CCAFS Investment-Oriented Outcome Pathways: Lessons and New Directions

CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)

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Abstract

This paper explores how CCAFS' work influences the investment decisions of others and what strategies are being pursued to reach a diverse range of investors globally. Outcomes and lessons from case studies and project outcomes of investment-focused research projects implemented over the last 10 years in many countries are examined. Interviews with project leaders and other key informants elicited insights on strategies and tactics that have and have not been working with respect to reaching CCAFS' goal of substantially increasing investment, by both public and private sector actors and institutions, in climate-smart agriculture and more sustainable food systems globally. Multiple investment-oriented outcome pathways and entry points for CCAFS teams to influence public and private sector actors are explored through specific project experiences. Future pathway refinements that start with novel joint problem definition approaches with targeted partners in specific geographies/regions and markets are suggested. These can build on the valuable lessons learned to date in this unique program about how to influence a wide range of investors and contribute to significant increases in investment in these complex global challenges.

Keywords: Impact investment; adaptation finance; blended finance; outcome pathways; climate-smart agriculture

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Introduction

CCAFS research led to many achievements around the world from 2010 to 2019. Through work on priorities and policies for climate-smart agriculture (CSA), CSA technologies and practices, low emissions development, climate services and safety nets, gender and social inclusion, and scaling CSA, CCAFS research has sought to inform policies, strategies, programs, and investment decisions of governments, development organizations, NGOs and private companies (Vermeulen et al. 2012). Significant investments were made in the first few years of the program to shift the approach of the research teams towards an outcome-driven one. This implies starting with a dialogue and better understanding of the outcomes (i.e. changes in behavior) being sought (including whose and how) and working backward from there to develop the needed outputs and strategies to achieve those outcomes.

This shift in a large, global and complex research for development program has been an ongoing experiment and a valuable learning experience for many. Ten years on, it is timely to revisit the outcome pathways and theories of change, and the lessons learned from developing and pursuing them. These lessons will not only be valuable for the design of the next stage of CCAFS but the CGIAR system as a whole (the "One CGIAR").

There are many CCAFS outcome pathways that could be examined in more detail. Here we focus on exploring how CCAFS' work, together with its partners, influences the investment decisions of others. We explore lessons learned over the last 10 years about how and which investors are being influenced (i.e. the investment outcome pathways). The objective is not to explore and quantify the returns from the investment in CCAFS research, as is done in typical impact assessments. The goal of this paper is to examine in more detail one specific type of outcome sought, i.e. where CCAFS research informs investments by others that help CCAFS achieve its goals. This focus has been chosen as it will contribute to filling a key knowledge gap and complement other related assessments, in particular, one that focuses on mapping the influence and reach of CCAFS (Carneiro et al. forthcoming), another on lessons

regarding enhancing science-policy engagements (Dinesh et al. 2018), and a third that examines the challenges and opportunities for unlocking financing towards sustainable food systems (Limketkai et al. 2020).

Outcome pathways and theories of change provided the conceptual framework for the analysis, and the main questions pursued were the following:

- What have we learned about specific tactics, beyond the key 'Knowledge to action' and 'Science to policy' outcome principles already published by CCAFS research teams, for enhancing the likelihood of achieving outcomes (here with a particular focus on investment-related outcomes)?
- What are some examples of those approaches that have worked, and those that have not been so successful, and what have we learned from those successes and failures?
- What have we learned about developing and using investment-focused outcome pathways, and what refinements will be useful for enhancing outcomes and impacts as this program, and the One CGIAR system as a whole, go into their next stage?

Approach

CCAFS invested roughly USD 64 million per year on agricultural research for development (AR4D) in relation to the intersecting challenges of climate change, sustainable agricultural development and food security from 2011 to 2019. It is an ambitious global program with both thematic and regional sub-programs. The thematic and regional teams each developed outcome/impact pathways and theories of change (ToC) in 2011 (which continued to be refined) and these were then 'nested' inside an overall program ToC (CCAFS 2016; Thornton et al. 2017). Here, we revisit these outcome pathways with a particular focus on investment-related outcomes/hypotheses. In addition, outcome case studies were used to analyze how well the original outcome pathways and performance indicators that have been followed have been able to capture investment outcomes, which kinds of investments,

and by whom. CCAFS research teams have reported on a total of 288 outcomes since 2011.[1]

The outcome case studies and relevant literature were evaluated across several criteria to narrow them down to those related primarily to investment. The first one is in connection with the type of project partners most likely to be investing in CCAFS-related outcomes, including international or regional financial institutions (e.g. African Development Bank, World Bank); bilateral development agencies/banks (e.g. ACIAR, GIZ, IDRC, SNV); national or local financial institutions; foundations; private companies; and governments.

Another filter used to identify investment-related case study outcomes was whether they specified investment amounts in their reporting. Projects that focused on farm-level investments (e.g. getting farmers to adopt new CSA practices) were excluded, although undeniably, influencing the investments made by farmers is fundamental to the success of the CCAFS program and others aimed at more sustainable food systems. However, evaluating changes in investments at farm-level and how they were influenced by CCAFS requires other approaches.

The review of the outcome case studies and related literature showed the nuances and complexities in trying to single out 'investment-related' outcomes, with much overlap and many projects with multiple outcomes; enhanced investment in CSA by government or private sector actors (e.g. farmers) almost always being one of them. Nonetheless, it revealed many project outcomes relating directly to influencing investment by others (both public and private sector organizations – Annex 1). Project leaders and/or team members associated with these cases studies (both inside and outside CCAFS) were identified and interviewed to follow up on the reports, and in

[1] 'Outcomes are changes in behavior, relationships, activities, or actions of non-research partners with whom a program works. While outcomes are important milestones in the pathway to impact, they are not measures of actual impact, which are further downstream and long term in nature. CCAFS interprets outcomes as use of research by non-research partners to develop new, or change, policies and practices' (Dinesh et al. 2018).

particular, the lessons learned regarding strategies and tactics for achieving investment outcomes.[2]

CCAFS' Theory of Change in relation to influencing development-oriented investments by others

Research outputs such as technologies, innovations, publications, trainings, etc. fall under a sphere of control, i.e. research teams have a high degree of control over these products. Investments, on the other hand, relate to a sphere of influence, i.e. the producers of research products aiming to change investments (e.g. see an additional USD X invested in Y) have little, if any, direct control over the investment decisions of others (beyond the investment in the research itself, which is not being explored here). In this case, the outcome sought is to inform and influence those decisions. Here, we are interested in exploring both the nature and size of such investments, who is making them, and how they have been influenced by the research outputs (including the time lag between research outputs and disbursement of funds). In particular, the specific tactics used by the research team to enhance the likelihood of achieving desired outcomes are explored in more detail than what is typically found in the performance (outcome) reports.

In 2014, CCAFS research teams built on an earlier outcome/impact pathway development exercise that lead to a detailed articulation of desired outcomes and indicators to measure progress towards them. This was done at the research theme (flagship) level, as well as by each of the five regional teams.

The flagship/research theme team that focused on policies and institutions (Flagship 4 in 2014) included the following desired outcomes related specifically to investment:[3]

[2] 22 interviews were carried out in the period July – Sept, 2020 (Annex 2).

[3] A policy-related outcome pathway was also described.
https://cgspace.cgiar.org/bitstream/handle/10568/68850/CCAFS%20flagship_IPs_2014.pdf?sequence=1

- **2019 outcome**: Appropriately directed institutional investment of regional/global organisations (e.g. IFAD, WB, FAO, UNFCCC) based on national/regional engagement to learn about local climate-smart food system priorities. **Indicator**: Number of regional/global organisations that inform their equitable institutional investments in climate-smart food systems using CCAFS outputs. (Target 2019: 20 - WA:1, EA:0, LAM: 2, SA:0; SEA: 4, Global: 3)
- **2025 outcome**: Policies and institutions at different scales enable equitable food systems that are resilient to a variable and changing climate. **Indicator**: Number of national/subnational jurisdictions that increased their equitable institutional investments in climate smart food systems. (Target 2025: 20)

By 2015/16, the ToC for the policy-oriented research theme (renamed Flagship 1 for Phase 2 of the program), was further refined and sought the following investment-related outcome targets for 2022 (CCAFS Phase 2 proposal):

- USD 450 million of new investments by state, national, regional and global agencies informed by CCAFS science and engagement.
- 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.
- 14 organizations and institutions in selected countries/states adapting plans and directing investment to optimise consumption of diverse nutrient-rich foods, with all plans examined for their gender implications.

Direct, country-level pathways. In 2013/14, the five regional programs defined activities and their own outcome pathways that would contribute to these overall CCAFS investment-related outcomes under Flagship 4.

For example, the **South Asia** team's 2025 desired investment-related outcome/vision was:

- Large-scale investments in science-informed climate-smart agriculture practices, institutions, and policies in the region, leading to long-term food security and poverty alleviation.
- Investment-related indicators for this outcome pathway included: Investments made, credit available, and infrastructure developed for climate-smart agriculture and Climate-Smart Villages (CSVs); and number of regional/global organizations using CCAFS outputs for investment decisions in climate-smart agriculture and food systems.

For **Southeast Asia**, as another example, the investment-related indicator specified was: percent change in investment in national/subnational equitable food system institutions that take into consideration climate-smart practices/strategies compared with 2014.

The **East Africa** regional program revisited and refined its Theory of Change in 2018 as part of its strategy (Solomon et al. 2018). In relation to investment specifically, it described the followed outcome: Increased investments and scaling of CSA to promote inclusive business models, climate-proofed value chains and innovative financing mechanisms. The indicator to measure this was: Amount of new investments in CSA based (in part) on CCAFS priority setting.

Overall, the regional outcome pathways envisioned in 2014 related primarily to influencing policy and institutional change, and no targets were set at that time for a specified amount of new investment/spending in CSA, for example. The country-level and regional change mechanisms aimed at contributing towards investment-related outcomes included those broadly related to *capacity, knowledge, and/or policies.* In other words, CCAFS-supported knowledge, tools and approaches would be used to enhance the capacity and ability of key decision-makers within these countries, in this case, to increase the amount of funds invested in climate-smart actions across the food system.

Indirect, international/regional pathways. Beyond country-level actions, regional and international-focused activities contributing to investment outcomes were specified. Key intermediaries identified in this pathway included international development organizations that directly invest in national governments and

institutions (e.g. through loans, grants and technical assistance), to enhance their food systems, such as IFAD, WB and FAO. In other words, the indirect pathway to influence national investments was envisioned as being by first influencing decisions (development/investment plans, strategies) made at the regional level or international level by major international and/or regional development agencies. The reasoning behind this was that these organizations have a strong comparative advantage (over a research program like CCAFS) in influencing government actions. For example, the World Bank and IFAD help design all their major agricultural and food system projects and investments jointly with national government-led teams, and all projects have many specified pre-conditions jointly agreed upon before the funds are granted or loaned.

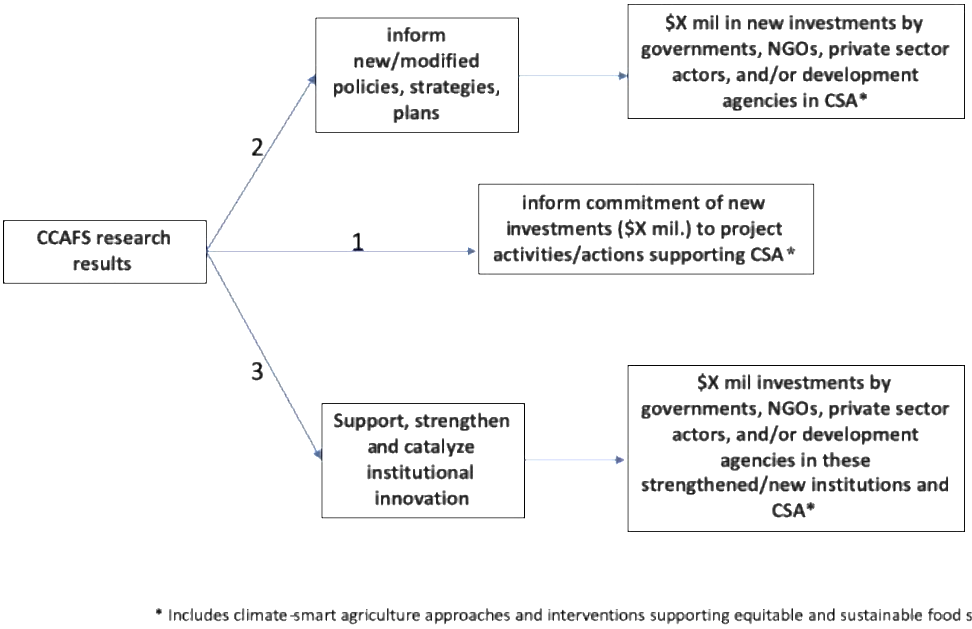
For reporting on progress towards these outcomes, the indicator that has been measured and reported on is:

- Number of policies, legal instruments, investments and similar modified in their design or implementation, informed by CCAFS research.

Unpacking Investment Outcome Pathways

Project implementation experience since 2013, and a review of 288 reported outcome case studies by CCAFS researchers since 2011, suggests the three broad pathways related to policies, institutions and investments (hypothesized and developed starting in 2013 and refined in 2014) remain valid, and often overlap. At the risk of over-simplification, the challenge of influencing development investments of partners and other users of the new knowledge, CCAFS research has generally followed a direct project-related pathway, as well as two indirect ones via policy change and institutional change/strengthening, as the following examples (not intended to be comprehensive) from the CCAFS investment-related outcome case studies, summarized in Annex 1, illustrate. Figure 1 captures the three pathways originally envisioned.

Figure 1. Original main investment-oriented outcome pathways.



* Includes climate-smart agriculture approaches and interventions supporting equitable and sustainable food systems

Direct project investment pathway

In this project/program-oriented pathway, researchers and development agencies, government bodies, non-governmental organizations and/or private sector firms use the research results (data, tools, reports, presentations, papers, trainings, etc.) to decide upon particular CSA-oriented project activities to invest in (Figure 1).

Examples:

- By 2016, CCAFS products (e.g. CSA country profiles) have been used to decide what CSA activities will be included in a USD 250 million World Bank CSA project in Kenya, and a USD 111 million investment in a WB CSA project in Niger.
- By 2018, CCAFS research results have informed a EUR 15 million government investment, plus a USD 21.5 million private sector investment, in climate-smart rice production in Thailand.
- By 2018, a financial impact investment firm (Root Capital) has used CCAFS analytical results to inform the allocation of over USD 300 million in loans for CSA activities in over 20 countries.

- By 2019, USD 5.8 mil in CSA project investments, based in part on CCAFS research results, are being made by national (government) and international funding sources in Guatemala and Colombia.
- CCAFS outputs inform investment design for African Development Bank's Sahel and Congo Basin Investments (USD 1.3 billion) under AfDB's Africa CSA program.
- A new USD 7 million investment in a climate-smart livestock/reduced GHG emissions project/program informed by CCAFS in Ethiopia is jointly funded by the Ethiopian government, ACIAR, WB and BMZ in 2019.

Indirect investments via policies pathway

Here, researchers, development agencies, government bodies, non-governmental organizations and/or private sector firms are using CCAFS research results in the formulation of new or revised policies, strategies, approaches, and/or action plans (Figure 1). These plans include intentions to target investments (again based on the research findings/products) in CSA-oriented actions.

Examples:

- In 2018, CCAFS research results inform Colombia's new 'Green Growth' policy. By 2019, an estimated USD 2 million is invested by the Colombian government in different CSA projects largely based on CCAFS recommendations.
- By 2019 in Nepal, the CCAFS-developed Climate-Smart Village (CSV) approach leads to initial CSV investments by 2 local governments of roughly USD 6 million, with action plans to reach 196 villages by 2020.
- By 2019, the CSV approach is mainstreamed in national policies and programs in five Southeast Asian countries, with new donor-supported CSV projects investments in the Philippines (USD 600,000), Vietnam (USD 705,000), Myanmar (USD 500,000), Laos, and Cambodia (USD 19 million).
- By 2019, CCAFS work informs more than USD 50 million investments in the Climate-Smart Village approach in multiple states in India, by state governments and an additional, non-quantified amount of investment from the private sector and foundations (ITC, Sonalika, Reliance). The Government of India also makes

investments of more than USD 170 million to control residue burning guided by the work of CCAFS and CIMMYT and the national agricultural research system.

- By 2019, CCAFS influenced the action plans/initiatives of the Global Commission on Adaptation, contributing to an additional investment to the CGIAR of USD 650 million.

Indirect investments via institutions pathway

In the third pathway as hypothesized in CCAFS' early days, capacity strengthening, knowledge, communication and engagement-related efforts by CCAFS teams lead to new intersectoral approaches, agencies, groups, networks, coalitions, platforms, communities of practice, 'rules of the game', etc., within and across development agencies, governments, non-governmental organizations and/or private sector firms (Figure 1). These institutional innovations include, and lead to further, investments in CSA and more climate-resilient food systems-oriented actions.

Examples:

- CCAFS efforts inform the creation of new, and strengthening of existing, local technical agro-climatic committees and train teams in digital agricultural approaches across Latin America (Guatemala, El Salvador, Honduras, Nicaragua, Colombia, Mexico, Paraguay, Chile, Panama). In 2018, governments start investing in these new institutions supporting millions of smallholders to be more climate-resilient, including direct investments from the Ministries of Agriculture in Colombia (about USD 1.5 million), Honduras, El Salvador and Guatemala (USD 0.5 million) from 2018 to 2020. Other investments (about USD 1 million) include an Adaptation Fund project in Chile to establish the LTAC as well as funds to establish 2 LTACs in Paraguay. In Mexico, the Ministry of Agriculture has allocated resources for LTAC establishment via the MasAgro project led by CIMMYT.
- By 2019, CCAFS science support to a CSA platform in West Africa and is informing Climate-Smart Agriculture Investment Plans of Governments of Côte d'Ivoire and Mali (among others), that include 12 CSA priority investment opportunities for each country, valued at roughly USD 300 million.

- In 2019, CCAFS collaboratively develops a digital agro-climatic advisory service platform in Ethiopia, informing investment decisions of tens of thousands of smallholder farmers.
- By 2020, CCAFS has influenced the development of a new climate-resilient agriculture office in the Philippines, with the government and others investing USD 112 million in 2019 and USD 107 million in 2020 in new CSA projects in 41 locations.

Lessons learned regarding investment outcome pathways and strategies

Enhancing science-policy engagement approaches matter. Key informant interviews and discussions with project team leaders revealed many additional complexities and lessons learned regarding the investment outcome pathways conceptualized early on in CCAFS. However, many of the more general lessons captured in Kristjanson et al. (2009) and Dinesh et al. (2018) on approaches for linking knowledge with action and enhancing science-policy engagement hold true for increasing the likelihood of achieving investment-related outcomes as well. These include the importance of participatory and demand-driven research processes with strategic partners; building scientific credibility while adopting an opportunistic and flexible approach to generating evidence that is relevant, salient and legitimate; and innovative and targeted communication efforts and inclusive capacity building efforts (Dinesh et al. 2018). Guidelines that include criteria for assessing relevance, credibility, legitimacy, and positioning for use are being proposed for the next stage of the CGIAR (One CGIAR) (Belcher and Child 2020; Belcher et al. 2016).

Efforts aimed at influencing public sector investments remain important. Shifting government priorities and policies towards those supportive of more sustainable food systems (Pathway 2) takes time. It begins with inclusive multi-stakeholder processes that support the co-development by public and private sector actors of strategies, action plans and policies. Ideally, it is followed up by shifts in public spending towards the priorities identified in those plans (e.g. climate-smart investment plans),

at both local and higher levels of government. CCAFS' teams have seen differing levels of success in shifting government investments, with capacity and institutional issues (Pathway 3; CCAFS' private sector team leader refers to this as the 'enabling environment') and large competing investment priorities (e.g. health, education, infrastructure, energy) looming large. There are multiple, well-documented challenges facing many of CCAFS' target governments in accessing international climate finance (GGGI 2019). Some countries are now establishing national environment funds (e.g. climate and green funds), although experience with those remains limited and mixed. More efforts towards understanding CCAFS' role and how to potentially influence these so-called 'national financing vehicles (NFV)' may be a priority research area to consider going forward (GGGI 2019).

The direct project investment pathway remains relevant and has been successful. Most of the key informants interviewed, including those that are not part of the CCAFS core team, indicated that the first pathway (direct project investment) was both the easiest and most direct way to see new investments that were directly influenced by the results of their research team's efforts. Lessons here included that timing is critical and windows of opportunity are typically very short. It is difficult for researchers that are part of a long-term program to act as short-term consultants, often an expectation of project designers within development agencies, for example. The strategy of embedding a CCAFS researcher at the World Bank helped to influence the direction of 65 large CSA-related projects and influence the behavior of WB clients, and have led to much greater attention to climate change concerns (2018 CCAFS Outcome Report #581). Similarly, an embedded CCAFS researcher in IFAD contributed to the design of the first large, multi-donor/country investment into climate change adaptation (Adaptation for Smallholder Agriculture Program) and the mainstreaming of climate change adaptation considerations in all new IFAD grants and loans. While this 'embedding' approach addressed all three pathways, a key lesson was that these large development agencies are not very interested in the tools, knowledge, technologies, etc., that CCAFS wanted to promote; rather, they are more interested in the 'brains' behind them—i.e. in being able to access the people that apply them (at short notice), particularly at the project design stage. This approach has also revealed that the level of evidence that the scientists feel comfortable with to

guide large investment decisions is typically significantly higher than the requests from development agencies.

Engagement processes and partners. Most of the project/program leaders described the importance of cultivating relationships and trust on a personal level, both with private and public sector partners, in support of behavioral and institutional change. Key informants outside CCAFS in particular stressed that different partners and approaches may need to be sought in different regions. For example, investors perceive Africa as much riskier than some other regions, and thus the need for public de-risking mechanisms (e.g. blended finance) is arguably highest here.

In many cases, the three pathways are interlinked, all needed, and build on each other over time. In many of the outcome cases examined and discussed with project leaders, the three pathways originally envisioned blend into one over many years. The work starts with relationship building and strategy development with strategic partners, leading to new projects, changes in policies and practices, and eventually, institutional change. It is only with all these fundamental changes occurring that truly transformational shift towards more sustainable food systems and enhanced food security will happen (Thornton et al. 2018; CCAFS 2016).

Linking work at different scales to bridge the 'missing middle.' CCAFS has faced the challenge of making their research findings at the local level useful and used at national, regional, and international levels and vice versa from the start of the program. While the 'bottom up' work can be very successful (at a small scale) and influencing the 'top down' international processes of relevance has had success, the challenge of bridging the 'missing middle' to have more transformative impacts remains. Some lessons here come from the experience in Central America, where CCAFS worked with the Central America Agricultural Council to inform and influence a CSA strategy for the region; through these regional efforts, multiple national and sub-national agencies are aligning to the policies of the regional CSA strategy. While some of those agencies are putting in new resources, or re-orienting them towards CSA, verifying and quantifying the amounts invested is difficult. The CCAFS regional team has thus been helping to implement a monitoring and evaluation (M&E) system that will track who is participating in local CSA

committees and what information they are disseminating to farmers, such as climate projections and potential adaptive practice changes/solutions. The strategy here is for research teams to act in a support rather than lead role, and empower local committee members (including women, often for the first time) to be able to link back up to the national level and show the Minister of Agriculture, for example, how effective such local organizations can be. And ultimately, to lead to increased levels of investment in such approaches.

More refined strategies for increasing private investment are still at early stages and knowledge gaps remain. Much progress has been made on developing more refined strategies aimed at increasing private sector investments in more resilient food systems. Dinesh et al. (2017) describe three types of investment vehicles that can help refine CCAFS' investment-related impact pathways and strategies for achieving them (i.e. an investment-focused theory of change). These investment vehicles involve: 1) mobilizing private adaptation finance; 2) impact investment; and 3) blended finance. These potential private sector-oriented outcome pathways are explored further below.

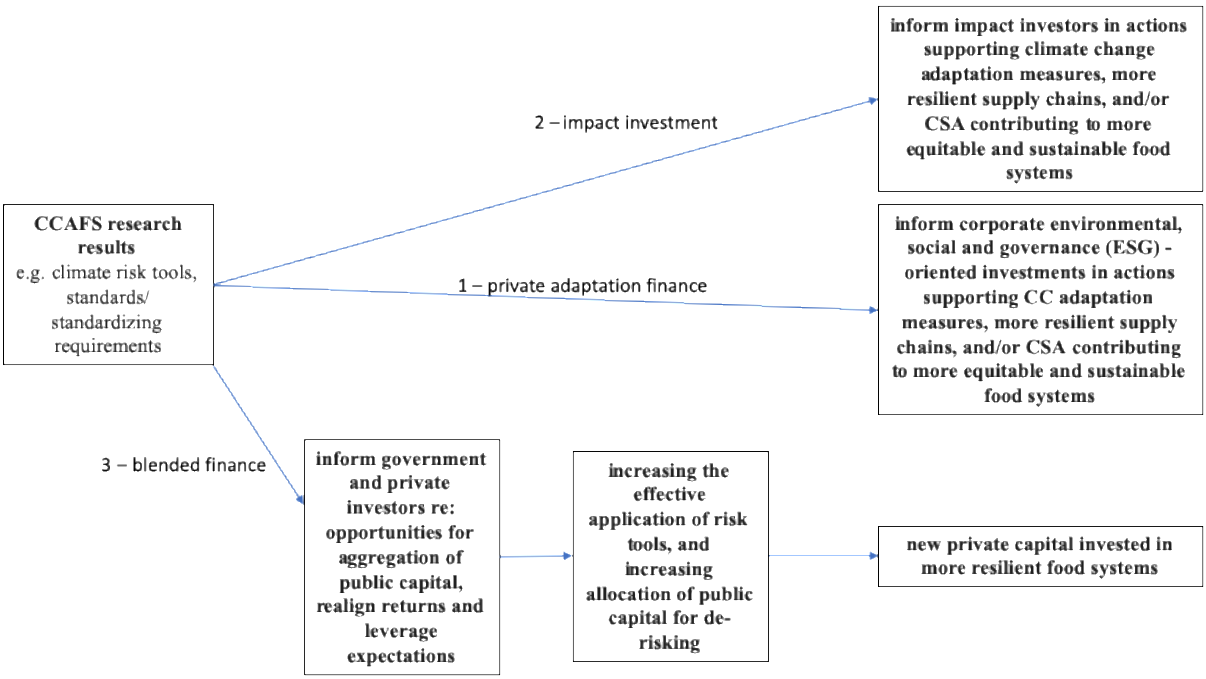
Understanding challenges to address in unlocking financing for sustainable food systems. Limketkai et al. (2020) delve further into three main challenges/market failures critical to consider in unlocking financing towards sustainable food systems—a lack of a deep pipeline of bankable projects; high investment risk, and lack of primary data/information asymmetries; and lack of intermediation to efficiently connect different pools of capital to investments. Broad strategies for addressing these challenges are outlined for government, public and philanthropic donors, public and philanthropic investors, corporate actors, and private financial investors in a comprehensive strategic roadmap (Limketkai et al. 2020). How these strategies are actually implemented—i.e. the specific tactics used in different places and circumstances—remains the biggest challenge. One area of focus in the key informant interviews in this assessment has been the lessons learned in the different regions and thematic areas with respect to the tactics CCAFS teams have been pursuing to achieve desired outcomes, particularly those related to investment.

Refining private sector investment-focused outcome pathways

One of the key lessons is that strategies and tactics/approaches for stimulating private sector investment need to be tailored to the type of private sector actor, as they vary widely in their needs and entry points for CCAFS project teams. They include actors at the micro, meso and macro-levels (Limketkai et al. 2020). Approaches for collaborating with actors at local scales (e.g. farmers, farm and community organizations, small and medium-sized enterprises/SMEs) will differ from those working at sub-national and national scales (e.g. commodity buyers) or regional and global scales (e.g. private sector-led commodity platforms).

Three investment models are described in Dinesh et al. (2017) as key CCAFS investment-oriented outcome pathways: private adaptation finance, impact investment and blended finance. Figure 2 captures these three pathways as potential CCAFS outcome pathways.

Figure 2. Refining private-sector investment pathways.



Private adaptation finance

Substantial investment in adaptation and resilience, financed by private capital, is already occurring in the private sector, financed by private capital (UNEP 2016). These private sector actors vary considerably in scale, including micro, meso and macro-level (Limetkai et al. 2020). Private enterprises 'will typically choose to invest in adaptation measures to reduce physical climate risks directly, transfer the risk through insurance, or to capitalise on a new business opportunity that has arisen as a result of climate change' (UNEP 2016).

Pathway 1 in Figure 2 shows the private adaptation finance outcome pathway described in Dinesh et al. (2017): CCAFS research results inform corporate environmental, social and governance (ESG)-oriented investments in a firm's actions supporting climate change adaptation measures, more resilient supply chains, and/or climate-smart agriculture contributing to more equitable and sustainable food systems.

CCAFS has been pursuing several potentially significant investment opportunities along this pathway. They involve direct work with companies that usually want non-disclosure agreements signed, as some of the information is perceived as sensitive or proprietary, not to be shared widely, particularly with competing firms.

Program and project leader interviews highlighted the following lessons to date regarding this pathway. They include:

- Private sector actors that need to be considered include those from all levels of the value chain, including input suppliers, investors, buyers, farmers, etc.
- Value chain assessments that examine feasible actions at the different levels are needed.
- This work has traditionally been quite supply-driven, working with partners from government agencies, farm organizations, etc., to produce outputs that are then expected to be taken up by the private sector. However, this rarely happens, and if it does, it has been at a relatively small scale.
- There is a need to reverse this approach/pathway and start from the demand side, i.e. understanding the ESG challenges of strategic corporate partners, and tailor

CCAFS' research approaches, tools, knowledge products, etc., to meet those needs/demands (i.e. the co-creation of new knowledge principle).

Impact investment

Impact investors focus on investments in companies, organizations, and funds aimed at generating a measurable, beneficial social or environmental impact alongside a financial return (https://thegiin.org/impact-investing/need-to-know/).

An impact investment-oriented outcome pathway for CCAFS is shown in Figure 2, whereby CCAFS research results inform impact investors in actions supporting climate change adaptation measures, more resilient supply chains, and/or climate-smart agriculture contributing to more equitable and sustainable food systems.

An example of this pathway is CCAFS' work with Root Capital, reported as an outcome in 2018. Root Capital is an impact investment firm that makes loans to producer organizations in cocoa, coffee, and other supply chains in many of the countries where CCAFS works. Root Capital used CCAFS-generated climate vulnerability analyses and data as an integral part of its priority setting and loan decision-making process, leading to 199 loans worth USD 146 million to coffee and cocoa producer organizations that address poverty and environmental vulnerability across 20+ countries.

Lessons from project leaders in relation to this pathway include the following:

- In engaging the impact investment firm Root Capital, the entry point for CCAFS was helping them to better understand climate and weather-related risks, how to value them and potential adaptation/mitigation actions farmers and farmer groups could take.
- Factoring in climate risk for specific clients helps such investors manage their overall financial risks, thus it impacts their decision-making on which investments to make, and allows them to have conversations with their clients, e.g. about how agricultural co-ops or SMEs can begin to factor in climate risk and what they can do in a practical way to address it (e.g. what practices make sense; how they might retool their extension approaches, etc).

Blended finance

Blended finance is the use of development capital to mobilize additional private finance for investments related to the Sustainable Development Goals (SDGs), including sustainable land-use and food systems. Development banks are the main blenders of capital (https://www.blendedfinance.earth/why-blended-finance).

Examples of blended finance include instruments like guarantees, insurance, currency hedging, technical assistance grants and first loss capital from development agencies, development banks and foundations that are crowding in commercial investment for developing countries (BSDC 2017).

Following Limketkai et al. (2020), a blended finance-oriented outcome pathway for CCAFS is shown as Pathway 3 in Figure 2. It involves CCAFS research results, such as climate risk tools, standards/standardizing requirements being taken up and informing government and private investors about opportunities for aggregation of public capital, realign returns and leverage expectations; leading to more effective application of risk tools, and increasing allocation of public capital for de-risking; resulting in new private capital invested in more resilient food systems.

An example of this pathway is CCAFS' role in co-designing and establishing the Althelia Biodiversity Fund Brazil (ABF) in 2019 with MNC, a global impact asset management company and USAID. It aims to generate USD 100 million of blended finance (public and private sector, international and national) into sustainable activities that protect, restore/improve biodiversity and livelihoods. Uniquely, CCAFS/CIAT was one of the founding investors (and not just a research partner) in the establishment of this Fund.

While this pathway is relatively new, some of the emerging lessons here include:

- Engagement with 'umbrella' private sector-led coalitions is important, and targeted (e.g. with a country, commodity, or specific challenge focus), fairly small 'roundtable' discussions driven by private sector actors that bring in relatively few public sector and international agency participants as guests are more desired by private sector actors than are large events with too many diverse interests represented.

- Examples of such coalitions critical to engage with include the Blended Finance Taskforce created by the Business and Sustainable Development Council; the World Business Council for Sustainable Development (WBCSD); the Food Action Alliance, among others.
- Some corporate actors may be interested in investing relatively small amounts, while others will be considering much bigger investments (e.g. institutional investors), but they are facing some of the same challenges and have similar questions—e.g. how to assess and measure risk—and the blended finance discussion is new for most of them.
- Innovative financial instruments and risk tools need to be co-developed (by researchers with corporate actors). An example of this is seen in the joint KOIS/CCAFS report on financing transformation of food systems under a changing climate (Limketkai et al. 2020).
- Corporate actors are interested in advisory services that help them understand their risk levels much better; how to assess and manage that risk and identify good investment opportunities.
- A key knowledge gap facing firms working on sustainability is the ability to assess the true investment potential of projects, beyond the needed productivity increases; this is research that needs to be done with actual investors.

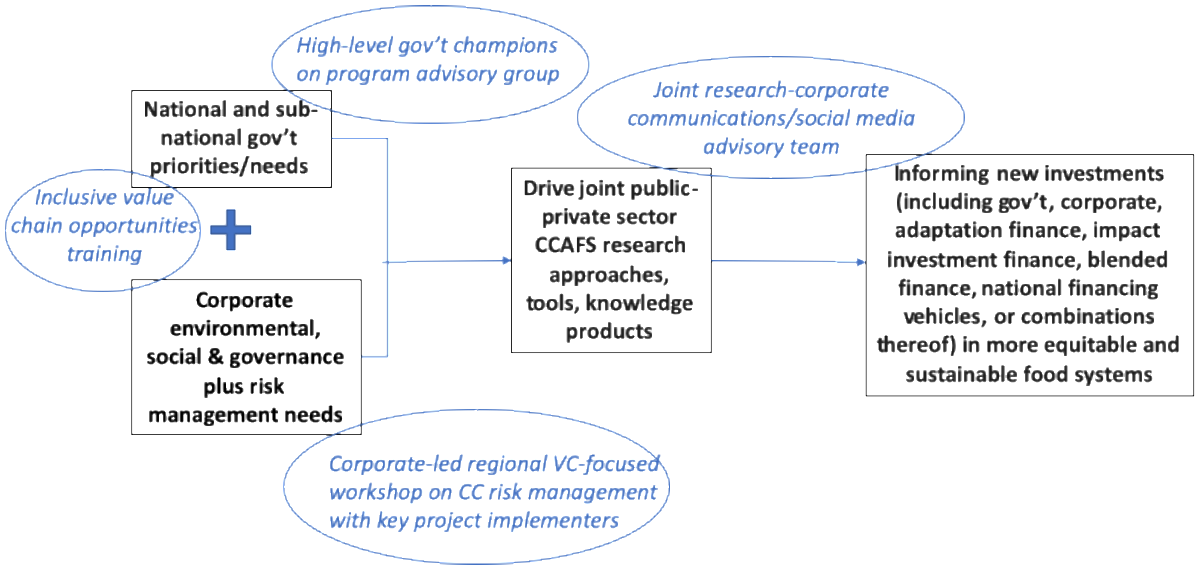
Conclusions and moving forward

A clear lesson from CCAFS' experience working with and through both public and private sector actors is that an understanding of their needs for information and what drives their decision-making is a critical starting point. More specifically it is about building trust and that science can inform behavioral change, i.e. it is seen as credible, salient, and legitimate (Dinesh et al. 2018). This insight, while not new, was articulated by both CCAFS research leaders and key informants from other organizations. This leads to a revised investment outcome pathway (recalling there are also others) with a trajectory described in Figure 3. It starts with a better understanding of relevant national and sub-national government priorities/needs, and key corporate environmental, social and governance (ESG) and risk management

needs. This refined knowledge drives joint public-private sector CCAFS research approaches, tools, knowledge products, informing and influencing new investments (including government, corporate, adaptation finance, impact investment finance, blended finance, national financing vehicles, or combinations thereof) in more equitable and sustainable food systems.

The value of such a relatively generic pathway is that it provides a starting point for research for development teams to refine, together with partners, in specific locations and circumstances. The lessons learned by exploring such pathways and their evolution over time means that we don't have to start from scratch. We do, however, have to continue to pursue 'linking knowledge with action' strategies (often referred to as K2A) related to inclusive and thoughtful, efficient engagement processes; targeted and inclusive capacity strengthening efforts; and innovative, open access communication approaches (Kristjanson et al. 2009). Specific tactics related to these strategies will need to be determined according to local circumstances. Examples of a few potential tactics to enhance the likelihood of investment-related outcomes being realized based on interview findings are included in Figure 3 in the circles. There are more, and it may be valuable for future lesson-learning endeavors to focus on further delineating them for different regions or geographies, commodities, private sector structures, public sector environment, etc.

Figure 3. Reversing outcome pathways with targeted K2A tactics (in blue).



In the next phase of the CGIAR (One CGIAR), the system management will advocate for an expanded use of Theories of Change, not just at design stage, but to make better use for them for adaptive management and for evaluating progress (i.e. ToC becomes how you manage your program). CCAFS was a trailblazer in many respects towards this goal, particularly with respect to mainstreaming gender and inclusion considerations across the entire program (Jost et al. 2015; Schuetz et al. 2016), together with the Challenge Program on Water and Food (Hall et al. 2014), and has learned many valuable lessons over the last 10 years (the numerous reports and learning briefs are provided in Thornton et al. 2017). Thus, it is a good time to reflect on and try to capture them as the system progresses to its next stage.

One of the lessons is that while a large, nested ToC has been necessary to pull together the many projects, country and regional CCAFS results, it will remain useful to sharpen specific pathways and tactics aimed at enhancing the probability of achieving sought-after outcomes. This is particularly true for private sector outcome pathways that originally received less attention. Refining investment-oriented pathways is a good step towards a better understanding of who exactly the science is trying to influence and how—i.e. going beyond broad strategies to specific tactics/approaches for different actors in different circumstances. Such efforts can also help explain how and why strengthening private sector actors (e.g. to meet sustainability goals) is justifiable for the CGIAR with a mandate to produce international public goods.

Getting beyond broad strategies to specific tactics for each strategic partner means that smaller, more geographically targeted engagement efforts will be needed. The earlier structural reform of the CGIAR system towards CRPs (CGIAR Research Programs) chose to organize around commodities and global challenges/research themes rather than regions, so meeting the challenge of centers working together in specified geographic areas, with the problems defined by the needs of the public and private sector partners within that region, has not been easy. Perhaps the evolving ‘One CGIAR’ would be well advised to make sure further structural changes address this issue. These CCAFS lessons also strongly point towards a need for continued emphasis on working with national and jurisdictional governments to fill knowledge

gaps that meet their investment needs, for example, on nationally-driven ‘green’ financing vehicles (GGGI 2019).

Clearly, the private sector differs significantly from place to place, and at widely varying operating scales. Better understanding the different actors and organizations at different scales (micro, meso, macro) and their specific needs and incentives, in different locations, is important and remains a challenge (Limketkai et al. 2020). Here, large and very inclusive processes that have been used by programs like CCAFS, which has proved to be efficient in bringing together new and key players to the table (Schuetz et al. 2014), may not be the most effective way going forward.

Entry points for CCAFS vis-à-vis increasing desired private sector investments include the co-development of innovative financial instruments (e.g. Althelia Biodiversity Fund), the provision of advisory services to companies and coalitions (e.g. the regional CSA investment fund in Central America), the co-development of environmental, social and governance frameworks with private companies and coalitions (e.g. the KOIS/CCAFS report), and co-developing tools to measure risk and monitor results (A. Millan, personal communication).

Public sector investment pathways remain important for CCAFS and are much more successful in countries with better governance and a supportive institutional environment in place, but in many instances, political motivations far outweigh evidence-based decision making. This applies equally to private sector pathways—corporate actors are not necessarily motivated by rigorous evidence per se, but they are interested in what will deliver the most investor confidence. This suggests that the starting point for refined outcome pathways and theories of change is not to focus on the outputs—the tools, reports, trainings, etc.—but instead on novel joint problem definition approaches with targeted partners in specific geographies/regions and markets.

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Annexes

Annex 1. Results matrix

Project/program examples - intended to be illustrative, not comprehensive - of three main investment outcome pathways for investments totaling some USD 3.5 billion, nominally.

Pathway	Outcome title	Investor(s)	Amount	By Year:	Country (ies)
1. Direct: Project	CSA Kenya project	World Bank & Gov't of Kenya	$250mil	2017	Kenya
	CSA Niger project	World Bank & Gov't of Niger	$111mil	2017	Niger
	CS Rice	Thailand government, private sector	Euro 15mil; $21.5mil	2018	Thailand
	CSA loans	Root Capital	$300mil	2018	20 countries
	CSA projects	National governments, international funding sources	$5.8mil	2019	Guatemala, Colombia
	Africa CSA Program	AfDB	$1.3 billion	2019	Sahel and Congo basin countries
	Ethiopia climate-smart livestock program	Ethiopian gov't; ACIAR, WB, BMZ	$7mil	2019	Ethiopia
2. Indirect: Policy	Colombia green growth policy	Gov't of Colombia	$2mil	2019	Colombia
	CSV Approach	Nepal local governments	$6 mil	2019	Nepal
	CSV Approach	Indian State govts +private sector: ITC, Sonalika, Reliance	$50 mil (estimated, see p. 14)	2019	India
	Controlling residue burning in India	Gov't of India, CIMMYT	$170 mil (estimated)	2019	India
	CSV Approach	Gov't of Myanmar &	$21 mil	2019	Myanmar, Philippines, Vietnam,

		ADB, FAO, IDRC			Laos, Cambodia
	CSA investments in Myanmar	Gov't of Myanmar, IIRR	$295 mil	2019	Myanmar
	Global Commission on Adaptation Food Security Action Plan - CGIAR	UN, IMF, BMGF, CGIAR	$650 mil	2019	Global
3. Indirect: Institutions	Latin America technical agroclimatic committees + teams using digital agriculture approaches	Gov'ts of Nicaragua, Guatemala, El Salvador, Honduras & private ag orgs	$3 mil	2019	Nicaragua, Guatemala, El Salvador, Honduras
	Climate smart nat'l platforms and investment plans	Gov'ts of Mali, Cote d'Ivoire & international funding sources	Approx. $300 mil.	2019	Mali, Cote d'Ivoire
	Digital agro-climate advisory service platform	Ethiopian gov't (MoA, NMA), CGIAR	In progress (see p. 16)	2019	Ethiopia
	Climate-resilient agriculture office	Philippines government - Agriculture	In progress	2019-2020	Philippines
	National climate services	Rwanda government - Agriculture	$10m	2019-2020	Rwanda

Annex 2. Guiding questions for key informants

1. Are these the correct (3) main pathways? Are there more that need to be added (or sub-pathways made clearer?)
2. What investment outcomes (i.e. 2-3 greatest investment amounts with solid evidence) would you pick for your region? Why?
3. What key lessons have you learned re: approaches/tactics to achieve investment-related outcomes?
4. There is often a significant time period/lag between initial work and actual investment made/USD spent; we see many of the outcome stories showing up in different years but with added $ each year; do you have such examples that show

how long it takes and how it adds up over time? Has it been possible to capture investment amounts from the time of release of outputs and add them up for an estimated total figure as of 2019/early 2020?

5. Should we focus this analysis on capturing a range of investment types/pathways that are greater than some cut-off amount? (E.g. USD 10 million, as we are never going to capture everything, and the objective is about better understanding and documenting lessons learned and not reporting to donors on returns to their research investments)?
6. How to deal with 'investment pledges'? Often these are not actually spent on what was promised; also there can be long delays between announcements and actual spending; should this analysis include commitments/pledges or just actual dispursements?
7. Regarding overlaps between institutions and policies; lots of trainings/capacity efforts lead to stronger institutions, but it is hard to link them with specific investments. Should we focus on the creation of new (CSA/cross-sectoral food system related?) agencies, committees, cross-sectoral/ministerial/agency efforts? Do you have examples, and can you link them to specific investments or commitments/pledges?
8. Related to 6), how best can we capture CSA 'platforms' supported by CCAFS for years in the regions, and now being invested in by gov'ts and hopefully self-supporting; can $$ be put to these? What examples do you have?
9. How can we capture the global high-level processes CCAFS has been engaged in (e.g. UNFCCC) and what kind of changes/increases in investment that has led to? Can we actually quantify/document evidence of these?
10. What other issues, concerns, questions come to mind for you?

Annex 3. Key Informants Interviewed

Focus	Name
Global/overview	Dhanush Dinesh, CCAFS global policy engagement manager
	Gracia Pacillo, Alliance Bioversity-CIAT
	Guiliana Resce, U of Rome
	Bia Carneiro
	Sonja Vermeulen, CGIAR management

	Nancy Johnson, CGIAR SPIA
	Christine Jost, ex-CCAFS
	Andy Jarvis, CIAT
	Philip Thornton, CCAFS
	Laura Cramer, CCAFS
	Alberto Millan, CCAFS, ex-WBG
	David Abreu, CCAFS
	Jules Colomer, CGIAR head of reporting
Regional	Robert Zougmore, WA
	Peter Laderach, LA
	Deissy Martinez-Baron, LA
	Leo Sebastien, SE Asia
	Pramod Aggarwal, S Asia
	Maren Radeny, EA
	Ana Maria Loboguerrero Rodriquez
Project-targeted	Todd Rosenstock, ICRAF
	Mark Lundy, CIAT
Non-CCAFS	Chris Brett, WBG
	Michael Morris, WBG
	Ioannis Vasileiou, WBG, ex-CCAFS
	Tanja Havemann, Claremondial