

# Lessons on bridging the science-policy divide for climate change action in developing countries

Working Paper No. 250

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

Laura Cramer  
Philip Thornton  
Dhanush Dinesh  
ML Jat  
Arun Khatri Chhetri  
Peter Laderach  
Deissy Martinez Barón  
Mathieu Ouedraogo  
Samuel Partey  
Edmond Totin  
Ioannis Vasileiou  
Marieke Veeger

**Correct citation:**

Cramer L, Thornton P, Dinesh D, Jat ML, Khatri Chhetri A, Laderach P, Martinez Barón D, Ouedraogo M, Partey S, Totin E, Vasileiou I, Veeger M. 2018. Lessons on bridging the science-policy divide for climate change action in developing countries. CCAFS Working Paper no. 250. Wageningen, the Netherlands: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Available online at: [www.ccafs.cgiar.org](http://www.ccafs.cgiar.org)

Titles in this Working Paper series aim to disseminate interim climate change, agriculture and food security research and practices and stimulate feedback from the scientific community.

The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) is a strategic partnership of CGIAR and Future Earth, led by the International Center for Tropical Agriculture (CIAT). The Program is carried out with funding by CGIAR Fund Donors, Australia (ACIAR), Ireland (Irish Aid), Netherlands (Ministry of Foreign Affairs), New Zealand Ministry of Foreign Affairs & Trade; Switzerland (SDC); Thailand; The UK Government (UK Aid); USA (USAID); The European Union (EU); and with technical support from The International Fund for Agricultural Development (IFAD). For more information, please visit <https://ccafs.cgiar.org/donors>.

**Contact:**

CCAFS Program Management Unit, Wageningen University & Research, Lumen building, Droevendaalsesteeg 3a, 6708 PB Wageningen, the Netherlands. Email: [ccaafs@cgiar.org](mailto:ccaafs@cgiar.org)

Creative Commons License



This Working Paper is licensed under a Creative Commons Attribution – NonCommercial–NoDerivs 3.0 Unported License.

Articles appearing in this publication may be freely quoted and reproduced provided the source is acknowledged. No use of this publication may be made for resale or other commercial purposes.

© 2018 CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). CCAFS Working Paper no. 250

**DISCLAIMER:**

This Working Paper has been prepared as an output for the Flagship on Priorities and Policies for CSA under the CCAFS program and has not been peer reviewed. Any opinions stated herein are those of the author(s) and do not necessarily reflect the policies or opinions of CCAFS, donor agencies, or partners. All images remain the sole property of their source and may not be used for any purpose without written permission of the source.

## Abstract

Decision makers in developing countries need evidence of the impacts climate change is having and will continue to have on agriculture and food systems as well as knowledge on how to design better policies to deal with such impacts. Research for development scientists are generating this evidence but it might not always be what decision makers want or need. We present here a synthesis that is an attempt to learn lessons from projects conducted by the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). These projects engaged with policy makers and other stakeholders by providing climate science and spaces for dialogue between researchers and decision makers for the purpose of improving climate change and agricultural policies. This study draws conclusions from across projects in five regions and confirms the presence of similar enablers to policy engagement and constraints to the use of scientific findings by policy makers in each region. The paper is guided by the following research questions: (a) What are the most effective means of science-policy engagement in the areas of climate change, food security, and agriculture?; (b) What are the enabling factors for research uptake in decision making?; and (c) What are the main constraints to policy engagement, and how can they be overcome? The Kaleidoscope Model for agricultural and food security policy change is used throughout the paper to help organize results and conceptualize the process of policy change.

The CCAFS projects included in this study relied on sustained engagement between researchers and decision makers through a variety of means. Respondents from all regions indicated the importance of involving decision makers with the research process from the very beginning so that knowledge can be co-created and will meet the needs of the decision makers. The learning alliances and science-policy dialogue forums created through CCAFS projects proved successful in bringing together actors from multiple stakeholders and sectors. One of the key lessons from the CCAFS projects was that, rather than starting from scratch or trying to force review or revision of a policy that was not on anyone's agenda, it was better to start by getting involved in a process that was already underway and look at how CCAFS could provide support and evidence. Major constraints faced by projects were the availability of decision makers to attend meetings and participate in project activities, staff turnover

within government ministries and departments, lack of time to engage, and the mismatch of political processes with research timelines.

### **Keywords**

Climate policy; science-policy interface; research uptake.

## About the authors

**Laura Cramer** is the Science Officer for the CCAFS Flagship on Priorities and Policies for CSA. Contact: [l.cramer@cgiar.org](mailto:l.cramer@cgiar.org).

**Philip Thornton** is the CCAFS Flagship Leader for Priorities and Policies for CSA. Contact: [p.thornton@cgiar.org](mailto:p.thornton@cgiar.org).

**Dhanush Dinesh** is the Global Policy Engagement Manager for the CCAFS Program Management Unit. Contact: [d.dinesh@cgiar.org](mailto:d.dinesh@cgiar.org).

**ML Jat** is Principal Scientist/Systems Agronomist at the International Maize and Wheat Improvement Center (CIMMYT) in New Delhi, India. Contact: [m.jat@cgiar.org](mailto:m.jat@cgiar.org).

**Arun Khatri Chhetri** is the Science Officer for CCAFS South Asia. Contact: [A.Khatri-Chhetri@cgiar.org](mailto:A.Khatri-Chhetri@cgiar.org).

**Peter Laderach** is the Global Theme Leader for Climate Change at the International Center for Tropical Agriculture (CIAT). Contact: [p.laderach@cgiar.org](mailto:p.laderach@cgiar.org).

**Deissy Martinez Barón** is the Regional Coordinator for CCAFS Latin America. Contact: [d.m.baron@cgiar.org](mailto:d.m.baron@cgiar.org).

**Mathieu Ouedraogo** is a Scientist for CCAFS West Africa. Contact: [m.ouedraogo@cgiar.org](mailto:m.ouedraogo@cgiar.org).

**Samuel Partey** is the Science Officer for CCAFS West Africa. Contact: [s.partey@cgiar.org](mailto:s.partey@cgiar.org)

**Edmond Totin** is a Climate Impact and Adaptation Expert for Climate Analytics and was previously a CCAFS Project Leader at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). Contact: [edmond.totin@climateanalytics.org](mailto:edmond.totin@climateanalytics.org).

**Ioannis Vasileiou** is an Agricultural Specialist at the World Bank's Agriculture Global Practice. Contact: [ivasileiou@worldbank.org](mailto:ivasileiou@worldbank.org).

**Marieke Veeger** is a Scenarios and Policy Researcher for CCAFS at the University for International Cooperation (UCI). Contact: [mveeger@uci.ac.cr](mailto:mveeger@uci.ac.cr).

## Acknowledgements

This work was implemented as part of the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), which is carried out with support from CGIAR Fund Donors and through bilateral funding agreements. For details please visit <https://ccafs.cgiar.org/donors>. The views expressed in this document cannot be taken to reflect the official opinions of these organizations.

The authors would like to thank the respondents who gave their time and insights through interviews. We thank Amy Cruz and Maliha Muzammil for each conducting one of the interviews. We also thank Tatiana Gumucio for providing helpful insights during a review.

# Contents

Introduction.....	8
Methods.....	9
Findings.....	14
Agenda setting .....	14
Design .....	20
Adoption .....	22
Implementation .....	25
Evaluation and reform.....	26
Discussion.....	27
Conclusion .....	33
Appendix.....	35
References.....	38

## Introduction

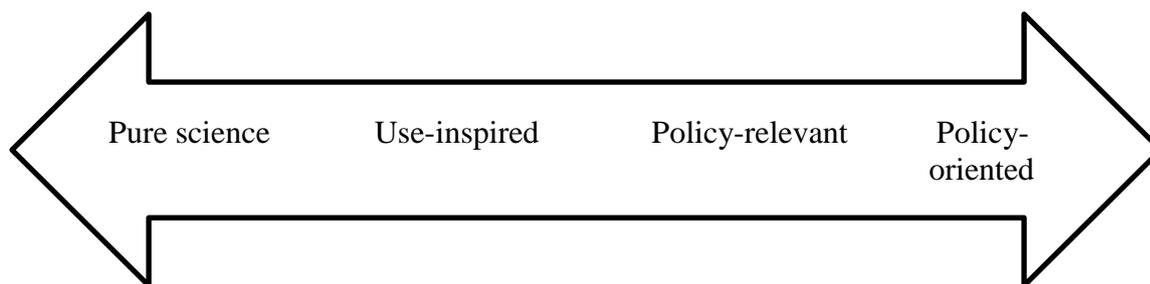
Developing countries must increasingly contend with the impacts of climate change on agriculture and food security (Thornton et al., 2018; Wheeler and von Braun, 2013). While there is still far to go in terms of agricultural development for many of these nations, sectoral policies and plans must now include adaptation and resilience to climate change effects, and policy makers need to consider the broader effects on the food system as a whole. These decision makers need evidence of the impacts of climate change on agriculture and food systems as well as how to cope with these impacts to be able to design better policies. Research for development scientists are generating this evidence but it might not always be what decision makers want or need (Cooper et al., 2008). Research outputs are often not designed in a way to facilitate access to policy actors. Better knowledge is still needed on how best to bridge this science-policy divide.

At the same time, scientists within CGIAR are being pushed to demonstrate outcomes in the realm of informing policy (CGIAR, 2016). Donors want to see improved policies, strategies and plans informed by scientific evidence which help meet the ultimate targets of reduced poverty, improved food and nutrition, and improved natural resources. With increased interest to inform policy, it seems important to understand how such a complex change occurs under constraints.

While there is a debate over how far downstream the CGIAR centres should work (Kamanda et al., 2017), there is also no settled answer on how far into an advocacy role CGIAR centres and research programs should venture. Over the past three decades, there has been an increased role of donors in agricultural policy making, particularly in Africa (Poulton, 2012). Policy-oriented research (POR) can be defined as “research aimed primarily at affecting choices made by government or other institutions whose decision are embodied in laws, regulation, or other activities that generate benefits and costs for people who are affected by those governments or institutions” (CGIAR Science Council, 2008; p. 1). While some might argue that CGIAR should be involved in more of the use-inspired types of science that enter the world as international public goods for adoption by any who choose, there are others who believe that to make lasting impact, CGIAR and its centres and research programs should tend more toward POR to achieve the desired outcomes and impacts (Fig 1).

This paper starts from the assumption that POR is a desired activity within CGIAR given the targets laid out in the Strategy and Results Framework (CGIAR, 2016). We present here a synthesis that is an attempt to learn lessons from POR-inspired projects conducted by the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). This study draws conclusions from across CCAFS projects in five regions and confirms the presence of similar enablers and constraints in each region. Other comparative approaches of POR have focused mainly on a single policy subsystem, but such work does not often look at policy arenas that require cross-sector engagement (Resnick et al., 2015). Climate change and agriculture policy quite often require cross-sector engagement.

**Figure 1. Research continuum for agricultural development and climate change**



Sources: Authors, adapted from Johnston and Plummer (2005); Sarewitz and Pielke (2007)

This paper is guided by the following research questions: (a) What are the most effective means of science-policy engagement in the areas of climate change, food security, and agriculture?; (b) What are the enabling factors for research uptake in decision making?; and (c) What are the main constraints to policy engagement, and how can they be overcome? In question (a), ‘effective’ is used to mean those methods that result in dialogue between researchers and decision makers that lead to use of scientific results in formulating or revising policies/plans/strategies.

The paper is structured as follows: the methods and analytical framework are presented in Section 2, with results following in Section 3. Section 4 provides a discussion of the findings, and Section 5 offers a conclusion and recommendations.

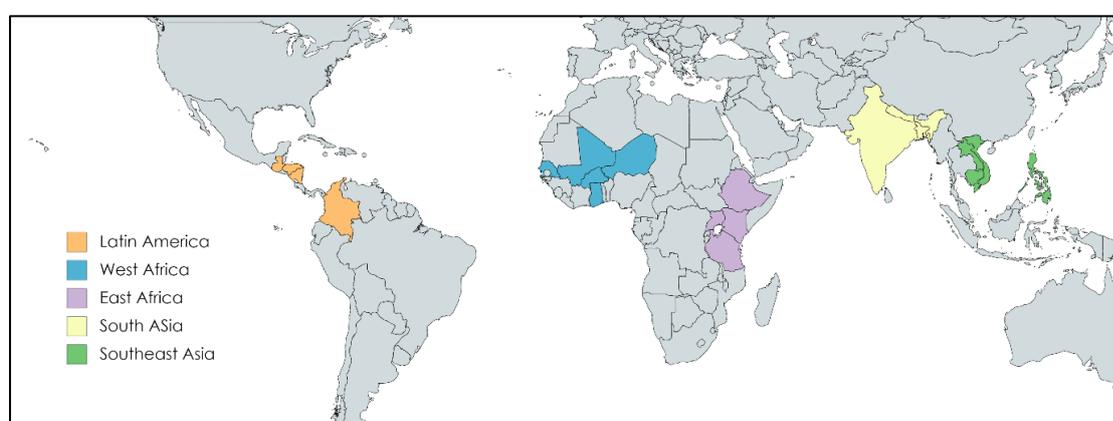
## Methods

This paper is based on case studies of projects implemented under the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). They focused on mainstreaming climate information, food security and agriculture into scientific evidence for development policies. CCAFS is an agricultural research for development program with a mandate to address the challenge of climate change impacts on agricultural practices, policies, and food security through research and engagement with a wide variety of partners and stakeholders. The CCAFS portfolio spans five regions (East Africa, West Africa, South Asia, Southeast Asia and Latin America), with activities and projects in each region aimed at informing climate-smart regional, national and subnational policies and investments (Fig 2).

To draw lessons from across the many CCAFS projects involved in such policy engagement work, this study used a purposive sampling of relevant projects. Projects were selected if they had a component that entailed engaging with national or subnational decision makers to inform policies, plans, or strategies related to climate change, agriculture, or food systems. All included projects had been operating for at least two years or longer. A total of 22 interviews were conducted with project leaders or other CCAFS-related staff involved with the project and nine interviews were carried out with key partners in government who had high levels of interaction with the CCAFS-related staff. See Table 1 for a breakdown of the interviews conducted by type of interviewee and by region and Table 2 for a summary of project details. The qualitative method of semi-structured interviews was used to solicit expert opinion from the respondents. The interviews were conducted over the course of two

months in late 2016. Two interview guides were developed: one for project staff and one for partners. The interview guides were developed to follow the structure of the Kaleidoscope Model of food security policy change developed by Resnick et al. (2015) as part of the Innovation Lab for Food Security Policy (see Fig 3). The Kaleidoscope Model is a framework for policy change research that identifies the key determinants of policy change along five stages. It has been used in other contexts, including agriculture and micronutrient policy in Zambia (Resnick et al., 2018). The interview guides for this study were designed based on the Kaleidoscope Model and focused on the constraining and enabling factors to engaging with policy makers and using science to inform policy. The guides can be found in Annex 1. Project documents, including published research papers and annual reporting documents, were also used to gather information about each project case. Given the small-N nature of the study, comparative analysis was used to extract similarities and differences between the projects/cases and to draw conclusions related to the research questions presented above.

**Figure 2. Map of regions and countries where CCAFS work is focused**



Source: Created by authors using mapchart.net

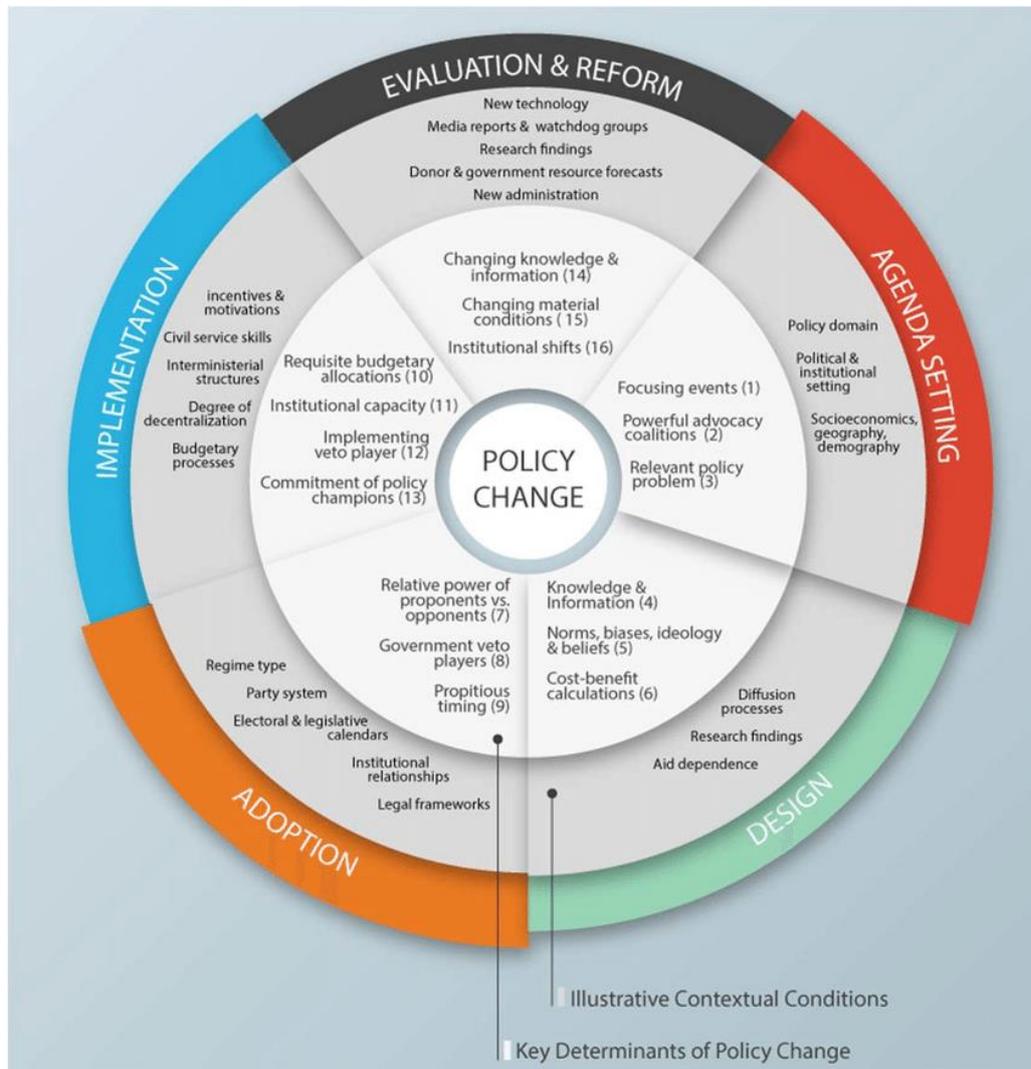
**Table 1. Numbers of interviewees by type and region**

Type of interviewee	East Africa	Latin America	Pacific	South Asia	South-east Asia	West Africa	Global	Total
Project staff	2	5	1	5	3	4	2	22
Partner	1	2	0	2	1	3	0	9

Given the nature of CCAFS as an agriculture research for development (AR4D) program, the projects did not typically engage in the agenda setting component of the framework but instead aimed to meet the needs of decision makers through a demand-led process. The Kaleidoscope Model is useful to broadly conceptualize the process of policy change, but as an AR4D program CCAFS was limited in its scope of engagement during its first phase (2011 – 2016) to mainly the design and adoption stages of the model, with much less emphasis on agenda setting or implementation. We also acknowledge that policy change is not a neat, linear or circular process; the Kaleidoscope Model is a general framework to help highlight the processes that may influence policy change at different points and in

different contexts. The findings are discussed in the section below with respect to the key determinants of policy change as shown in the inner circle of the framework diagram to the extent possible. It was not feasible to explore each key determinant fully; for example, the role of veto players was difficult to address through the key informant interviews because the projects had not been explicitly designed to address those issues. Other key determinants not fully addressed were requisite budgetary allocations and changing material conditions.

**Figure 3. The Kaleidoscope Model of food security policy change**



Source: Resnick et al., 2015

**Table 2. Summary of project information**

Name of project	Lead center/ flagship	Geographic scope	Project was active during phase(s) of:				
			Eval. & reform	Agenda setting	Design	Adoption	Implementation
Capacitating science-policy exchange platforms to mainstream climate change into national agricultural and food security policy plans	ICRISAT	West Africa	x	x	x		
Scenario-guided policy and investment planning for food- and nutrition-secure futures under climate change	CCAFS-led	Global	x	x	x	x	
Policy information and response platform on climate change and rice in ASEAN and its member countries (PIRCCA)	IRRI	ASEAN		x	x		
Influencing and linking national and local level policies and institutions to adopt climate-resilient food systems	IITA	Tanzania and Uganda	x	x	x	x	x
Relevant climate change information meets decision-making to influence policy and institutions for climate resilient food systems	CIAT	Latin America	x	x	x	x	
Influencing and linking national and local level policies and institutions to adopt climate-resilient food systems	CCAFS-led	East Africa		x	x	x	
Scaling-up climate smart agriculture through policies and institutions: linking it with national agenda of food security	IFPRI	South Asia		x	x	x	
Addressing the impacts of climate change in the Philippine agriculture sector	IFPRI	Philippines	x	x			
Global policy support for biologically diverse, climate resilient agriculture	Bioversity	Global	x	x	x	x	
West Africa regional/national synthesis, engagement and support	CCAFS-led	West Africa	x	x	x	x	x
Partnerships on mainstreaming Climate Smart Agriculture (CSA) with national governments in SEA	CCAFS-SEA	Southeast Asia		x	x	x	
Local to national/regional synthesis, research and engagement	CCAFS-led	Latin America	x	x	x	x	x

Developing, adapting and targeting portfolios of CSA practices for sustainable intensification of smallholder and vulnerable farming systems in South Asia	CIMMYT	South Asia	x	x	x	x	x
Priority-setting for building resilience and strengthening climate change adaptation in the Pacific	WorldFish	Pacific region		x			
Developing a strategy for climate resilient agriculture in Nigeria	CCAFS participation	Nigeria			x		
Climate change policy analysis and engagement in Nepal and Sri Lanka	IWMI	Nepal and Sri Lanka		x	x	x	
Scaling up Climate-Smart Agriculture (CSA) practices and technologies across South Asia	CCAFS-led	South Asia	x	x	x	x	x
Enhancement of modelling tools (IMPACT) and targeted policy engagement	IFPRI	Colombia		x	x	x	
National and regional partnerships to support integration of climate change in agriculture and food systems	CCAFS-EA	East Africa		x	x	x	

# Findings

## Agenda setting

Using the Kaleidoscope Model as an analytical framework, we begin by considering the stage of agenda setting. The CCAFS projects included in this review did not generally attempt to select specific policies or plans for revision or creation; the approach was to offer scientific findings and other tools and methods that would be of use to decision makers in their work. Most projects were opportunistic in helping inform policies that had already been selected by partners for review and revision.

At the beginning of each project, each CGIAR centre staff selected local partners to implement the CCAFS project. The partner selection process can be seen as part of the advocacy coalitions sub-topic under agenda setting. From the respondents interviewed, it was clear that involving the correct people and partners from an early stage was important. One of the interviewees reported that in Nepal, partner selection was key to enabling the uptake of research. The local partner selected had very good connections with the Government and had been working with them in agriculture and development for a long time. The key stakeholders, especially the senior officers of the Government, were engaged during the planning and implementation of the Climate Smart Villages (CSVs). Local partners have implemented the climate-smart agriculture (CSA)/CSV project in collaboration with the Ministry of Agriculture and other relevant ministries in Nepal. The results of these CSA evaluations have been integrated into village and district agriculture development plans and linked with local/national adaptation plans (LAPA and NAPA). Regular communication and engagement with national and sub-national level policy makers and implementers, policy dialogues and workshops, and periodic visits of CSV-AR4D sites has created awareness about the CSV approach to scale out CSA in Nepal, and policy makers were convinced to integrate it in their adaptation programs. Another interviewee reinforced the idea that connections with the government are very important in South Asia when choosing local partners.

For the work in the scenarios project, the project staff intentionally cast a wide net when first convening regional meetings to create the regional level scenarios. The aim was to get a wide range of people in the room, not just stakeholders from ministries of agriculture and

environment but people from planning and finance ministries as well. They also wanted to have a range of decisionmakers from high level policy makers to technocrats who delve deeply into details. The same range for civil society was also required—high level people and those who do the hands-on work.

In West Africa, the CCAFS team took a participatory approach to the formation of science-policy dialogue platforms. They invited a range of actors from agriculture and environment ministries, universities, national agricultural research services (NARS), NGOs, and farmers' organizations. Each large group was then allowed to decide how to organize itself and who to nominate as the leader. The chairman of the Senegal platform came from the Ministry of Agriculture, while in Ghana the chairman came from NARS. In Mali and Niger, the chairman was from an institution within the Ministry of Environment. Empowering the platform members to self-organize allowed for an arrangement best suited for each country. At the local level in West Africa, engaging with the local chiefs was important because they are seen as neutral actors, and they have recognized authority over natural resources in their jurisdiction.

The scenarios process in Latin America has used “champions” at the national level to help bring the process from the regional level down to the national scale. The process can take time: in Costa Rica, the person who was involved in the creation of the regional scenarios came back to CCAFS two years later to request help in using the scenarios at a national scale. The CCAFS regional team helped promote the scenarios approach with their contacts within ministries and that helped build relationships. In South Asia, finding the right people within ministries was key, and those who took a personal interest in the climate change and agriculture research agenda were critical in helping to adopt the scenarios approach. At times, a higher-level person in a ministry was not as helpful as a more junior-level person who had a keen interest in working with CCAFS. A person who was well regarded within the government helped build a trustworthy relationship with the ministry. According to another interviewee from South Asia, knowing which people can make a difference within ministries is a major key to success. Inviting those key people to events and also attending and making presentations when invited by them to their events has helped build the relationship. For research on the ground, universities and the Indian Council on Agricultural Research (ICAR) have been critical, and the departments of agriculture have been the partners of choice for

scaling out interventions because they are the front wings of extension. In Uganda, one of the projects using the scenarios approach had a setback when the policy makers responsible for the selected policy were not completely on board with the use of the scenarios process. Without buy-in of the people responsible for the policy document, the process became difficult and stalled. Without the involvement of such people, there was a lack of mandate to review and revise the policy.

Power mapping was used in Latin America to see how to get connected with the partners and other stakeholders needed for the planned work of the project. The exercise was used to see with whom they were already connected who could lead them to others with whom they needed to be connected. Power analysis was also used in West Africa to identify strategic actors whose activities are linked to climate change as a way of understanding which partners needed to be included in the project. A more specialized piece of a project in Latin America needed to find partners with expertise or interest in promoting gender equality in climate change policymaking. To seek out the right partners, the team used the contacts of the regional CCAFS team at relevant ministries and a partner (CATIE) with a long history of working in the region. Using these networks to identify contacts helped find the appropriate people to involve.

In another Latin American project, the partner selection process depended on the country in which it was working. Non-state local partners were preferred in Nicaragua given the political context, whereas the government in Costa Rica was a natural partner due to its existing work on two initiatives to develop sector-specific Nationally Appropriate Mitigation Actions (NAMAs). In Colombia, producers' associations were selected because of their role in the agricultural sector and their ability to influence policy. Building the partnerships with the associations and the government took time but was a necessary step to success.

Partnering with other stakeholders also was used to bring in expertise that was not available in-house, for example the scenarios approach in Latin America. Partners with different expertise helped combine methodologies. For work on an IWMI-led project in SEA, partners with complementary skills were selected. Building a team with cross-disciplinary skills helped cover the different roles that were needed. In Southeast Asia, the partners were selected by looking at the needed outcomes and then choosing partners who could help deliver those outputs and outcomes. Research partners were selected for delivering outputs,

and partners responsible for delivering outcomes had to feel a sense of ownership for the research outputs. Another key in SEA was understanding who within certain institutions has authority and influence. Those without authority may have a high level of influence, and those power dynamics were important to understand. A good mix of people with authority and with influence were needed. The Philippines project used personal ties within the National Economic and Development Authority (NEDA) as an entry point and then selected individuals from within the agency who had expertise in the relevant sectors. NEDA carries the mandate of acting as the planning and policy coordinating body within the country, which made them a natural partner for the work that was planned.

Partners have also been added during the process as needed. In East Africa, work started with the agriculture ministries at the national level but then the Ministries of Finance and Planning were brought in when their cooperation became necessary. NGO partners also joined to seek out climate change research findings when they learned of CCAFS. Because of the devolution process in Kenya, the Council of Governors became involved when the goal of extending climate smart agriculture to the county level arose.

CCAFS has also used calls for proposals as a mechanism for selecting partners. In a global project on agrobiodiversity and for the work in Nepal, competitive processes were used to select partners who met specific criteria within their proposal.

Another part of agenda setting is the selection of target policies to be created or renewed. As mentioned earlier, CCAFS projects did not try to lead this process but instead mostly relied on joining ongoing processes to provide advice as needed. Both the CCAFS staff and the partner interviewees were asked how the target policies were selected in the work to which CCAFS contributed. An interviewee from West Africa stated that the process in that region was intentionally participatory within the science-policy platforms, and it was up to the platforms to decide which policy or plan would be their focus. In Burkina Faso, the government partners were the ones who selected the policy to be reviewed, the National Plan for the Rural Sector (PNSR). It was up for renewal, and they decided to use the scenarios process from CCAFS as a way to incorporate climate change into the second phase. The selection process was the same in Ghana; the government representatives on the science-policy dialogue platform suggested the policies that needed to be reviewed using the scenarios process. The National Climate Change Policy (NCCP) began with an inception workshop and needs assessment that

arose due to climate change becoming an issue of global concern. This can be considered both a focusing event and a relevant policy problem as defined in the Kaleidoscope Model. In Honduras, a focusing event caused a shift in the policy that was to be worked on using the scenarios approach. The original idea was to work on the National Investment Plan for the Agrifood Sector, but two weeks before the scenarios workshop was scheduled to take place, the national partner shifted the focus to the Climate Change Adaptation and Risk Management Strategy. The shift was precipitated by an announcement that the country had lost 70% of its agricultural production due to recent natural disasters, and the need for a climate change adaptation and risk management strategy was deemed more urgent.

In Nepal, the National Agro Biodiversity Plan was selected to enable the country to fulfil its obligations as a party to the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA). The Ministry of Agriculture in Senegal was the driving force behind selecting two key national policies for review and in which to mainstream climate change: the Programme for Accelerated Agricultural Development (PRACAS) and the Emerging Senegal Plan (PSE). The CCAFS platform in Senegal also had input into the process, and the policies were selected based on national priorities and the pressing need to mainstream climate change adaptation.

In Latin America, a combination of approaches was used. In some cases, the government approached the CCAFS team and requested assistance for a specific piece of work. For example, the local government in a specific region of Colombia requested assistance in working on a local climate change adaptation plan. In other cases, the CCAFS team sought out information on what policies were being reviewed and then approached the policy makers who were working on relevant documents to offer technical support. In such instances, it was harder for CCAFS to make as much of a contribution as in other cases when they were specifically approached for help, because when they approached policy makers to offer assistance there were also other stakeholders already involved, resulting in a sort of competition to offer the most useful support.

The regional team in South Asia took a slightly different approach. Instead of approaching policy makers to provide support in the development of policies, the CCAFS staff provided assistance in developing projects governed by policies already enacted. Instead of trying to inform an agriculture development strategy for the next 20 years in Nepal, they worked with

the Department of Agriculture staff to design activities or programs to be included within the rubric of that strategy. When necessary, they also became involved in working with policy makers and the government to help inform policies. An IITA-led project used a similar approach in East Africa, where the team would join ongoing policy processes instead of trying to initiate new efforts. The IITA project staff were invited to many meetings and had to select which were most relevant and fell under their mandate. In Tanzania, they joined an effort to roll out the Climate Change Agriculture Resilience Plan to the districts.

The scenarios team also used an opportunistic approach when selecting plans or policies with which to get involved. These were either specific or general in nature. Specific plans or policies were easier in some respects because there were fewer people involved. In more general cases, especially when the targeted plan or policy was multi-sectoral, it was more difficult according to the project leader because there are more people involved. However, these cases offered a higher chance to have more impact, so the risk was worth the potential reward. For the case in Ghana, the scenarios coordinator and the West Africa regional team worked with the science-policy platform to identify an existing policy opportunity. The livestock plan was under revision, so it was chosen as the way to start using the CCAFS scenarios approach in Ghana. The same process was followed in Bangladesh: the country was in the process of working on its seventh five-year plan, and this was chosen because it was currently being worked on, it provided an opportunity to have a broader impact, and it brought an understanding of climate change and agriculture to a wider audience. In Latin America, the scenarios coordinator and the regional team used a continual scoping process to know what was underway within the relevant government ministries and where there were opportunities to collaborate and assist with technical support or CCAFS science. Having a network of people with strategic connections allowed the team to gather helpful information and engage easily when needed.

The regional team in Southeast Asia was mindful of being demand driven instead of supply driven, according to the interviewed staff. They worked within the priorities of the focus countries and used engagement to identify what was needed by the national governments. The East African team used the same method of providing demand driven services. By understanding the global processes related to the UNFCCC, it was clear that countries would

need to submit their Intended Nationally Determined Contributions (INDCs), and the East African team was poised to provide contributions and support for those.

A more technical, science-led approach was used in the CIAT-led project in Peru, where CIP identified the significant amount of carbon in production systems in the highlands of the country, which could be categorized as a potential system around which to formulate a NAMA. The government of Costa Rica also chose coffee and livestock as the most relevant sectors for the formulation of NAMAs and CIAT joined in to help provide technical assistance in those cases.

## **Design**

The interviewees were asked about the knowledge outputs from CCAFS that were used to inform decision making processes. This relates mainly to the knowledge and information element identified in the framework as a key determinant of policy change. The other two key determinants as listed in the kaleidoscope framework (cost-benefit calculations and norms, biases, ideology and beliefs) were not given as much attention. Some CCAFS projects provided assistance with cost-benefit calculations as evidence for policy makers about the effectiveness of some technologies. A few of the CCAFS projects included in this review aimed at addressing issues of norms, biases, ideology and beliefs; these were mainly the projects that had elements of gender equity, in which gender roles were examined and assessed.

Several of the projects included in this review used a method of engaging with stakeholders for policy review known as the future scenarios approach and providing a variety of scientific findings from CCAFS and CGIAR centres to help inform decision makers. The scenarios approach has been used in all five regions with positive feedback from partners. Use of the scenarios approach in Honduras and Costa Rica led to stakeholders requesting additional scientific evidence to be included in their policy and decision-making processes. In several regions, the quantification of the scenarios using global integrated assessment models added legitimacy to the findings.

Other scientific findings used in the projects were a mix of reports and climate smart agriculture (CSA) profiles, agronomic data, modelling outputs, and survey findings. The agronomic information included findings on alternate wetting and drying (AWD) for use in

rice cultivation in Southeast Asia, Vietnam in particular, to provide support to policy development in the rice sector. Additionally, results from more than 200 farmers in India who used zero tillage created evidence under a CIMMYT-led CCAFS project that was shared with the government and provided the rationale to increase investment and begin promoting the practice more widely to help farmers cope with variability and risk. Other evidence was used to help advise the government on a portfolio of practices that can help increase farmer income and produce more “crop per drop”. The IITA-led project in East Africa helped fund research on water use efficiency technologies that was very useful to decision makers in Tanzania, according to the partner interviewed.

In South Asia, the CSA prioritization (CSAP) toolkit developed by CCAFS (CCAFS, 2014) along with choice experiments for CSA prioritization have been used to help inform decision makers of various CSA options. The CCAFS Mitigation Options Tool (CCAFS-MOT; Feliciano et al., 2017) was created and shared with policy makers for emission measurement, and the regional team has also provided the gender and social inclusion toolbox (Jost et al., 2014), crop simulation models and climate analogues to stakeholders as tools for project design. Additionally, they have provided scientific publications to the scenarios coordinator in South Asia to make available to regional partners. Results of modelling done by IFPRI using scenarios in South Asia had to be distilled in a way that was understandable and usable by decision makers. It allowed the stakeholders to see how taking the information and factors into consideration could make the policy more robust.

A resource known as the CSA prioritization framework (CIAT, 2014) was used in Mali to come up with specific suggestions of CSA options for agro-ecological zones with detailed analyses to inform investment. A partner in Honduras reported that a CCAFS publication on the state of risk management in the country helped greatly to demonstrate the need for decisions needed in the Ministry of Agriculture and Livestock (Spanish acronym SAG). The information from the report was used to help create the National Climate Change Strategy for SAG and other national plans. The scenarios coordinator in the region also reported that SAG used the document frequently. The government has also requested research on index insurance in Honduras. In South Asia, the regional team has provided assistance to stakeholders on designing index insurance products. In East Africa, CCAFS Report 16, *Options for agriculture at Marrakech climate talks: messages for SBSTA 45 agriculture*

*negotiators*, was used by the African Group of Negotiators (AGN) to develop a submission to the UNFCCC.

The global projects led by Bioversity have used desk-based policy analysis as a starting point to provide guidance to countries to integrate genetic resources for food and agriculture into their national climate change adaptation strategies. Other work used case studies at the community level with inputs from multiple stakeholders. In Ghana, the CSA profiling tools have been used to characterize CSA practices and technologies, and this is now a key reference documents for many stakeholders.

Crop modelling has been useful in Honduras, and the GLOBIOM and IMPACT models have been used in Bangladesh. The IMPACT model (a partial equilibrium model) was also used by IFPRI in its work in the Philippines. It was enhanced with a dynamic computable general equilibrium (CGE) model specific to the Philippines (Phil-DCGE) to understand effects on the domestic economy possible under climate change aberrations and other shocks. The enhanced IMPACT model with the Phil-DCGE model will be used in scenario analysis to justify the need and soundness of particular policies and to provide technical advice on agriculture-related issues that are usually requested by the Office of the President/Executive and Legislative Offices including partner institutions and other stakeholders. IFPRI's engagement in Colombia also used the IMPACT model.

Maps produced by CIAT for the adaptability of cacao, coffee, maize, beans and rice were used to show farmers in a workshop in Honduras how climate change could affect their crops. Coffee and cocoa suitability maps were also used in conjunction with climate change scenarios in Nicaragua. Work on integrating gender concerns in policies in Latin America used results from a gender survey in Colombia in a policy brief that was aimed at decision makers (Tafur et al., 2015).

## **Adoption**

During the interviews with project staff and partners, the main focus was on means of engagement between CCAFS and local decisionmakers to assess the most effective ways to stay involved and bridge the science-policy divide. It was beyond the scope of this study to examine who were the veto players and the relative power of proponents and opponents.

One of the key determinants in the adoption stage, propitious timing, was mentioned by several interviewees as essential to the success of their project. For IFPRI's work with the government in Colombia, a prior project had finished in 2014 and the country was in the preparation phase of its INDC in 2015. The ability to provide needed information at the correct time led to its uptake and use in the country's INDC submission. Another CCAFS respondent from Latin America echoed the critical nature of proper timing. According to her, the science being offered might be the best available, but if the timing is not right, it will not be used. Respondents from South Asia and East Africa agreed that it is more productive to work on policies that are already under review instead of trying to initiate an entirely new process. The policy review process can be a lengthy endeavour, and the scientific staff need the patience to maintain engagement, according to one interviewee. Understanding the electoral and legislative calendars is important. In East Africa, the election of a new president in Tanzania led to changes in the administration and caused delays in work that had been underway with the previous administration. An interviewee from Southeast Asia remarked that the difficult part is whether there is enough time to work with the bureaucracy. The sense of urgency was not always there. Although the CCAFS projects were under pressure to demonstrate outcomes, the government took its time, according to another interviewee. Another respondent acknowledged the immense amount of staff time that is required from the researchers' side to engage with decision makers.

Building the institutional relationships required for effecting policy adoption is a long process. CCAFS projects used very similar ways to establish and build those relationships. Workshops were the top means of engagement mentioned by respondents, followed by communication pieces and science-policy dialogue platforms. Other face-to-face modes of engagement used by the projects included seminars, conferences, consultations, and dialogues. The use of multi-stakeholder committees, learning alliances, and science-policy dialogue platforms were crucial in West Africa, East Africa, and Southeast Asia to bring together actors from a variety of sectors and disciplines. These multilateral, in-person meetings served an important role in relationship building, as did one-on-one in-person meetings. One partner respondent from Southeast Asia noted that, "When you provide this type of work, the most important thing here is to persuade the top tiers, and that can only be done in person."

Communication pieces to promote scientific findings, including policy briefs, videos and info notes, were created by the projects for dissemination to decisionmakers. Field visits to CSVs, to visit and witness relevant research taking place, also helped in the uptake of findings for policy and decision making, as well as laboratory visits and field days. In East Africa, CCAFS project staff organized ‘climate analogue learning journeys’ for a group of policy makers during which they visited several agricultural research stations and met with farmers to learn about how agriculture is being affected by climate change. Field days and traveling seminars are also used in South Asia to demonstrate to policy makers the technologies and practices being researched.

In between these hands-on interactions, Skype, email and phone calls were used to maintain connections and move forward with planning other engagements. A mobile messaging application (WhatsApp) was also utilized in East Africa to create a group chat among stakeholders involved in the Tanzanian learning alliance.

An important factor in building relationships with policy makers was attending and participating in other meetings to which CCAFS project staff were invited. In South Asia, East Africa and Latin America, respondents discussed the importance of creating two-way relationships with those key decision makers who are poised to take up the scientific findings being promoted. In South Asia, a respondent described being invited to serve on a committee formed by the government, and in East Africa an interviewee talked about being invited and attending meetings held by the policy makers as a way of building trust and social capital. Attending meetings to which they are invited also helps scientists convey their findings. Several respondents talked about how making presentations in such meetings is more effective for disseminating research results than creating 4–5-page briefs, because even those are often too long for a policy maker to read. One of the East African projects had a dedicated team for engagement because these interactions are very time consuming. If engagement with policy makers is saved for the end of a project, it puts the uptake of research findings in jeopardy, as was experienced by a project in Southeast Asia. When CCAFS had to cut its budget, the project lost a significant amount of funding that was intended for follow-up visits and discussions with policy makers. This hurt the ultimate outcome of the project.

## Implementation

The policy work within CCAFS has mostly focused on the agenda setting, design, and adoption phases of the Kaleidoscope Model and has placed less emphasis on implementation and evaluation of policies, although some of the use of the scenarios process has begun with evaluation of existing policies to examine their robustness for possible different futures. Nevertheless, CCAFS projects spend significantly less time on the implementation aspect of policy-oriented research. A few projects have been operating for a long enough timeframe to see some of the work come to fruition through policy implementation.

In Ghana, the National CSA and Food Security Action Plan, informed by CCAFS science and prepared by a task team from the CCAFS science-policy platform, was launched in 2015 and institutionalized by the Ministry of Food and Agriculture (MoFA). It has influenced the formation of 12 sub-national or district science-policy dialogue platforms. It also influenced the United Nations Food and Agriculture Organization (FAO) to sign a Memorandum of Understanding with MoFA to transition its activities into CSA. The CCAFS platform was contracted by the West Africa Agricultural Productivity Pan (WAAPP) to develop CSA extension leaflets. In Uganda, the IITA project was successful in incorporating research findings into district level five-year development plans, and those plans are now being implemented.

In Honduras, agriculture is one of the most organized sectors across the government on climate change, according to the partner interviewed. The Climate Change Strategy has been the guideline for creating other plans, and the government was using it to update the national food security strategy. It also spurred the creation of the National Plant Genetic Resources Committee. The National Climate Change and Risk Management Policy for livestock in Honduras was approved in 2015 after a workshop in 2014 and is now being implemented. At the time of interview, the ministry was updating the national food security strategy. The National Plant Genetic Resources Committee was also created as part of the strategy. With regard to NAMAs, the livestock NAMA in Colombia has reached the implementation stage as well as the Costa Rica livestock NAMA. The coffee NAMA in Costa Rica received funding and is being implemented.

## Evaluation and reform

As mentioned previously, CCAFS projects have not been operating for a long enough time period to have gone through the entire process starting from agenda setting to evaluation and reform. Some projects started with evaluation and reform, however, and progressed then through agenda (re)setting and (re)design. These projects used the future scenarios process along with the provision of new knowledge regarding climate change impacts to help evaluate existing policies in light of possible futures. The creation of possible future scenarios helps decisionmakers to think through the ways policies might need to adapt to accommodate not only climate change but also shifting institutional arrangements, in terms of increased regional integration in some cases, shifting global markets, and other possible variables. They can then evaluate and reform existing policies to create more responsive policies, plans, and strategies.

For those projects that started within the framework with agenda setting and design, some evaluation activities are planned for the policies that were designed and implemented. In Burkina Faso, the National Plan for the Rural Sector (PNSR II) was being reviewed, starting in 2015. A series of several workshops was planned to review and validate this document, which was similar to the annual review workshops used in the first phase of the PNSR. In Tanzania, there are plans to develop monitoring and evaluation guidelines for CSA to track implementation as it is promoted through the extension system. The indicators to be developed will track progress and will feed into the monitoring and evaluation of the Ministry of Agriculture and of the National Statistics Bureau. In Bangladesh, the partner interviewed said there will be a mid-term review half way through the seventh five-year plan that was informed by the CCAFS scenarios process (scheduled for July 2018).

There are also formalized ex post impact assessments of policy-oriented research that are conducted by CGIAR centres as part of their evaluation requirements by the CGIAR system office. CCAFS is funding an impact assessment of Bioversity's work on seed policy activities in India. These efforts help assess the impacts of the policy(ies) within the countries where they were enacted.

It should be noted, however, that there can be limitations on the ability of time-limited projects to evaluate their outcomes and impacts before funding for the project is finished. Several of the projects listed in this study have since completed their activities, and the overall CCAFS program must devise ways to continue to monitor for outcomes even after project

activities come to an end and staff move on to other roles. There is a risk of losing valuable lessons associated with policy change research because of the short time span of specific projects. This potential loss can affect both the researchers and the decision makers with whom they were working because there may be inadequate evaluation and reform without continued engagement.

## **Discussion**

The interview responses were coded according to thematic categories, and information on lessons learned have been drawn from the interviews and used to answer the research questions presented in the introduction. We also draw relevant findings from related literature to help place our findings in the broader debate over evidence-based policy and policy-oriented research.

### **What are the most effective means of science-policy engagement in the areas of climate change, food security, and agriculture?**

The CCAFS projects included in this study relied on sustained engagement between researchers and decision makers through a variety of means. Respondents from all regions indicated the importance of involving decision makers with the research process from the very beginning so that knowledge can be co-created and will meet the needs of the decision makers. There is no single approach that will work everywhere, and solutions must be adapted to institutional contexts (Klerkx et al., 2017), but the CCAFS experiences indicate that face-to-face meetings, whether through workshops, individual visits, field days, or other formats are the most effective ways of building interpersonal relationships and helping bridge the gap between scientists and policy makers. Continuous interaction over the course of the project is critical, with various means of communicating and interacting, particularly with a broad array of stakeholders. Seven of the interviewees expressed the importance of personal relationships between CCAFS project staff and policy makers or technical staff within ministries to accomplishing project goals. Having personal relationships with partners helps open doors and build trust. This has been verified by CCAFS previously as a key to success (De Pinto et al., 2017; Blundo Canto, 2016). A similar research for development program known as the Collaborative Adaptation Research Initiative in Africa and Asia (CARIAA) used a core

activity called ‘Research into Use’ that had personnel dedicated to the strategic engagement of stakeholders to ensure that research findings reached the intended audiences in a timely manner and appropriate format (Cochrane et al., 2017), providing additional evidence that engagement with the next users of information is critical.

The learning alliances and science-policy dialogue forums created through CCAFS projects have proved successful in bringing together actors from multiple stakeholders and sectors. They have provided spaces for discussion, presentation of evidence, and mutual learning. Using a similar strategy, a project in Ethiopia used learning alliances to encourage stakeholders to make use of evidence in policy making, which led to a broader trend of increased demand for evidence and data (Tucker et al., 2013). Within CCAFS projects, at least one forum brought together institutions that existed in the same country but had never interacted (Sogoba et al., 2014). Creating such spaces for interaction between researchers and policy makers from diverse sectors helps throughout the stages of agenda setting, design, and adoption.

Climate change adaptation and mitigation policies require more cross-sectoral cooperation than many other policy areas in which international research for development organizations may work. Bringing together decision makers from different ministries is no easy task. Each one may have its own organizational culture, institutional capacity, and operating processes (Resnick et al., 2015). Navigating the intricacies of facilitating cooperation and setting mutual goals among diverse stakeholders may not be the bailiwick of all researchers, which highlights the importance of crafting a balanced team within the project. Interviewees from CCAFS mentioned the need for a different set of skills from traditional research. Having the right people on the project team with a mix of skills that includes facilitating interaction is important for successful science-policy engagement. Cochrane et al. (2017; p.1557) found that “research programs with explicit aims to support more informed policy and practice have to be strategic about where they place energy and emphasis in responding to the needs of decision makers,” hinting at avoiding a pitfall of becoming too immersed in meeting policy maker needs.

## **What are the enabling factors for research uptake in decision making?**

Several lessons can be gleaned from the CCAFS projects on how to enable the uptake of research in decision making. One of the key lessons from the CCAFS projects was that, rather than starting from scratch or trying to force review or revision of a policy that was not on anyone's agenda, it was better to start by getting involved in a process that was already underway and to look at how CCAFS could provide support and evidence. The policy process can take many years and can even outlast the life of a CCAFS-funded project, so starting from scratch to help select the policy to be reviewed can lead to disappointment when the project funding ends and the policy is still not finalized and adopted. Related to this factor is the importance of identifying needs of policy makers. Critical to achieving outcomes, which in this case is the use of scientific findings in improved policies, is the ability to respond to needs of policy makers. This finding is corroborated by Dinesh et al. (2018) through another study of CCAFS engagement. By involving them from the beginning of a project, researchers can understand how to best meet their needs. Producing products that do not speak to the needs of policy makers is not useful in policy-oriented research.

The collaboration needed to work with decision makers takes time and effort. Scientists expect policy makers to attend meetings to which they are invited but can sometimes forget that there are competing demands for their time and attention. A number of CCAFS researchers interviewed for this study acknowledged that decision makers have busy schedules and pointed out that building trust and relationships with them meant attending meetings to which they (the researchers) were invited by the policy makers. This provided opportunities to present scientific findings to relevant audiences and assisted in the uptake of research. Collaborating with decision makers and other local partners in this way is productive but places additional time burdens on the researchers. Being prepared for these commitments from the start of a policy-oriented research project is necessary.

Especially within the agenda setting stage, putting together or joining the right advocacy coalitions is another key factor to success. CCAFS interviewees discussed the importance of selecting appropriate and well-connected local partners. Working with well-established local research institutes provides existing connections to decision makers and earns credibility for researchers who are not yet connected to policy makers in the given country or region.

Another key consideration when putting together coalitions and creating spaces for science-policy dialogue is inclusion of a broad range of stakeholders from a variety of sectors. In East Africa, the CCAFS team began working primarily with decision makers in the agriculture sector, but as work progressed they found it necessary to also include people from planning and finance ministries. Having people on board from as close to the beginning as possible can help create the buy-in needed from across government agencies. It is not always possible to know who will be needed from the beginning, however, so periodic checks should be consciously scheduled to allow for a reassessment of who is included and who needs to be brought in. During these reassessments, the project team should not limit their consideration to government stakeholders but should also look across civil society actors, academia, and other international organizations to help coordinate efforts and avoid duplication of actions and research.

During the design phase, several factors helped influence the uptake of research results. Both project staff and partners interviewed mentioned specific scientific outputs or approaches, particularly the scenarios method, as being key to the process of informing policy. These were not just handed over from researchers to policy makers and automatically used, however. Capacity building was a key part of the usage by decision makers. Helping decision makers understand specific tools or approaches increases their capacity to use the information generated. Co-production of knowledge also aided in findings then being used to shape policies and plans. By involving decision makers in the project from the beginning, not only were researchers better able to understand their needs, but it also gave the decision makers a chance to help shape the research. They then have ownership of, and empowerment through, the learning process. Results are much more likely to be used if policy makers feel they were part of the production process. Ampaire et al. (2017) found that involving decisionmakers in research from the beginning helps the own the findings once they are available. This helps with including its use in policies and plans.

### **What are the main constraints to policy engagement, and how can they be overcome?**

There are several major obstacles to the uptake of science in policy that have been encountered by CCAFS projects, as identified by the respondents. Many cut across the stages of the Kaleidoscope Model and its key determinants of policy change. As mentioned by

several interviewees, funding stability was an issue in carrying out the planned work. Many projects suffered setbacks due to CCAFS funding cuts. There were engagement meetings that had been planned and then were not possible due to cuts in funding, and this led to damaged trust with local partners. One possible way to avoid the complete loss of possible outcomes is to involve decision makers from the beginning instead of saving engagement to the end of the research project. If engagement is only planned as the final activity in the last year of a project and then funding is cut, the interaction with decision makers will suffer. Involvement from the beginning helps build the relationship, and transparency about funding availability might help avoid disappointment if funding levels go down.

Even when adequate funding was available, another constraint was the availability of decision makers to attend meetings and participate in project activities. Policy makers have competing priorities that also require their attention; scientists working on a project are involved with them on one particular facet of their jobs but there are many other things contending for their time and attention. Being mindful of other responsibilities borne by decision makers and finding patience to deal with long policy processes are necessary when engaging in science-policy interface projects.

Another aspect that inhibited progress in some projects was staff turnover. This was mentioned as a constraint in Latin America, South Asia and East Africa. Government staff in ministries and other agencies are often moved around, and this hurts continuity of the engagement work and causes setbacks. CCAFS staff in Latin America tried to minimize the disturbance of staff turnover by maintaining a strong institutional arrangement with the targeted ministry, but acknowledged that it often felt like starting over when staff was changed. In West Africa, the constraint mentioned was not turnover of staff but the substitution of different staff members in subsequent meetings. It makes difficulty in building capacity, but is the reality of trying to work with policy makers who have busy schedules and are not always available so they send someone else to stand in for them.

Lack of time to engage is one constraint, and the mismatch of political processes with research timelines is another issue related to timing. It can sometimes be contradictory: policy makers may need answers quickly, and yet policy processes take a long time. Ampaire et al. (2017) found that policy makers are interested in scientific evidence but are constrained by a set planning time frame. Jones et al. (2017) also identified mismatched timescales of

information and policy processes as a constraint to the uptake of research. Although many of the CCAFS interviewees acknowledged the constraint of timing, there were no readily available options for overcoming this struggle.

While the advantage of having a team with mixed skills and ability to interact with decision makers was mentioned above as an enabler to research uptake in policy, the lack of such skills was noted in some CCAFS projects as a constraint to engagement. Scientists do not always have the most appropriate training for interacting with policy makers (Cullen et al., 2014; Klerkx et al., 2017). This constraint can be overcome by research institutions hiring scientists with varied skill sets, but may also be addressed at the university level by offering a wider range of opportunities to early career scientists for engagement with different types of stakeholders. Addressing the university training system is beyond the scope of CCAFS and other research for development organizations, but should not be overlooked as a factor in improving science-policy engagement.

Improved capacity of scientists to interact with decision makers can help overcome another constraint: lack of capacity among policy partners to engage with scientific findings. There is often a need to build capacity of policy partners with whom a project is engaging, which takes time. Improving the ability of scientists to interact with policy makers and of policy makers to engage with scientific evidence can help projects avoid the missed opportunity trap (Sarewitz and Pielke, 2007; Fig 4). Successful projects and programs ensured both that users can benefit from the research produced and that the research undertaken was relevant to the needs of decision makers. CCAFS projects have been encouraged to operate under a three-thirds principle of allocating one third of resources to developing evidence, one third to engagement with partners and stakeholders, and one third to outreach in the form of communication and capacity building (Dinesh et al., 2018). This emphasis on the three-thirds principle has likely helped avoid falling into the missed opportunity trap.

**Figure 4. The missed opportunity matrix of connecting science and decision-making**

		Demand: Can user benefit from research?	
		YES	NO
Supply: Is relevant information produced?	NO	Research agendas may be inappropriate	Research agendas and user needs poorly matched; users may be disenfranchised.
	YES	Empowered users taking advantage of well-deployed research capabilities.	Unsophisticated or marginalized users, institutional constraints, or other obstacles prevent information use.

Source: Sarewitz and Pielke (2007)

## Conclusion

There is a large role for research for development organizations to play in conducting policy-oriented research to help bring relevant scientific research findings into policy making. The policy engagement projects implemented by CCAFS over the past several years provide an opportunity to examine what works best to create opportunities for scientists and decision makers to interact and co-create knowledge. While progress has been made in achieving certain goals of informing new plans, policies, and strategies with CCAFS-led research, there is still room to improve the work conducted by CCAFS and similar organizations by taking a broader view of the determinants of policy change at each step and delving into the issues around the implementation stage of the Kaleidoscope Model. The need for more focus/research on policy implementation and enforcement has been raised previously. Ampaire et al. (2017) found that relevant policies were in place in Uganda but were not enforced leading to a mismatch with realities at the smallholder farmer level. There is a need for further research on effective policy implementation at local levels, because "...a wide range of inter-related contextual factors work together to constrain effective policy implementation" (Ampaire et al. 2017 p. 88).

There may be interesting and important researchable issues at any/all stages of the Kaleidoscope Model, and different players (including CCAFS) may drop in and drop out of what may be long-term processes over many years. There can still be interesting results that come out of even limited involvement.

The adoption of the Sustainable Development Goals in 2015 by the Member States of the United Nations has provided a clear path toward which we must work in harmony, but which also paves the way for an ever-increasing involvement of donors in national policy making. Poulton (2012) highlights the fact that, beginning with structural adjustment, donors have increasingly played a role in agricultural policy making in Africa. He goes on to cite the argument of van de Walle (2001) and Cooksey (2010) that “local elites have ways of using donor support to buttress their own interests” (p. 4). As researchers involved in POR with those already in positions of power, we should be mindful of, and build in ways of researching, the ways that elite capture and existing control of power may perpetuate long-standing inequities in the societies we are trying to improve. These issues were not an explicit topic of focus in this study, but the issue warrants further investigation. There also may be scope to look beyond working with the traditional governance structures to becoming involved with different types of actors at different levels. For example, GHG emission reduction plans are now being pioneered at the municipal level and in certain private sector industries in some developed countries, and there may be scope to engage in some non-traditional types of work in developing countries as well.

# Appendix

## Interview guides

### Project staff:

Question 1: What factors have enabled the uptake of research in the policy making process throughout your project?

Question 2: What were the main constraints to engagement with policy makers that you encountered, and how did you try to overcome them? Were you successful in overcoming them?

Question 3: How were the key partners for your project selected?

Question 4: In terms of efforts to bring about policy change or reformulation using CGIAR/CCAFS-produced science and outputs, how were the targeted policies selected?

#### *Probing questions:*

- a. *Who had input into the process?*
- b. *Were there conflicting options?*
- c. *Who supported the selection of the policy being worked on? Did anyone oppose it?*
- d. *How did their beliefs differ over what the most pressing needs were?*

Question 5: What CGIAR/CCAFS science have you drawn upon to help inform decision makers?

#### *Probing questions:*

- a. *For each CGIAR/CCAFS science output/tool/method, how was it selected for use?*
- b. *Please describe the process used in determining what information would best serve the needs of the stakeholders.*

Question 6: Please describe how the project has engaged with stakeholders to work toward the adoption of new policies and decision-making processes.

*Probe for: frequency of engagement, modes of communication, difficulties or hurdles, any missteps, and best practices used*

Question 7: Have any of the new policies/plans/etc. been implemented? Since what time?

What have been the results thus far?

Question 8: Has there been any analysis or evaluation of the new policy(ies)?

Question 9: Is there anything else you would like to share regarding these topics?

## **Partners:**

Question 1: In your opinion, what are the most effectiveness means by which scientists can engage with policy and decision-making partners to bridge the science-policy divide?

Question 2: What factors have enabled the uptake of research results from CCAFS and CGIAR centers in the policy making process?

Question 3: In terms of the policies that have been reviewed or reformulated during your involvement with CCAFS, how were they selected as important to address?

### *Probing questions:*

- a. *Who had input into the process?*
- b. *Were there conflicting options?*
- c. *Who supported the selection of the policy being worked on? Did anyone oppose it?*
- d. *How did their beliefs differ over what the most pressing needs were?*

Question 4: What scientific knowledge has CCAFS shared that has helped inform the new/revised policy? How has it been used, and did it meet your needs?

Question 5: Please describe how you have been engaged with CCAFS to work toward the adoption of new policies and decision-making processes.

*Probe for: frequency of engagement, modes of communication, difficulties or hurdles, any missteps, and best practices used*

Question 6: Have any of the new policies/plans/etc. been implemented? Since what time?

What have been the results thus far?

Question 7: Has there been any analysis or evaluation of the new policy(ies)?

Question 8: Is there anything else you would like to share regarding these topics?

## References

- Ampaire EL, Jassogne L, Providence H, Acosta M, Twyman J, Winowiecki L, van Asten P. 2017. Institutional challenges to climate change adaptation: A case study on policy action gaps in Uganda. *Environmental Science & Policy* 75: 81-90.
- Blundo Canto G. 2016. Lessons learned on research uptake by next users. Cali: International Center for Tropical Agriculture (CIAT). 3 p.
- CCAFS. 2014. A toolkit to prioritise interventions in climate-smart agriculture. (CCAFS, ed.). New Delhi: CCAFS South Asia.
- CGIAR. 2016. "CGIAR Strategy and Results Framework 2016 - 2030: Redefining how CGIAR does business until 2030." Montpellier: CGIAR.
- CGIAR Science Council. 2008. "Impact Assessment of Policy-Oriented Research in the CGIAR: Evidence and Insights from Case Studies." Rome, Italy: CGIAR Science Council Secretariat.
- CIAT. 2014. Climate-smart agriculture investment prioritization framework. Cali, Colombia: CIAT. 4p.
- Cochrane L, Cundill G, Ludi E, New M, Nicholls RJ, Wester P, Cantin B, Murali KS, Leone M, Kituyi E, Landry ME. 2017. A reflection on collaborative adaptation research in Africa and Asia. *Regional Environmental Change* 17: 1553-1561.
- Cooksey B. 2010. "Politics, patronage and projects: The political economy of agricultural policy in Tanzania." Brighton: Future Agricultures Consortium.
- Cooper PJM, Dimes J, Rao KPC, Shapiro B, Shiferaw B, Twomlow S. Coping better with current climatic variability in the rain-fed farming systems of sub-Saharan Africa: An essential first step in adapting to future climate change? *Agriculture, Ecosystems & Environment* 126 (1-2): 24-35.
- Cullen B, Tucker J, Snyder K, Lema Z, Duncan A. 2014. An analysis of power dynamics within innovation platforms for natural resource management. *Innovation and Development* 4: 259-275.
- De Pinto A, Loboguerrero AM, Londoño M, Ovalle Sanabria K, Suarez Castaño R. 2017. Informing climate policy through institutional collaboration: reflections on the preparation of Colombia's nationally determined contribution. *Climate Policy* 1-15.
- Dinesh D, Zougmore R, Vervoort J, Totin E, Thornton P, Solomon D, Shirsath P, Pede V, Lopez Noriega I, Läderach P, Körner J, Hegger D, Girvetz E, Friis A, Driessen P, Campbell BM. 2018. Facilitating change for climate-smart agriculture through science-policy engagement. *Sustainability* 10(8): 2616.

- Feliciano D, Nayak DR, Vetter SH, Hillier J. 2017. CCAFS-MOT - A tool for farmers, extension services and policy-advisors to identify mitigation options for agriculture. *Agricultural Systems* 154:100-111.
- Johnston R, Plummer P. 2005. What is policy-oriented research? *Environment and Planning A* 37: 1521-1526.
- Jones L, Champalle C, Chesterman S, Cramer L, Crane TA. 2017. Constraining and enabling factors to using long-term climate information in decision-making. *Climate Policy* 17: 551-572.
- Jost C, Ferdous N, Spicer TD. 2014. Gender and inclusion toolbox: Participatory research in climate change and agriculture. Copenhagen, Denmark: CGIAR Research Program on Climate Change, Agriculture and Food Security, CARE International, World Agroforestry Centre (ICRAF).
- Kamanda J, Birner R, Bantilan C. 2017. The “efficient boundaries” of international agricultural research: A conceptual framework with empirical illustrations. *Agricultural Systems* 150: 78-85.
- Klerkx L, Seuneke P, de Wolf P, Rossing WAH. 2017. Replication and translation of co-innovation: The influence of institutional context in large international participatory research projects. *Land Use Policy* 61: 276-292.
- Poulton C. 2012. Democratization and the Political Economy of Agricultural Policy in Africa. FAC Working Paper 43. Brighton: Future Agricultures Consortium.
- Resnick D, Babu S, Haggblade S, Hendriks S, Mather D. 2015. Conceptualizing Drivers of Policy Change in Agriculture, Nutrition, and Food Security: The Kaleidoscope Model. Washington, DC: International Food Policy Research Institute.
- Resnick D, Haggblade S, Babu S, Hendriks SL, Mather D. 2018. The Kaleidoscope Model of policy change: Applications to food security policy in Zambia. *World Development* 109: 101-120.
- Sarewitz, D., and Pielke, R. A. (2007). The neglected heart of science policy: reconciling supply of and demand for science. *Environmental Science & Policy* 10, 5-16.
- Sogoba B, Ba A, Zougmore R, Samaké OB. 2014. How to establish dialogue between researchers and policymakers for climate change adaptation in Mali: Analysis of challenges, constraints and opportunities. Copenhagen, Denmark: CGIAR Research Program on Climate Change, Agriculture and Food Security (CAAFS).
- Tafur M, Gumucio T, Twyman J, Martinez D, Muriel J. 2015. Avances en la inclusión de intereses y necesidades de mujeres rurales en políticas públicas agropecuarias y de cambio climático: el caso de Colombia. Copenhagen, Denmark: CGIAR Research Program on Climate Change, Agriculture and Food Security (CAAFS).

- Thornton P, Dinesh D, Cramer L, Loboguerrero AM, Campbell B. 2018. Agriculture in a changing climate: Keeping our cool in the face of the hothouse. *Outlook on Agriculture* 47 (4): 283-290.
- Tucker J, Le Borgne E, Iotti M. 2013. Policy and practice influence through research: critical reflections on RiPPLE's approach. In "Achieving Water Security: Lessons from research in water supply, sanitation and hygiene in Ethiopia" (R. Calow, E. Ludi and J. Tucker, eds.), pp. 173-194. Warwickshire: Practical Action Publishing.
- van de Walle N. 2001. African economies and the politics of permanent crisis, 1979-1999. New York: Cambridge University Press.
- Wheeler T, von Braun J. 2013. Climate change impacts on global food security. *Science* 341 (6145): 508-513.