approach, will likely yield much greater impact for the CGIAR.

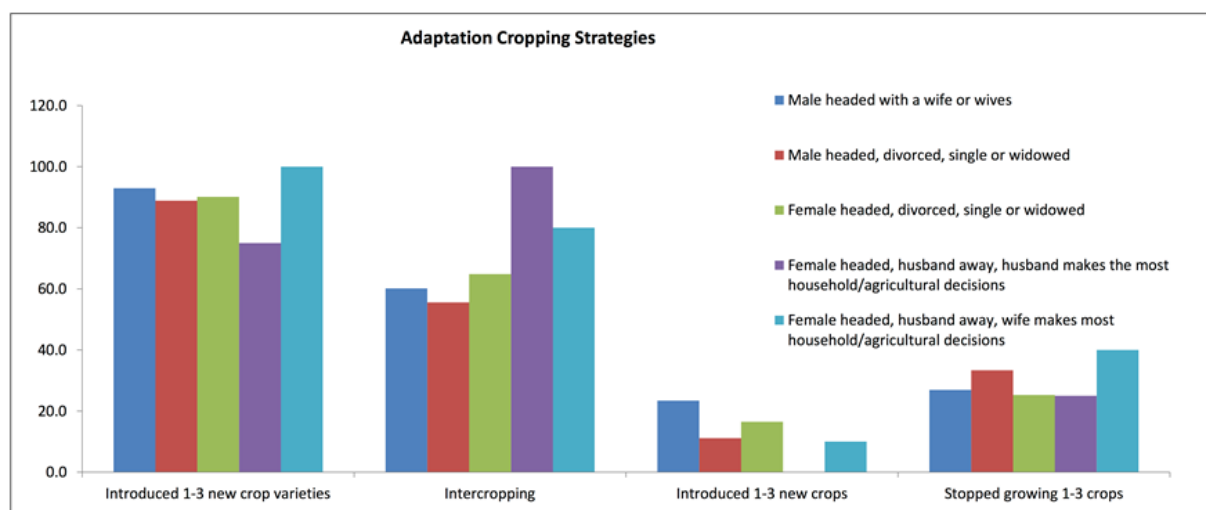
The Learning Platform (LP2) on participatory evaluation of CSA technologies and practices in CSVs is central to achieving CGIAR-wide collaboration around the topic of CSA technologies and practices. The LP will generate methodologies for evaluating CSA related outcomes for emerging practices and technologies, and build a CSA evidence base for CGIAR technologies that increase the potential impact and open new potential streams of investment from the climate community.

Through partnerships with key development actors in the CSA domain, FP2 will place the CGIAR at the interface of the discussion between development and research to build evidence, design interventions and successfully roll-out CSA practices and technologies at scale. Thus, the CGIAR becomes a catalyst for smart CSA investment.

2.2.1.9. Gender

Men and women have different perspectives on risk and adaptation needs ([Jost et al. 2015](#); [Twyman et al. 2014](#); Murray et al. forthcoming; FP2 Figure 3) and environmental stewardship ([Denton 2002](#); [Perez et al. 2015](#)). FP2 will contribute to the gender and youth IDOs by identifying trade-offs of food security, adaptation and mitigation of CSA technologies and practices and whether they differ for men and women, young and old. For example, *how do certain CSA practices or packages affect women's and youth's labour workloads? Who controls the benefits received from CSA technologies/practices?*

The CCAFS gender survey will be analyzed to further understand socially differentiated adoption profiles of CSA practices and technologies. Initial results indicate women are less aware of CSA practices but when they are aware they are just as likely (if not more so) than men to adopt the practices ([Twyman et al. 2014](#); [Bernier et al. 2015](#)). Some factors influencing adoption by women include information, access to credit or finances, interaction with local institutions, and demonstrated effects on decreased workloads ([Jost et al. 2015](#)). Research will generate effective indicators for gender-related benefits of CSA and apply them in CSVs to understand sex- and youth-disaggregated adoption profiles for a range of CSA options, and allow cross-regional comparison and customizing of approaches of the primary barriers holding back adoption especially by women. This work will feed into CoA 2.4 to explore how incentive mechanisms can pro-actively target adoption of CSA by women farmers, focusing on value chain and financial incentives that empower women to be the agents of CSA adoption in the household. Addressing questions related to CSA and gender will help identify those technologies and practices that have positive impacts on the control of productive assets and resources within communities and contribute to achieving the gender and youth IDOs (see 1.0.4 for the gender-related hypothesis).



FP2 Figure 3. Gender trends in adaptation in cropping strategies

Source: Nyasimi et al. 2015

2.2.1.10. Capacity development

In the 4th Assessment Report, the IPCC reviewed the full literature on adaptive capacity and identified six determinants: economic wealth, technology, information and skills, infrastructure, institutions, and equity ([Smit and Pilifskova 2007](#)). FP2 is designed to produce outputs and outcomes in five of these six dimensions (excl. infrastructure). Capacity development is central to the FP's ToC: to make development more "climate-smart". In essence, this is achieved through the capacity strengthening of development actors, at individual, organizational and institutional levels, to manage towards improved CSA outcomes. During Phase I, FP2 has been closely engaged at the national level in several target countries with capacity needs assessments, working with national partners both within formal processes, such as the NAPA or NAFSIP in different African countries, and via stand-alone situation analyses like the [CSA country profiles](#).

Going forward, FP2 will focus on partner capacity building in five areas of the CapDev Framework: intervention strategy design, learning materials and approaches, gender-sensitive approaches, organizational development and institutional strengthening. Capacity development is planned to be especially high in CSV sites, where the participatory approach strengthens local economic wealth, technology, information and skills, institutions, and equity. Horizontally networked institutions among farmers and communities will be used as a mechanism for capacity development. For example, in Kenya, best practices identified in local Community Action Plans will be implemented through farmer-to-farmer extension and training. Likewise policy makers will be directly involved in all stages of research relevant to policy design and implementation to build capacity. For example in South Asia, CCAFS scientists will join with policy makers to undertake case studies of Local Adaptation Plans of Action (LAPAs).

2.2.1.11. Intellectual asset and open access management

In Phase I FP2 was a CGIAR-wide leader in generating Open Access/Open Data products, and complying with the ambitious CGIAR OA/OD policy. This will continue in Phase II. Research methods, data, tools and associated information generated under FP2 will be made available for indexing and interlinking, so that research outputs are open via FAIR principles. Furthermore, the proposed FP Research Leader is also the co-lead on the Big Data and ICT platform proposal which includes a strong OA/OD emphasis.

Targeted open access data bases to be produced or maintained during Phase II include:

- [Agtrials.org](#): information portal that provides access to a database on the performance of agricultural technologies at sites across climate gradients. It builds on decades of evaluation trials
- Compendium of CSA practices and technologies: Database of the benefits of different CSA technologies and practices, as reported in scientific literature, disaggregated for geographic regions and different farming systems
- Ag-Impacts: Collation of impact studies from IPCC report and other sources that allows a user to query scientific literature on likely crop impacts
- Site-specific management datasets and ICT platforms for delivery of optimal management recommendations under a varying climate

- CCAFS-Climate.org (together with FP1): Global downscaled climate projections for use in agricultural modelling of impacts

The FP is not a primary generator of technologies and their related intellectual assets, but rather a user to stimulate adoption of emerging agricultural technologies. IP considerations will be taken into account when testing and promoting such technologies. Given the focus on participatory evaluation in FP2 (that includes attention to traditional knowledge and close work with farmers), FP1 will comply with the CGIAR Principles on IAs (see Section 1.0.12).

2.2.1.12. FP management

FP2 will continue to be led by CIAT in Phase II. CIAT is well positioned given strong geographic representation in all of CCAFS target Regions, direct involvement in five AFS-CRPs as a strategic contributing Centre, and a broad multi-crop and livestock focused mandate which is advantageous given the breadth of this FP. Nevertheless, a primary success factor for this FP lies in sourcing integrative research between CRPs and Centres in contribution to the research hypotheses, and CIAT has a strong track record in nurturing such partnerships.

The FP is led by CIAT, but includes activities from eight CGIAR Centres directly, and others through collaborative work in AFS-CRPs. The FPL – Andy Jarvis – will dedicate 80% time to leadership, management and research synergy of the FP. He was competitively selected for a similar role in Phase I. Andy Jarvis has published over 50 articles, with over [13,000 citations](#) (9th highest in the CGIAR according to Google Scholar) and in journals such as Nature Climate Change, PNAS, Proceedings of the Royal Society and Nature Plants.

Some specific responsibilities within the FP include:

- Regional Program Leaders overseeing CoA 2.1 activities within their region, with support from the FPL
- Scientific backstopping from Dr. Andy Challinor, University of Leeds, in CoA 2.2, who was a co-author on the most recent IPCC AR 5 chapter on food security
- CoA leadership from Dr. Annemarie Groot from WUR for CoA 2.4, responsible for defining CoA directions and synergy
- Six project leaders from different Centres delivering specific activities across the CoAs of the FP

Global learning workshops around key FP topics will be organized, building off a successful CSV South-South exchange and visioning workshop held in 2015 as part of Phase II proposal development. Future topics could focus around lessons learned on CSA scaling, CSA business models and finance, and modelling approaches to understand trade-offs and synergies.

2.2.2 Flagship Budget Narrative

2.2.2.1 General Information

CRP Lead Center's Name: CIAT

Center Location of Flagship Leader: CIAT

2.2.2.2 Summary

Total Flagship budget summary by sources of funding (USD)

Funding Needed	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total
W1+W2	6,025,280	6,326,544	6,642,871	6,975,015	7,323,766	7,689,955	40,983,431
W3	-	-	-	-	-	-	-
Bilateral	15,312,533	17,667,550	20,626,971	23,339,131	25,931,082	28,446,345	131,323,612
Other Sources	-	-	-	-	-	-	-
Total	21,337,813	23,994,094	27,269,842	30,314,146	33,254,848	36,136,300	172,307,042

Funding Secured	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total
W1+W2 (Assumed Secured)	6,025,280	6,326,544	6,642,871	6,975,015	7,323,766	7,689,955	40,983,431
W3	-	-	-	-	-	-	-
Bilateral	10,718,773	9,717,153	4,125,394	2,100,522	-	-	26,661,841
Other Sources	-	-	-	-	-	-	-
Total	16,744,053	16,043,697	10,768,265	9,075,536	7,323,766	7,689,955	67,645,272

Funding Gap	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total
W1+W2 (Required from SO)	-	-	-	-	-	-	-
W3 (Required from FC Members)	-	-	-	-	-	-	-
Bilateral (Fundraising)	(4,593,760)	(7,950,398)	(16,501,576)	(21,238,609)	(25,931,082)	(28,446,345)	(104,661,770)
Other Sources (Fundraising)	-	-	-	-	-	-	-
Total	(4,593,760)	(7,950,398)	(16,501,576)	(21,238,609)	(25,931,082)	(28,446,345)	(104,661,770)

Total Flagship budget by Natural Classifications (USD)

	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total
Personnel	6,922,015	7,488,695	8,291,168	12,649,441	8,820,147	9,098,153	53,269,620
Travel	1,610,800	1,656,357	2,077,455	2,102,211	2,337,902	2,397,677	12,182,402
Capital Equipment	139,250	95,326	98,648	105,624	105,760	109,565	654,174
Other Supplies and Services	5,360,889	6,540,840	6,528,078	6,696,898	6,792,316	7,053,910	38,972,932
CGIAR collaborations	723,371	742,894	763,392	784,916	807,516	831,246	4,653,334
Non CGIAR Collaborations	4,052,051	4,593,361	6,196,518	4,239,584	10,281,586	12,158,314	41,521,413
Indirect Cost	2,529,438	2,876,622	3,314,584	3,735,472	4,109,620	4,487,432	21,053,168
Total	21,337,814	23,994,093	27,269,843	30,314,147	33,254,848	36,136,298	172,307,042

Total Flagship budget by participating partners (signed PPAs) (USD)

	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total
CIAT	6,208,662	6,256,364	6,305,748	6,356,876	6,409,816	6,464,637	38,002,101
AFRICARICE	60,000	68,595	69,682	73,153	72,021	73,279	416,731
BIOVERSITY	2,560,433	4,755,044	7,787,057	5,025,213	12,957,549	15,407,650	48,492,945
CIFOR	15,000	15,648	16,328	17,042	17,791	18,578	100,387
CIMMYT	4,274,174	4,773,828	4,843,770	4,997,267	5,267,897	5,486,587	29,643,524
CIP	24,000	24,488	24,991	25,510	26,043	26,593	151,625
ICARDA	1,036,150	1,087,958	1,142,355	1,199,473	1,259,447	1,322,419	7,047,803
ICRAF	1,976,575	1,910,264	1,953,263	1,979,785	1,992,728	2,020,865	11,833,479
ICRISAT	1,043,358	1,043,358	1,043,358	6,494,064	1,043,358	1,043,358	11,710,854
IFPRI	15,015	14,974	15,012	15,043	14,971	14,983	89,999
IITA	681,704	689,567	701,575	713,944	726,683	739,805	4,253,278
ILRI	553,000	559,661	566,521	573,588	580,866	588,362	3,421,998
IRRI	592,990	592,991	592,989	592,991	592,990	592,991	3,557,940
IWMI	1,475,725	1,545,917	1,586,575	1,628,301	1,671,126	1,715,076	9,622,720
WORLD FISH	378,528	212,936	178,118	179,398	179,063	178,615	1,306,658
Copenhagen University	170,000	170,000	170,000	170,000	170,000	170,000	1,020,000
CIAT-Gender & Social Inclusion Leader	122,500	122,500	122,500	122,500	122,500	122,500	735,000
Wageningen University (WUR)	150,000	150,000	150,000	150,000	150,000	150,000	900,000
Total	21,337,814	23,994,093	27,269,843	30,314,147	33,254,848	36,136,298	172,307,042

Explanations of these costs in relation to the planned 2022 outcomes:

(Outcome numbers as in PIM Table B)

The largest portion of FP2 budget goes to **Outcome 2.3** (*50 site-specific targeted CSA technologies and practices tested, with all options examined for their gender implications*). This is the heartland of FP2 research and builds on the collaborative and inter-CRP work that will be implemented in the Learning platform on Participatory evaluation of CSA technologies and practices in CSVs across the 5 focused regions and Integration sites. Work towards this outcome is across all 5 regions and requires operational investment in on-the-ground testing in CSVs. CSVs are where CCAFS, with national programs, partner with rural communities to develop CSVs at tens of sites in five regions, as platforms to select and trial portfolios of technologies and institutional interventions to meet the challenge of climate change. Outcomes are measured in terms of enhancing productivity, incomes, climate resilience and mitigation. The focus is on a basket of synergistic options, combining water-smart (e.g. micro-irrigation), weather-smart (e.g. index-based insurance in collaboration with FP4), nutrient-smart (e.g. manure management), carbon- and energy-smart (e.g. agroforestry, solar) and knowledge-smart activities (e.g. farmer-to-farmer learning).

The remaining budget is fairly equally split between the other 4 outcomes. Twenty-five percent of the funding is allocated to **Outcome 2.1** on *6 million farm households receiving incentives for adopting CSA related practices and technologies that potentially reduce production risks*; twenty per cent goes to **Outcome 2.2** on *15 sub-national public/private initiatives providing access to novel financial services and supporting innovative CSA business models*; fifteen per cent to **Outcome 2.4** on *15 development organizations, with the focus on investments for CSA activities, adapting their plans or directing*

*investment to increase women's participation in decision-making about CSA investment and the final ten percent of the funding is allocated to **Outcome 2.5** on 10 policy decisions taken (in part) based on engagement and information dissemination by CCAFS.*

The major budget share related to **Outcome 2.3** will support the testing and piloting of promising climate smart water, crop-livestock-agroforestry practices, the development of common analytical frameworks and protocols, the development of innovative tools/approaches for scaling out CSA/CSVs and building the evidence base and lessons learned on CSA adaptation benefits across time-scales and geographies, in collaboration with FP3 and AFS-CRPs.

25% percent of the funding will go to projects contributing to **Outcome 2.1** supporting the development of incentive frameworks and mechanisms for out-scaling CSA options. This work will include understanding local-level enabling environment and subnational policies supporting CSA investment and enhanced adoption, identifying business models for the best-bet CSA options, developing CSA targeting and prioritization tools, approaches and guidelines for local adaptation and investment planning, climate sensitive extension schemes and advisory systems for farmers and training workshop to subnational governments, development agencies and grower associations.

With 20% of the funding the portfolio of projects contributing to **Outcome 2.2** will develop CCAFS outputs to promote CSA business models and incentives, pilot voluntary certification schemes and test innovative financial mechanisms in cocoa or coffee value chains supported by multi-stakeholder platforms. They will also assess the efficacy of impact investment and other novel financial instruments (incl. from climate finance) and support the mainstreaming of CSA financial products across different levels in the value chains.

15% of FP2 funds (**Outcome 2.4**) will be allocated to activities focused on assessing the gender disaggregated impact of CSA technologies and practices evaluated in CSVs, identifying CSA business cases in gender focused value chain as well as socially differentiated financial vehicles and incentive mechanisms, and on developing gender and youth tailored CSA information to raise awareness and build capacity in development and subnational organization.

10% of the funding, allocated to **Outcome 2.5** on 10 policy decisions taken (in part) based on engagement and information dissemination by CCAFS, will support work on evidence-based adaptation domains for LAPA and CSVs Investment plans, subnational policy and institutional frameworks that can support the adoption of preferred CSA practices, strategic engagement with subnational government for uptake of CSA knowledge products and capacity building activities on climate smart local development planning.

In FP2, W1/W2 will be used for highly strategic research and engagement with value as international public goods, whereas W3 bilateral activities will be tailored to specific locations and stakeholder groups as per funding conditions. Significant W3 funds are aligned to FP2 from centers, but are aligned through Flagship projects which were competitively selected and co-designed with Centers. Therefore, W1/W2 is being strategically used to fund core research activities including synthesis and partnership, whilst W3 bilateral is focused primarily on place-based efforts that complement and extend the depth and scope of research outcomes that CCAFS can achieve.

FP2 budget will be allocated to all 15 Centres as research under FP2 is fairly core to the CGIAR. Bioversity, CIAT and CIMMYT share the greatest budget allocation (29%, 23% and 17% respectively) and collectively receive 69% of total FP2 funds. A large proportion of Bioversity budget is W3/Bilateral, and so additional W1/W2 resources are also included under uplift. CIAT also receives a large share of FP2 funds as it will host the FP2 leader, house the RPL in LAM, and lead research on CSA value chains, CSVs in SE Asia and climate specific management systems. FP2 leader funds will support synthesis activities, and promote engagement and partnership with key global and regional CSA investors.

FP2 has allocated 2% of its budget to MELIA. Of this USD 227,550 over the six-year period is allocated to external assessments. These are shown in Annex Table 5. FP2 will allocate funds to CCEEs for FP2 and CSVs, and contribute to gender, regional and Learning Platform external reviews.

Costs in relation to the natural classification

Personnel. Of the total budget 31% goes to personnel. This reflects the considerable staff inputs into the program.

Travel. Of the total budget 7% goes to travel. Given the program is globally distributed, there is a significant amount of travel. However, through virtual meetings there is also a significant budget reduction (e.g. the management team only meets once or twice per year face-to-face, the monthly meetings being conducted via video-conferencing. Much travel is regional and focussed on researcher visits to CSV sites, although some south-south learning activities also contribute to trans-continental travel.

Capital equipment. This is a very small percentage (0,4%) of the total costs, as CCAFS-related research is not dependent on high-cost equipment.

Other Supplies and Services. See below in section 2.

CGIAR Collaborations. 3% of the total budget goes to Collaborations among CGIAR Centres but only with W3 and Bilateral funds as all W1W2 budget are sent directly from CIAT Lead Centre to Participating Centres via Program Participant Agreements (PPAs).

Non-CGIAR collaboration. Partnerships for research and development outcomes are a crucial component of the ToC. Thus CCAFS will allocate at least 24% of the budget to partners of its budget to partners. This amount is expected to leverage own-resources from within partners at 2-3 times that level. The fundraising strategy will try to increase this level.

Indirect costs. 15% is the average Indirect Cost rate that comes from the different rates among CGIAR Centres defined on estimated income.

2.2.2.3 Additional explanations for certain accounting

Benefits:

Using CIAT as point of reference, we assumed most of CGIAR Centers follow the following differentiation of benefits among National and International Staff:

National Research Staff (NRS): Fringe benefits for national staff (costs for all benefits are added to the base salary to provide the total cost of the position) are comprised of legal benefits (local mandatory) and extralegal benefits (CIAT mandatory) and the provisions to cover local legal requirements such as: Pension - social security, training and development, occupational health, transportation costs and subsidies, work clothes and personnel protection requirement, and food subsidy.

International Research Staff (IRS): Fringe benefits for international staff (costs for all benefits are added to the base salary to provide the total cost of the position) are comprised of housing allowance, education allowance, car allowance, Cost Of Living Allowance (COLA), hardship, home leave tickets, insurance, retirement contribution, occupational health, training and development, repatriation and relocation provisions.

Other Supplies and Services:

Of the budget 23% goes to cover Supplies and Services. These represents most of Centres' Full Cost Recovery units such as IT, Facilities, Public Space, Research and Technical Support plus the considerable funds for consultancies, workshops and operational services.

2.2.2.4 Other Sources of Funding for this Project

Relative proportions of W3 and Bilateral are unknown, and thus we have used a single category of Bilateral to capture both W3 and Bilateral.

The Centres participating in FP2 are committing to raising 74% of total Flagship funds through Window 3 and bilateral contributions from 2017 onwards. Considerable effort will be made to jointly source and tap into bilateral funding for the Flagship with Centre partners and non-CGIAR partners alike. FP2 leader is strongly engaged in bilateral fundraising for core Flagship activities, and the prospects of maintaining and increasing these funds is good as there is considerable interest in CSA practices and technologies by donors. Given that much of the work is grounded in specific country- and local- contexts, national level funding from governments in emerging economies such as India and Colombia will be especially prioritized.

Some of the key strategic partners to FP2 have already demonstrated a strong track record in generating in kind contributions to the Flagship. IIRR for example have already leveraged W1/W2 funds by 300% for activities in climate smart villages in Vietnam and in the Philippines. Other key partners such as the University of Galway have been strongly engaged in joint fundraising, especially tapping into science funding in Ireland, and through IrishAid missions in priority countries. WUR, with their significant

contribution to FP2 can also potentially align student and other research programs to further bolster FP2 in kind contributions.

2.2.2.5 Budgeted Costs for certain Key Activities

	Estimate annual average cost (USD)	Please describe main key activities for the applicable categories below, as described in the guidance for full proposal
Gender	5700000	Gender research for this Flagship is USD 5.7 million per year (20% of the FP budget). It covers updating of the CCAFS gender household survey; development and cross-regional comparison of indicators for gender-related benefits of CSA; development of incentive mechanisms to pro-actively target adoption of CSA by women farmers in particular value chain and financial incentives; identification of technologies and practices that have positive impacts on the control of productive assets and resources within communities and contribute to achieving the gender and youth IDOs.
Youth (only for those who have relevant set of activities in this area)	850000	Youth research for this Flagship is USD 850,000 per year (3% of the FP budget). It covers efforts in South Asia and Latin America to address youth through novel ICT tools to better manage climate related risks, integrated within CSA practice and technology adoption programs; and development and application of indicators in CSVs to understand sex- and youth-disaggregated adoption profiles for a range of CSA options; and identification of technologies and practices that have positive impacts on the control of productive assets and resources within communities and contribute to achieving the gender and youth IDOs.
Capacity development	4600000	Capacity Development has a budget of USD 4.6 million per year (22%) in the Flagship. A significant part of the strategy and ToC for FP2 centres on developing partners capacities to invest in CSA, design appropriate strategies and policies, and robustly implement and roll-out CSA. Hence much of the CSV work of FP2 is aligned to capacity building as partners, communities and local governments are strongly engaged through capacity building activities. Some is allocated through the partnership budget but other comes from CGIAR staff costs and operational expenses.

Impact assessment	80000	FP2 has allocated c. USD 200,000 to impact assessments over the six-year period. These will focus on revisiting baselines from Phase 1 in climate smart villages (CSVs) in 15 countries, with a view to understanding poverty impacts of a range of CSA technologies and practices. Evaluations will also be performed on the CSV approach in 2020 as part of the comprehensive M+E approach of CCAFS.
Intellectual asset management	8000	The budget for this is USD 8,000 per year. Many topics under this category are dealt with under the following two activities. Flagship teams contribute to implementation of CCAFS Intellectual Asset policy. Activities will contribute to ensuring all knowledge products (primarily publications and databases) are, wherever possible, disseminated using open access principles, with clear branding to acknowledge authorship.
Open access and data management	267000	FP2 will dedicate a budget of USD 267,000 per year and targeted open access data bases to be produced or maintained during Phase II include: • Agtrials.org: information portal that provides access to a database on the performance of agricultural technologies at sites across climate gradients. It builds on decades of evaluation trials. • Compendium of CSA practices and technologies: Database of the benefits of different CSA technologies and practices, as reported in scientific literature, disaggregated for geographic regions and different farming systems • Ag-Impacts: Collation of impact studies from IPCC report and other sources that allows a user to query scientific literature on likely crop impacts • Site-specific management datasets and ICT platforms for delivery of optimal management recommendations under a varying climate • CCAFS-Climate.org (together with FP1): Global downscaled climate projections for use in agricultural modelling of impacts
Communication	1500000	The budget for communications is c. USD 1.5 million per year. Flagship communications activities are central to the ToC and will contribute to delivery of outcomes through engagement with key stakeholders in CSV sites, at the regional and national level, as well as in relevant communities of practice. Budget is allocated for salary of regional communications specialists (1 in each region, with responsibility for all flagships), and staff time for communications activities at project level. The budget covers delivery of communications products and initiatives through events, media engagement, field visits, training journalists, producing/disseminating publications, multimedia production, and staff travel.

2.2.2.6 Other

Uplift

Most of the topics selected for uplift have been identified from topics cut from CCAFS as a result of budget cuts, but which are considered to be a crucial part of the science and outcome agenda. These are:

- [Recommendation domains, incentives and institutions for equitable local adaptation at sub-national level and scaling-up CSA practices and technologies in wheat & maize systems in South Asia](#) (P53) (CIMMYT, ICRISAT, IFPRI, IWMI, ICAR, NARC, BARC, WUR)
- [Participatory planning and investment in climate-smart agriculture to reduce risks for small-scale farmers in Central American coffee landscapes](#) (P44) (Bioversity, ICRAF, CEDECO, Hivos, University of Vermont)
- [Integrated agricultural technologies for enhanced adaptive capacity and resilient livelihoods in climate-smart villages \(CSVs\) of Southeast Asia](#) (P28) (CIAT, BIOVERSITY, ICRAF, IRRI, ILRI, IWMI, WORLD FISH, CIP)
- [Outscaling a citizen science approach to test climate adaptations on farm](#) (P43) (Bioversity, CIAT, Pennsylvania State University, CATIE, Escuela Agrícola Panamericana Zamorano, Mekelle University, SARC, Scuola Superiore S. Anna, Institute for Biodiversity Conservation, Hivos, Environmental Resource Management Center for sustainable development – Kenya, Indian Council of Agricultural Research, Protection of Plant Varieties and Farmers' Rights Authority – India, Gene Campaign – India; Humana People to People India, Indian National Bureau of Plant Genetic Resources, Indian Agricultural Research Institute, Central Arid Zone Research Institute, Vivekananda parvatiya krishi anusandhan sansthan, India)
- [Building Climate smart farming systems through integrated water storage and crop livestock interventions, WA](#) (P38) (IWMI, ILRI, INERA - Institut de l'Environnement et de Recherches Agricoles - Burkina Faso; IER - Institut d'Economie Rural – Mali)
- [Participatory evaluation and application of climate smart agriculture practices to enhance adaptation to climate change in mixed smallholder systems, EA](#) (P39) (CIMMYT, CIAT, IITA, ILRI, KARI - Kenya Agricultural Research Institute – Kenya; SARI - Selian Agricultural Research Institute – Tanzania; Ministry of Agriculture, Kenya – Kenya)

In addition, to the above topics some new ones have been proposed during discussions with partners in the development of the phase II proposal. These include:

- WHEAT on the ground testing of model outputs including socioeconomics, crop management and germplasm deployment. Outcome contribution: 2.4 through testing of additional CSA practices and technologies in target wheat production areas, especially in South Asia.
- Evaluation of biofortified bean materials in African target countries and analysis of climate-nutrition relations (CIAT, Galway). Outcome contribution: 2.1 and 2.4 through additional CSA

practices and technologies being tested and evaluated, and through collaboration with A4NH and Harvest Plus activities promoting further adoption in Southern Africa.

- Additional funds for Impact Assessment to increase depth of CSV related assessment and poverty impact evaluation of a greater number of CSA practices and technologies.

2.2.3 Flagship Uplift Budget

Outcome Description	Amount Needed	W1 + W2 (%)	W3 (%)	Bilateral (%)	Other (%)
FP2.1: 1 million farm households receiving incentives (training, financial, programmatic, policy-related) for adopting CSA related practices and technologies that potentially reduce production risks	10,782,695	25	-	75	-
FP2.2: 2 sub-national public/private initiatives providing access to novel financial services and supporting innovative CSA business models	8,626,156	25	-	75	-
FP2.3: 10 site-specific targeted CSA technologies/practices tested, with all options examined for their gender implications.	12,939,234	20	-	80	-
FP2.4: 2 development organisations, with the focus on investments for CSA activities, adapting their plans or directing investment to increase women's access to, and control over, productive assets and resources.	6,469,617	25	-	75	-
FP2.5: 1 policy decisions taken (in part) based on engagement and information dissemination by CCAFS	4,313,078	24	-	76	-

2.3. FP3-Low Emissions Development

2.3.1 Flagship Project Narrative

2.3.1.1 Rationale, scope

The vision. The FP3 vision is that low emissions development (LED) will reduce agricultural greenhouse gas (GHG) emissions while ensuring food security at large scales. Research will provide guidance for LED technical packages, monitoring, incentives, trade-offs and enabling conditions. Key 2022 outcomes are: a) 20 agricultural development initiatives where CCAFS science is used to target and implement interventions to increase input efficiency; b) 0.8 million hectares targeted by research-informed initiatives for restoring degraded land or preventing deforestation; c) 10 low emissions plans developed that have significant mitigation potential for 2030, i.e. contribute to at least 5% GHG emissions reduction or reach at least 10,000 farmers, with all plans examined for their gender implications; d) 15 organizations adapting their plans or directing investment to increase women's participation in decision-making about LED in agriculture; and (e) 15 policy decisions taken (in part) based on engagement and information dissemination by CCAFS (FP3 Table 1).

The challenge. FP3 addresses two of the greatest challenges of the 21st century – the massive reduction of GHG emissions needed to avoid catastrophic climate change (SDG 13) and ensuring future food security (SDG 2). Globally, agriculture and related land use change contribute nearly a quarter of annual GHG emissions, $\sim 10\text{--}12 \text{ Gt CO}_2\text{e yr}^{-1}$ ([Smith et al. 2014](#)). Emissions from agriculture and related land use must be reduced if global warming is to be limited by 2°C ([van Vuuren et al. 2011](#)), however, 3/4 of agricultural emissions originate from the developing world and $\sim 1/3$ come from smallholder farmers ($1.7 \text{ Gt CO}_2\text{e yr}^{-1}$). To “double agricultural productivity and incomes of small-scale food producers by 2030” (SDG 2.3) and minimize further emissions, developing countries need options to achieve food security and value chain development while reducing GHG emissions.

Options to reduce agricultural emissions include agronomic practices (can reduce 0 to $1.59 \text{ Gt CO}_2\text{e yr}^{-1}$, USD 20/t CO_2e), decreasing agricultural conversion of forests ($\sim 3/4$ of avoided deforestation, 0.01 to $1.45 \text{ Gt CO}_2\text{e yr}^{-1}$, USD 20/t CO_2e), and reduced food loss or shifting diets (technical potential of 0.76 to $8.6 \text{ Gt CO}_2\text{e yr}^{-1}$) ([Smith et al. 2014](#)). Improved technologies or policies would enable more mitigation.

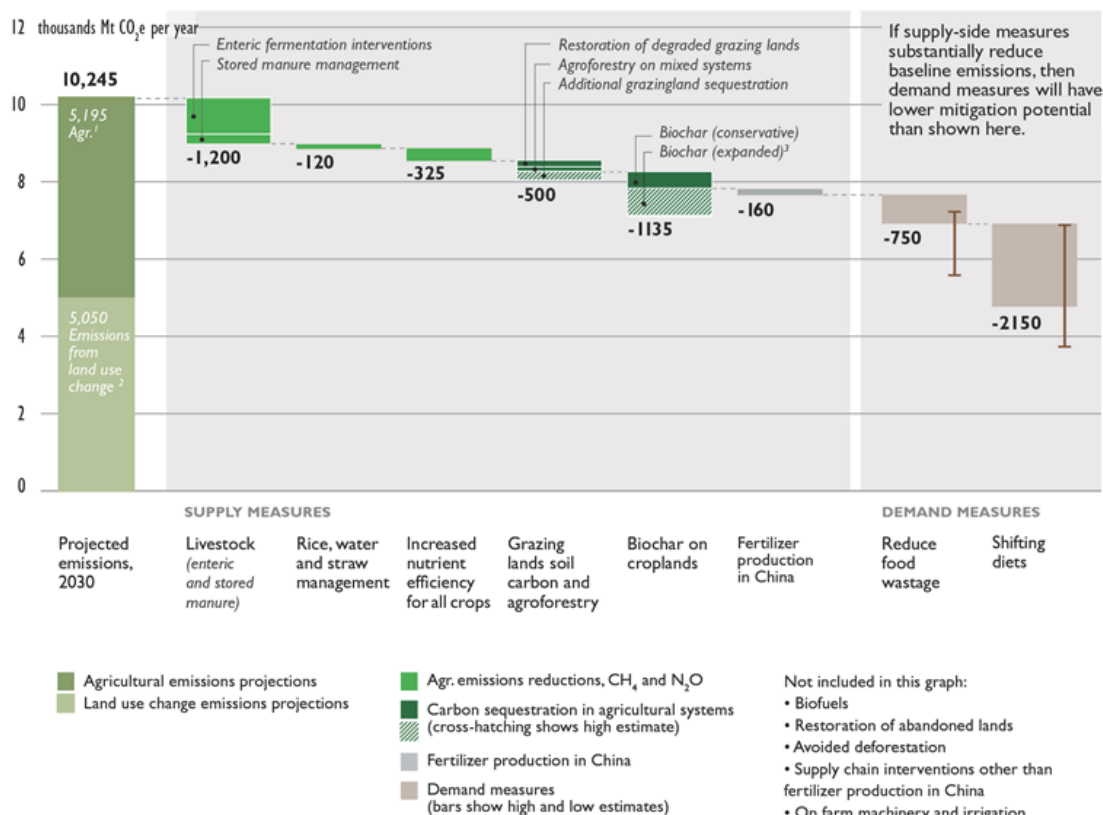
National governments recognize agriculture's potential for mitigation. Of 160 INDCs submitted by countries, 103 included mitigation in agriculture ([Richards et al. 2015a,b](#)). Many countries are thus now seeking technical assistance and finance for LED. In addition, an increasing number of donors (IFAD, WB, IADB, USAID), investors (Althelia Fund, Livelihoods Fund), food suppliers (Unilever, Brookside) and standards organizations (SAN, Plan Vivo) aim to integrate mitigation and GHG assessment in agriculture in their programs.

Scientific and strategic rationale. Despite this demand and agriculture's mitigation potential, the evidence and capacity to support LED in agriculture at large scales remain weak. High uncertainty and few data from the developing world constrain reliable GHG estimates ([Rosenstock et al. 2013](#)). LED's impacts on emissions, food production, livelihoods and equity and their trade-offs are poorly understood ([Scholes et al. 2014](#)). Programs for national mitigation action, climate finance and LED lack the evidence and technical guidance needed ([Wilkes et al. 2013](#)). The knowledge base for smallholder

farming is particularly weak. Access to new technical practices, climate finance and markets will bypass smallholders and lead to increasing economic disparities unless attention is given to smallholder LED.

Improving the science underlying LED in agriculture will provide the evidence for where LED makes sense and how to do it most effectively. Improved science can inform global policy to achieve both food security and climate goals, and contribute to more reliable national inventories or global monitoring of emissions and mitigation impacts.

Hypotheses and scope. Progress on LED in agriculture is constrained by poor evidence of its feasibility for different production systems, incentives for farmers to change practices and weak technical capacities. FP3 will examine the following hypotheses as part of the ToC: *H1*: LED practices for agricultural landscapes and value chains significantly reduce GHG emissions while ensuring rural food security and improved livelihood options. *H2*: Improved evidence, incentives, technical capacity, social mobilization and other enabling conditions for LED will support farmers, governments, the private sector and donors to implement LED policies and programs at large scales (> 250,000 farmers or 1 million ha per program). To test the hypotheses, FP3 will focus on high mitigation-impact practices relevant to smallholder development: carbon sequestration in agricultural landscapes, reducing methane from livestock and paddy rice, reducing nitrous oxide from fertilizer use in cereal crops, and reducing food loss (FP3 Figure 1).



FP3 Figure 1. Mitigation technical potential in agriculture, 2030 (Source: [Dickie et al. 2014](#))

CRP links. FP3 will provide a Learning Platform (LP) to identify options for low-emissions development across all CRPs (CoA 3.2). FP3 will work with individual CRPs to: develop LED scenarios for ex-ante analysis (PIM); explore options for soil carbon sequestration (WLE and France's [4% Initiative](#)); co-invest in LED for livestock systems (Livestock's Environment Flagship Program); collaborate on responsible finance for avoided deforestation (CoA 3.3) (FTA); and explore biological nitrification inhibitors for reducing N₂O emissions and increasing nitrogen use efficiency in agricultural systems (MAIZE, WHEAT, DCLAS and LIVESTOCK). FP3-CRP collaboration will address grand challenges related to reducing GHG emissions, natural resource use efficiency (land, energy, nutrients, water) and reducing waste (post-harvest loss).

2.3.1.2 Objectives and targets

Objectives. FP3's overall goal is to test the feasibility of reducing agricultural GHG emissions at large scales while ensuring food security in developing countries. Objectives are to provide evidence and tools for (1) improved estimates of emissions from LED in smallholder farming; (2) impacts of LED on emissions, food security and other outcomes and resulting priorities and (3) conditions enabling LED at large scales among smallholder farmers and in major supply chains. The primary beneficiaries of FP3 are smallholder farmers for whom LED practices can contribute to food security and climate resilience by

increasing yields, reducing inputs and improving natural capital. Research will also benefit national LED efforts through better emissions estimates, technical capacities to implement and monitor LED, and policy development.

Strategic relevance to CGIAR objectives and targets: FP3 will contribute to two CGIAR SLOs (FP3 Figure 2; FP3 Table 1): (a) Reduced poverty and (b) Improved natural resource systems and ecosystem services. By 2022, FP3 plans to reduce agricultural emissions in developing countries by 160 Mt CO₂e yr⁻¹ (4% relative to projected 2022 levels). It will contribute to five IDOs (**bold**) and five sub-IDOs (*italics*):

- **Mitigation and adaptation achieved** via *reduced net GHG emissions from agriculture, forests and other forms of land use*, through local, state and regional organizations using CCAFS science to develop low emissions plans for agriculture that have significant mitigation potential for 2030. Part of this outcome is achieved through carbon sequestered in biomass and soil, with FTA and WLE.
- **Natural capital enhanced and protected, especially from climate change** via *minimizing and reversing land, water and forest degradation*, through research-informed initiatives for restoring degraded land or preventing deforestation and forest degradation in commodity supply chains.
- **Increased incomes and employment** via *more efficient use of inputs* by farm households, through agricultural development initiatives where CCAFS science is used to target and implement interventions to increase input efficiency.
- **Equity and inclusion achieved** via *improved capacity of women and young people to participate in decision-making*, through organizations adapting their plans or directing investment to increase women's and youth's participation in decision-making about LED in agriculture
- **National partners and beneficiaries enabled**; via *increased capacity for innovation in partner development organizations and poor and vulnerable communities*, through partner organization and community engagement in CCAFS research and training.

Mitigation and adaptation achieved: The three CoAs will support development of at least 10 low emissions agricultural development plans with significant mitigation potential, e.g. reduce GHG emissions by 5% or reach 10,000 farmers. Outputs: improved country targets for INDCs and LED priorities; "proof of concept" of mitigation practices for priority sectors; scenarios for food security and LED pathways; technical and policy guidance to focus countries, supply chains and donors; methods for MRV of agricultural emission reductions; business models and finance options for scaling of LED options.

Natural capital enhanced and protected, especially from climate change: CoA 3.3 will help minimize and reverse land, water and forest degradation to achieve 0.8 million ha targeted by research-informed initiatives for restoring degraded land or preventing deforestation by 2022. With WLE, FTA, Livestock and France's 4% Initiative, FP3 will seek to improve soil carbon sequestration in grasslands and integrate soil carbon sequestration into LED decision-support tools, policy, MRV and CSVs (other than organic soils, which is addressed by FTA). Outputs: analysis of producer incentives; good practice guidelines for public, private and hybrid governance for improved sustainable commodity supply chains.

Increased incomes and employment: CoAs 3.2 and 3.3 will enable more efficient use of inputs to achieve 20 agricultural development initiatives where CCAFS science is used to target and implement interventions to increase input efficiency by 2022. CoA 3.1 contributes indirectly by providing the evidence needed for identifying priorities and scaling up LED. Outputs (coordinated with FP2 and

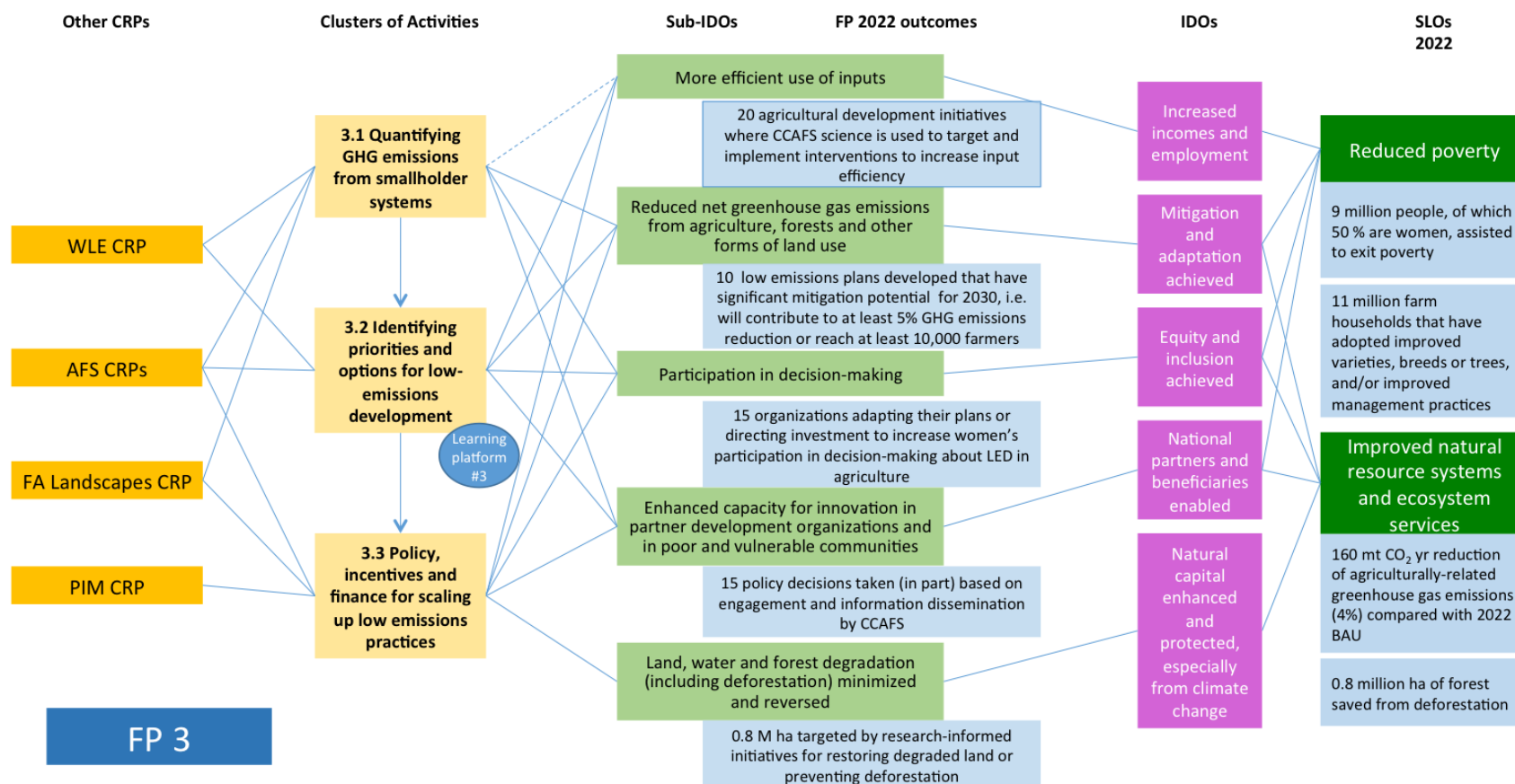
regions): analysis of farmers' incentives to increase input efficiency and reduce food loss and waste; technical and policy guidance on more efficient management options including impacts on women; analysis of lessons learned on using public-private dialogue to support scaling up of LED options in agri-food sectors.

Equity and inclusion achieved: CoA 3.1 addresses the capacity of women scientists and policy makers to participate in LED decision-making and CoAs 3.2 and 3.3 address the role of women and youth farmers in implementing LED, contributing to a 2022 target of 20 organizations adapting their plans or directing investment to increase women's participation in decision-making about LED in agriculture. Outputs: metrics for monitoring and evaluation of impacts of LED on livelihoods and gender equity; strengthened capacity of young female scientists in GHG quantification; best practices for increasing women's and men's participation in NAMAs and LEDs.

National partners and beneficiaries enabled: All three CoAs contribute to increased capacity for innovation in partner development organizations and in poor and vulnerable communities with a 2022 target of 10 policy decisions taken (in part) based on engagement and information dissemination by CCAFS. Outputs: improved options for global donors to support LED and agricultural climate readiness; countries trained in scenarios analysis for LED planning; improved capacity of UNFCCC focal points and NAMA or LED policy implementers to measure and monitor mitigation.

FP3 Table 1. FP3 outcomes, and their targeted delivery over time

SLOs, IDOs, and sub-IDOs	2022 Outcome Description	Target					
		2017	2018	2019	2020	2021	2022
SLO: Reduced poverty							
IDO: Increased incomes and employment							
Sub-IDO: More efficient use of inputs	20 agricultural development initiatives where CCAFS science is used to target and implement interventions to increase input efficiency	3	6	10	12	15	20
SLO: Improved natural resource systems and ecosystem services							
IDO Natural capital enhanced and protected, especially from climate change							
Sub-IDO: Land, water and forest degradation (including deforestation) minimized and reversed	0.8 million hectares targeted by research-informed initiatives for restoring degraded land or preventing deforestation	0.1	0.2	0.2	0.5	0.6	0.8
Crosscutting IDO on Mitigation and adaptation achieved directed (directed at natural resources SLO and poverty SLO)							
Sub-IDO: Reduced net GHG emissions from agriculture, forests and other forms of land use	10 low emissions plans developed that have significant mitigation potential for 2030, i.e. will contribute to at least 5% GHG reduction or reach at least 10,000 farmers, with all plans examined for their gender implications	1	2	3	6	8	10
Crosscutting IDO on Equity & inclusion achieved (directed at natural resources SLO and poverty SLO)							
Sub-IDO: Participation in decision-making	15 organizations adapting their plans or directing investment to increase women's participation in decision-making about LED in agriculture	4	6	8	10	12	15
Crosscutting IDO: National partners and beneficiaries enabled (directed at natural resources SLO and poverty SLO)							
Sub-IDO: Increased capacity for innovation in partner development organizations and in poor and vulnerable communities	15 policy decisions taken (in part) based on engagement and information dissemination by CCAFS	1	2	4	8	12	15



FP3 Figure 2. FP3 Impact Pathway. Under each CoA there will be several research outputs (see Section 2.3.1.6). This FP contributes to the SLO targets (with other CCAFS FPs) but is accountable for delivery, with external partners, of the sub-IDO outcome targets.

2.3.1.3. Impact pathway and theory of change (for each individual FP)

The impact pathway for FP3 is shown in FP3 Figure 2 and the Flagship's ToC is explained by the assumptions and strategy below. Crucial components of the ToC include working with partners, other CRPs, other CCAFS FPs and the CCAFS Learning Platform on CSA, Gender and Social Inclusion to deliver on outcomes, and building the capacity of actors in the impact pathway (see Section 2.3.1.10). The CCAFS LP on Partnerships and Capacity for Scaling CSA will be a key route to achieve impact at national to global levels. The ToC is aligned to the CRP ToC.

FP3's ToC is that programs and policies for agricultural development (e.g. irrigation and energy infrastructure, fertilizer subsidies, private or public investments in sustainable intensification or climate change adaptation) will be the primary platform for scaling up LED. Climate finance, policies, standards and infrastructure as well as consumer demand in some supply chains (e.g. oil palm, coffee) will catalyze the integration of LED into agricultural development programs, policies and practices, and gradually become the institutions shaping LED pathways to *reduce net GHG emissions from AFOLU, increase above- and below-ground biomass, minimize and reverse land, water and forest degradation* while ensuring rural food security and *improving livelihood options*. The ToC will be tested with evidence from CoA 3.3.1, to identify effective means for achieving large-scale LED impacts.

The ToC assumes: (1) suitable agricultural development programs and policies exist in the focus country; (2) programs and policies will implement LED to help meet mitigation targets, access climate finance, or better compete in global markets; (3) LED implementers require information on which practices reduce GHG emissions, viable business models, enabling conditions and tools to set priorities and assess feasibility of new practices and their potential impact on food security; (4) improved evidence for the compatibility of LED practices with food production in diverse production systems and through demonstration in CSVs will lead to scaling up. Risks include that political pressure will lead donors and countries to prioritize adaptation at the cost of mitigation and exclude smallholders from mitigation. The risk will be managed by working with countries actively interested in mitigation among smallholders.

Based on these assumptions and risks, FP3's strategy to achieve large-scale impacts is to use action research in countries pioneering LED where rapid implementation is likely and the CGIAR has a comparative advantage (Vietnam, Bangladesh, Mexico, Colombia, Costa Rica, Kenya). While budgetary and time commitments to some of these countries is not high (e.g. Costa Rica, Mexico), they are important for South-South learning. Research will engage farmers' groups, local governments, national government ministries, as well as development banks, donors, private sector suppliers, youth organizations, women's organizations, and investors in LED and agricultural development. In each country, research will improve emissions estimates (CoA 3.1), prioritize and test technologies (CoA 3.2) and provide evidence for scaling up (CoA 3.3). Research will include biophysical, social, economic and policy analysis. With successful country cases and working with global partners and ARIs, FP3 will build generalizable evidence for mitigation at larger scales.

FP3's CoAs are organized to respond to gaps in knowledge: improved emissions estimates (CoA 3.1), technical options' impacts (CoA 3.2), and means for scaling up LED (CoA 3.3). Results from each CoA feed into the next. Better estimates are needed to assess technologies. Technological impacts are necessary to provide evidence for scaling up. Primary users of the research will be 1) national agricultural decision-makers; 2) investors in agricultural development, including development banks, private finance, and

farmers' associations; and 3) advocates for sustainable and low-emissions food systems, including NGOs such as the EDF and the Rainforest Alliance. FP3 will prioritize women and young scientists from developing countries for capacity strengthening.

To ensure impacts, FP3 will work with well-established partners in CCAFS' regional programs and using regional platforms such as LAMNET to co-develop technical and institutional options in CCAFS' regional CSVs and other existing innovation hubs of CRPs and partners. Communication campaigns will be essential to increase the visibility of focal country experiences, new tools and new information platforms, making use of tools and approaches for engaging and informing next users, building on successes in Phase I. This includes learning events and workshops jointly organized with partners, sharing information with relevant communities of practice via e-newsletters and blogs, disseminating engaging briefing materials to decision makers, and placing key messages in high-profile media outlets to help disseminate results to global audiences. For example, media outreach on CCAFS INDC analysis of mitigation and adaptation targets was highly visible immediately before COP21 and contributed to deliberations and increased recognition of country adaptation and mitigation priorities in agriculture. To ensure technical capacities and impacts over the long-term, collaboration with local universities, training of young and women scientists and participation of women decision-makers in action research are essential. Enabling conditions include expected global agricultural investment of USD 83 billion/yr to meet 2050 food needs ([FAO 2009](#)) and climate finance from the Green Climate Fund and other donors. In the private sector, demands by consumers of beef and milk, oil palm and other major commodities will incentivize supply chain actors to lower carbon footprints and reduce deforestation.

FP3 results will inform FP1, FP2 and the Partnerships and Capacity for Scaling CSA LP for CSA policy and implementation. FP1 analysis of food systems policies will enable better understanding of the context for LED.

2.3.1.4. Science quality

State of evidence. Mitigation of GHG emissions in food systems can significantly contribute to stabilizing the climate ([Del Grosso & Cavigelli 2012](#); [Stehfest et al. 2009](#); [Smith et al. 2007](#)). Reducing food system emissions is probably necessary to meet future climate targets ([van Vuuren et al. 2011](#), [Hedenus et al. 2014](#)). To stay within the 2°C warming limit, most models indicate non-CO₂ GHG emissions from agriculture need to be reduced by ~1 Gt CO₂e yr⁻¹ by 2030 globally and by at least ~4 Gt CO₂e yr⁻¹ if soil carbon, diet shifts, value chain efficiencies and land use change are also considered ([Hedenus et al. 2014](#); Wollenberg et al. submitted). This is 4% of the 26 Gt CO₂e yr⁻¹ needed across all economic sectors in 2030 to stay below the 2°C limit. Developing countries can contribute to the target with reductions of ~0.76 Gt CO₂e yr⁻¹ (Smith et al. [2008](#), [2013](#)) including 0.3 Gt CO₂e yr⁻¹ from smallholder farms (Vermeulen & Wollenberg submitted). Scenarios indicate that mitigation by all countries, including developing countries, will be necessary to meet targets ([Kleinwechter et al. 2015](#)). Reliable estimates of mitigation in developing country conditions are difficult to find however, and Tier I emissions factors have high uncertainty ([Olander et al. 2013](#); [Rosenstock et al. 2013](#)), especially in smallholder systems (Richards et al. submitted). In addition, globally, N₂O estimates need to be revised based on improved biogeochemical models ([Shcherbak et al. 2014](#)).

A large volume of evidence exists for mitigation strategies that also deliver food security ([Branca et al. 2011](#); [Dickie et al. 2014](#); [Lobell et al. 2013](#); [Valin et al. 2013](#)), including subsectoral analyses for paddy

rice ([Sanchis et al. 2012](#)), livestock ([Gerber et al. 2013](#); [Herrero et al. 2013](#)), fertilizer efficiency ([Akiyama et al. 2010](#)), agroforestry ([Mbow et al. 2014](#); [Verchot et al. 2007](#)), pasture intensification ([Rao et al. 2015](#)), and avoided deforestation ([Nepstad et al. 2014](#)). However, most available evidence has been derived from experimental station research, modeling, anecdotes, and limited geographic areas, and countries and donors are demanding better evidence for diverse farm production systems and that are also aligned with agricultural policies for growth. Some processes and associated practices remain less well known, such as biological nitrification inhibition ([Subbarao et al. 2015](#)) or crop diversification in conservation agriculture to enhance soil C and require more attention ([Powlson et al. 2016](#)). The IPCC 4th ([Smith et al. 2007](#)) and 5th Assessments ([Smith et al. 2014](#)) provide syntheses of mitigation options, technical and economic potentials, regional distributions, compatibility with adaptation and constraints to implementation.

The conditions for adoption and innovation are highly site-specific with large gaps in economic data ([McCarthy et al. 2011](#)). Reviews of LED policies ([Gardiner et al. 2015](#); [Wilkes et al. 2013](#)), climate finance ([Buchner et al. 2015](#)) and strategies for mitigation ([Dickie et al. 2014](#)) indicate nascent efforts, and most governments are still seeking evidence and technical support. Both private and public governance measures will be necessary to halt commodity-driven deforestation ([Agrawal et al. 2014](#)). Resources are available on concepts, literature, technical overviews, guidance for GHG quantification ([FAO 2013a](#); [MICCA](#), [Tiwari et al. 2015](#); [Rosenstock et al. in press](#); [WBCSD](#); [WRI](#)), and reviews of more mature practices such as alternate wetting and drying are increasingly available ([Sanchis et al. 2012](#), [Adhya et al. 2014](#); [Richards and Sander 2014](#)). The challenge now is to consolidate scientific evidence to provide guidance for countries and investors on impacts and how to scale-up.

Development of research priorities Assessments from the IPCC ([Smith et al. 2014](#)), donors ([Dickie et al. 2014](#)), and the CGIAR ISPC ([Scholes et al. 2014](#)) were used together with a 2014 CCEE of FP3 to identify where high potential mitigation impacts were feasible and the knowledge needs associated with achieving impacts. To ensure relevance, also FP3 draws on priorities of “LED leader” countries, including Colombia, Vietnam, Kenya, Costa Rica, Brazil and Indonesia, as indicated in their climate change strategies, agricultural development priorities and mitigation commitments. Some of these countries will be crucial to South-South learning. Resulting priorities were carbon sequestration in agricultural landscapes, reducing methane from livestock and paddy rice, reducing nitrous oxide from fertilizer use in cereal crops, and reducing food loss. Centre and regional stakeholder exchange provided further development of specific research questions and hypotheses.

How FP3 will advance the science. The FP3 portfolio will generate and synthesize evidence for the technical and policy aspects of how to achieve food security with mitigation co-benefits for smallholder farmers at large scales across multiple subsectors and regions. This is the only systematic research of this nature of which we are aware. Working with other CCAFS FPs, FP3 also will integrate low emissions approaches with practices and policies for resilience.

FP3 will integrate findings across diverse methods, from future scenarios based on integrated assessment models and biogeochemical modeling of emissions, to value-chain analysis of gender impacts and spatial analysis of LED suitability. Using standardized, low-cost methods for quantifying emissions will enable more cost-effective data collection. Participatory action research will ensure the relevance of findings to policy and large-scale implementation. See CoAs for further details.

Managing for science quality. The quality and relevance of FP3’s research will be maintained through collaborative development of proposed projects, peer-review, internal and external scientific advisory mechanisms, formal evaluation and internal reflection and review. The research portfolio was developed by establishing outcome targets and potential impact pathways; soliciting concept notes contributing to these; conducting internal and external review of the notes; and holding regional workshops to revise notes and IPs with Centres and regional stakeholders. The CCAFS ISC will provide independent scientific advice and approval of the portfolio. FP3 will conduct an independent evaluation of CoAs in 2019 and 2022, with special attention to the quality of emissions estimates and household-level impacts. The FP as a whole will be evaluated in 2022 (See Annex Table 5). FP3 reviews Centres’ annual plans for their clarity, completeness and provides feedback on how to improve impacts. Mid-year consultations indicate the state of progress and where adjustments are needed. End-of-year reports and bibliometric reviews inform evaluation of scientific merit and program impacts for the allocation of budget resources.

Research team qualifications. The 13 key FP3 research scientists have produced over a thousand publications and have 250 combined years of experience in biogeochemistry, agroecology, agronomy, animal science, climate change, economics, engineering, governance, irrigation, policy, resource management, gender and soil science. The team’s recent high-impact publications include: contribution to IPCC guidelines, measurement and mitigation of emissions from livestock and rice, assessment of mitigation from no-till agriculture and biological nitrification inhibition (BNI), development of nitrogen efficiencies for annual crops, feasibility of market approaches in decreasing land use change, modeling and econometric analysis of land use data, governance of agriculture-forest landscapes, and analysis of country commitments (INDCs) to mitigation through agriculture for COP21. The team leads cutting edge participatory action research with a focus on enabling smallholder farmers – including women – to decrease emissions and emissions intensities while safeguarding agricultural productivity in the CCAFS regions.

2.3.1.5. Lessons learnt and unintended consequences

Building on Phase I experience with outcomes, in Phase II FP3 will focus on selected subsectors to concentrate resources and ensure significant contributions to SLOs. Selection will be based on guidance from major reports (Scholes et al. 2014, Dickie et al. 2014, Smith et al. 2014) (see Sections 2.3.1.1 and 2.3.1.2) Country-level outcomes will be prioritized to increase scale. By engaging with stakeholders throughout the research process, FP3 aims to ensure that rigorous science informs both practitioners and decision-makers. Given the high costs and technical demands of estimating GHG emissions reductions, collaboration with global partners such as the GRA, IPCC and FAO will enable FP3 to efficiently share data, build capacity and improve modeling and sampling. We have learned that consolidating information on a well-designed webpage supports wide user access. FP3 shifted from testing “how mitigation increases incomes for the poor” (e.g. via Carbon markets) to how “agricultural development can deliver mitigation,” due to carbon prices declines in 2012. This has meant aiming to mainstream LED technical options rather than increase smallholders’ access to Carbon markets.

In response to External Evaluations of CCAFS (2016) and FP3 ([2014](#)), FP3 will focus country efforts and review selection in 2019. F3 will compare alternative technologies and rigorously analyse finance, incentives and adoption barriers in all subsectors. FP3 will continue to develop methods for low-cost estimates of GHGs with special attention to improved N₂O estimates using a statistical model.

In response to ISPC comments on the preproposal: (1) the comparative advantage of CCAFS as a multi-subsector, multi-region program across the Centres is demonstrated by the use of common methods, data platforms, and tools that integrate information across subsectors (see CoA 3.1, 3.2), analysis of agricultural sector-wide targets and landscape approaches to governing emissions (CoA 3.1, CoA 3.3). (2) The justification for targeting smallholders (Section 2.3.1.1) is their significant current emissions (twice the emissions from global aviation and four times the agricultural emissions of the EU or US), and evidence that mitigation in agriculture among developing countries will be needed to meet climate policy targets. (3) FP3's novelty is addressed in *How FP3 will advance the science* (Section 2.3.1.4). (4) Hypotheses have been reframed to focus on the testing of technologies to generate joint food security and mitigation benefits and the evidence and capacity needed to scale up technologies. The ToC and CoA questions have been stated more precisely and justified in the new review of the literature. (5) The research on supply chain governance and deforestation addresses finance and private-public mechanisms for linking responsible supply chain finance and standards. These are emerging mechanisms with little evidence available to date. (6) The research on food loss has been updated with more detail. FP3 will be integrated across CGIAR by identifying best practices for LED that link to Centres' and CRPs' aims, and working with CGIAR contact points and project leaders collaboratively to identify priorities and guidelines.

Potential unintended consequences include: incorrectly estimating mitigation potentials; missing opportunities for mitigation based on priority-setting with limited information; overly rapid expansion of technical options not appropriate for farmers in some places. As part of the technology development process, FP3 will analyse trade-offs and monitor the impacts of interventions, reducing the risk of unintended consequences. We will use safeguard analysis to minimize unintended impacts for women and marginalized communities. Achieving targets can only occur through partnerships with implementation entities, and depends on global and national action to support enabling conditions.

2.3.1.6. Clusters of activity (CoA)

FP3 has three CoAs (*italics*). CoA 3.1, *Quantifying GHG emissions from smallholder systems*, will improve the reliability of GHG emissions estimates for smallholder mitigation practices through measurement and modelling. These results will feed into CoA 3.2, *Identifying priorities and options for low-emissions development (Learning Platform - LP3)*, to assess technical options and LED priorities among smallholders. The evidence from CoA 3.2 will in turn provide the foundation for larger-scale action in CoA 3.3 *Policy, incentives and finance for scaling up low emissions practices at national and subnational levels*. This cluster will focus on incentives and institutional arrangements to scale up practices, including sustainable development initiatives, supply chain governance and food loss and waste, using results from CoA 3.1.

CoA 3.1 Quantifying GHG emissions from smallholder systems

A transition to LED requires robust information on GHG emissions and practical methods for monitoring. Insufficient data on emissions for heterogeneous smallholder systems, particularly on N₂O and enteric CH₄ has led to emission factors with high uncertainty ([IPCC 2006](#); [Scholes et al. 2014](#); [Stehfest & Bouwman 2006](#)). FP3 will work across CRPs to support better data, innovative estimation methods,

quantification of uncertainty, and a shared database, and collaborate with partners to support learning among NARES and global scientists to improve baselines and mitigation planning.

Key research questions are: What are the potential net reductions of emissions and emission intensities from smallholder farms in priority sectors? What are the most cost-effective methods of quantifying GHG emissions of smallholder food systems? What are generalizable metrics for measuring progress on low-emissions agriculture and assessing trade-offs? What MRV procedures are appropriate to national needs and best achieve accountability for agricultural systems? Research in this CoA will link with FTA research on national GHG accounting.

Standardized methods will be used across CRPs. Controlled, experimental trials on farmers' fields will be used to develop emission factors and mitigation potentials for prioritized systems and source categories (livestock, rice and soil nutrient management, see Development of research priorities).. To optimize the benefit/cost ratio of emissions measurement, we will prioritize systems for measurement based on: (1) percent of GHG emissions from this source in the country/region; (2) expected mitigation potential based on the literature; (3) uncertainty of emissions estimates; (4) adoption potential of the practice and (5) ability to monitor the flux or stock change cost-effectively, including use of activity-based indicators. Livestock and nitrogen management were selected for field measurement due to their high relevance to smallholders, the large associated mitigation potentials and the high uncertainty associated with currently available emission factors and models.

Measurements will be further targeted to specific mitigation practices and locations based on the above criteria. Measurements of interventions for which mitigation is now relatively well-understood (e.g. water management in rice) will be phased out. A key component of this work will be testing and validation of low-cost methods for livestock emissions measurement to reduce future data costs and enable validating emissions factors in new contexts. Validation methods will be developed in the course of the program. FP3 will improve models for N₂O and test existing tools for estimating GHGs, such as the Cool Farm Tool, EX-ACT and [SHAMBA](#). FP3 will also develop novel approaches to [activity data](#), making use of ICT, crowd-sourced data and large data sets. Existing data from analog sites, e.g. Australian semi-arid systems that resemble agro-ecosystems in Africa and South America, will be consolidated. Results will improve biogeochemical process and statistical models to reduce the costs of emissions estimates and feed into CoA 3.2 and 3.3 for impact. Projects will use these methods to establish baselines and track progress towards targets. More reliable emissions estimates will enable countries to plan and monitor interventions and provide the evidence needed to access climate finance.

Key outputs will be:

- Improved emissions factors and Tier 2 and 3 emissions estimates for key source categories and mitigation practices (e.g. reducing ruminant emissions through improved feeding) for smallholder production systems and consolidated on a single website.
- Improved GHG estimation models for smallholder conditions in the tropics (e.g. N₂O emissions model for agriculture soils), including linkages with crop-soil models to better estimate productivity. Training of NARES scientists in use of models in CCAFS regions.
- Verified low-cost methods for monitoring. "Big data" spatial data sets and emissions factor platforms with the IPCC and the GRA, integrating results with existing data platforms and building on available data, feeding into FP4 and AgMIP.

- Comparison and improvement of tools, such as the Ex-ACT tool to assess mitigation co-benefits from a wide range of agricultural activities (with FAO).
- Metrics and systems for national and subnational monitoring and evaluation of impacts of LED on livelihoods, gender equity, food security and mitigation.
- Improved accounting for GHG and soil C uncertainty and analysis of trade-offs among competing objectives (e.g. cost, scale and accuracy) to inform measurement and LED policy, with WLE.
- Strengthened capacity of young scientists, 50% of which will be women, using the CLIFF-LAMNET Network.
- Impact assessment of changes in capacity in NARES.

CoA 3.2 Identifying priorities and options for low-emissions development (Learning Platform - LP3)

Empirical evidence for the feasibility of LED for different production systems and impacts on emissions, food production, livelihood resilience, and equity is lacking. FP3 will provide decision-makers with ex-ante analysis and tools to identify targets, low-emissions options, and the suitability of options for different production systems. It will also test the feasibility of different options for ensuring food security and reducing their trade-offs using farmer field trials. Among ICRPs, FP3 will synthesize findings across diverse technical options and AEZs. CoA 3.2 will build on CoA 3.1 results.

Key research questions are: What are plausible global and developing country targets for reducing agricultural emissions and how can countries meet them? What are global and country-level best-bet, scalable technical and policy options for LED? What are technical options' feasibility and potential impacts in priority agro-ecological zones, production systems and target countries?

The research design will involve participatory evaluation and comparison of different technologies using trials with smallholders in regions with expected high potential for mitigation and planning tools at national levels. Key outputs will be:

- Global and country targets across all CCAFS regions for mitigation in agriculture and comparison with INDCs.
- Identification of global hot spots for emissions and mitigation opportunities across all subsectors in developing countries, especially among smallholders.
- Ex-ante analysis of LED pathways needed to meet targets based on scenarios using global data sets, RCPs and shared SSPs (in coordination with FTA, PIM).
- Policy scenario tool to simulate impact of low emission strategies at the level of a region or a value chain, based on GHG coefficients per ha or per ton (with FAO).
- Comparison of promising LED technical options and their trade-offs, including emerging options such as BNI, based on multi-year field-trials.
- LED options for women in dairy value chains and identification of livelihood benefits and safeguards for women.
- User-friendly tool and training for mitigation planners to compare mitigation options and priorities. Current tools focus on emissions rather than mitigation options and lack smallholder data.

- Global information platform synthesizing LED agricultural practices and evidence

CoA 3.3 Policy, incentives and finance for scaling up low emissions practices

This cluster has three components: scaling up LED, private-public partnerships for supply chain governance in agriculture-forest landscapes, and an exploratory scoping of mitigation through efficient food systems. Similar to 3.2, FP3 will integrate information about policy and institutional options across CRPs. Each component of this CoA will use comparative analysis to identify and test promising models using participatory action research and pilot programs in target countries working in collaboration with national partners, agricultural input providers and producer organizations. This CoA will have strong links with CoA 2.4 (FP2) and policy results and options will be fed into FP1 scenario processes (CoA 1.2).

CoA 3.3.1 Scaling up LED

Building on options identified in CoA 3.2 and evidence for impacts, and with lessons learned from scaling up in FP2 and 4, FP3 will develop and test approaches for integrating mitigation into national agricultural development programs, sustainability initiatives and private sector investment to support large-scale implementation of low-emissions agriculture. Global experience in implementing LED is limited to a few pilot projects ([Ha 2014](#); [Seeberg-Elverfeldt & Tapio-Biström 2010](#); [Woelcke 2012](#)) and little information exists on the incentives, finance and business models, enabling conditions and accountability needed to implement LED ([Branca et al. 2011](#)). Integrated approaches to mitigation in landscapes and value chains are needed to support increasing Zero Deforestation commitments by the private sector and financial institutions' interests in embracing environmental, social and governance (ESG) criteria. CoA 3.3.1 will link into work in many other FPs through the cross-CRP LP on partnerships and capacity for scaling CSA.

Key research questions are: What evidence is needed to inform policy, incentives and finance and overcome adoption barriers to lead to successful farm-level changes in practices at large scales, especially to inform good agricultural practices and integrated crop management? How can promising mechanisms such as NAMAs, public-private institutional arrangements, support for farmer innovation and sustainable intensification or sustainability standards be improved to facilitate farmer-led, large-scale change? What are their costs? What conditions enable new practices by women and men farmers, farm advisers, and supply chain actors? How can inclusiveness and the influence of women farmers in the design of mechanisms be improved?

Key outputs will be:

- Evidence for policy, economic and finance measures appropriate to different farmers, production systems and countries.
- Comparative policy analysis of sustainable intensification, NAMAs, LEDS and private sector sustainability initiatives to inform up-scaling to multiple sites in countries.
- Information platform on business opportunities for green investment in low emissions agriculture.
- Technical and policy guidance and standards broadly disseminated through communications and public outreach campaigns and partnerships, including messages about enabling conditions for women farmers.

CoA 3.3.2 Responsible finance and standards for supply chain governance

FP3 will advance knowledge of commodity supply chain governance to incentivize forest conservation and assess compliance in practical ways. Agriculture's largest contribution to mitigation is through reduced deforestation ([Hosonuma et al. 2012](#)). Responsible finance based on supply chain standards and private sector commitments for zero deforestation and reduced emissions can provide an incentive for alternative practices. Yet the challenges to implementing private sector commitments remain high and evidence for the impacts and improvement of supply chain governance poor. In this CCAFS-FTA collaboration, CCAFS will emphasize supply chain governance related to agriculture (e.g. soy, beef), while FTA CoA 3.3 will focus on governance for timber and high-value trees crops (e.g. oil palm, rubber). The work will improve generalizable models for finance and standards for commodities, and improve the coherence between national and local LED governance. Activities will take place in the Brazilian Amazon, and pending funds, Indonesia, and the Congo Basin. Findings will be shared with the LEDSGP AFOLU working group and UN-REDD, and business platforms (e.g. GCF, TFA 2020, IPOP, GTPS).

Key research questions are: How do public regulations and incentives interact with corporate policies and pledges to create incentives for improved sustainability practices by producers? How can technical information and inputs be made available to all landholders (from large to small) to transition to LED? What are the most promising public and private arrangements at the national and sub-national level combining supply chain interventions and territorial-based ones for reducing deforestation and forest degradation? Is there scope for hybrid arrangements as a way for up- and out-scaling?

Key outputs will be:

- Impact assessment of public regulations and private sector-driven sustainability initiatives avoided deforestation, carbon sequestration, and social impacts and trade-offs.
- Good practice guidelines and options for public-private governance for improved social and environmental supply chain performance
- Engagement in multi-stakeholder platforms (e.g. RSPO and GRSB) and national commodity sustainability initiatives (e.g. IPOP, ISPO)
- Methods and tools to assess stakeholder compliance with sustainability commitments

CoA 3.3.3 Reducing food loss and waste

Globally ~1/3 of food is lost or wasted, contributing to ~8% of annual GHG emissions ([Smith et al. 2014](#)). Food waste will increase further with growth of the middle class, diet shifts and increased incomes. Reducing food loss and waste (FLW) (SDG 12.3) therefore has a high potential for reducing emissions across subsectors ([Dickie et al. 2014](#); [Smith et al. 2013](#)). Reducing biomass loss related to food production may also contribute to non fossil fuel-energy options ([Popp et al. 2014](#)). WUR will lead this work in partnership with the Champions 12.3 Coalition and PIM, and linked to FP1 scenarios. The work will build on innovations in the CGIAR such as on-farm storage options. Although agendas for reducing FLW exist ([HLPE 2014](#)), the link to climate change remains poorly understood. The aim of CoA 3.3.3 is thus to provide evidence for the mitigation that could be achieved by reducing FLW, the drivers for FLW in supply chains important to mitigation, and strategies for reducing FLW in ways that achieve a food- and nutrition- secure food system while also reducing emissions.

Research questions include: What are priority supply chains (i.e. high GHG footprints due to FLW) for reducing FLW and emissions in developing countries? What are the causes of FLW within supply chains? What are promising cost-effective interventions (e.g. infrastructure with lower GHG footprints, regulation and accountability mechanisms in the private sector) and their potential impacts on food, nutrition and emissions?

Key outputs will be:

- Identification of FLW priorities and commercially viable interventions in priority product value chains.
- Analysis of the causes of FLW in priority value chains and potential drivers of reductions.
- Producers' incentives to reduce FLW in their own operations, including technical feasibility, costs and benefits (including GHG mitigation benefits).
- Review of existing policies, policy barriers and synergies between FLW reduction measures with other policy domains (e.g. animal health, food security, feed hygiene and safety, trade).
- Business models and analysis of options for structuring finance for replication and scaling of FLW reduction measures in priority value chains.
- Analysis of lessons learned and best practices using public-private dialogue to support agri-food sector engagement with GHG emission reductions associated with FLW.

2.3.1.7. Partnerships

Central to the ToC is a partnership of 1) large-scale implementers (national ministries, local governments, private sector) with 2) civil society organizations addressing farmers' interests, including producer, women's and youth organizations and 3) biophysical and social science researchers developing and evaluating LED options (NARES, ARIs, GRA, the CGIAR). As recommended by the CCAFS External Evaluation, FP3 will partner with organizations delivering development outcomes. For example, In Kenya, we will partner with MoALF and county governments to pilot a dairy NAMA. We will explicitly seek partners such as Vi Agroforestry with demonstrated success in channeling resources to farmers' organizations, community groups and local government for farmer-level impacts.

Partners that bridge science and policy are critical to impacts. For example, FP3 will work with the GRA to advance quantification methods, contribute to global data platforms and share results with national policy makers; with FAO to support science-policy workshops; and with both to produce guidance documents. With the CCAC, FP3 will develop regional strategies for scaling up. With the World Bank and other donors, FP3 will identify metrics, readiness indicators and technical opportunities. GACSA will provide a forum for stakeholder input to research and dissemination. Research partners provide complementary expertise and links to decision-makers. For example, national partners such as IAE in Vietnam and INTA in Costa Rica monitor GHG emissions and inform policy development. Collaboration with regional/national partners such as CATIE or Universidad Nacional de Colombia-sede Medellín ensure locally relevant technical packages. IIASA, as a leader of global land use scenario analysis, model

development pathways and emissions targets. France's 4‰ initiative (involving INRA and CIRAD) for increasing global soil carbon provides leadership for wider ambition.

In the private sector, FP3 will partner with 1) agricultural input suppliers, 2) beef, dairy and palm oil companies, 3) producers' organizations and 4) standards groups to reduce the environmental impacts of supply chains, with leadership from Wageningen University in the fertilizer and dairy supply chains. Yara International will help collate and analyze data to develop improved N₂O models and use findings to identify optimal regional fertilizer application strategies. With the Livelihood Fund we will support best management practices for LED dairy in Kenya. The producers' organizations CORFOGA, FEDEGAN and FEDEARROZ will support implementation of NAMAs in the livestock and rice sectors in Costa Rica and Colombia. The WBCSD and the Consumer Goods Forum are interested in how to best monitor emission reductions.

Comparative advantage of the CGIAR.

The CGIAR has grown to become a significant player in mitigation in developing countries, aided by the cross-Centre approach adopted in Phase I. This comparative advantage arises from CGIAR Centres' location in developing countries and work across sub-sectors, longstanding technical research on related agronomic practices, and national, regional and global partnerships. With the capacity to test technologies and policies in multiple sites globally, the CGIAR is well positioned to generate generalizable scientific evidence and syntheses for LED options. CCAFS can develop models, scenarios and decision support tools for landscapes across diverse production systems (e.g. livestock, rice, cereal crops, forest areas) and regions. As a global player, we are well positioned to partner with other global actors such as the GRA, FAO, WB, and CCAC. We complement the GRA's research on more basic science and methods by delivering science outputs for specific users and development outcomes. In comparison with GRA and FAO, we enjoy scientific independence from government.

2.3.1.8. Climate change

FP3 is designed to make a major contribution to the global challenge of climate change, in particular reducing GHGs and LED. Mitigation requires technical expertise; FP3 will establish a Learning Platform (LP5) on Priorities and Options for LED (CoA3.2) across all CRPs and with partners such as GACSA (see Annex 3.1, Annex Table 2) to marshal CGIAR-wide and partner expertise to support 1) country demands for comparison of mitigation options and priorities across the entire agricultural sector; 2) solutions that integrate information from plot-level measurements to NAMA-type policy analysis and global tools; 3) standardized guidelines and metrics for robust GHG estimation across subsectors; and 4) linking crop and livestock production with avoided deforestation (e.g. avoided land use change informed by future land use scenarios by IFPRI, pasture intensification options by CIAT and expected expansion of coffee agroforestry by ICRAF, CIAT and IITA). FP3 will facilitate shared databases (e.g. for emissions factors, nitrogen management) and mitigation decision tools.

As a result of CGIAR-wide collaboration in Phase I, the CGIAR has positioned itself as a global actor for LED. In 2013, the CCAC invited CCAFS with GRA participation to lead a global initiative to consolidate information on and scale up mitigation in paddy rice. GACSA publishes practice briefs on CSA and CCAFS

FP3 has led briefs on conservation agriculture, nutrient management, and integrated soil fertility management. In 2015, 34 individuals from more than 20 organizations, including six Centres, produced a global target for mitigation in the sector.

Partners such as the IPCC, GACSA, GRA, FAO, CCAC, CTCN, Rainforest Alliance, TNC, the World Bank and the WBCSD, now recognize the value of CCAFS as an entry point to LED research in the CGIAR. In Phase II, a coherent FP3 program across Centres and CRPs will enable consolidated approaches to these partnerships and communications.

2.3.1.9. Gender

A 2015 review of opportunities for improving women's benefits and participation in LED agronomic practices for rice, cattle and fertilizer use ([Farnworth 2015](#), forthcoming; [Farnworth et al. 2015](#)) informs FP3 priorities for Phase II. Priorities included participatory technology development by men and women at the household, farm and community levels; identifying opportunities for strengthening gender relations in decision-making in supply chains; and increasing women's capacity as scientists and policy makers. These components will be embedded in regional and subsector programs to deliver the sub-*IDO Improved capacity of women and young people to participate in decision-making* (see Section 1.0.4 for the FP3 gender-related hypothesis). FP3 will prioritize training women scientists and policy makers in CLIFF-LAMNET. Post-doctoral positions for GSI specialists will support more gender-sensitive research in supply chains. The review also indicated that the dairy supply chain is an area where high benefits for women are probable; women make up ~2/3 of the world's 600 million livestock managers ([FAO 2013b](#)), and the value-added in dairy can provide significant increases in livelihood opportunities, income and child nutrition ([Nicholson et al. 1999](#)). FP3 will thus focus additional resources on facilitating women's role in LED and relationship with men in dairy value chains. Within supply chains, we will use methods from ProInnova, FIPAH and others that create spaces for women and men to exchange views and information to support changes in gender relations ([Hottle 2015](#)). Achieving outcomes in both GHG mitigation and gender involves trade-offs. Men dominate some activities associated with priority mitigation options, such as beef cattle intensification in Brazil, and few opportunities exist for women to shift to these activities in the near-term. An FP3 goal is to identify where these trade-offs can be reduced by identifying enabling conditions to benefit women and men.

2.3.1.10. Capacity development

In 2001 the UNFCCC established guidance on capacity building for mitigation technology priorities, barriers to their implementation and enhancing enabling conditions ([2/CP.7, 3/CP.10, Metz et al. 2000](#)). To develop locally appropriate LED, farmers, farm advisers, and policy makers need to know about technical options and their benefits and risks, as well as have the skills to test them. National governments will need capacity to set targets and estimate emissions reductions. FP3 will assess, build and monitor capacity in 5 areas to advance progress in FP3's impact pathway: 1) *learning about LED options* by farm advisers and mitigation planners through the use of tools such as IRRI's Crop Manager, CIMMYT's Nutrient Expert® and the Mitigation Options Tool developed by the University of Aberdeen in collaboration with national policy makers; 2) *institutional strengthening* of ministries and producers' organizations to plan and implement LED at scale through collaboration in building LED scenarios and by

convening multi-stakeholder platforms to generate policy-relevant information (e.g. with cattle ranchers, banks, and local policy makers in Brazil in partnership with CIRAD and FTA, and for scaling up paddy rice in Vietnam, Bangladesh and Colombia); 3) *development of future LED research leaders* using fellowships for post-graduate students from developing countries with priority given to women, to learn GHG estimation and measurement techniques at CGIAR Centres (through the CLIFF and LAMNET networks); 4) *development of organizational capacities* at ministries and NARS to develop and monitor LED policies and NAMAs by co-producing data, tools and scenarios about mitigation opportunities and impacts (NAMA design and MRV systems in Kenya); 5) continue bringing policy makers and scientists together in expert workshops with global partners such as FAO to *assess needs and develop interventions*.

2.3.1.11. Intellectual asset and open access management

FP3 will continue to meet countries' and practitioners' demands for IPGs in low emissions development by facilitating open access to data, tools and methods, and research findings, guided by CCAFS intellectual asset and open access management strategies plan. Tier-2 emission factors resulting from CCAFS research will inform the IPCC EF database and GRA's database (available to its network of 46 member countries) will be freely accessible via an FP3 database sharing metadata and links to data sources (Dataverse). Emissions and sequestration accounting tools and methodologies (for example, cost-effective measurement methods, SHAMBA, MOT, suitability maps, methods for social and gender impacts), will render state-of the art-science available online and widely shared. Science and policy research—from measurement to decision-making to climate finance and scaling up—will be designed to inform users and meet their needs, feeding into international climate frameworks, national targets and policies and private sector mechanisms.

Some of FP3 work includes participatory evaluation with farmers, and also involves traditional knowledge. FP3 will be in compliance with the CGIAR Principles on IAs (see Section 1.0.12). This includes attention to respecting the traditional knowledge of farmers, maintaining confidentiality where appropriate, embracing prior informed consent and ensuring that results are returned to all partners in the research process.

2.3.1.12. FP management

The Gund Institute at the University of Vermont will host FP3. The Gund Institute's comparative advantage includes: an international centre of excellence for transdisciplinary research on global environmental challenges; expertise in climate change, agriculture and environment; ecosystem services and modeling; participatory action research; a network of more than 50 resident fellows plus affiliates from CATIE, Woods Hole Research Centre, Stanford University, ANU, McGill University, University of Minnesota and WWF.

Lini Wollenberg, competitively selected in Phase I, will continue to lead FP3 with annual input from Centre Contact Points and project leaders and with the assistance of a science officer and program manager. The FPL (Google-H Index 30) is the lead editor of *Climate Change Mitigation and Agriculture* (Routledge, 2012); she also helped initiate the [SAMPLES platform](#) co-organized 22 articles for

Environmental Research Letters on GHG quantification, and led a global effort for a target for mitigation with 34 co-authors.

CCAFS Contact Points will play a strong advisory role in FP3 and facilitate links to CRPs, including Reiner Wassman (IRRI), to RICE; Henry Neufeldt (ICRAF) to FTA; Clare Stirling to WHEAT and MAIZE; Alex de Pinto to PIM; and Polly Ericksen to L&F.

Sub-FP3 management arrangements include: advisory team (ILRI, ICRAF, CIFOR, CIAT and IRRI) for SAMPLES; WUR management of Food Loss and Waste (CoA 3.3.3); CIFOR management of Responsible Finance with FTA (CoA 3.3.2); CCAFS GSI leader input on gender; Global Research Leader on Scaling CSA input on private sector; CLIFF CIAT and CCAFS LAM on LAMNET. FP3 will manage risk of partners not delivering by selecting partners with known high performance, clarifying available staff time, using contracts that deliver the majority of payment upon approval of outputs, and working with partners to align activities and CCAFS objectives. Partner funds will be managed from CCAFS' CIAT office.

2.3.2 Flagship Budget Narrative

2.3.2.1 General Information

CRP Lead Center's Name: CIAT

Center Location of Flagship Leader: University of Vermont (UVM)

2.3.2.2 Summary

Total Flagship budget summary by sources of funding (USD)

Funding Needed	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total
W1+W2	4,365,597	4,583,877	4,813,071	5,053,724	5,306,410	5,571,731	29,694,410
W3	-	-	-	-	-	-	-
Bilateral	5,874,312	5,664,336	4,946,457	4,755,758	4,761,666	4,578,375	30,580,904
Other Sources	-	-	-	-	-	-	-
Total	10,239,909	10,248,213	9,759,528	9,809,482	10,068,076	10,150,106	60,275,314

Funding Secured	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total
W1+W2 (Assumed Secured)	4,365,597	4,583,877	4,813,071	5,053,724	5,306,410	5,571,731	29,694,410
W3	-	-	-	-	-	-	-
Bilateral	4,112,019	3,115,385	989,291	428,018	-	-	8,644,713
Other Sources	-	-	-	-	-	-	-
Total	8,477,616	7,699,262	5,802,362	5,481,742	5,306,410	5,571,731	38,339,123

Funding Gap	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total
W1+W2 (Required from SO)	-	-	-	-	-	-	-
W3 (Required from FC Members)	-	-	-	-	-	-	-
Bilateral (Fundraising)	(1,762,294)	(2,548,951)	(3,957,166)	(4,327,740)	(4,761,666)	(4,578,375)	(21,936,191)
Other Sources (Fundraising)	-	-	-	-	-	-	-
Total	(1,762,294)	(2,548,951)	(3,957,166)	(4,327,740)	(4,761,666)	(4,578,375)	(21,936,191)

Total Flagship budget by Natural Classifications (USD)

	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total
Personnel	2,894,006	2,949,813	3,060,201	3,159,308	3,260,111	3,353,432	18,676,872
Travel	702,869	722,169	711,338	708,629	709,876	701,688	4,256,569
Capital Equipment	6,250	3,250	3,250	6,250	3,250	3,250	25,500
Other Supplies and Services	1,993,480	2,088,904	1,900,703	1,819,932	1,915,030	1,873,246	11,591,295
CGIAR collaborations	229,182	203,891	214,086	224,790	236,029	247,831	1,355,809
Non CGIAR Collaborations	3,378,072	3,245,360	2,903,513	2,922,568	2,942,579	2,963,592	18,355,684
Indirect Cost	1,036,050	1,034,826	966,438	968,004	1,001,200	1,007,067	6,013,586
Total	10,239,909	10,248,213	9,759,528	9,809,482	10,068,076	10,150,106	60,275,314

Total Flagship budget by participating partners (signed PPAs) (USD)

	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total
CIAT	1,664,446	1,674,510	1,684,932	1,695,725	1,706,904	1,718,483	10,145,001
AFRICARICE	-	-	-	-	-	-	-
BIOVERSITY	-	-	-	-	-	-	-
CIFOR	298,000	303,956	310,210	316,777	323,672	330,912	1,883,527
CIMMYT	1,968,092	2,141,849	2,114,059	2,185,026	2,287,718	2,380,938	13,077,682
CIP	-	-	-	-	-	-	-
ICARDA	-	-	-	-	-	-	-
ICRAF	1,140,001	921,841	607,175	620,076	636,257	655,729	4,581,078
ICRISAT	160,962	160,962	160,962	160,962	160,962	160,962	965,772
IFPRI	758,044	758,160	758,043	758,092	758,040	758,076	4,548,456
IITA	649,971	663,368	478,361	401,862	497,633	436,539	3,127,734
ILRI	1,573,674	1,596,847	1,619,066	1,644,240	1,670,170	1,681,747	9,785,745
IRRI	414,220	414,220	414,220	414,220	414,220	414,220	2,485,320
IWMI	-	-	-	-	-	-	-
WORLD FISH	-	-	-	-	-	-	-
Copenhagen University	170,000	170,000	170,000	170,000	170,000	170,000	1,020,000
CIAT-Gender & Social Inclusion Leader	122,500	122,500	122,500	122,500	122,500	122,500	735,000
Wageningen University (WUR)	550,000	550,000	550,000	550,000	550,000	550,000	3,300,000
University of Vermont (UVM)	770,000	770,000	770,000	770,000	770,000	770,000	4,620,000
Total	10,239,909	10,248,213	9,759,528	9,809,482	10,068,076	10,150,106	60,275,314

Explanations of these costs in relation to the planned 2022 outcomes:

(Outcome numbers as in PIM Table B)

45% of the FP3 budget will be used to achieve **outcome 3.3**: 10 low emissions plans developed that have significant mitigation potential for 2030, i.e., will contribute to at least 5% GHG emissions reduction or reach at least 10,000 farmers, with all plans examined for their gender implications. The major share of FP3 funding will be allocated to this outcome as the central theme of FP3, which, due to the novelty of LED, requires intensive evidence generation and stakeholder engagement. Budget towards this outcome will support proofs of concept for mitigation practices in priority sectors, technical and policy guidance for scaling up LED, policy analysis for LED pathways using future scenarios, finance options, decision-

making tools and methods for estimating GHGs and conducting MRV. 20% of the FP3 budget will be used to achieve **outcome 3.1**: 20 agricultural development initiatives where CCAFS science is used to target and implement interventions to increase input efficiency. Programs and policies related to agricultural input use and efficiency (e.g. fertilizer subsidies, food waste and loss, livestock intensification, soil management, irrigation infrastructure) provide a platform for rapidly mainstreaming and scaling up LED, with increased decreased costs and increased incomes for farmers. This research will build on the results from **outcome 3.3** to inform agricultural programs and policies. FP3 will invest substantial budget with an emphasis on sustainable intensification of livestock, soil nutrient management and value chain efficiency. FP3 will ensure that results for **outcomes 3.3 and 3.1** are channelled into F2 for CSA planning and F1 for policy development.

15% of the FP3 budget will be used to minimize and reverse land, water and forest degradation (including deforestation), achieving **outcome 3.2**: 0.8 million hectares targeted by research-informed initiatives for restoring degraded land or preventing deforestation. FP3 will collaborate with WLE, FTA, and Livestock to reduce agriculturally-driven deforestation and land degradation in commodity supply chains.

10% of the FP3 budget will be used to achieve **outcome 3.4**: 15 organisations adapting their plans or directing investment to increase women's participation in decision-making about LED in agriculture. FP3 will focus on increasing the capacity of women scientists and policy makers to participate in LED decision-making and address the role of women and youth farmers in implementing LED using participatory technology selection and through mitigation in dairy value chains.

10% of the FP3 budget will be used to achieve **outcome 3.5**: 15 policy decisions taken (in part) based on engagement and information dissemination by CCAFS. National partners and community beneficiaries will have increased capacity for innovation in partner development organizations and in communities.

The major budget share related to **outcome 3.3** will support the development of improved estimates of smallholder emissions and mitigation potentials; technical and policy guidance to focus countries, supply chains and donors for LED priorities; and building the evidence base for finance and scaling of LED options, together with FP1 and FP2. Work contributing to this outcome will include experimental trials of mitigation options to develop emission factors and mitigation potentials for priority systems. Research will engage national governments, farmers' groups, local governments, as well as development banks, donors, private sector suppliers, youth organizations, women's organizations, and investors in LED and agricultural development. Another 20% of the budget will go towards projects contributing to **outcome 3.1**, supporting the implementation of agricultural development initiatives that increase input efficiency. These projects will test more efficient management options for fertilizer, feed, water and land use; analyse farmers' incentives to increase input efficiency; develop business models for scaling up efficiency measures; and recommend options for reducing food loss and waste in agricultural value chains. With 15% of FP3 budget, the portfolio of research contributing to **outcome 3.2** will develop institutional innovations and public-private governance options for commodity supply chains in order to reduce agriculturally-driven deforestation and restore degraded lands. This work will pilot monitoring frameworks and examine producer incentives for commodity sustainability, with a focus on livestock products. Ten percent of FP3 funds (**outcome 3.4**) will be allocated to activities focused on the gender-disaggregated impacts of LED technologies and the potential for LED options to provide improved livelihood options for women, with a particular focus on dairy value chains where women play a large role. Research contributing to this outcome will also incorporate indicators for women's and men's

participation and benefits into monitoring systems (MRV) for LED initiatives. Ten percent of FP3 budget will also go towards building the capacity of decision-makers in national governments and donor organizations to support LED implementation (**outcome 3.5**) by developing knowledge products and training materials on LED, emissions quantification, and MRV; engaging directly with policy-makers for scenario analysis; and convening multi-stakeholder platforms for commodity sustainability standards. Activities contributing to this outcome will also strengthen scientific capabilities for agricultural mitigation research in target countries.

In FP3, W1/W2 will be used for highly strategic research and engagement with value as international public goods, whereas W3 bilateral activities will be tailored to specific locations and stakeholder groups as per funding conditions. W1/W2 funding will emphasize priority mitigation interventions relevant to smallholder agriculture in the focal countries of Colombia, Kenya, and Vietnam, among other countries, to assess the feasibility for implementation and develop relevant practices and policies. Practices include: reducing methane from livestock and paddy rice, reducing nitrous oxide from fertilizer use in cereal crops, sequestering carbon in agricultural landscapes, and reducing food loss. W1/W2 funds will be allocated across regions in consideration of mitigation potential, centres' sub-sectoral and regional strengths, and to ensure gender and social inclusion benefits. W3/bilateral funds will build upon on core W1/W2-funded work, expanding outcomes using complementary activities or expanding FP3's geographical scope. For example, W3/bilateral funds will contribute to scaling up the practice of AWD in Bangladesh and Vietnam through funding to IRRI from CCAC, and complement W1/W2 efforts to increase productivity and reduce emissions intensities in dairy value chain in East Africa, with funding from IFAD to ILRI. W3/bilateral funds demonstrate the private sector and development partners' interest in FP3 objectives and will allow for both mitigation at larger scales and institutionalization of LED practices in value chains.

FP3 budget will be allocated to nine Centres. CIAT will receive the largest share of FP3 funds as it will host the FP3 leader, house the RPL in LAM, and lead research on LED in the livestock sector in Colombia and Costa Rica. FP3 leader funds will support the LP on priorities and options for LED and ensure rigorous research and development outcomes. In addition to CIAT, CIFOR, ICRAF, IFPRI, ILRI and IRRI will lead W1/W2-funded initiatives and contribute W3/bilateral funds to FP3.

FP3 has allocated 2% of its budget to MELIA. Of this USD 185,000 over the six-year period is allocated to external assessments. These are shown in Annex Table 5. FP3 will allocate funds to a CCEE, and contribute to gender, regional and Learning Platform external reviews.

Costs in relation to the natural classification

Personnel. 31% of the total budget is dedicated to personnel. FP3 is working with research and thought leaders in 10 centers. With twin foci on research excellence and application of research to climate change mitigation and development goals, FP3 personnel are noted for their productivity and influence at scientific and global, national, and sector-specific policy levels. In addition to advancement of the science and project management, personnel will also advance climate change mitigation integration in the CGIAR, lead and collaborate on fundraising, and coordinate with the mitigation LP.

Travel. 7% of the budget will be for travel for research and to strategic events and meetings. Virtual meetings have significantly decreased the need for travel, and FP3 will focus on traveling when it

contributes to outcomes. As such, the FP3 travel budget supports research – and research quality, learning events, especially for country partners, and influential conferences and events that are a platform for communications and engagement.

Capital equipment. A very small percentage (0.04%) of FP3 total costs is needed for capital equipment. FP3 is not capital-dependent because it has developed a two-pronged strategy to keeping the costs of GHG measurement low. First, Phase 1 focused on developing methods and building capacity in low-cost measurement methods through collaboration with the FAO and SAMPLES. Second, in cases where expensive equipment is necessary. FP3 has strategized to form partnerships, in each region and globally, with universities and research centres that have the high-cost equipment to measure GHGs.

Other Supplies and Services. See below in Section 2.

CGIAR Collaborations. 2% of the total budget goes to Collaborations among CGIAR Centres but only with W3 and Bilateral funds as all W1W2 budget are sent directly from CIAT Lead Centre to Participating Centres via Program Participant Agreements (PPAs).

Non-CGIAR collaboration. FP3 will allocate 30% of its budget to partners, as partnerships for research and development outcomes are a crucial component of the ToC. Partners will leverage their own resources at 2-3 times the W1/2 budget level. The fundraising strategy aims to maintain or exceed this level. FP3 has developed strategic partners with 1) large-scale implementers (national ministries, local governments, private sector), 2) civil society organizations addressing farmers' interests, including producer, women's and youth organizations, and 3) biophysical and social science researchers developing and evaluating LED options (NARES, ARIs, GRA, the CGIAR). Partnerships with global organizations and businesses that bridge science and policy are either self-funded or provide bilateral or in-kind funding to FP3, for example the CCAC, FAO, GRA, World Bank, as well as Yara International and the Livelihood Fund from the private sector. Most partnerships with civil society and research organizations are co-funded between CCAFS and partners, including national ministries, producers' organizations, GACSA, IAE in Vietnam, INTA in Costa Rica, etc. F3 does not entirely fund any partners. Partnerships are built on our common agendas.

Indirect costs. 15% is the average Indirect Cost rate that comes from the different rates among CGIAR Centres defined on estimated income.

2.3.2.3 Additional explanations for certain accounting

Benefits:

Using CIAT as point of reference, we assumed most of CGIAR Centers follow the following differentiation of benefits among National and International Staff:

National Research Staff (NRS): Fringe benefits for national staff (costs for all benefits are added to the base salary to provide the total cost of the position) are comprised of legal benefits (local mandatory) and extralegal benefits (CIAT mandatory) and the provisions to cover local legal requirements such as: Pension - social security, training and development, occupational health, transportation costs and subsidies, work clothes and personnel protection requirement, and food subsidy.

International Research Staff (IRS): Fringe benefits for international staff (costs for all benefits are added to the base salary to provide the total cost of the position) are comprised of housing allowance, education allowance, car allowance, Cost Of Living Allowance (COLA), hardship, home leave tickets, insurance, retirement contribution, occupational health, training and development, repatriation and relocation provisions.

Other Supplies and Services:

19% of the FP3 budget is allocated to Supplies and Services. This includes Centres' Full Cost Recovery units, covering essential expenses such as IT, Facilities, Public Space, Research and Technical Support. Supplies and Services also includes funds for consultancies directly related to FP3 outcomes and MELIA, workshops and learning events, and operational services such as payments for open access and book publishing, and MELIA activities.

2.3.2.4 Other Sources of Funding for this Project

Relative proportions of W3 and Bilateral are unknown, and thus we have used a single category of Bilateral to capture both W3 and Bilateral.

Centres have committed to raising 51% of total Flagship funds through Window 3 and bilateral contributions from 2017 onwards. FP3 works closely with all centres to coordinate and collaborate around fundraising. Funding reductions in 2015 and 2016 triggered development and implementation of an FP3 fundraising strategy that will continue through Phase II, as contingency in case that full funding does not materialize. FP3 plans to exceed W3/bilateral fundraising targets by linking to climate finance opportunities for high mitigation-impact practices relevant to smallholder development: carbon sequestration in agricultural landscapes (4/mil initiative), reducing methane from livestock and paddy rice (CCAC), reducing nitrous oxide from fertilizer use in cereal crops (private sector), and reducing food loss (Champions 12.3). Documenting cutting-edge research and outcomes, and ensuring visibility of open access tools, information platforms, and engagement of next users can also help attract funding. Specific references to CCAFS and LED strategies in the February 2016 USAID report on Climate-smart agriculture in Feed the Future Programs and the March 2016 announcement by the CCAC of Phase II funding (2017-2019) for expansion of AWD work in Bangladesh and Vietnam show evidence of the high potential of fundraising for FP3. Potential sources of funding for FP3, and with whom FP3 has established relationships, include foundations and donors, such as the Rockefeller Foundation and the Asian Development Bank; the nascent Green Climate Fund; private sector leaders in sustainability in high-potential value chains such as Danone, location- and sector-specific sources such as the Amazon Fund; and research opportunities funded through the Natural Environment Research Council, the US Department of Agriculture and others. By working independently, with CCAFS regions, other flagships, centres and other CG partners, and with well-established strategic partners such as the GRA and the University of Aberdeen, FP3 is increasing the strength of its fundraising strategy while decreasing risks from a funding shortfall.

FP3 expects significant collaboration involving in-kind support from a large range of partners. At the global level, FP3 expects to continue to collaborate with the CCAC, USAID, FAO, GRA partners and the World Bank in research, engagement, and events that support outcomes of mutual interest. Examples from Phase 1 include: in-kind contribution by FAO for half the costs of a series of capacity

building workshops on rigorous, low-cost GHG emissions estimates with developing country partners and full World Bank support for gathering leading scientists, practitioners and financiers to identify actionable opportunities for meeting global food needs with lower emissions in reaction to the IPCC WGIII report release. FP3 has also leveraged funds for research partners to collaborate on FP3-related priorities. For example, FP3 leveraged in-kind contributions from the Institute of Agricultural Management and Forest Certification (IMAFLOA), the Rainforest Alliance, and the Universities of Michigan, Oxford and São Paulo, with support from the Global Innovation Initiative, to investigate how private sector cattle certification may reduce the amount of deforestation and greenhouse gas emissions from cattle farming in Brazil.

If fundraising and in-kind contributions cannot cover future budget reductions, decisions on which projects and activities to cut will be made in an equitable and transparent process involving project leaders, Centre contact points and CCAFS management. Based on CCAFS experience, the process would likely include assessment of projects and activities based on progress, ability to deliver stated outcomes, value for money, value to region, gender, Centre priorities. The process would also consider thresholds of funding necessary for continuation or early termination of projects.

2.3.2.5 Budgeted Costs for certain Key Activities

	Estimate annual average cost (USD)	Please describe main key activities for the applicable categories below, as described in the guidance for full proposal
Gender	1800000	Gender research for this Flagship is USD 1.8 million per year (18% of the FP budget). FP3 will focus on opportunities including targeting value chains where women have integral roles, such as dairy; participatory technology development and strengthening the capacity of female scientists and policy makers. Participatory analysis of incentives for AWD will take place in Southeast Asia. Current research on gender priorities and training in livestock in Kenya is influenced by an understanding that overcoming barriers for women in the sector is important for achieving NAMA goals. Dairy research will be undertaken in Kenya, Costa Rica, Colombia and Indonesia. Additionally, two postdoc positions on gender and livestock are in place. While the gender outcome is specifically articulated in outcome 3.4, all outcomes have gender components.
Youth (only for those who have relevant set of activities in this	300000	Using USD 300,000 per year (3% of FP3's total budget), FP3 will work with networks of trial sites in CSVs in each FP3 country in relation to adaptation and mitigation of GHG emission, including activities by women and youth farmers' groups. FP3 research will engage youth organizations and partner with youth organizations, along with other partners. F3 will address the

area)		roles of women and youth farmers in implementing LED, contributing to increased capacity of women and young people to participate in decision-making. Outputs will include networks of trial sites in CSVs, including activities by women and youth farmers and strengthened capacity of young female scientists in GHG quantification.
Capacity development	1900000	Capacity Development has a budget of USD 1.9 million per year (19%) in the Flagship. FP3 will assess, build and monitor capacity in 5 areas to advance progress in FP3's impact pathway: 1) learning about LED options by farm advisers and mitigation planners through the use of tools such as IRRI's Crop Manager, CIMMYT's Nutrient Expert® and the Mitigation Options Tool developed by the University of Aberdeen in collaboration with national policy makers; 2) institutional strengthening of ministries and producers' organizations to plan and implement LED at scale through collaboration in technical and policy guidance and by convening multi-stakeholder platforms to generate policy-relevant information (e.g. with cattle ranchers, banks, and local policy makers in Brazil in partnership with CIRAD and FTA, and for scaling up paddy rice in Vietnam, Bangladesh and Colombia); 3) development of future LED research leaders using fellowships for post-graduate students from developing countries with priority given to women, to learn GHG estimation and measurement techniques at CGIAR Centres (through the CLIFF and LAMNET networks); 4) development of organizational capacities at ministries and NARS to develop and monitor LED policies and NAMAs by co-producing data, tools and scenarios about mitigation opportunities and impacts (NAMA design and MRV systems in Kenya); 5) continue bringing policy makers and scientists together in expert workshops with global partners such as FAO to assess needs and develop interventions. In all of the above areas, capacity development will be designed to be gender-sensitive. Capacity development is funded through partnerships, staff, and operational expenses. Capacity building is a component of all FP3 outcomes.
Impact assessment	70000	Impact assessments of FP3 in 2014 and CCAFS in 2015 are informing FP3's strategy for 2017-2022, including informing hypotheses and strategy to maximise impact, recognition of intended and unintended outcomes, and increased integration with national strategies and institutions. In Phase II, FP3 will allocate USD 200,000 to impact assessment over the six-year period and will support CRP-wide assessments, as the latter will include a representative set of FP3 activities. To evaluate the impact of research to reduce GHG emissions, FP3 is planning to assess a) GHG reductions and b) changes in input use efficiency as a result of CCAFS-informed adoption of mitigation practices. These assessments will inform FP3's ToC and project-level methodologies and objectives. As FP3 progresses, impacts will be assessed in specific geographies and sub-sectors, and for stakeholders and beneficiaries along the impact pathway. Gender and social impacts will be integrated throughout.

Intellectual asset management	8000	The budget for this is USD 8,000 per year. Many topics under this category are dealt with under the following two activities. Flagship teams contribute to implementation of CCAFS Intellectual Asset policy. Activities will contribute to ensuring all knowledge products (primarily publications and databases) are, wherever possible, disseminated using open access principles, with clear branding to acknowledge authorship. FP3 will be in compliance with the CGIAR Principles on IAs (see Section 1.0.12), including respecting the traditional knowledge of farmers, maintaining confidentiality where appropriate, embracing prior informed consent and ensuring that results are returned to all partners in the research process.
Open access and data management	127000	FP3 will dedicate a budget of USD 127,000. FP3 will continue to meet countries' and practitioners' demands for IPGs in low emissions development by facilitating open access to data, tools and methods, and research findings, guided by CCAFS intellectual asset and open access management strategies plan. Tier-2 emission factors resulting from CCAFS research will inform the IPCC EF database and GRA's database (available to its network of 46 member countries) will be freely accessible via an FP3 database sharing metadata and links to data sources (Dataverse). Emissions and sequestration accounting tools and methodologies (for example, cost-effective measurement methods, SHAMBA, MOT, suitability maps, methods for social and gender impacts), will render state-of the art-science available online and widely shared. Science and policy research—from measurement to decision-making to climate finance and scaling up—will be designed to inform users and meet their needs, feeding into international climate frameworks, national targets and policies and private sector mechanisms.
Communication	530000	The budget for communications is USD 530,000 per year. Flagship communications activities will contribute to delivery of outcomes through engagement with key stakeholders in sites, regions, at the national level, as well as in relevant communities of practice. Main communication activities for FP3 include: facilitating engagement activities, dialogue, and outreach campaigns for stakeholders in regions; producing and sharing knowledge products relevant to next users; outreach on globally relevant messages and cases including supporting IPCC communications; and supporting learning and sharing with partners. Budget is allocated for salary of regional communications specialists (1 per region, with shared responsibility for all flagships) and staff time for communications activities at project level. The budget covers delivery of communications products and initiatives through events, media engagement, field visits, training journalists, producing/disseminating publications, multimedia production, and staff travel.

2.3.2.6 Other

Uplift

Most of the topics selected for uplift have been identified from topics cut from CCAFS as a result of budget cuts, but which are considered to be a crucial part of the science and outcome agenda. By outcome contribution, these are listed below.

- [Improving nitrous oxide globally](#) (P22) (CIMMYT, YARA, U. Aberdeen, BISA). This topic responds to CCAFS external evaluation by providing more robust indicators for GHG efficiency.
- [Supporting technical options and innovative private-public partnerships by linking sustainable beef production and landscape management](#) (P11) (CIFOR, CIRAD, EMBRAPA, MPEG, Imaflora). This topic responds to CCAFS external evaluation by supporting better collaboration across CRPs on AFOLU.
- [Mitigation in livestock and LED pathways in East Africa](#) (P12) (ILRI, CIFOR, ICRAF, UNIQUE, KIT, Heiffer). This topic responds to CCAFS external evaluation by enabling better integration with FP1 and FP2.
- [Livestock Plus: Supporting low emissions development planning in the Latin American cattle sector](#) (P9) (CIAT, ICRAF, CATIE, MAG, UNICAUCA, UNAL, Unillanos, INTA). This topic responds to CCAFS external evaluation by enabling better integration with FP2.
- [Landscape approach to climate change mitigation in agriculture](#) (P18) (IFPRI, NIAPP, IAE). This project responds to CCAFS evaluation with more systematic integration of gender.
- [East Africa NAMA for dairy development](#) (P13) (ICRAF, ILRI, UNIQUE, Livelihoods Fund, MALF, MEWNR, FAO, KDB). This topic responds to CCAFS external evaluation by enabling better integration with FP2.
- [Assessing incentives for scaling up mitigation in rice production](#) (P21) (IRRI, Cantho U., VAAS, James Hutton Institute)

In addition, new topics have been proposed due to recent developments in the field or external evaluation recommendations. These include:

- Innovative monitoring and modelling for soil carbon and GHG emissions and enhancing management transitions to increase soil carbon to inform new UNFCCC and Green Climate Fund credit schemes, responding to evaluation recommendation to enhance indicators.
- Mitigation potentials and policy guidance for integrated agriculture-forest landscapes in Vietnam, Kenya, Colombia and Brazil, responding to evaluation request for more collaboration with CRPs on AFOLU.
- Develop metrics, tools and approaches for monitoring emissions from food loss and waste with private sector partners, responding to evaluation recommendation to enhance indicators.
- Monitor impacts of biological nitrification inhibitors in cereal and grass varieties and develop implementation options in India, Mexico and Colombia.

2.3.3 Flagship Uplift Budget

Outcome Description	Amount Needed	W1 + W2 (%)	W3 (%)	Bilateral (%)	Other (%)
FP3.1: 14 agricultural development initiatives where CCAFS science is used to target and implement interventions to increase input efficiency	9,644,050	46	-	54	-
FP3.2: 0.4 million hectares targeted by research-informed initiatives for restoring degraded land or preventing deforestation	7,233,038	44	-	56	-
FP3.3: 5 low emissions plans developed that have significant mitigation potential for 2030, i.e. will contribute to at least 5% GHG emissions reduction or reach at least 10,000 farmers, with all plans examined for their gender implications	21,699,113	41	-	59	-
FP3.4: 7 organisations adapting their plans or directing investment to increase women's participation in decision-making about LED in agriculture	4,822,025	44	-	56	-
FP3.5: 7 policy decisions taken (in part) based on engagement and information dissemination by CCAFS	4,822,025	44	-	56	-

2.4. FP4: Climate services and safety nets

2.4.1 Flagship Project Narrative

2.4.1.1 Rationale, scope

The vision. The FP4 vision is that farmers across Asia, Africa and Latin America are supported by effective climate services and protected by well-targeted safety nets, enabling transition toward climate-smart agricultural systems, and resilient livelihoods. Key 2022 outcomes include: (a) 8 million farm households with improved access to capital, with increased benefits for women; (b) 40 institutions or major initiatives use CCAFS research outputs for services that support farm households' management of climatic risks; (c) USD 150 million of new investments by state, national, regional and global agencies, informed by CCAFS science and engagement; 20 organizations adapting their plans and directing investment to increase women's access to gender-sensitive climate-based advisories and insurance; and (e) 15 policy decisions taken (in part) based on engagement and information dissemination by CCAFS (FP4 Table 1).

The challenge. Climate change makes the SDGs of poverty eradication, food security and agricultural sustainability particularly daunting. Because anthropogenic forcing interacts with natural climate variability, climate change is experienced largely as shifts in the frequency and severity of extreme events. Evidence points to increasing risk from extreme events – including drought, flooding from extreme precipitation and coastal storm surge, and heat waves – in much of the developing world ([IPCC 2012](#); [IPCC 2014](#)). Interactions between climate change and natural variability impact crop seasonality and intensify biological threats. Extreme events erode livelihoods through loss of productive assets, while the uncertainty associated with climate variability is a disincentive to investing in agricultural innovation ([Carter and Barrett 2006](#); [Maccini and Yang 2009](#); [Morduch 1994](#); [Dercon 1996](#); [Simtowe 2006](#)). Within farming communities, the impacts are borne disproportionately by the relatively poor ([Rosenzweig and Binswanger 1993](#); [Zimmerman and Carter 2003](#)) and by women ([World Bank, FAO, IFAD 2015](#)). The combined *ex-post* impact of climate shocks on farmers' assets, and *ex-ante* impact of climate risk on farmer decision-making and investment by rural finance markets and supply chains contribute to poverty traps that lock many farmers in climate-vulnerable livelihoods ([Barnett et al. 2008](#); [Carter and Barrett 2006](#); [Barrett and Swallow 2006](#); [Barrett and Santos 2014](#)), thereby working against the transformation needed to adapt to climate change.

Scientific and strategic rationale. There is increasing recognition that adapting to climate change requires developing resilience to the risks associated with climate variability ([Burton and van Aalst 2004](#); [DfID 2005](#); [Thomas et al. 2007](#); [Cooper et al. 2008](#); [Baethgen 2010](#); [IPCC 2012](#)). Development organizations increasingly integrate resilience – one of the three pillars of CSA – into their programming. In a development context, “resilience” captures both protection of livelihoods from irreversible setbacks from stochastic shocks, and promotion of livelihoods that are currently in a low-level equilibrium (e.g. poverty trap) to a more desirable configuration ([Barrett and Constanas 2014](#)). By supporting farmers to adopt climate-smart practices while protecting them from climatic extremes, climate services, insurance and other climate-informed safety nets are part of an enabling environment for CSA ([Lipper et al. 2014](#)).

A surge of interest globally, and new strategic partnerships, have opened the door for major advances. The UN Global Framework for Climate Services (GFCS) formalized global commitment to develop climate services in vulnerable countries. Index-based insurance, which overcomes barriers to insuring

smallholder farmers, has gained momentum over the past decade ([Greatrex et al. 2015](#)). Major support is promised by the [G7 Initiative on Climate Risk Insurance](#), with the aim of extending climate hazard insurance to 400 million vulnerable people by 2020. Many countries include climate services and insurance in their INDCs ([Richards et al. 2015](#)). Yet major gaps in knowledge, information, capacity and evidence must be addressed in order for these interventions to be implemented effectively at the scale of the GACSA goal of 500 million farmers adopting CSA by 2030.

Hypotheses and scope. For the ToC, research will target two hypotheses: *H1*: Effective use of relevant climate-related information by farming communities; and by the insurance providers, agricultural planners, food security safety net interventions that serve them; enables more climate-smart agricultural systems and climate-resilient farmer livelihoods. *H2*: Overcoming key gaps in available climate information, in knowledge and methods to effectively target and implement climate-informed services and interventions, and in the evidence of their benefits, leads to more effective use of climate information by farmers and by the institutions that serve them. FP4 research priorities are informed by evidence, including CCAFS experience, that the impact of the target interventions is constrained by aspects of targeting, design and implementation; and by the quality and relevance of the information that they act on. The hypotheses relate *outcomes* to *impact* (H1), and research *outputs* to *outcomes* (H2).

CRP links. FP4, with PIM, will develop a cross-CRP Learning Platform (LP) to share knowledge, coordinate research and synthesise evidence on weather-related agricultural insurance. FP4 will work with other CRPs to: advance and assess the role of insurance to enhance uptake of drought-adapted maize in EA and WA (MAIZE), and rice in SEA and Nigeria (RICE); integrate index-based livestock into climate-smart strategies for pastoralists in Kenya and Ethiopia (LIVESTOCK); and advance index-based flood insurance in India and Bangladesh (WLE). FP4 collaboration across CRPs will include guidance on appropriate use of climate information, and access to historic and seasonal climate information and related tools.

2.4.1.2 Objectives and targets

Objectives. FP4 aims to work with partners to develop climate information and advisory services that support farmers, weather-related insurance that protects farmers and increases investment in CSA, food security early warning and safety net systems that protect livelihoods from extreme events, and climate informed planning by governments and by development organizations. These services will provide an enabling environment for smallholder farmers to transition towards more climate-smart production systems and climate-resilient livelihood strategies, while protecting them from climatic extremes. Research will develop the knowledge, methods, capacity and evidence needed to design, target and implement these interventions effectively at scale.

Strategic relevance to CGIAR objectives and targets: FP4 is designed to make a significant contribution to the reduced poverty SLO, which for CCAFS as a whole targets 11 million farm households with improved practices, and 9 million people for poverty reduction by 2022 (FP4 Figure 1; FP4 Table 1). FP4 targets 8 million farm households by 2022 with improved access to capital, with increased benefits for women. Through the cross-cutting IDOs FP4 will also contribute to the food and nutritional security SLO. It will contribute to four IDOs (**bold**) and five sub-IDOs (*italics*):

- **Mitigation and adaptation achieved;** via *enhanced capacity to deal with climatic risks and extremes*, as a result of more effective climate services, insurance programs and climate-informed safety net interventions; via an *enabled environment for climate resilience*, through economic analysis and policy guidance in support of investment of climate services funds.
- **Enhanced smallholder market access;** via *improved access to financial and other services*, including increased benefits to female-headed households and to women in male-headed households, through deep engagement with the insurance industry.
- **Equity & inclusion achieved;** via *gender-equitable control of productive assets and resources*, through improved access to gender-sensitive climate-based advisories and insurance.
- **National partners and beneficiaries enabled;** via *increased capacity for innovation in partner development organizations and poor and vulnerable communities*, through innovative methods for production and communication of agriculturally relevant climate information and advisories; and supporting improved climate service investment.

Mitigation and adaptation achieved. CoA 4.1, 4.2 and 4.3 contribute to *enhanced capacity to deal with climatic risks*, through research and engagement that strengthen climate services and weather-related insurance for vulnerable farmers. The current FP4 project portfolio is positioned to bring innovations into rural climate services and index-based insurance in the first 2 years of Phase II. Geographic focus will be reassessed with RPLs in late 2018, informed by assessment of the current portfolio, emerging opportunities and available resources. Bilateral funding is expected to support significant advances in climate services in Rwanda and Senegal. Progress will be enabled by growing interest in climate services and in index insurance among donors and development organizations. CoA 4.4 contributes to an *enabled environment for climate resilience* (with FP1) by engagement and analyses that shape investment in climate services and policy. Established FP4 relationships with major climate services programs (GFCS, ACPC, ClimDev-Africa (through ACPC and AfDB) and interested donors (USAID, DfID, WB (PPCR, GFDRR)), and inclusion of climate information services in 30% of INDCs that include agricultural adaptation measures, provide an enabling environment to influence major investments.

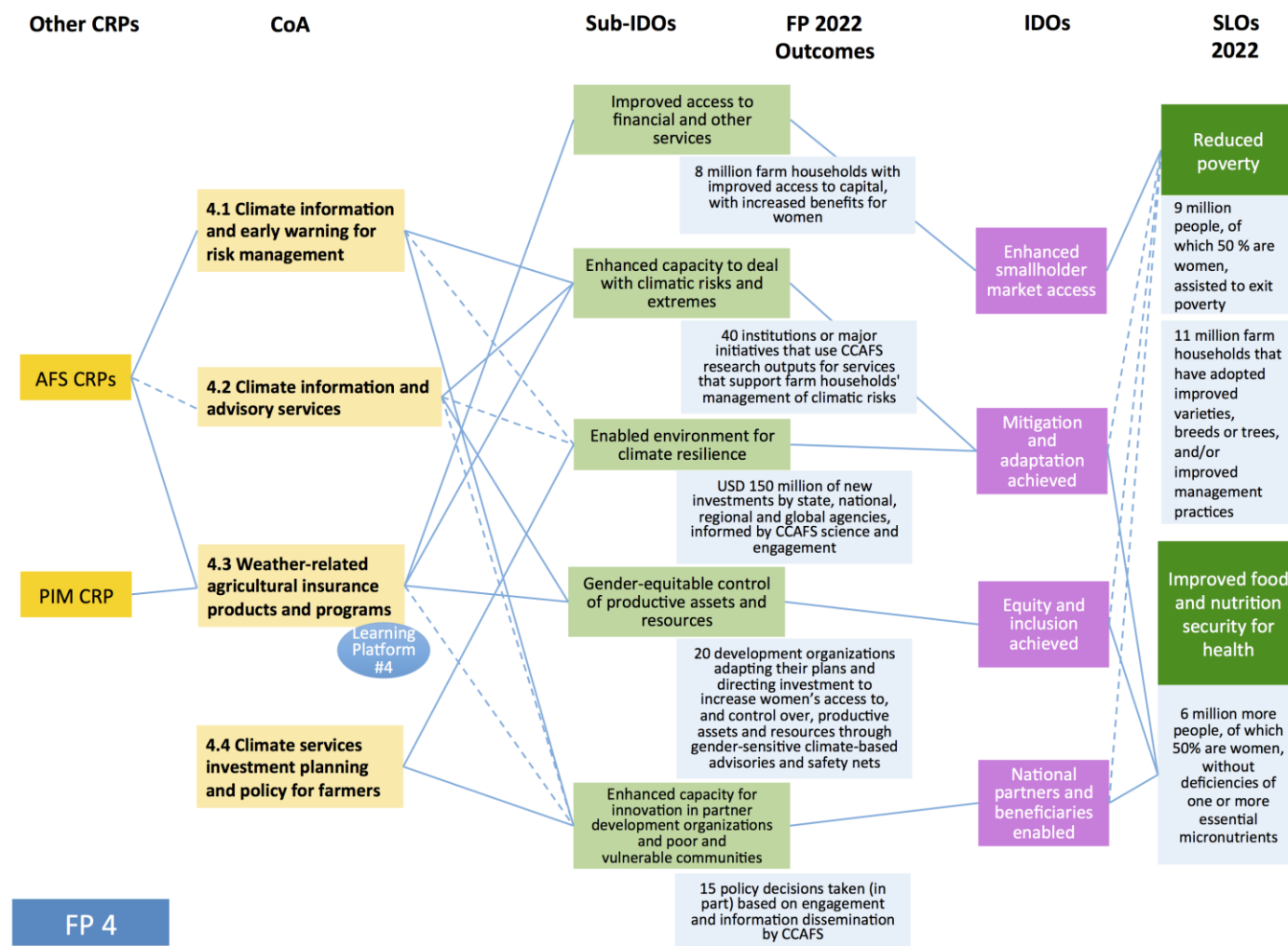
Enhanced smallholder market access. CoA 4.3 contributes to *improved access to financial and other services* by research that strengthens the design, targeting and implementation of insurance programs that enable vulnerable rural communities, including women, youth and disadvantaged groups, to manage climate risk and adapt to climate change. Well-designed and targeted insurance enhances smallholder farmers' access to financial and other services by overcoming risk as an obstacle to development of rural markets and value chains, and farmers' access to credit. As a Learning Platform, CoA 4.2 will support the efforts of AFS CRPs to bring insurance to bear on risk-related barriers to access to credit, the adoption of innovation and investment in value chains.

Equity & inclusion achieved. FP4 contribution to equity and social inclusion will focus on supporting rural climate services (CoA 4.2) and weather-related agricultural insurance services (CoA 4.3) that are responsive to needs of women, engaging to youth, and exploit students' influence on farming communities. Tailoring services to gender-specific needs, and improving the participation of women in these services, will contribute to *gender-equitable control of productive assets and resources*. As a Learning Platform, CoA 4.3 (with PIM) will foster sharing of knowledge across AFS-CRPs and WLE on challenges to providing gender-equitable weather-related agricultural insurance.

National partners and beneficiaries enabled. All CoAs contribute to *increased capacity for innovation in partner development organizations and poor and vulnerable communities*. Because they provide crucial information but their capacity is often constrained, CoA 4.1 has a focus on building capacity of NMS and regional climate centres to provide agriculturally relevant information. CoA 4.4 will enhance capacity of national and regional climate service efforts through supporting investment with economic and policy analysis. Work on climate information and advisory services (CoA 4.2), and weather-related agricultural insurance services (CoA 4.3) will include training and capacity development for implementing institutions, and training and capacity development for beneficiary farming communities.

FP4 Table 1. FP4 outcomes, and their targeted delivery over time

SLOs, IDOs, and sub-IDOs	2022 Outcome Description	Target					
		2017	2018	2019	2020	2021	2022
SLO: Reduced poverty							
IDO: Enhanced smallholder market access							
Sub-IDO: Improved access to financial and other services	8 million farm households with improved access to capital, with increased benefits for women	1.3	2.6	3.9	5.2	6.6	8.0
Crosscutting IDO on Mitigation and adaptation achieved (directed at poverty SLO and food and nutrition security SLO)							
Sub-IDO: Enhanced capacity to deal with climatic risks, extremes	40 institutions or major initiatives that use CCAFS research outputs for services that support farm households' management of climatic risks	8	16	24	32	36	40
Sub-IDO: Enabled environment for climate resilience	USD 150 million of new investments by state, national, regional and global agencies informed by CCAFS science	25	50	75	100	125	150
Crosscutting IDO on Equity & inclusion achieved (directed at poverty SLO and food and nutrition security SLO)							
Sub-IDO: Gender-equitable control of productive assets and resources	20 organizations adapting their plans and directing investment to increase women's access to gender-sensitive climate-based advisories and insurance	4	8	11	14	17	20
Crosscutting IDO: National partners and beneficiaries enabled (directed at poverty SLO and food and nutrition security SLO)							
Sub-IDO: Increased capacity for innovation in partner development organizations and in poor and vulnerable communities	15 policy decisions taken (in part) based on engagement and information dissemination by CCAFS	2	4	6	9	12	15



FP4 Figure 1. FP4 Impact Pathway. Under each CoA there will be several research outputs (see section 2.4.1.6). This FP contributes to the SLO targets (with other CCAFS FPs) but is accountable for delivery, with external partners, of the sub-IDO outcome targets.

2.4.1.3. Impact pathway and theory of change (for each individual FP)

The impact pathway for FP4 is given in FP4 Figure 1. The Flagship's Theory of Change (ToC) is explained by the assumptions and strategy below. Critical aspects of the ToC include working with partners, other CRPs, other CCAFS FPs and the CCAFS LP on CSA, Gender and Social Inclusion to deliver on outcomes, and building the capacity of actors in the impact pathway (see section 2.4.1.10). The CCAFS LP on Partnerships and Capacity for Scaling CSA will be a key route to achieve impact at national to global levels. The ToC is aligned to the CRP ToC.

The overall ToC for FP4 is that effective climate information and advisory services for farmers, and climate-informed safety net interventions, will enable farmers in environments prone to climate risk to transition towards more climate-smart agricultural systems and climate-resilient livelihood strategies, while protecting their livelihoods from climatic extremes. Improvements to the information that is available to farmers and the institutions that serve them, research that addresses gaps in knowledge and methodology to design effective services, enhanced capacity to bring new innovations into implementation, and evidence that supports well-targeted investment will enable the relevant institutions to provide more effective services at scale.

There is evidence that climate services, index-based agricultural insurance, and safety net interventions have potential to protect and enhance farmer livelihoods, but that a range of challenges currently limits the scale and impact of these interventions. These challenges include gaps between the climate-related information that is needed and what is routinely available; gaps in knowledge, methods, communication channels and capacity to develop services that meet farmer needs; and gaps in evidence of benefit to inform donors interested in scaling up these interventions. Efforts to scale up successful pilot initiatives often reveal additional challenges, including supporting equitable benefit by disadvantaged sub-populations, and particularly women farmers. In some cases, unresolved questions about which challenges represent fundamental constraints, and which can be overcome through improved design and implementation, represent a critical knowledge gap.

Recognizing CCAFS' comparative advantages, FP4's four clusters of activity and their associated research questions target these major gaps in knowledge, methodology, evidence and capacity that currently constrain the effective use of climate information to manage risk, enhance adaptive capacity and build resilience to a variable and changing climate. Addressing these constraints will be enabled through partnerships with the climate research, climate services, insurance and food security information communities. Work that is focused on developing effective climate services and weather-related insurance for smallholder farmers will pay particular attention to targeting women in order to address their differing needs and overcome gender-related inequalities. Given capacity limitations of many partners in the impact pathways, including national meteorological services and agricultural extension services in most CCAFS target countries, capacity development is an integral part of many activities. Capacity enhancement efforts will be structured to ensure participation of partners and, where appropriate, farmers in the co-development of products and services to ensure their usefulness. FP4 will prioritize women and young scientists for training activities in target countries.

FP4 will make use of tailored communications tools and approaches for engaging and informing next users, building on successes in Phase I. This includes learning events such as webinars and workshops, media outreach at the national and global level to share high-profile results and initiatives, and field

visits to share research in action with partners, potential investors and media. It also includes South-South learning.

As a result of FP4 research and engagement, credible, accessible and equitable climate services coupled with innovative insurance schemes will contribute to enabling small-scale farmers to intensify production, adopt improved technology and practice, invest in their soils in climatically favourable seasons, and to protect scarce assets in unfavourable seasons. Improved climate-related information will also support public, private and civil society actors in the food system – whose decisions impact rural food and livelihood security – to better manage the impacts of climate shocks. Whenever the impact of a climate shock, such as a drought or flooding, exceeds the capacity of small-scale farmers to cope, climate-informed, timely, well-targeted safety net interventions will build adaptive capacity by protecting food security, productive assets and infrastructure. The security will foster investment in climate-smart technologies and practices. The safety net aspect of the research involves the participation of public and private sectors, and actors involved in the management of the whole food chain and those involved in emergency relief.

The ToC depends on the following assumptions: (1) Interest in climate services and index-based agricultural insurance, by governments, development organizations and funders, will continue to grow. (2) Effective partnerships with relevant major organizations and initiatives working in climate services, agricultural insurance, and food security information and response will be maintained and expanded. (3) Investment in these interventions will be responsive to evidence, and will not be disrupted by major economic or political changes.

2.4.1.4. Science quality

State of evidence. There is growing consensus that resilience-building services, such as climate information services and weather-related insurance, play a vital role in CSA development. Efforts to design services that meet farmers' needs can build on a rich body of knowledge and experience. But critical gaps in evidence, particularly demand in the case of insurance and livelihood impacts in the case of climate services, must be addressed if they are to contribute to CSA at scale.

Index-based insurance has overcome obstacles (moral hazard, adverse selection, high transaction costs) that made traditional loss-based crop insurance infeasible for smallholders. Program evaluation ([Madajewicz et al. 2013](#)) and pilot-scale experimental studies ([Cole et al. 2013](#); [Karlan et al. 2014](#); [Hill and Viceisza 2012](#); [Mobarak and Rosenzweig 2013](#)) show that insurance can improve livelihoods by enhancing adoption of agricultural innovation. Payouts triggered by major climate shocks reduced loss of productive assets and hastened recovery ([Janzen and Carter 2013](#); [Bertram-Huemmer and Kraehnert 2015](#)). Low uptake rates in many initiatives and randomized trials have led to concern that low demand may limit the potential for index insurance to benefit smallholder farmers at scale ([Giné et al. 2008](#); [Cole et al. 2013](#); [Binswanger-Mkhize 2012](#); [Tadesse et al. 2015](#)). On the other hand, evidence that farmer demand is influenced by design-related factors, including the degree of basis risk ([Elabed and Carter 2015](#)) and farmers' understanding and trust in the products ([Hill and Viceisza 2012](#); [Karlan et al. 2012](#); [Cai et al. 2011](#)) suggests that improving design and implementation could enhance uptake. Recent rapid scaling of several initiatives suggests that uptake may be determined largely by evolving capacity to overcome the challenges and provide effective services ([Greatrex et al. 2015](#)).

Available evidence suggests there is considerable demand and use of climate information by smallholder farmers ([Hansen et al. 2011](#)). Empirical research shows that access to climate information influences farmers' decisions, even when resource constraints limit their options ([Ngugi et al. 2011](#); [Phillips et al. 2002](#); [Mudombi and Nhamo 2014](#); [Rasmussen et al. 2014](#); [Wood et al. 2014](#); [Bryan et al. 2009, 2013](#); [Gebrehiwot and van der Veen 2013](#)). Evidence that climate services improve farmer livelihoods is more limited, and comes largely from participatory pilot projects ([Patt et al. 2005](#); [Roncoli et al. 2009](#); [Rao et al. 2015](#)) and model-based valuation ([Hansen et al. 2009](#); [Roudier et al. 2012, 2014](#); [Meza et al. 2008](#)). As with insurance, the design of climate services can influence the benefits to farmers. Pilot-scale participatory research has improved understanding of farmers' needs, and produced innovative processes that improve farmers' understanding and use of climate information ([Patt et al. 2005](#); [Roncoli et al. 2009](#); [Rao et al. 2015](#)). Yet only a few pilot projects have attempted to address the widely recognized mismatch between available information and the needs of farmers and other agricultural decision-makers ([Lemos and Dilling 2007](#); [Ziervogel 2004](#); [Hansen et al. 2011](#); [Rasmussen et al. 2014](#); [Podesta et al. 2002](#)).

Development of research priorities. FP4 research priorities were developed in the process of redesigning the project portfolio at the start of the Extension Phase, and refined in response to CCAFS External Evaluation recommendations, a 2014 CCEE of the climate services component ([Feinstein 2015](#)) and ISPC evaluation of the Phase II pre-proposal. They have been shaped by stakeholder workshops on rural climate services and index-based insurance ([Tall et al. 2013](#); [de Nicola et al. 2011](#); [Garvin and Hansen 2014](#)), and understanding of key gaps in knowledge, methodology, capacity and evidence.

How FP4 will advance the science. FP4 research will focus on: (a) addressing key gaps in the information, knowledge, methodology and capacity needed to develop effective, equitable climate services and climate-informed safety nets (including insurance) at scale; (b) advancing innovations that address major bottlenecks to the delivery of effective services at scale, within the comparative advantage of CCAFS and its partners; and (c) strengthening and synthesizing evidence on the role that these interventions can play in building resilience and enabling CSA. Project-based MELIA, aligned with the overarching hypotheses, will be backstopped with strategic synthesis studies and evaluations.

Research to address key gaps will be undertaken in the context of implementation efforts at various stages of piloting and scaling, including: portfolios of activities coordinated by Regional Programs at CSV sites, pilot development of new innovations and scaling methodologies within the current FP core project portfolio, an expanding set of bilateral projects focused on implementation and capacity development at scale, and as research partner to externally led initiatives such as the GFCS. Through its partnerships with the climate research community; and exploiting a new generation of high-resolution gridded historical data ([Dinku et al. 2014a,b](#); [Funk et al. 2015](#)); FP4 is positioned to contribute to significant advances in the quality and utility of information that is available to support improvements in insurance, national climate services, early warning systems, and climate-informed decision-making at multiple levels. FP4 will continue work with partners to advance innovations in scalable and gender-sensitive communication processes that support scaling of rural climate and insurance services. Key gaps in evidence of demand and impacts will be addressed through: (a) improving the methodology and application of ex-ante cost-benefit methodology to investments in climate information and advisory services; (b) improvements in evaluation methods across CCAFS-related implementation efforts; and (c) periodic synthesis of emerging evidence across FP4 activities, the FP4 partner network and the literature. Projects under FP2 or AFS CRPs, that deal with risk management technologies and are co-

located with FP4 projects e.g. at CSV, will be used to study synergies and trade-offs between FP4 interventions and those technologies.

Managing for science quality. The core CCAFS project portfolio was developed through a competitive process, based on peer review of project concept notes and proposals. Additional commissioned research is used to fill critical gaps not covered within the core FP4 projects, to synthesise knowledge and evidence, and to provide background knowledge for promising new initiatives and research directions. Applying a results-based management system, CCAFS evaluates projects annually based on the significance and scope of Outcomes that are derived from research Outputs. CCAFS online Planning and Reporting platform is designed to support learning and the evolution of impact pathways. An annual FP4 science meeting will include internal assessment, reflection and learning across participating projects, researchers and Centres. A review of the FP4 portfolio, scheduled for 2018, will document progress and inform corrections to the research agenda and strategy.

Research team qualifications. The FP4 team brings a range of expertise to bear on understanding and managing climate related agricultural risks including: remote sensing, agricultural systems modelling, spatial analysis of risks and hazards, land and water resource modelling, plant physiology, agrometeorology, satellite rainfall estimation, seasonal to sub-seasonal climate prediction, statistics, agricultural supply chain analysis, agricultural market economics, farmer participatory methodology and gender analysis. The team has already made significant contributions to framing priorities to advance [climate services](#) and [index-based agricultural insurance](#), developing scalable [participatory](#) (with FP1) and [ICT-based](#) processes for communicating rural climate services, strengthening the evidence base for climate services, assessing [gender-based climate service](#) needs, and in advancing methods for [monitoring and forecasting climate impacts on crops](#). The FP4 Leader has 20 years of research experience on the use of information to manage climate-related agricultural and food security risks, including five years within his current CCAFS role.

2.4.1.5. Lessons learnt and unintended consequences

Research and engagement in Phase I led to successful piloting and scaling of insurance and climate services, significant advances in engaging major international climate service initiatives, and advances in methods and capacity targeted at key bottlenecks to producing and using relevant climate-related information. The scope of FP4 narrowed as the focus shifted from scoping and pilot testing to partnership and scaling, demands for evidence increased, and CCAFS shifted from a logframe to a theory of change approach at the start of the Extension Phase. Most farm-level adaptation practices address both progressive climate change and risk from climate variability, which led to boundary challenges between the Phase I climate risk management Theme and progressive adaptation Theme. Field- and farm-level risk management practices (e.g. crop diversification, water harvesting), were therefore incorporated into CSA Technologies and Practices (FP2), or dropped where progress was slow.

Additional feedback from various sources provided opportunities to refocus and strengthen the FP4 agenda and strategy. In line with a commissioned evaluation of Phase I climate services work ([Feinstein 2015](#)), FP4 research will fill a critical gap in economic analysis and evidence to inform investments in climate services; and develop solutions to the challenge of scaling up services, while also tailoring them to the diverse and context-specific needs of farmers and particularly vulnerable groups within farming communities. In response to ISPC commentary on the CCAFS pre-proposal, which cites published

arguments that demand limits the prospects for scaling up insurance for smallholder farmers, the insurance CoA (4.3) prioritizes research to understand demand and other potential bottlenecks to effectively scaling up insurance for smallholder farmers, and the degree to which they are amenable to intervention. ISPC commentary and discussion with colleagues led to more logically consistent and strategic formulation of the FP4 ToC hypotheses. In line with CCAFS External Evaluation recommendations, work on climate service investment was extended to include policy (CoA 4.4); and the insurance CoA (4.3) was extended to include influence of insurance on (mal)adaptation, and climate-adaptive social safety nets.

Information and insurance services carry risk of unintended consequences. For example, communicating inherently probabilistic forecast information in deterministic terms can trigger maladaptive decisions. Inequitable access might enable the privileged to use information to the detriment of disadvantaged groups. Because institutions that serve rural communities are often biased against women farmers ([Perez et al. 2015](#)), scaling up climate and insurance services carries the risk of reinforcing existing inequalities. Overly subsidized insurance may inhibit the shift from poorly adapted to better-adapted production systems, contributing to maladaptation. Where such risks are already recognized, research will be oriented towards anticipating them and developing pre-emptive solutions. For example, FP4 is developing training approaches to help intermediaries and farmers interpret forecasts in probabilistic terms to reduce the risk of inappropriate response, incorporating lessons from IRI's experience. All activities related to rural climate information or insurance services will assess and proactively target the needs and constraints of female and young farmers. Where FP4 research is connected to rural communities or the institutions that serve them, monitoring and evaluation will disaggregated by gender, and will be sensitive to potential unintended negative consequences. Achieving target contributions to IDOs and the Reduced Poverty SLO depends in part on maintaining effective partnerships and on continuing investment. While neither is under full control of CCAFS, FP4 will devote much effort to maintaining and developing strategic partnerships.

2.4.1.6. Clusters of activity (CoA)

Four clusters of activity (CoAs) address knowledge, methodology, evidence and capacity gaps that constrain the effective use of climate information to manage risk and build resilience. CoA 4.1 deals with producing information about climate variability and its impacts, tailored to decision-maker needs. CoA 4.2 ensures that farmers and the institutions that serve them have access to actionable climate information. CoA 4.3 supports weather-related insurance and adaptive safety nets for smallholder farming communities. CoA 4.4 supports scaling of climate services through investment and policy. Improving the utility of information and capacity of information providers (CoA 4.1) supports the use of climate information within climate services (CoA 4.3) and insurance (CoA 4.3). Engagement, evidence and investment planning (CoA 4.4) facilitates the investment needed to develop effective climate services (CoA 4.1 and 4.2) at scale.

CoA 4.1 Climate information and early warning for risk management

This CoA is about the production of relevant information (historic, monitored, predicted) about climate variability, including predictions of impacts of seasonal to sub-seasonal climate variations and extreme

events on agricultural production and biological threats, to enable better management of risk. It will enhance the capacity of NMS, regional climate centres, and food security information systems to respond to the information needs of decision-makers. Improved climate-related information and tools will contribute to improved early response and contingency finance systems for responding to extreme events, and improved climate screening methods that development funders increasingly require. CoA 4.1 complements FP1 work on climate change projections for priority setting (CoA 1.1). Many promising opportunities to manage risk, protect and enhance smallholder livelihoods, and adapt to a changing climate are information-dependent, but are constrained by the availability of relevant information. These include government agricultural planning and food security management, index-based insurance and climate-informed rural advisory services. An Africa-focused multi-stakeholder gap analysis concluded that inadequate provision of climate information and weak effective demand by development practitioners are mutually-reinforcing, therefore both must be addressed in parallel ([IRI 2006](#)).

Key research questions are: What is the potential for merging remote sensing and reanalysis data with ground observations, to fill gaps in historical meteorological data and support real-time monitoring with useful accuracy and resolution? To what degree can advances in climate science and system modelling improve the lead-time, accuracy and spatial resolution of forecasts of the impacts of seasonal climate on agricultural production and biological threats? What are the most efficient strategies to produce locally relevant climate information tailored to particular decision-makers; and to what degree can these strategies enable resource-constrained national meteorological services to expand agriculturally relevant services? Can probabilistic seasonal forecasts be integrated with models of production, price, and household food security, to develop a rigorous predictive component to food security information systems?

Advancing this research requires collaboration between agricultural and climate science, and participation of information users. Research will include methodology and tool development; and place-based efforts to address gaps and build capacity to meet information needs of agricultural planning, rural climate services (CoA 4.2), and index-based insurance (4.3). High-quality, merged historic gridded data sets provide a foundation for downscaling climate predictions; and for operational climate information providers to assess their quality, with backstopping from climate experts from IRI and other advanced research institutes. It will be informed by FP1 and FP2 work to advance CSA practice, and inform CSA priorities and policies. Expected research outputs include:

- validated methods for seasonal and sub-seasonal prediction of agriculturally-relevant information;
- methods and tools to improve agricultural monitoring systems; forecast impacts of seasonal climate and extreme events on crops and biological threats; and extend the lead time and accuracy of food security early warning systems;
- guidance on interpretation and appropriate use of climate change projections;
- efficient methods to tailor historic and forecast climate information to farmers' needs;
- facilitated access to available historic and seasonal climate information and related tools.

CoA 4.2 Climate information and advisory services for farmers

This cluster addresses the design, communication and institutional challenges in providing effective, equitable climate services that benefit smallholder farmers at scale (in line with CCAFS External Evaluation recommendations); including integrating climate information into agricultural advisory services and into the operations of institutions that support farmers. It will develop and evaluate communication strategies that address particular needs of women, and that involve youth and exploit [students' influence on farm communities](#). With enabling institutional support and policies, climate information and advisories offer great potential to inform farmer decision-making, enabling farmers to better manage risk, take advantage of favourable climate conditions and adapt to change. CoA 4.2 therefore contributes to FP1 work on enabling policy environments for CSA (CoA 1.3). CCAFS is positioned to leverage growing interest among development organizations that see climate services as a way to support climate change adaptation and climate-resilient development goals. While mounting evidence of the potential benefits has made the case for climate services, a substantial body of research also shows that the availability of information is often not sufficient for smallholder farmers to benefit. Benefits are often constrained by gaps between known farmers' needs; and the types, scale, formats, and timing of the information that are routinely available ([Hansen et al. 2011](#)). Research targets five key challenges that have been validated by stakeholders in the initial CCAFS focus regions in Africa and SA ([Tall et al. 2013](#)), namely: salience, access, legitimacy, equity and integration.

Key research questions are: How, and to what degree, can rural climate services be scaled up, while meeting context- gender- and age-specific user needs? What factors enable or constrain the ability of smallholder farmers – particularly women, youth and marginalized groups – to access and benefit from climate services; and what is the scope for enhancing capacity to respond? In a given context, how can actionable climate-related information best be identified, packaged and communicated along with its uncertainties? What are the best communication channels and institutional arrangements for co-production of climate services at scale, that are sufficiently tailored to the differing needs of women and vulnerable user groups, and that engage the creativity and social media channels of youth? How can institutional communication networks and decision processes be optimized to take advantage of increased lead-time, in order to link early warning to early action?

Research questions will be answered in the context of efforts to develop climate services at pilot to national scales including: ongoing work at CSV sites (with FP1 CoA 2.1), the new FP4 project portfolio, an expanding set of bilateral projects currently in EA and WA, and partner-led initiatives such as the GFCS. Participatory approaches will be integral. Evaluation of how farmers and other relevant decision-makers access, use and benefit from information will strengthen the evidence base. Expected research outputs include:

- evidence and insights from CSVs (with FP1), climate service pilots and national implementation initiatives;
- scalable communication channels based on ICT and radio;
- methods and curricula to equip intermediary organizations to deliver services to rural communities (with FP1);
- methods to identify and meet particular climate service needs of women and youth;
- institutional arrangements that foster sustainable co-production of services with relevant agencies and targeted rural communities;

- tools and evidence to improve the nature, timing or targeting of climate-informed agricultural planning and food security interventions.

CoA 4.3 Weather-related agricultural insurance products and programs (Learning Platform – LP4)

This cluster will strengthen knowledge and evidence about how to design, target and implement insurance and adaptive safety nets that enable vulnerable rural communities (in line with CCAFS External Evaluation recommendations), including women, to manage climate risk and adapt to climate change. Working with partners, research will improve index design to reduce basis risk, develop and test gender-responsive communication and participatory design methods, develop strategies to engage youth and exploit their creative influence on farming communities, and develop and test strategies for integrating insurance with climate-smart technologies. It will assess farmer demand and other determinants of scaling, impact of insurance on access to credit and adoption of climate-smart technologies and practices, and impacts on adaptive and maladaptive behaviour. Research questions on design and targeting, and influence of insurance on (mal)adaptation, are in line with CCAFS External Evaluation recommendations. Work on insurance to foster adoption of CSA technologies at scale links to FP2 (CoA 2.4) and FP1 (CoA 1.3). As a LP for AFS-CRPs and WLE, it will foster knowledge sharing and coordination, connections with relevant initiatives, and work across CRPs to explore solutions to the challenges of developing viable insurance for smallholder farmers at scale. Although coverage remains small globally and uptake is often disappointing, several well-designed and targeted index-based insurance initiatives are overcoming the challenges of insuring smallholder farmers. Index insurance is a core component of CSVs across CCAFS regions. Initial CCAFS-led work in India and Nigeria has shown huge potential to support the livelihoods of millions of vulnerable households by protecting productive assets, and enabling access to credit and improved technologies. Recent evidence refutes earlier doubts about the feasibility of providing insurance for relatively poor farmers at scale, and highlights the importance of insurance specific risk-related development needs ([Greatrex et al. 2015](#)).

Key research questions are: What are the key bottlenecks to effectively scaling up insurance for smallholder farmers, and are they amenable to intervention? How does insurance influence either adaptive or maladaptive behaviour in given contexts, and how can it be designed and targeted to maximize positive adaptation and minimize risk of maladaptation? What is the potential for advances in agricultural systems modelling, remote sensing, data assimilation and other relevant technologies to design scalable insurance products that capture the important risks and increase farmers' satisfaction? How can insurance be best designed, bundled with other synergistic risk management options, and targeted to address particular climate-related agricultural risks? What public-private partnership arrangements and business models best enable insurance for smallholder farmers in a given context, in a manner that is scalable and sustainable? What is the scope for index-based triggers to enhance the contribution of social safety net programs to climate resilience?

Similar to CoA 4.2, research questions will be answered in the context of existing and new insurance programs, and pilots that are developed with a view to implementation at scale including ongoing work at CSV sites. Research will be coordinated with relevant external programs and networks. Work on developing improved insurance indexes will link closely with CoA 4.1. As a Learning Platform, CoA 4.2 will foster greater coordination and knowledge sharing within a community of researchers across the CGIAR. Collaboration with AFS-CRPs under this LP will emphasize the role of insurance in overcoming

risk-related barriers to the adoption of innovation and investment in value chains. The research will be informed by efforts under FP2 to address constraints to adoption of CSA.

Expected research outputs include:

- evidence of the benefits of agricultural insurance on smallholder livelihoods and adoption of CSA; and the factors that determine benefit;
- tools and indexes that better cover important risks and raise satisfaction of farmers and insurers, including atlases of risks and triggers for weather index insurance in target countries;
- science-based schemes for targeting and scaling insurance as an effective risk management option;
- communications and capacity-building approaches, including South-South learning;
- sustainable public-private partnership and business models.

CoA 4.4 Climate services investment planning and policy

This cluster will support the development of climate services at scale, through analyses and evidence that guide climate service investment and integration into policy (with FP1). It will engage major stakeholders, policy processes and donors that support climate, and advance ex-ante analysis and synthesis of evidence of the development impacts of investment options. Economic analyses and evidence will support national efforts integrate climate services into policy and access adaptation funds. CoA 4.4 complements FP1 work on ex-ante evaluation and priority setting (CoA 1.1) and enabling policy (CoA 1.3), and FP2 work on evidence and investment planning for CSA (CoA 2.2). Guiding integration of climate services into national policies and funding priorities, and shaping how major programs and donors invest in climate services, provide opportunity to expand the impact of FP4 research. CCAFS has developed relationships with the GFCS and several relevant investors (USAID, WB, DfID, IFAD). Despite mounting evidence that has supported the case for climate services, a gap remains in the quantitative evidence of the returns on investment that development donors increasingly require. An FP4-commissioned evaluation ([Feinstein 2015](#)) and CCAFS External Evaluation draft recommendations highlighted this as a critical gap and research priority.

Key research questions are: What are the costs and benefits of alternative options for investing in climate services for agriculture and food security? What methods can best overcome current address gaps in the knowledge and evidence needed to inform national and regional investments in climate services? How can donors and technical support institutions best target and coordinate efforts to build capacity for climate services, considering potential synergies and overlaps? How can climate services and early warning be best integrated into national adaptation and Food and Nutrition policies?

The research will initially be addressed through a CCAFS position hosted by ACPC and supported by a small team of interested experts, to develop and adapt methods (e.g. [WMO](#), [WBG](#), [GFDRR](#) and [USAID 2015](#)) for ex-ante cost-benefit analysis of climate services investments, and apply them in Africa. Economic analyses and engagement with major climate services partners and funders will be tied to and informed by research and capacity development activities under CoA 4.1 and 4.2.

Expected research outputs include:

- synthesised *ex-post* evidence of impacts of climate services on agricultural livelihoods and food security;
- improved methods for ex-ante evaluation of climate services investments;
- strategy guidance to identify bottlenecks and target investments across the chain of climate services;
- analyses of alternative climate services investments at national to regional scales;
- strengthened capacity to integrate climate services within national adaptation policy and access climate finance;
- analysis of the potential benefit of national open data policies, and the cost of restricting access in order to raise revenue by selling data.

2.4.1.7. Partnerships

FP4 partners with major global and regional actors in climate science, climate services, insurance and food security information systems where: (a) untapped synergies offer opportunity to advance the agenda, or (b) partners are positioned to bring research into development at scale. The current set of partners reflects engagement and learning through Phase I; and the process of developing a new outcome-focused, regionally coordinated project portfolio in the Extension Phase.

Research partners either provide expertise that complements CGIAR core strengths, or bring capacity in a particular area that enables rapid progress. U of Reading contributes expertise in use of meteorological data, and participatory communication approaches. U of Florida supports development and application of crop forecasting tools, leveraging the AgMIP crop modelling network and tools. Larger projects in the new FP4 portfolio involve regional research partners: CATIE in Latin America and AGRHYMET in W Africa. Most projects partner with relevant NARS or national universities.

Most FP4 partners play a role in impact pathways, e.g. as service providers, policy drivers, change agents, or funders. Global partners include climate services (e.g. WMO, GFCS, GFDRL, USAID, DfID), and food security early warning and response (e.g. WFP, FAO, FEWSNET, ACF). CoA 4.1 involves national meteorological services; and climate (e.g. AGRHYMET, ICPAC, RIMES, IITM) institutions that also contribute to research. CoA 4.2 involves communications partners: agricultural extension and NGOs that work with rural communities (World Vision, CARE), and media and ICT ([FRI](#), [Manobi](#) (Senegal), [Esoko](#) (Ghana), [URAC](#) (Senegal), [AGRONET](#)). CoA 4.3 engages insurance parastatals of India and Nigeria, the private insurance sector, and experienced technical partners (GIZ, Pula Advisors). Activities generally engage agriculture and other relevant ministries and agencies, as sustainability depends on government buy-in.

Private sector partnerships, which include insurance (e.g. SwissRe, ACRE), and ICT and media (Manobi Société Anonyme, ESOKO, URAC), are expected to expand as opportunities to scale up climate services and insurance mature. FP4 partners with consulting companies (e.g. Pula Advisors for insurance in Nigeria) that are strong in particular niches outside of CGIAR core strengths.

Comparative advantage of CGIAR. Although FP4 focuses on innovations that are relatively new to CGIAR as a whole, new partnerships have already enabled CCAFS to make significant advances that would not have otherwise been possible. CGIAR’s deep understanding of smallholder agriculture, combined with new partnerships within the climate research and climate services communities, have enabled significant progress in methods to provide more effective climate services for smallholder farmers. CGIAR brings to the climate community understanding of climate-sensitive farmer decisions, and a wealth of experience communicating with farmers. CGIAR understanding of how weather impact crops and biological threats provide opportunities to improve food security early warning systems. While recent innovation in index-based agricultural insurance has been largely driven from outside of agriculture, CGIAR offers the insurance community experience in at least 18 countries from an agricultural research-for-development perspective; deep understanding of agricultural risks and their impact on smallholder farmers; understanding of interactions among insurance, improved seed, production technologies and value chains; and practical impact evaluation expertise. Hosting FP4 (in its earlier forms) at the IRI has facilitated partnerships with the broader climate services, index insurance and humanitarian communities while providing direct access to the IRI’s expertise in climate science and its application to a range of climate challenges across the developing world.

2.4.1.8. Climate change

Climate risk is a barrier to the adoption of innovation and investment in smallholder agriculture. By improving the management of climate risk and the utility of climate information, FP4 will backstop the AFS-CRPs as they contend with these challenges. FP4 deals with interventions that are relatively new to the CGIAR; and will support researchers across the CGIAR to build on knowledge, methods and networks developed through Phase I. FP4 will work with PIM’s Social Protection Strategies and Programs Flagship, and MAIZE CRP’s Identifying value chain opportunities to enhance smallholder livelihoods CoA, to establish a Learning Platform (LP4) on Weather-Related Insurance (CoA 4.3) that will facilitate knowledge sharing and coordination across CRPs, and support the efforts of AFS-CRPs to bring insurance to bear on risk-related barriers. FP4 is also in a unique position, through its IRI host, to provide guidance on appropriate use of climate information across CRPs.

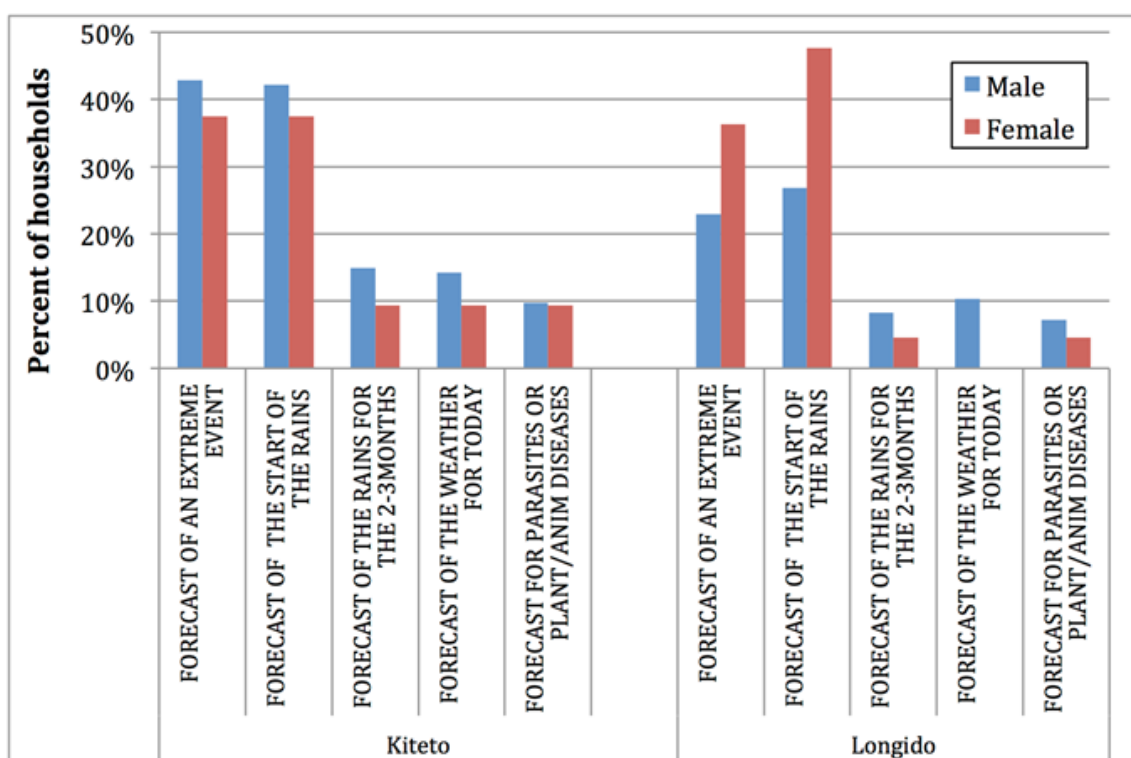
Strong partnerships with the climate research, climate services, humanitarian and insurance communities have enabled FP4 to be positioned as a global player. This has been fortified through strong communications. CCAFS partnership with IRI, which leads FP4, provides access to development-focused climate science expertise, and global climate services and index insurance networks. Furthermore, engaging the major external initiatives and funders that are seeking to scale up climate services and index-based insurance requires a critical mass of coordinated activity. FP4 will continue to act as a focal point for a growing set of strategic partnerships that can benefit other CRPs as they seek to integrate climate-related information and early warning systems, climate services, and weather-related insurance and safety nets into their strategies.

2.4.1.9. Gender

Location-specific social norms impose gender-differentiated responsibilities and constrain women’s choices ([Huyer 2012](#)), leading to differences in the types of information that women need and

information channels they can access ([Archer 2003](#); [McOmber et al. 2013](#); [Jost et al. 2015](#); [Tall et al. 2014](#); [Poulsen et al. 2015](#); FP4 Figure 2). Women who do access information use it to adapt their practices ([Kristjanson et al. 2015](#); [Twyman et al. 2014](#)). Similarly, women farmers who access index-based insurance have been shown to benefit at least as much as male counterparts ([Madajewicz et al. 2013](#)). Rural information, advisory and insurance services have the potential to protect and empower women if they recognize their differing needs, and design services and communication channels to overcome the obstacles women face. However, if they fail to understand and effectively target the needs of women, they could reinforce the gender bias that is prevalent in formal institutional structures ([Perez et al. 2015](#)).

Research under CoA 4.2 and 4.3 will strengthen understanding of how climate services and agricultural insurance can meet the differing needs of women farmers; incorporate those insights into efforts to scale up climate services and agricultural insurance; and test the degree to which these services can be gender transformative by improving control of resources and participation in decision-making (see Section 1.0.4 for gender-related hypothesis). Current evidence will be synthesised and new knowledge and evidence will be generated to inform the design and implementation of gender-equitable services. FP4 will contribute to the sub-IDO, *gender-equitable control of productive assets and resources*, through methods, insights and evidence that will lead organizations to adapting plans and directing investment to increases women's access to, and control over, productive assets and resources. At least 40% of farmers that benefit from FP4 interventions will be women.



FP4 Figure 2. Current climate information received by households, CCAFS Baseline Survey

Source, [Tall et al. 2015](#)

2.4.1.10. Capacity development

Mutually reinforcing capacity constraints in the production and use of climate information have constrained the development of effective climate services in target regions, and must be addressed in parallel ([IRI 2006](#)). Likewise, investing in the capacity of insurers, local intermediaries (e.g. agro-dealers, agricultural extension), and in parallel enhancing the capacity of farming communities to understand insurance and contribute to its design, has contributed to scaling within several index insurance initiatives ([Greatrex et al. 2015](#)). Because resource constraints and mandates often limit the capacity of meteorological services to support agriculture, FP4 will work with NMS to assess capacity needs and inform intervention strategy, supporting efforts to ensure that development funds invested in NMS are well targeted and coordinated. FP4 will focus on partner capacity building in four areas of the CapDev Framework: (1) Learning materials and approaches: FP4 will incorporate successful approaches to communicating climate information with farmers into innovative learning materials, to mainstream them within agricultural extension and intermediary organizations. Experience with the design and delivery of innovative learning materials and approaches will also be extended to insurance, to enable local dealers and intermediary organizations to help rural communities make appropriate decisions about agricultural insurance options; (2) Gender-sensitive approaches: For example tailoring the content and format of agro-advisory services will to accommodate preferences of women farmers; (3) Organizational development: For example collaborative work (“ENACTS”) with IRI to equip African NMS to reconstruct historic weather data, and make high-resolution products tailored to user needs available through web-based “maprooms”; (4) Institutional strengthening: Includes developing national governance frameworks for climate services, in coordination with WMO under the GFCS.

2.4.1.11. Intellectual asset and open access management

FP4 will seek to maximize global accessibility and impact through its production and dissemination of public goods, in conformity with CGIAR Intellectual Asset Principles (see Section 1.0.12) and CCAFS Open Access Strategy (Annex 3.8).

FP4 has a particular focus on climate-related information. The IRI, which hosts FP4, provides free access to an extensive set of climate and related data; and powerful data manipulation, analysis and visualization tools; through its online Data Library. Climate data and derived products, produced by CCAFS as global public goods, will be made freely available through the IRI Data Library and other appropriate open access data portals.

Although CCAFS champions open access and the public goods nature of information, climate observations are often intellectual assets of national meteorological services (NMS). Most NMS in the developing world have restrictive data access policies that are driven by national policy or by requirements to raise revenues. When developing new climate information products, CCAFS will give priority to building the capacity of mandated information providers such as NMS, and avoid producing products that compete with these institutions. CCAFS will honour any restricted use policies and agreements. By working with partners such as WMO, GFCS and ACPC, it will also strengthen and communicate evidence of the benefits of free data access, and where feasible build capacity of NMS to develop alternative business models around value-added services.

FP4 field-testing involves extensive work with farmers and local organizations. This includes working with traditional knowledge (e.g. traditional ways of predicting the weather of the coming season). FP4 will pay attention to respecting the traditional knowledge of farmers, maintaining confidentiality where appropriate, embracing prior informed consent and ensuring that results are returned to all partners in the research process.

2.4.1.12. FP management

FP4 will continue to be hosted by the International Research Institute for Climate and Society (IRI), Columbia University, as it has since 2010. A global leader in research at the interface of climate science and development, IRI is at the forefront of the development of climate services, and has contributed to major agricultural index insurance initiatives throughout the developing world.

FP4 will be led by Jim Hansen, who was competitively selected in Phase I. His 20 years of research focused on climate information use and climate risk management for agriculture has contributed 120 research and technical publications (Google H-index 35). As FPL, he has overseen development of a portfolio involving 7 Centres across all 5 CCAFS regions. He was instrumental in positioning CCAFS within major climate service initiatives and mobilizing US\$8M bilateral funds for climate services. His research on participatory communication strategies and crop forecasting methods have been integrated into CCAFS work in Africa and Asia.

The research portfolio will be managed in two periods. Assessment of the current portfolio, emerging opportunities and available resources in 2018 will inform adjustments to the research portfolio and potentially the geographic balance in 2019, with increased emphasis on mainstreaming in policy and investment.

Sophia Huyer (GSI Leader) will co-lead knowledge synthesis and strategy for gender and social inclusion for rural climate services (CoA 4.2) and insurance (CoA 4.3). FP Project and Activity Leaders, who comprise the FP4 core team (Annex 3.8), will play an advisory role. Annual FP4 science meetings will foster internal learning, coordinate research, and identify emerging priorities. The Weather-Related Insurance Learning Platform (LP4) will be developed collaboratively with Daniel Gilligan (PIM) and Jonathan Hellin (MAIZE), building on cross-CRP work on insurance to enhance uptake of drought-adapted seed in EA and Nigeria.

2.4.2 Flagship Budget Narrative

2.4.2.1 General Information

CRP Lead Center's Name: CIAT

Center Location of Flagship Leader: Columbia University-IRI

2.4.2.2 Summary

Total Flagship budget summary by sources of funding (USD)

Funding Needed	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total
W1+W2	3,961,509	4,159,584	4,367,564	4,585,942	4,815,239	5,056,001	26,945,839
W3	-	-	-	-	-	-	-
Bilateral	5,930,764	5,823,369	5,767,918	5,641,333	5,548,541	5,519,141	34,231,067
Other Sources	-	-	-	-	-	-	-
Total	9,892,273	9,982,954	10,135,482	10,227,275	10,363,780	10,575,142	61,176,906

Funding Secured	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total
W1+W2 (Assumed Secured)	3,961,509	4,159,584	4,367,564	4,585,942	4,815,239	5,056,001	26,945,839
W3	-	-	-	-	-	-	-
Bilateral	4,151,535	3,202,853	1,153,584	507,720	-	-	9,015,692
Other Sources	-	-	-	-	-	-	-
Total	8,113,044	7,362,437	5,521,147	5,093,662	4,815,239	5,056,001	35,961,530

Funding Gap	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total
W1+W2 (Required from SO)	-	-	-	-	-	-	-
W3 (Required from FC Members)	-	-	-	-	-	-	-
Bilateral (Fundraising)	(1,779,229)	(2,620,516)	(4,614,335)	(5,133,613)	(5,548,541)	(5,519,141)	(25,215,376)
Other Sources (Fundraising)	-	-	-	-	-	-	-
Total	(1,779,229)	(2,620,516)	(4,614,335)	(5,133,613)	(5,548,541)	(5,519,141)	(25,215,376)

Total Flagship budget by Natural Classifications (USD)

	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total
Personnel	3,678,147	3,741,737	3,822,901	3,906,148	3,992,456	4,081,012	23,222,401
Travel	591,884	656,183	661,189	666,363	671,715	671,303	3,918,637
Capital Equipment	39,250	39,382	39,516	39,655	39,797	39,943	237,543
Other Supplies and Services	2,020,741	1,964,939	1,996,022	1,971,348	1,981,581	2,059,654	11,994,285
CGIAR collaborations	107,523	112,116	116,939	122,004	127,321	132,905	718,808
Non CGIAR Collaborations	2,345,448	2,348,637	2,360,361	2,372,600	2,385,387	2,398,743	14,211,176
Indirect Cost	1,109,281	1,119,960	1,138,553	1,149,157	1,165,524	1,191,581	6,874,056
Total	9,892,273	9,982,954	10,135,482	10,227,275	10,363,780	10,575,142	61,176,906

Total Flagship budget by participating partners (signed PPAs) (USD)

	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Total
CIAT	1,151,098	1,161,211	1,171,729	1,182,668	1,194,046	1,205,881	7,066,633
AFRICARICE	-	-	-	-	-	-	-
BIOVERSITY	425,078	466,386	480,482	495,001	509,955	525,357	2,902,259
CIFOR	15,000	15,648	16,328	17,042	17,791	18,578	100,387
CIMMYT	1,047,898	1,048,426	1,098,355	1,102,300	1,148,273	1,272,023	6,717,274
CIP	36,000	36,816	37,657	38,523	39,415	34,583	222,994
ICARDA	-	-	-	-	-	-	-
ICRAF	1,587,727	1,598,064	1,643,729	1,672,997	1,703,142	1,734,192	9,939,851
ICRISAT	1,984,986	1,984,986	1,984,986	1,984,986	1,984,986	1,984,986	11,909,914
IFPRI	718,138	718,043	718,134	718,119	718,102	718,141	4,308,677
IITA	-	-	-	-	-	-	-
ILRI	963,000	971,011	982,206	993,737	1,005,613	1,017,846	5,933,413
IRRI	171,880	171,880	171,880	171,881	171,880	171,880	1,031,280
IWMI	722,969	741,983	761,497	781,524	802,079	823,173	4,633,225
WORLD FISH	-	-	-	-	-	-	-
Copenhagen University	170,000	170,000	170,000	170,000	170,000	170,000	1,020,000
CIAT-Gender & Social Inclusion Leader	122,500	122,500	122,500	122,500	122,500	122,500	735,000
Columbia University-IRI	776,000	776,000	776,000	776,000	776,000	776,000	4,656,000
Total	9,892,273	9,982,954	10,135,482	10,227,275	10,363,780	10,575,142	61,176,906

Explanations of these costs in relation to the planned 2022 outcomes:

(Outcome numbers as in PIM Table B)

The largest proportion (40%) of the Flagship 4 budget goes to research contributing to **Outcome 4.2** (40 institutions or major initiatives that use CCAFS research outputs for services that support farm households' management of climatic risks). This outcome receives the largest portion because the use of CCAFS research and engagement to strengthen climate information, insurance and safety net services is the major aim of FP4 and a scalable mechanism to contribute to the resilience of farming communities and an enabling environment for CSA. **Outcome 4.1** (8 million farm households with improved access to capital, with increased benefits for women) receives 25%, the next largest portion of the budget. This Outcome is focused on the use of weather-related insurance to enhance access to credit – a major constraint to smallholder farmers adopting CSA in many countries. **Outcome 4.4** (20 development organizations adapting their plans and directing investment to increase women's access to, and control over, productive assets and resources through gender-sensitive climate-based advisories and safety nets) receives 15% of the flagship 4 budget. **Outcome 4.3** (USD 150 million new investments by state, national, regional and global agencies, informed by CCAFS science and engagement) and **Outcome 4.5** (15 policy decisions taken (in part) based on engagement and information dissemination by CCAFS) receive an equal share of 10% each. Once innovations are developed, tested and brought into improved design and implementation of services for farmers, influencing investment and policy provide opportunity to scale out these innovations at relatively low cost to CCAFS.

The 40% budget related to **Outcome 4.2** is directed toward working with partners to develop, test and pilot promising tools and methods to provide decision-relevant climate-related information, climate services for farmers, and weather-related agricultural insurance. This is divided roughly evenly between

improving climate-related information (CoA 4.1) and developing climate services (CoA 4.2), with a smaller portion devoted to methods and tools for agricultural insurance (CoA 4.3). The 25% related to **Outcome 4.1** is largely focused on scaling insurance that is targeted toward improving access to credit and uptake CSA and other agricultural innovations (part of CoA 4.3). Ongoing examples include efforts to improve farmer satisfaction with index-based insurance, and plans to support the development of a community of practice and public-private partnership to implement flood insurance, both in SA. Funds related to **Outcome 4.4** are used for research under CoA 4.2 (climate services) and CoA 4.3 (insurance) to strengthen understanding of how climate services and agricultural insurance can meet the differing needs of women farmers; incorporate insights into efforts to scale up gender-responsive climate services and agricultural insurance; and test the effectiveness of those services on women's participation and empowerment. This is the primary focus of work on rural climate services led by CARE and ICRAF in SEA. Funds related to **Outcome 4.3** support CoA 4.4 activities including: development of improved ex-ante valuation methods appropriate for climate information services, and engagement and analyses that inform major investments in climate services, beginning in Africa through partnership with ACPC. Funds related to **Outcome 4.5** are used to strengthen evidence, and support engagement and science-policy dialogs that bring climate services and insurance into national agricultural development and adaptation plans (in collaboration with FP1).

W1/2 funds will generally support development of the knowledge, methods, tools and evidence needed to design, target and implement FP4-related interventions (climate services, weather-related insurance and safety nets) effectively at scale. W1/2 funds will support development, piloting and testing of innovative methods to support these services. Because the research priorities and hypotheses are focused on scalable contributions to the adoption of CSA and transformation to more climate-resilient livelihoods, W1/2-funded core research to address key gaps must be undertaken in implementation contexts that include the early stages scaling. For example, in SA, W1/2 funds are being used to develop and test innovations in index-based agricultural flood insurance. To test the viability of the innovations at scale, the IWMI-led research involves development of public-private partnerships and engagement of the insurance industry that will test the viability and acceptability of the index-based flood insurance at sufficient scale to inform further investment by donors, governments and the insurance industry. As another example, W1/2 funds have been used to support the development, piloting and early scaling of the ENACTS approach to building NMS capacity to produce high-resolution climate information products (led by IRI), and the PICSA approach to building the capacity of agricultural extension services to communicate climate information with farmers (led by U. Reading). This provided a foundation for bilateral funding for a CCAFS-led project that will integrate these methods into operational climate services for the agricultural sector at a national scale in Rwanda, providing further evidence and insight to inform implementation and investment elsewhere.

FP4 funds are allocated among 10 Centres. CIAT will receive the largest share, which includes funds for the FP4 Leader, LAM RPL, and leadership of W1/2 and bilateral FP4 projects on climate information and advisory services, and index-based in LAM. This is followed by ICRISAT, covering work led by the WA RPL under FP4, and leadership of W1/2 and bilateral FP4 projects focused on climate services, early warning and insurance in WA. The 16% of the FP4 budget allocated to ICRAF includes leadership of W1/2-supported projects in WA and SEA, and substantial bilateral funding. Substantial allocations to CIMMYT (11%) and ILRI (10%) reflect their role in hosting the SA and EA RPLs, and their roles in project research on insurance (CIMMYT) and climate services (ILRI).

FP4 has allocated 2% of its budget to MELIA. Of this USD 185,000 over the six-year period is allocated to external assessments. These are shown in Annex Table 5. FP4 will allocate funds to a CCEE for FP4, and contribute to gender, regional and Learning Platform external reviews.

Costs in relation to the natural classification

Personnel. Of the total budget 38% goes to personnel. This reflects the considerable staff inputs into the program.

Travel. Of the total budget 6% goes to travel. Given the program is globally distributed, there is a significant amount of travel. Scientists from Centres (ILRI, IFPRI, CIMMYT) and partner institutions (IRI, U. Reading) lead work in locations far from the headquarters where they are based. The FP4 Leader is engaged with partners and funders based in Europe (WMO, WFP, DfID) and Africa (ACPC, ICPAC, Rwanda climate services project). Use of virtual meetings where feasible reduces travel costs. For example, the management team only meets once or twice per year face-to-face, and conducts monthly meetings via video-conferencing.

Capital equipment. This is a very small percentage (0,4%) of the total costs, as CCAFS-related research is not dependent on high-cost equipment.

Other Supplies and Services. See below in Section 2.

CGIAR Collaborations. 1% of the total budget goes to Collaborations among CGIAR Centres but only with W3 and Bilateral funds as all W1W2 budget are send directly from CIAT Lead Centre to Participating Centres via Program Participant Agreements (PPAs).

Non-CGIAR collaboration. Partnerships for research and development outcomes are a crucial component of the ToC. Thus CCAFS will allocate 25-30% of its budget to partners. This amount is expected to leverage own-resources from within partners at 2-3 times that level. In the current budget 23% of the FP4 budget is allocated to partners. This includes significant involvement of IRI (climate science, climate services, index-based insurance), U. Reading (participatory communication methods, materials and capacity development; NMS capacity development), and a range of regional and national partner institutions that participate in most FP4 projects. The fundraising strategy will try to increase this level.

Indirect costs. 15% is the average Indirect Cost rate that comes from the different rates among CGIAR Centres defined on estimated income.

2.4.2.3 Additional explanations for certain accounting

Benefits:

Using CIAT as point of reference, we assumed most of CGIAR Centers follow the following differentiation of benefits among National and International Staff:

National Research Staff (NRS): Fringe benefits for national staff (costs for all benefits are added to the base salary to provide the total cost of the position) are comprised of legal benefits (local mandatory) and extralegal benefits (CIAT mandatory) and the provisions to cover local legal requirements such as: Pension - social security, training and development, occupational health, transportation costs and subsidies, work clothes and personnel protection requirement, and food subsidy.

International Research Staff (IRS): Fringe benefits for international staff (costs for all benefits are added to the base salary to provide the total cost of the position) are comprised of housing allowance, education allowance, car allowance, Cost Of Living Allowance (COLA), hardship, home leave tickets, insurance, retirement contribution, occupational health, training and development, repatriation and relocation provisions.

Other Supplies and Services:

20% of the budget goes to cover Supplies and Services. This includes most of Centres' Full Cost Recovery units such as IT, Facilities, Public Space, Research and Technical Support; plus considerable funds for consultancies, workshops and operational services.

2.4.2.4 Other Sources of Funding for this Project

Relative proportions of W3 and Bilateral are unknown, and thus we have used a single category of Bilateral to capture both W3 and Bilateral.

Centres have committed to raising 56% of of total Flagship funds through Window 3 and bilateral contributions from 2017 onwards. FP4 plans to continue fundraising jointly with Centres and partners. FP4 already has good visibility within the international climate services community, and will invest considerable effort to strengthen relationships with key initiatives and donors that invest in climate services. FP4 will also expand its engagement in partners and funders working on weather-related insurance and safety nets. Plans to work with interested countries to integrate climate services, insurance and safety nets into adaptation plans (in collaboration with FP1) raises the prospect of tapping into international climate finance.

FP4 expects in-kind contribution from a variety of project partners throughout Phase II. The International Research Institute for Climate and Society at Columbia University, which hosts the FP4 Leader, will actively seek to raise funds that complement and support FP4 efforts. CCAFS is currently leveraging independent IRI project funding for coordinated development of capacity of Regional Climate Centers in Africa. World Vision expressed plans to bring leveraged funds into their partnership with CCAFS, around coordinated development of climate services to build resilience of the rural communities that they serve in shared priority countries. Plans are already advanced to bring World Vision leveraged funds into ongoing FP4 project activities in Mali.

2.4.2.5 Budgeted Costs for certain Key Activities

	Estimate annual average cost (USD)	Please describe main key activities for the applicable categories below, as described in the guidance for full proposal
Gender	2100000	Average annual budget for gender research is USD 2.1 million per year (21% of FP4 budget). It covers: synthesizing and strengthening understanding of how climate and insurance services can meet the differing needs of women farmers; integrating gender-sensitive approaches into services; and assessing the impact on women's control of resources and participation in decision-making.
Youth (only for those who have relevant set of activities in this area)	310000	Average annual budget for research on youth is USD 310,000 per year (3% of FP4 budget). It covers: understanding the ICT-based communication channels that rural youth prefer; assessing the potential for use of those channels to increase participation in climate information and advisory services; and exploring potential to involve schools and students to raise awareness of climate information and insurance services within their communities.
Capacity development	1800000	Capacity Development has an average annual budget of USD 1.8 million per year (18% of FP4 budget). It covers four areas of the CapDev Framework: (1) Learning materials and approaches, such as developing training materials for agricultural extension on particularly climate communication approaches; (2) Gender-sensitive approaches, for example tailoring the content and format of agro-advisories to preferences of women farmers; (3) Organizational development, for example working with Regional Climate Centers to build the capacity of National Meteorological Services; (4) Institutional strengthening, for example fostering development of national climate service governance frameworks.
Impact assessment	70000	FP4 has allocated c. USD 200,000 to impact assessments over the six-year period. This will include a commissioned external evaluation of the current portfolio in 2018, informing adjustments to the portfolio for 2019-2022. It will also include assessments (in 2021-2022) of contributions of FP2 research to target Outcomes, sub-IDs and IDs. This is in addition to the up to 10% of individual FP4 project budgets devoted to MELIA.

Intellectual asset management	8000	The budget for this is USD 8,000 per year. Many topics under this category are dealt with under the following two activities. Flagship teams contribute to implementation of CCAFS Intellectual Asset policy. Activities will contribute to ensuring all knowledge products (primarily publications and databases) are, wherever possible, disseminated using open access principles, with clear branding to acknowledge authorship.
Open access and data management	98894	FP4 will dedicate a budget of USD 98,894 per year to open access and data management, and has a particular focus on climate-related information. The IRI, which hosts FP4, provides free access to an extensive set of climate and related data; and powerful data manipulation, analysis and visualization tools; through its online Data Library. Climate data and derived products, produced by CCAFS as global public goods, will be made freely available through the IRI Data Library and other appropriate open access data portals. Capacity-building work with National Meteorological Services and Regional Climate Centers incorporates development of open access portals for derived data products.
Communication	530000	The budget for communications is USD 530,000 per year. Flagship communications activities will contribute to delivery of outcomes through engagement with key stakeholders in sites, regions, at the national level, as well as in relevant communities of practice. In addition to raising awareness of the general public, communication campaigns will focus on particular issues (e.g., data as a public good, higher quality of national than international gridded climate data sets) targeting particular development and funding communities. Budget is allocated for salary of regional communications specialists (1 in each region, with responsibility for all flagships), and staff time for communications activities at project level. The budget covers delivery of communications products and initiatives through events, media engagement, field visits, training journalists, producing/disseminating publications, multimedia production, and staff travel.

2.4.2.6 Other

Uplift

Most of the topics selected for uplift have been identified from topics cut from CCAFS as a result of budget cuts, but which are considered to be a crucial part of the science and outcome agenda. These are:

- [Capacitating African Smallholders with Climate Advisories and Insurance Development](#) (P46) (ICRISAT, ICRAF, CIMMYT, IRI, U. Reading, AGRHYMET, MANOBI S.A., U. Florida; NMS of Ghana, Mali, Senegal)
- [Develop Index insurance for drought-prone maize and bean-based farming systems in Africa to enhance farmer adoption of climate-adapted germplasm](#) (P51) (CIMMYT, IRI, ILRI, ACF International (Guatemala), CATIE, FENALCE (Colombia), Colombia Ministry of Agriculture and Rural Development)
- [Tailored Agro-Climate Services and food security information for better decision making in Latin America](#) (P42) (CIAT, Bioversity, IRI, ILRI, ACF International (Guatemala), CATIE, FENALCE (Colombia), Colombia Ministry of Agriculture and Rural Development)
- [Integrated Agricultural Production and Food Security Forecasting System for East Africa](#) (P40) (CIMMYT, ICRISAT, ICPAC, WFP, Partnership for Economic Policy).
- [Surveillance and early warning systems for climate sensitive diseases in Vietnam and Laos](#) (P49) (ILRI, ICRAF, VWB/VSF-Canada, HSHP, CENPHER, Nat'l. U. of Laos, Vietnam MARD).
- [Enhancing adaptive capacity of women and ethnic minority smallholder farmers through improved agro-climate information in South-East Asia](#) (P48) (ICRAF, CARE, Vietnam Ministry of Natural Resources and Environment, Farmers' Union Ha Tinh – Vietnam, Center for Community Development in Dien Bien Province – Vietnam)
- [Enhancing benefits of Remote Sensing Data and Flood Hazard Modeling in Index-based Flood Insurance \(IBFI\) in South Asia](#) (P41) (IWMI, IFPRI, Agriculture Insurance Company of India Limited – India, SwissRe, eeMausam Weather Risk Management Services).

In addition to restoring funds to projects adversely affected by budget cuts, new topics have been proposed during discussions with partners in the development of the phase II proposal.

- In line with the recommendations of the External Evaluation, uplift funds will be used to strengthen the evidence of the contribution of climate services and weather-related insurance and safety nets, and of FP4 research, to the uptake of CSA, the resilience of smallholder farmers to climate variability and change, to the poverty reduction SLO, and to target IDOs and sub-IDOs.
- *Expansion of crop monitoring and forecasting in S Asia using CRAFT.* The CCAFS Regional Agriculture Forecasting Toolbox (CRAFT) is being piloted part of the Nepal Food Security Monitoring System (NeKSAP) is a new initiative to incorporate crop yield forecasting in Nepal. With the uplift budget, funds will be used for a proof-of-concept study with a view to developing crop forecasting regionally. Outcome contribution: FP4.2: at least one additional

institution or major initiative that uses CCAFS research outputs for services that support farm households' management of climatic risks.

- *Enhanced crop monitoring and food security early warning in W Africa.* As a partner in the ICRISAT-led CASCAID Flagship project in West Africa, AGRHYMET is exploring methods for improving model-based crop monitoring. With the uplift budget, funds will be used, and leveraged to mobilize bilateral funds, to enhance AGRHYMET's regional crop monitoring and food security early warning services by: (a) incorporating improved merged gridded meteorological data; (b) replacing the current water balance-based approach with process-based crop simulation models; and (c) integrating seasonal climate forecasts to produce crop production forecasts early in the growing season.
- *Mobilizing resources to scale out climate services and insurance in Latin America.* Building on CCAFS experience in strengthening agro-climatic services in Colombia, and pilot testing index insurance in Honduras, uplift funds will be used to leverage additional resources to: (1) extend agro-climatic services in Central America with emphasis in Guatemala and Honduras based on Colombian experience; and (2) support implementation of index insurance in other Central American countries based on Honduras experience.

2.4.3 Flagship Uplift Budget

Outcome Description	Amount Needed	W1 + W2 (%)	W3 (%)	Bilateral (%)	Other (%)
FP4.1: 6 million farm households with improved access to capital, with increased benefits for women (millions)	12,235,381	37	-	63	-
FP4.2: 28 institutions or major initiatives that use CCAFS research outputs for services that support farm households' management of climatic risks	19,576,610	37	-	63	-
FP4.3: USD 100 million new investments by state, national, regional and global agencies, informed by CCAFS science and engagement	4,894,152	40	-	60	-
FP4.4: 15 development organizations adapting their plans and directing investment to increase women's access to, and control over, productive assets and resources through gender-sensitive climate-based advisories and safety nets	7,341,229	40	-	60	-
FP4.5: 10 policy decisions taken (in part) based on engagement and information dissemination by CCAFS	4,894,152	38	-	62	-