A web analytics approach to map the influence and reach of CCAFS: Latin America Focus

Working Paper No. 409

CGIAR Research Program on Climate Change,

Agriculture and Food Security (CCAFS)

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RESEARCH PROGRAM ON
**Climate Change,
Agriculture and
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About CCAFS working papers
Titles in this series aim to disseminate interim climate change, agriculture and food security research and practices and stimulate feedback from the scientific community.

About CCAFS
The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) is led by the International Center for Tropical Agriculture (CIAT), part of the Alliance of Bioversity International and CIAT, and carried out with support from the CGIAR Trust Fund and through bilateral funding agreements. For more information, please visit https://ccafs.cgiar.org/donors.

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Abstract

Based on a Digital Methods framework developed to map the policy influence of the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) globally (Carneiro et al 2020), this study adapted the approach to focus on the Latin America regional program (LAM). The influence of CCAFS in LAM was explored through data analytics, with the application of machine learning techniques primarily focused on text mining, network analysis and hyperlink analysis of web-based sources. The foundation of this research is to assess the process of knowledge dissemination and influence of CCAFS activity to stakeholders and local beneficiaries, by considering online networks and narratives as evidence of "offline" program influence. It found that CCAFS plays a key role in raising awareness, building capacity, and supporting policy development around Climate-Smart Agriculture (CSA).

Keywords

Latin America; climate change; diffusion of information; big data; internet; social media; digital methods; Climate-Smart Agriculture

Executive Summary

Based on a Digital Methods framework developed to map the policy influence of the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) globally (Carneiro et al 2020), this study adapted the approach to focus on the Latin America regional program (LAM). The main objective was to explore CCAFS' influence in motivating stakeholders to tackle climate change in the region.

Going beyond traditional reporting mechanisms to uncover the 'soft power' processes that enable policy or investment decision-making, the previously established conceptual framework was adapted to the context of CCAFS delivery in Latin America. An innovative approach based on the Digital Methods epistemology (Rogers, 2013) was employed to explore the dynamics of knowledge dissemination and changes in attitude towards Climate-Smart Agriculture (CSA) among stakeholders at various levels. By considering online networks and narratives as evidence of "offline" program influence, web sources were assessed through data-driven, machine learning techniques such as text mining, network analysis, and hyperlink analysis. The digital research was framed by qualitative, primary data collection.

Key findings include:

- CCAFS plays a key role in raising awareness, building capacity, and supporting policy development around CSA.

- Qualitative interviews show that CSA frameworks have successfully raised the awareness of program partners about the connections between climate change and food insecurity.

- The opportunities for regional cooperation and dialogue were considered a key value added of the program, as they enabled the exchange of knowledge and experiences that could be adapted to local contexts.

- CCAFS capacity development efforts were considered pivotal to increase the confidence of local partners to amplify CCAFS' mission.

- Since CCAFS was implemented in Latin America, the text correlation between a program-specific taxonomy and the institutional communications of strategic partners on Twitter has increased by about 40%.

- The broader CCAFS LAM partner network, as measured by Twitter mentions, comprises more than 44 thousand unique users, within which CCAFS is positioned

among key agricultural development players at the local, regional, and international levels.

- CCAFS LAM's immediate network contains more than 500 nodes, which represent both Twitter accounts that @cgiarclimate_LA has mentioned, and those that have mentioned it.

- CCAFS LAM is an important bridge between the research developed by CGIAR centers and policy-level institutions in Latin America.

- The diffusion of knowledge produced by CCAFS projects in Latin America science has a global reach. Project outputs have been disseminated in over four thousand URLs from 1,300 unique domains, and across more than 70 countries.

Acknowledgements

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Acronyms

CCAFS	CGIAR Research Program on Climate Change, Agriculture and Food Security
CSA	Climate-Smart Agriculture
IDN	International Domain Names
IPCC	Intergovernmental Panel on Climate Change
LAM	Latin America
MARLO	Managing Agricultural Research for Learning and Outcomes
MTA	Local Technical Agro-climatic Committees (MTAs, by its acronym in Spanish)
SDGs	Sustainable Development Goals
TLD	Top Level Domain
URL	Uniform Resource Locator

Background

Several parts of the world increasingly experience the effects of climate change through more frequent extreme weather events, higher average temperatures, and increased variability. The Latin American and Caribbean regions are highly vulnerable to climate change due to their socioeconomic, geographic, and institutional characteristics. The agricultural sector in particular presents high sensibility to climate variations and the region is facing significant losses in biodiversity and human lives due to extreme climate events. Most of the impacts of climate variability have been in Mesoamerica and some along the Andes, regions with an extensive agricultural sector and crop variety[1]. The region is also a big emitter of greenhouse gases, due to deforestation and an expansive livestock industry[2].

Within this context, the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) recognizes the need to address the relationship between climate change and declining food security. The program aims to "marshal the science and expertise of CGIAR and partners to catalyze positive change towards Climate-Smart Agriculture (CSA), food systems and landscapes, and position CGIAR to play a major role in bringing to scale practices, technologies and institutions that enable agriculture to meet triple goals of food security, adaptation and mitigation" (CCAFS, 2016).

The program expanded to Latin America in 2012, with the goal of providing scientific evidence to support initiatives that improve access to food while also contributing to low-emissions agricultural development. The four main objectives for the region, to be achieved by 2023 are[3]:

- Reach six million farmers and help them change their agricultural practices to adapt to, and mitigate, climate change in a sustainable and socially appropriate way.

- Collaborate with institutions that support rural communities with information, advice, and safety networks for food security. Create practices on adaptation to climate change for two million producers, through information services that are more relevant and effective.

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[1] https://ccafs.cgiar.org/index.php/regions/latin-america

[2] https://ccafs.cgiar.org/index.php/news/big-facts-focus-latin-america

[3] https://ccafs.cgiar.org/index.php/news/better-together-when-building-climate-change-strategy-latin-america

- In at least four countries in Latin America, promote the application of low-emissions agriculture policies that will help in achieving a measurable reduction of greenhouse gases in the agriculture sector.

- Help eight countries in the region establish policy frameworks to address agriculture, climate change, food security issues and their relationships. This will be reflected in increased investment in agro-ecological practices and technologies.

To achieve these, a key element of CCAFS is the establishment of strategic, broad-based partnerships[4]. With over 40 projects implemented across six countries in Latin America and the Caribbean since 2012, the program has engaged more than 80 different partner institutions, from universities and research centers to the private sector and government bodies at local, national, and regional levels.

This evaluation sought to adapt the web analytics evaluation of CCAFS influence and reach at a global level (Carneiro et al, 2020) to focus specifically on the program's impact in Latin America. It employed Digital Methods and Machine Learning techniques to assess content disseminated on the World Wide Web (or simply, the web) that provides insights about program engagement at various levels. The digital research was framed by qualitative, primary data collection. This report describes the methodology and presents the main findings from the research carried out between June-September 2021.

Data and Methods

While CCAFS progress monitoring includes reporting on the number of policies, legal instruments, and investments that have been informed by the program's research, this indicator may not be capturing the full extent of the program's influence, as it does not consider the processes that enable policy or investment decisions. In such cases, 'soft power' plays an important role in shaping perceptions and gaining visibility of Climate-Smart Agriculture (CSA) as an attractive and viable approach to climate adaptation.

Based on this notion, an innovative approach based on the foundations Digital Methods (Rogers, 2013) was developed to explore the dynamics of knowledge dissemination and changes in attitude towards CSA and climate change among stakeholders at various levels, by considering online networks and narratives as evidence of "offline" program influence.

The application of web analytics followed the aforementioned study that evaluated Phase II of CCAFS globally (Carneiro et al, 2020). The work streams were adapted to account for specificities of program delivery in Latin America, as shown in Figure 1. Full details of the methodology are available in the original study.

Work stream 1	Work stream 2	Work stream 3	Work stream 4
Uncover first-hand narratives about partners' experience with CCAFS	Determine similarity between messaging from CCAFS and project partners	Locate CCAFS within partner networks	Map dissemination of CCAFS-generated knowledge
>> Stakeholder interviews	>> Text mining	>> Network analysis	>> Hyperlink analysis
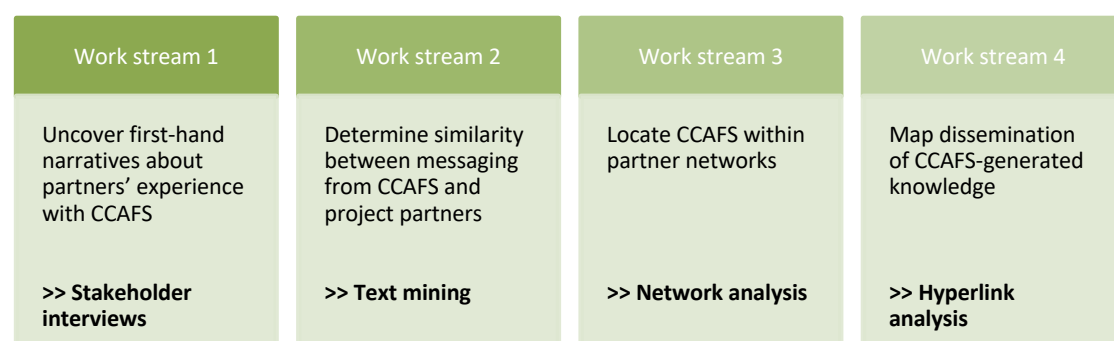
Figure 1 Work streams and their respective methods

Two main aspects of the approach were adjusted. First, additional interviews were conducted to broaden the scope of narratives. Whereas in the program-wide study the interviews focused on government stakeholders only, in this regional iteration, CCAFS LAM staff identified other strategic partners to interview, including civil society and private sector institutions. The full list of stakeholders interviewed is in Appendix 1.

Secondly, for the text mining analysis, we modified the approach to improve detection of language specificities and local perceptions of the program. Instead of using project-level taxonomies, which were originally constructed from program documentation in English, we developed a custom taxonomy based on the narratives uncovered through the stakeholder interviews. The same text mining techniques to identify significant words were applied, but in this case, to the full transcriptions of the interviews. This ensured both the local partners'

understanding of the program's activities and any relevant local terminology were captured. From this new taxonomy, text mining of the key terms associated with CCAFS against the content of partner Twitter posts was performed to determine a similarity measure between the discourse and the knowledge generated from the program and the institutional communication of project partners.

Main results: how has CCAFS influenced stakeholders on climate adaptation in Latin America?

Narrative from project partners

> **Key findings**
> - CCAFS played a crucial role in providing both a clear framework that connects agriculture and climate adaptation, and reliable solutions at the technical and policy levels.
>
> - The opportunities for regional cooperation and dialogue were considered a key value added of the program, as they enabled the exchange of knowledge and experiences that could be adapted to local contexts.
>
> - CCAFS capacity development efforts were considered pivotal to increase the confidence of local partners to amplify CCAFS' mission.

Semi-structured interviews with 11 project partners provided significant insight into the mechanisms through which CCAFS helped not only increase awareness of the relationship between climate and agriculture, but also support climate-sensitive policymaking[5]. While the experiences from different respondents varied, there were many common threads that reinforced the positive impact of the CCAFS approach.

Awareness raising

Interviewees across the board shared a similar view concerning the way in which CCAFS contributed to raise awareness of climate change within their institutions. They considered CCAFS played a crucial role in providing both a clear framework that connects agriculture and climate adaptation, and reliable solutions at the technical and policy levels:

"We had no expertise; our knowledge of climate change was more general... we did not have a specific approach to deal with agriculture." (Central America)

"Before CCAFS, the ministry had one-off initiatives regarding climate change. To implement a good plan of action, we needed know-how and we found it with CCAFS." (Colombia)

"The training offered by CCAFS helped us start a training process within the secretariat … This generates more awareness and more initiatives… including among the staff of the Ministry of

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[5] Statements from respondents have been edited for clarity and context. Full transcriptions are available in Spanish upon request and the interview protocol is in Appendix 2.

Agriculture, which in that way can transmit this knowledge to the producers. It also has an impact on policies and strategies. For example, when discussing budgets, climate change was never mentioned before. Now we talk about it, and you can see results". (Honduras)

"In the rural communities, many workers are already implementing CSA practices, the producers already know about it, but now it is carried out with further information, with growing awareness, with more foundation and with more knowledge". (Guatemala)

"We had spoken about gender and climate change before, but with CCAFS we found out 'how' it could be done at the technical level." (Guatemala)

In a concrete example from Guatemala, the involvement of various stakeholders in CCAFS projects has not only generated higher awareness of the critical issues that the agricultural sector must face due to climate change, but it was also useful to trace a path towards the enforcement of sustainability standards. A private sector partner highlighted the disposition of governmental institutions to introduce a sustainability certification on agricultural products, thus generating wider awareness both along the production chain and among policymakers:

"Achieving a product that meets sustainability standards is a dream come true, and I think that… both CCAFS and CIAT were essential to show that impact across the whole chain, from the producer to the final consumer." (Guatemala)

Institutional support

As noted in some narratives above, CCAFS has strengthened institutional strategies to deal with climate change at various levels. It has provided crucial support to develop and implement agricultural adaptation frameworks across the region through the credibility of the program, the expertise of program staff, and by building local capacity. Often the interviewees noted the ability of CCAFS initiatives to apply scientific evidence to the field and to make this knowledge accessible to different stakeholders:

"The collaboration with CCAFS has helped us to improve what we were doing and to add value to the information we are generating." (Central America)

"At the institutional level, it has allowed us to manage new resources. As a science-based methodology, it ensures credibility when it is presented to a cooperating partner." (Central America)

"Through CCAFS, we can speak confidently, with technical knowledge, about climate change. We are recognized." (Colombia)

"With better knowledge, we can make better proposals for climate change and gender." (Guatemala)

"The process of training, capacity building, and exchanges generates awareness, not only through the work of the technical staff or the farmers, but also the at policy level." (Honduras)

CSA implementation strategies are an important resource according to the interviewees, as they play a strategic role in agricultural management, not only in terms of increased environmental sustainability but also as evidence-based decision support and training tools for both rural communities and decision-makers:

"Several CSA practices promoted were already known; the advantage is that now we have the scientific basis for these practices (...) to be able to speak with proper scientific knowledge gives the team more confidence about the work being done." (Guatemala)

"When we started [collaborating with CCAFS], we did not have all this technical know-how, such as regarding the feasibility of a project or a diagnosis of the institutions we were going to work with…. factors that were fundamental to the structuring of projects." (Latin America and Caribbean)

"My job as a Unit Coordinator is to provide technical knowledge and link it to both climate change and land use. CCAFS support has made my job easier" (Guatemala)

"We ourselves, after the collaboration with CCAFS, have conducted training workshops for other institutions, organizations on the field, as a proof that we have enriched our knowledge – as an organization – in the topic of CSA." (Guatemala)

While some partners describe prior experiences working with agroclimatic forecasts and the analysis of seasonal predictions, they maintain that CCAFS has advanced the systematization of institutional activity through support in establishing consistent processes, and the engagement with a broader governance network:

"We have been holding forums for 21 years and we have always worked with the agricultural sector, but we did not call it a Local Technical Agro-climatic Committees (MTAs, by its acronym in Spanish)[6] ... we did not have an established working methodology, we did not have a schedule of meetings and so on. CIAT [through CCAFS] has helped organize this work." (Central America)

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[6] https://ccafs.cgiar.org/local-technical-agroclimatic-committees-mta-its-acronym-spanish

"Another important issue is what is being done at the national level. For example… the actions that each country is taking in response to their climate change agreements… several advances have been made and MTAs have involved the participation of NGOs. CCAFS has supported us a lot so that we as an institution could participate in other technical meeting roundtables." (Guatemala)

Regional cooperation and knowledge exchange

The huge value of regional cooperation and knowledge exchange was highlighted by all partners interviewed. The opportunity to visit projects in other countries, to take part in international meetings and to exchange experiences was considered a key value-added of CCAFS. Several respondents revealed that they were inspired by what they saw in a country visit, or that they had shared their knowledge for the creation of similar initiatives in other countries. Such south-south cooperation generates a "multiplier effect" of interest and involvement among stakeholders in tackling the challenges of climate change. According to the stakeholders interviewed, these exchanges are crucial in supporting decision-making processes concerning climate change, with Colombia in particular playing a key role in providing a benchmark for the Local Technical Agro-climatic Committees (MTA) model that has been replicated in several countries in the region:

"Our engagement with CCAFS began with a visit to Colombia to see a well-established MTA there, where I thought 'we can do that in Guatemala too'." (Guatemala)

"[We] were not working with a climate perspective before, it was fresh ground for us. We saw the Colombian experience and wanted to replicate it in our context." (Honduras)

"It all started with a trip to Colombia. It was not an expenditure, it was an investment that has impacted thousands of people... we copied Colombia and improved it, adapted it to our context." (Honduras)

"The exchange of knowledge that we experienced with [CCAFS] in Colombia allowed us to focus on these issues and it has generated a multiplier effect. In our strategic plan, there is a very strong component of climate change." (Honduras)

The initiative "Un *Viaje en Común*", as well as other opportunities for exchange of information and experiences organized by CCAFS were welcomed as extremely insightful occasions for the development of internal policies. Getting to know what has been done in other countries offers ideas and examples to the individuals and the institutions participating in the initiative:

"The Un *Viaje en Común* was useful to identify both the right actors and the guidelines to manage the work". (Guatemala)

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"The step-by-step guide[7] with a focus on gender and climate change is an example of success… We had not worked on this issue at all in the region. I had the opportunity to join Un *Viaje en Común*, where I realized the links between our [Climate Change] Unit and gender issues." (Guatemala)

Multi-stakeholder engagement and alliances

A multiplier effect was also noted at the project level, where participation in CSA platforms was perceived to enable multi-stakeholder engagement and awareness raising and was useful to amplify CCAFS' core message beyond direct beneficiaries. Stakeholders are involved in collaborative projects such as the Scale for Resilience Campaign, founded in January 2021 to respond to the gap between climate adaptation and finance. In such cases, CCAFS is considered a key partner in creating "multi-stakeholder ecosystems" that support a resilient and sustainable agricultural market.

"The farmer learns to work with various issues, for example gender issues. [They] have an 'ancestral' way of working, so a change of paradigm is needed in order to adapt... these exchanges have a multiplier effect" (Honduras)

"The work that we are doing with CIAT has helped us develop business models, it has created the conditions to invest more in nature-based solutions because with [CCAFS] data we establish the conditions needed by microfinance institutions to carry out investment decisions (…) that play an important role in transforming the whole value chain of sustainable finance." (Latin America and the Caribbean)

The capacity building processes implemented through CCAFS are perceived as transversal, since they involve not only Ministries, Directors, or technical groups, but also the producers and final beneficiaries of the projects, thus generating a strong awareness of climate adaptation in agriculture across stakeholders. According to respondents, the complementary nature of the activities proposed by CCAFS results in strong strategic alliances:

"For us it is a very successful collaboration… because CCAFS has the scientific tools and the scientific knowledge to look at matters such as climate services, and we have the ability to implement and to be present in the field, and to really reach the communities and the producers in the communities. I believe it is a strategic alliance, an alliance where there is a real win-win situation and where there is real complementarity." (International Organization)

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[7] https://ccafs.cgiar.org/resources/publications/step-step-process-mainstream-gender-climate-smart-agricultural

The importance of engaging at the local level was also highlighted as a key element to achieve national level policymaking and to mediate the transition to an increasingly sustainable agri-food market:

"The support of CCAFS and CIAT played a key role: at this moment we are bringing to the consumer meat products with a seal of environmental, social and, obviously, financial sustainability. The producer is also receiving an economic incentive for doing everything in a proper way." (Colombia)

"The support of CIAT and CCAFS gives us credibility to establish relationships with retailers, banks or with other partners or strategic allies. It is a matter of credibility and reputation that CIAT and CCAFS have had and continue to have in the region and in the country." (Colombia)

"Collaborating with CCAFS gives us more confidence because what we propose to other institutions or cooperating partners is scientifically endorsed." (Guatemala)

"The rural community has told us how they would like this [CSA] project to benefit the whole community, not only the 25 people who will see the results. As the families have changed their precarious conditions, they now have more options, so this helps many children and young people. So, that's when we tell them that they are now able *to share what they already know…* They perceive the enhancement of CSA as a contribution not only to food security but also to the household economy." (Guatemala)

"The perspective of CCAFS on local capacity and also local ownership of agroclimatic information is crucial." (International Organization)

Policy support

At the policy domain, respondents provided many examples of successful engagement of CCAFS projects with national level policymaking. For instance, CCAFS was involved in drafting the Honduras institutional strategic plan. In Guatemala, the gender strategy has influenced the rural development agenda for women in the region and the agriculture/livestock policies, which have strengthened peasant agriculture with an adaptation perspective. A climate change plan developed by the ministry of environment also received many inputs by CCAFS, and climate information services is now incorporated into the planning processes of the Ministry of Agriculture. Likewise, in Colombia, the Technical Agroclimatic Committees (MTA) have been incorporated into permanent public policy, and knowledge from CCAFS has enabled the development of specific climate change plans various productive sectors in the country. Regional partners believe that countries in the region are now developing national climate adaptation strategies because of the program's regional approach.

"One of the weaknesses we faced was that the information generated in the forums did not reach the territories. Through the MTAs, with a methodology and a work schedule, have greatly strengthened our efforts to take the information to the territories." (Central America)

"CCAFS strategies have had an influence in regional rural development strategies... When the family farming program for strengthening peasant agriculture was being implemented – between 2016 to 2020 –, there was a discussion around more resilient agriculture and some adaptation practices. It was one of the strongest programs implemented by the Ministry of Agriculture, and we see the incorporation of the research and of the work done around policies. Because, frankly, we can no longer talk about agriculture without considering what is happening in the field of climate change research." (Guatemala)

In Mexico, the collaboration with CCAFS aimed at the development of a local Agroclimatic Bulletin required governmental institutions to invest in the necessary tools for the collection of meteorological data:

"MTAs are undoubtedly also being used as a justification to increase investments in the rehabilitation of meteorological stations at the national level, as we have many stations, but half of them is not working." (Mexico)

In Guatemala there are ongoing processes aiming to extend CSA into 25 rural communities, and to increase the development of specific climate change plans for each productive sector in the country:

"We have a proposal to implement the CSA methodology, extending it to 25 communities in the territory. The original project has been expanded fivefold, and we already have projects with other partners in other communities. I believe that there is no better proof of the success of the collaboration with CCAFS". (Guatemala)

"To date, we have 15 active committees with the potential to reach 19 committees by the end of next month, with which we will be covering 100 percent of the country". (Guatemala)

"MTAs have already been implemented by the government. We see these technical committees as a point of convergence of knowledge (…) that reaches the ultimate user, where it will be applied." (Guatemala).

The program's successes have also helped secure funding in other instances. When Colombia's livestock program did not have enough funds to complete implementation, producer associations helped cover the costs. Honduras also secured additional funds from USAID, IFAD and the Japanese government to expand work on climate change: "CCAFS planted the seed for CSA, but we still have a long way to go" (Honduras).

"Institutionally, it has allowed us to get more resources from [the units] involved. At the community level, there are families who sell some of their surplus production and this allows them to obtain funds to cover other needs that they have in their household." (Guatemala)

"Taking ownership of the CSA methodology has allowed us to promote it to other funding partners, organizations from Spain, Germany, the United States... We are in charge of promoting this and bringing this methodology to the attention of our partners." (Guatemala)

Capacity development

As capacity building is a key objective of CCAFS, responses show efforts are well targeted and effective. The knowledge acquired through technical training and other capacity development initiatives was essential to increase the confidence of local partners willing to disseminate CCAFS' mission. From the interviews, it emerges that capacity development is one of the focal points of the CCAFS strategy that was most appreciated by the partners. Interviewees noted that CCAFS' capacity development initiatives encompassed both technical subjects, such as climate-related tools and technologies, as well as themes around project management and delivery (project proposal writing, M&E, cost benefit analysis, communications, etc.).

According to respondents, the CCAFS working methodology is open to dialogue and promotes the sharing of procedural knowledge between stakeholders. This has contributed to the development of skills between technical groups and within the institutions:

"It is easy to find capacity development for general issues, but CCAFS develops knowledge at the technical level." (Central America)

"CCAFS has extensive experience, qualified technical experts and a good perspective of applied field research, of applied knowledge." (Colombia)

"CCAFS exposed us to new tools and helped us train farmers for weather-related issues... We leveraged on this knowledge transfer and now various groups work together. The technical work strengthens cooperation." (Guatemala)

"We have greatly improved our knowledge about CSA. The first workshops I attended with CCAFS were about how to structure a climate change unit, and another about how to develop a guide for gender-sensitivity... We have been exposed to technical and technological instruments, and to intersectionality." (Guatemala)

 An example effective targeting from Guatemala were training courses on how to use new software: "The palm farmers were given an R course and through the Ministry of Agriculture we were invited to participate in an AquaCrop course. In that sense, CCAFS has helped us a lot with capacity building." (Guatemala)

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Collaborative mechanisms, iterative planning and reflective practice are some of the key elements highlighted by respondents that can help address CSA challenges. For example, the "Climate Dialogue" series organized by CCAFS in partnership with the Ministry of Agriculture in Guatemala: "we shared many talks on different topics, some related to basic grains, basic forms of cultivation, related to pests and diseases… water harvesting, crop association. It has been very comprehensive and interesting." (Guatemala)

"The CSA workshop has contributed to improve many technical capacities, to have a greater knowledge of tools for agricultural extension and as an institution to have our own methodology in dealing with regional and environmental issues, as we are one of the territories most affected by these climate changes. So, knowing this approach, in a more comprehensive and scientific way, helps us to properly prepare ourselves, to propose solutions… we are working not only with partners, but also with all the communities". (Guatemala)

Furthermore, CCAFS projects developed capacity to formulate appropriate and adequate policies and legislation; to link institutions with other comparable bodies within the region; to facilitate funding; to train personnel; and to identify needs and demands from partner countries:

"We learned a lot during this collaboration, especially on the technical side, in terms of diagnostics, measures, small-scale farmers, vulnerability, partnerships, climate. It was really very important for us". (Costa Rica)

"We did not have an agroclimatic bulletin before collaborating with CCAFS." (Honduras)

According to the interviewees this collaboration allows them to understand and employ a more technical language:

"[The Gender Unit] did not have a good coordination with the Climate Change Unit (…) So [CCAFS] first allowed us to have a better coordination, to link both approaches. Then it opened up the possibility of enhancing knowledge to make better proposals for the country's climate change program, to which we contributed when the Gender Units of this sector was prepared. We contributed in some elements around network issues, everything that has to do with safeguards, forest governance and agroforestry, so CCAFS gave us both the knowledge to have a more qualified opinion and the knowledge needed to provide a representation of the sector." (Guatemala)

"The collaboration with CCAFS in terms of policy helped us a lot in thinking about how to deal with climate change." (Colombia)

Evidence from social media

Key finding
- Since CCAFS was implemented in Latin America in 2012, the text correlation between a program-specific taxonomy and the institutional communications of strategic partners on Twitter has increased by about 40%.

Within the social sciences, content analysis methods enable researchers to identify patterns and changes in political agenda over time and across geographies (Brandt 2019). Based on the principles of Digital Methods, social media activity can act as a proxy for how CCAFS activity influences stakeholders, and how stakeholders in turn amplify the program's mission to a broader audience. To assess the extent to which climate adaptation activities developed through CCAFS projects in Latin America are represented in the social media profiles of regional partners, we applied text mining techniques to determine a similarity measure between program activities and messaging from partners on the Twitter social media platform. Twitter was selected as it is considered an important "source for climate change information-exchanges" (Pearce et al. 2019), as well as an established platform for institutional position-taking.

The first step in our approach was the development of a custom taxonomy that identified key terminology from which we could map text from partner sources against. For this, machine learning algorithms were applied to carry out unsupervised text mining of the transcripts of the stakeholder interviews.

We used the statistic tf-idf, a widely used measure of how important a word is to a document in a collection (or corpus) of documents (Silge and Robinson, 2017). In our case, the tf-idf combines frequency, i.e., how many times a word is appeared in an interview, and the inverse of ubiquity, ie. how exclusive the association is between a word and an interview (Hidalgo and Hausmann, 2018; 2019). The main outcome of this analysis was a vector of words with an associated vector of weights (importance = tf-idf) for the program. This information constitutes a program-level taxonomy that ranked the significance of words in the stakeholder interviews. Table 1 shows an example of significant words identified in the interview transcripts, and their respective weight (or importance).

Table 1 Example of significant words estimated by TF-IDF for the stakeholder interviews. All 3925 unique words were considered (excluding stopwords), weighted by importance.

Word	Importance
ministerio	135.0004
cambio	132.586
climático	131.8664
unidad	131.2494
ciat	129.8212
agricultura	125.2882
mesas	121.504
ccafs	119.906

On Twitter, to assess the influence of CCAFS on project partners, we measured the change in the content of the tweets over time, based on the year CCAFS was expanded to Latin America (2012), so that we could compare the text of tweets before and after the program was implemented. This timeframe was selected – as opposed to the previous study that considered specific project start dates – because many of the partners had already been involved with CCAFS in projects prior to Phase II of the program.

Through MARLO and with support from local staff, 66 regional partners were identified. From those, 61 had active Twitter accounts (92%). An algorithm was applied to scrape 63 unique Twitter accounts from the different partners[8] and collect all their tweets, from 2008 until June 2021. A total of 462,196 unique tweets were collected. Figure 2 shows an example of a partner Tweet where the terminology identified in the taxonomy is visible.

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[8] Some partners had more than one official Twitter account, usually in Spanish and English – in these cases, both accounts were scraped.

Figure 2 Example of a partner Tweet with the presence of the program-level taxonomy.

Hashtag use is a typical affordance of Twitter, with topics and issues frequently denoted by specific hashtags (Resce and Maynard, 2018). Hence, a first approximation of prevalent topics covered by CCAFS LAM's partners over the period of analysis can be obtained in Figure 3, which shows word clouds (Fellows et al., 2018) for hashtags for all partners, one year before and one year after CCAFS began in Latin America. While #CIAT was already the top hashtag before CCAFS interventions, there is a clear increase in the presence of #CambioClimatico (climate change) as well as the appearance of other central elements of the program's agenda such as #agriculture, #foodsecurity, and #pronosticodeltiempo (weather forecast).

Figure 3 Word Clouds of hashtags for all partners, before and after project start dates.

However, word clouds provide only an absolute representation of the frequency of the hashtags. The results can be influenced by the level of activity of particular partners (or partner types, such as CGIAR centers). For an analytical assessment of Twitter communication, and as a measure of similarity between CCAFS taxonomy and text from the tweets, we use a text correlation measure. In the text correlation, biased data is tackled by measuring the whole text of tweets (not only hashtags) against the program-specific taxonomy, over a period of time. As such, the potential influence of CGIAR centers or other high-frequency profiles is constant throughout the analysis.

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For each partner, we estimate the text correlation between their tweets and the taxonomy developed from the stakeholder interviews by measuring the presence of significant words in the corpus of tweets. By construction, the text correlation is included in the interval [0:1] and gives a measure of how similar the content of tweets is to the taxonomy of CCAFS projects.

Figure 4 shows the text correlation between the CCAFS LAM taxonomy and the corpus of tweets for all partners with Twitter profiles. The x-axis represents months – we considered the entire timespan of 2008-2021. There is an increase over time, with a consistent correlation with the date CCAFS began its Latin American initiatives.
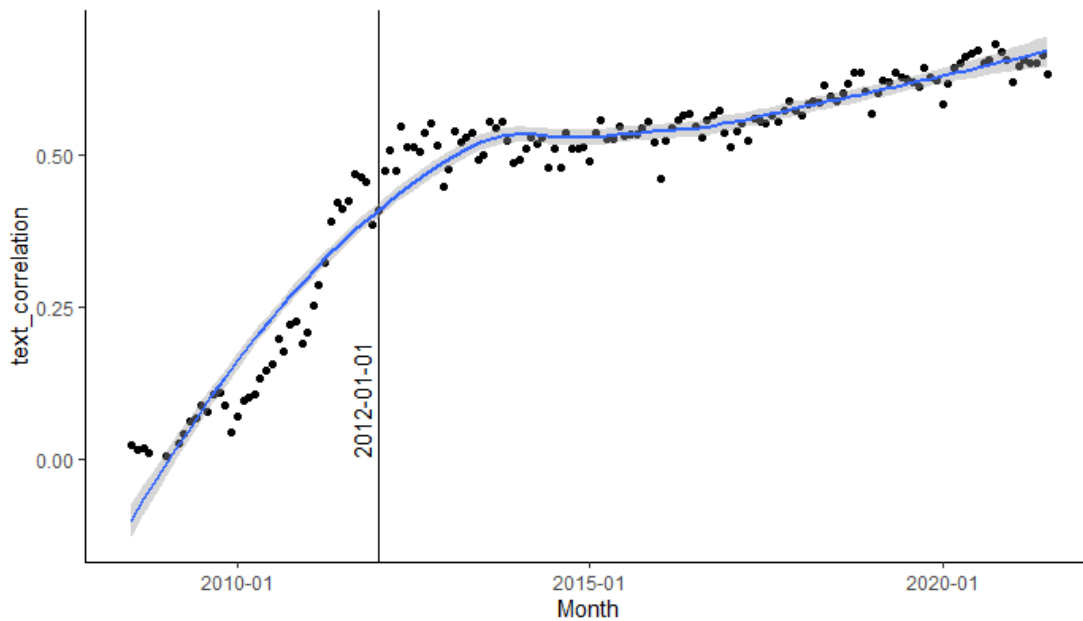
Figure 4 Overall text correlation between CCAFS taxonomy and tweets of regional partners before and after the program was implemented in Latin America.

To provide an empirical measure of this correlation over time, and to test whether the correlation after the program's start is significant, a linear regression was performed. Results in Table 2 show that the text correlation increases by almost 40% after 2012, and that the increase is statistically significant ($p<0.01$).

Table 2 Regression results for text correlation between CCAFS taxonomy and tweets of partners.

	Text Correlation
(Intercept)	0.181 ***
	(0.014)
After approval	0.383 ***
	(0.017)
*** p < 0.01; ** p < 0.05; * p < 0.1.	

How central is CCAFS LAM in its network of regional partners?

Key findings

- The broader CCAFS LAM partner network, as measured by Twitter mentions, comprises more than 44 thousand unique users, within which CCAFS is positioned among key agricultural development players at the local, regional, and international levels.

- CCAFS LAM's immediate network contains more than 500 nodes, which represent both Twitter accounts that @cgiarclimate_LA has mentioned, and those that have mentioned it.

- CCAFS LAM is an important bridge between the research developed by CGIAR centers and policy-level institutions in Latin America.

Using the dataset collected from Twitter, it was possible to assess CCAFS' place within its network of strategic partners by analyzing the accounts mentioned in the tweets of partners and in CCAFS' accounts (@CGIARclimate and @cgiarclimate_LA). A network analysis was performed to explore the relationship between accounts mentioned in the corpus. Network analysis techniques enable the visualization of relational data organized as matrices, where entities are the nodes – in this case, @mentions – and their relations are the lines connecting pairs of nodes. This means that accounts are connected if they are mentioned by another.

A force-directed algorithm was used to construct the network displays. Force-directed graphs show the spatialization of nodes by mapping the proximity and the authority of categories in relation to each other (Jacomy *et al.* 2014). This means that linked nodes are drawn closer while unrelated nodes are pushed farther apart, thus allowing for a visual interpretation of the dynamics between actors in the network. A modularity algorithm (Blondel et al., 2008) was applied to identify "communities", or clusters – as represented by nodes that are more densely connected together than to the rest of the network, and which were colored accordingly.

The entire network of Twitter mentions is very large, as more than 44 thousand accounts were mentioned by CCAFS partners over the period of analysis, and these were connected almost 60 thousand times. Figure 5 presents a visualization of this network. It is already possible to observe some dynamics of proximity and regional clusters, such as Colombia (in red), Guatemala (light blue), Peru (brown), Brazil (pink), as well as a large CGIAR cluster (dark blue and green).
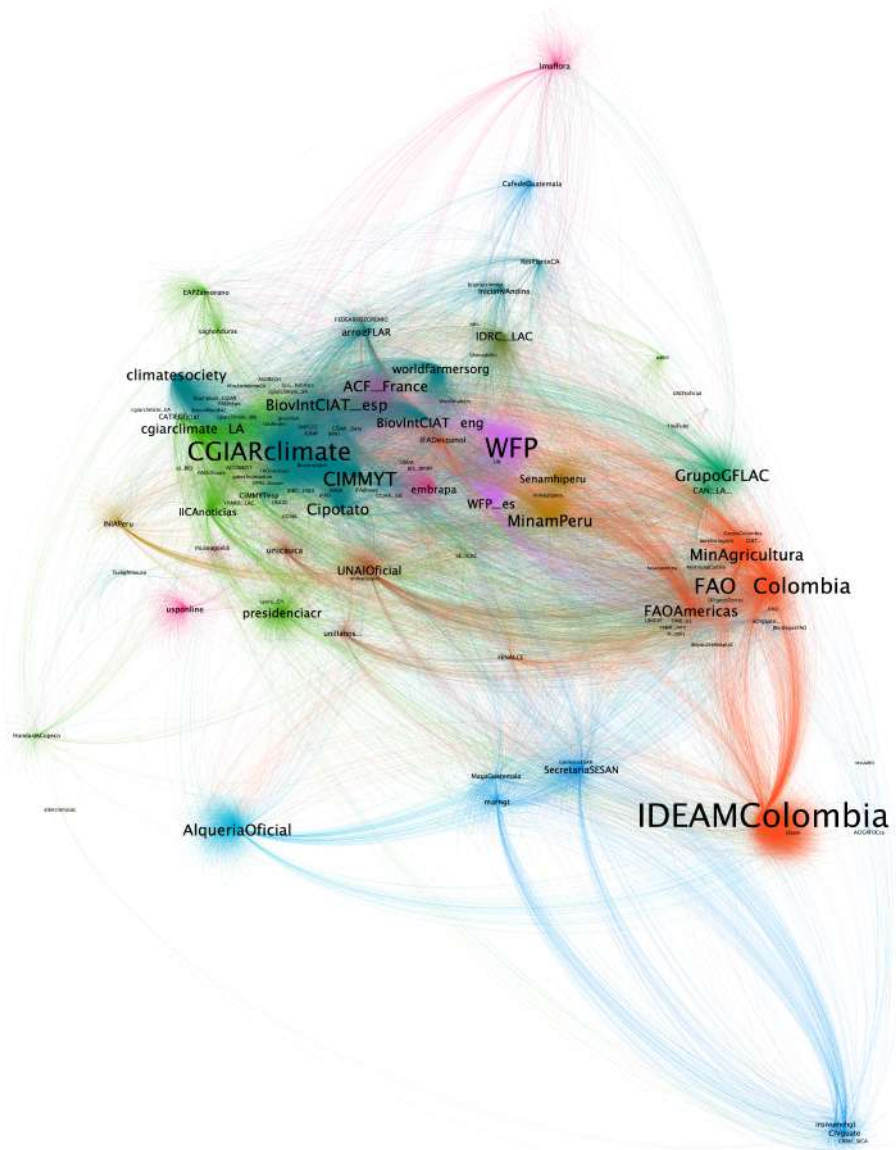
Figure 5 Overall partner network. Parameters: force-directed graph, with title size partitioned by Degree, colored by modularity class. Nodes = 44,201 accounts, edges = 59,731 connections.

However, to identify the key actors, we next considered only accounts that were mentioned at least five times. This criterion reduced the number of nodes to approximately 1,122, with 8,500 connections between them. As expected, this delimited network is denser, with nodes connected on average to 7.6 other nodes.

The resulting visualization is shown in Figure 6. The sizes of the labels correspond to their degree of connectivity in the network, that is, the sum of in-links (when they are mentioned by other accounts) and out-links (when they mention other accounts), whereas the colors pertain to clusters identified by the modularity algorithm. Once one-off mentions are removed, this focused network is quite different from the overall network, as the stricter degree criteria

deals with some of the imbalances on Twitter activities. Several clusters are represented, which indicate that certain groups often participate in the same conversations. The largest one is the light blue cluster, which contains prominent international organizations related to agricultural development and climate research. The accounts for CCAFS (@cgiarclimate_LA and @CGIARclimate) and the Alliance of Bioversity International and CIAT (@BiovIntCIAT_esp and @BiovIntCIAR_eng)– the most prominent in the network – are within this cluster. This is also where we find other CGIAR research centers, such as International Maize and Wheat Improvement Center (@CIMMYT) and the International Potato Center (@Cipotato). International development organizations such as USAID (@usaid), the International Fund for Agricultural Development (@IFAD), and the Bill and Melinda Gates Foundation (@gatesfoundation) are also located in this cluster, as well as global civil society institutions like the World Farmers' Organization (@worldfarmersorg) and university research centers like the International Research Institute for Climate & Society at Columbia University (@climatesociety).

In proximity to the blue cluster is a group colored in red that contains additional international organizations, including UN agencies like the regional Food and Agriculture Organization (@FAOAmericas) and the World Food Program (@WFP and @WFP_es), as well multilateral institutions like the EU Commission (@EU_Commission) and the World Bank (@BancoMundial and @BancoMundialLAC). Country-focused clusters are also observed. A pink cluster groups together Peruvian institutions, in purple and brown we see Colombian accounts, and in light green and lilac are Guatemalan accounts.
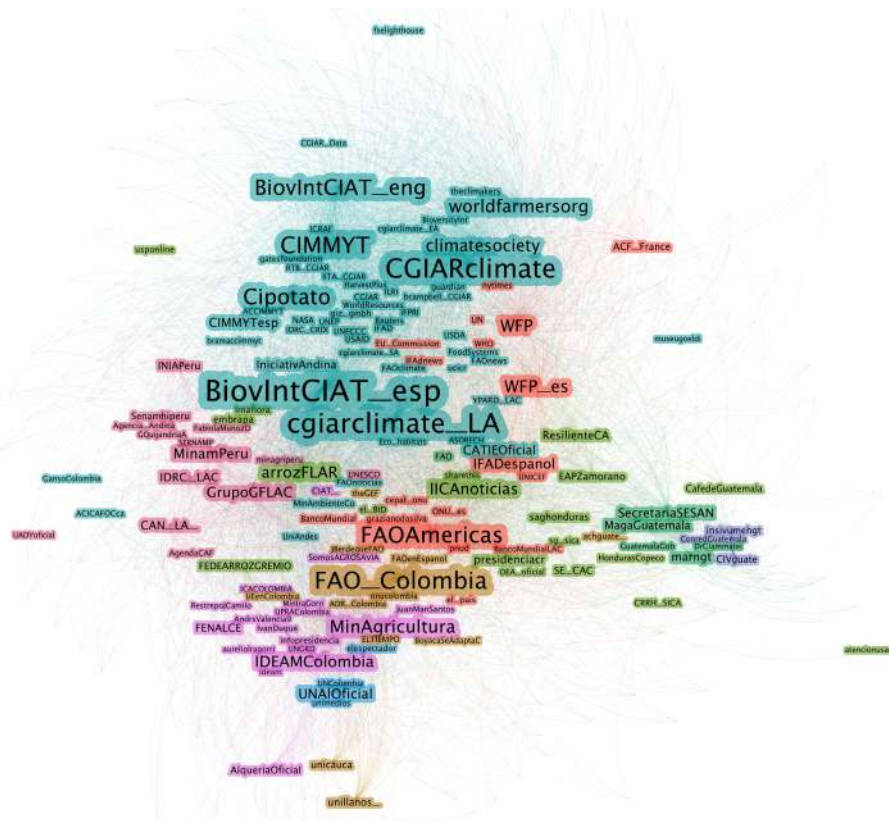
Figure 6 Network of mentions from CCAFS partner twitter accounts. Parameters: force-directed graph, with node size partitioned by Degree, colored by modularity class. Nodes restricted to those mentioned at least five times. Nodes = 1,122 accounts, edges = 8,531.

Lastly, figure 7 presents an 'ego network' for the CCAFS Latin American account, which is composed of nodes directly connected to @cgiarclimate_LA – an indication of the program's closest associations, as represented by the dynamics of Twitter. There are 528 nodes in this graph, which represent both Twitter accounts that @cgiarclimate_LA has mentioned, and those that have mentioned it. Once again, the presence of diverse institutions is evident, indicating that CCAFS is engaging in conversations with regional governments, international organizations, and civil society.

Figure 7 CCAFS Ego Network. Parameters: force-directed graph, with node size partitioned by Degree, colored by modularity class. Nodes restricted to depth of 1 degree from node @cgiarclimate_LA. Nodes = 528 accounts, edges = 4,610.

In all three network visualizations, CCAFS is clearly positioned among key local, regional, and international players. In particular, the spatialization algorithm in the two latter networks clearly places CCAFS LAM as an important bridge between the CGIAR research centers and policy-level institutions in Latin America.

How far has knowledge produced by CCAFS projects in Latin America been disseminated?

Key finding
- The diffusion of knowledge produced by CCAFS projects in Latin America science has a global reach. Project outputs have been disseminated in over four thousand URLs from 1,300 unique domains, and across more than 70 countries.

An approximation of how knowledge products from CCAFS projects in Latin America are disseminated beyond the program's direct stakeholders – both regionally and globally – was explored through a hyperlink analysis, which used a list of CCAFS deliverables from projects in Latin America, as reported in MARLO, to explore how they are diffused through the web. This led to the identification, by means of web scraping algorithms, of the web pages hyperlinking to the items of the considered list.

Out of 435 deliverables reported by projects between 2017-2021, 335 were considered eligible for the analysis, as they were classified as having been disseminated. Figure 8 shows the distribution of disseminated deliverables by type, as classified in MARLO.
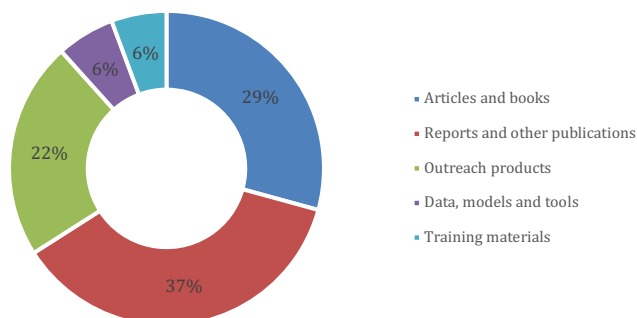

- Articles and books
- Reports and other publications
- Outreach products
- Data, models and tools
- Training materials

Figure 8 Disseminated deliverables, by type as classified by MARLO (%).

Our custom algorithm generated non-ambiguous results for 247 deliverables (74%), for a total of 4,079 web pages pointing to them. Out of those, there were 1,338 unique domains. Figure 9 breaks down the frequency of URLs by type of deliverable. It shows that while scientific research was not the most prevalent deliverable, it was by far the most frequently disseminated, followed by reports and outreach materials.
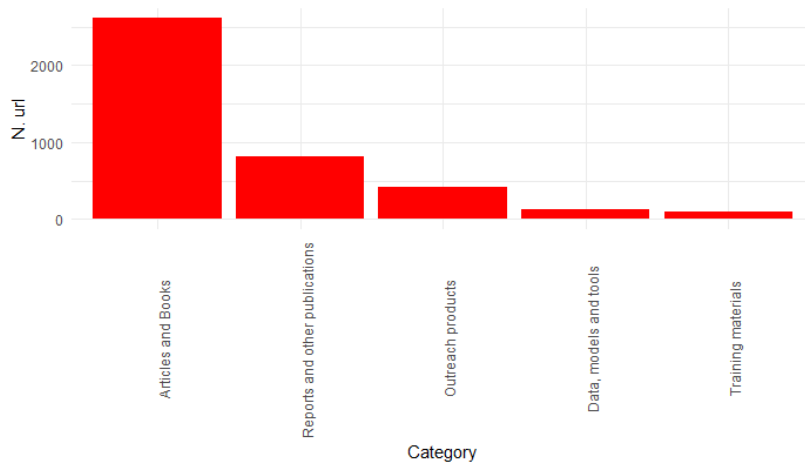
Figure 9 Frequency of URLs, by categories of deliverables.

Figure 10 shows the top domains where content was disseminated. Expectedly, websites hosted under the CGIAR institutional umbrella account for the highest frequency, but in line with the categories identified above, Google Scholar and Google Books are the most frequent domains where CCAFS content is present and/or mentioned. The other top domains also indicate that project outputs are disseminated in academic platforms such as SemanticScholar and ResearchGate, through journals with publishers like MDPI or Springer, as well as by international organizations (FAO), governmental institutions (Colciencias, the Colombian Department of Science, Technology and Innovation) and on social media (LinkedIn, Twitter),
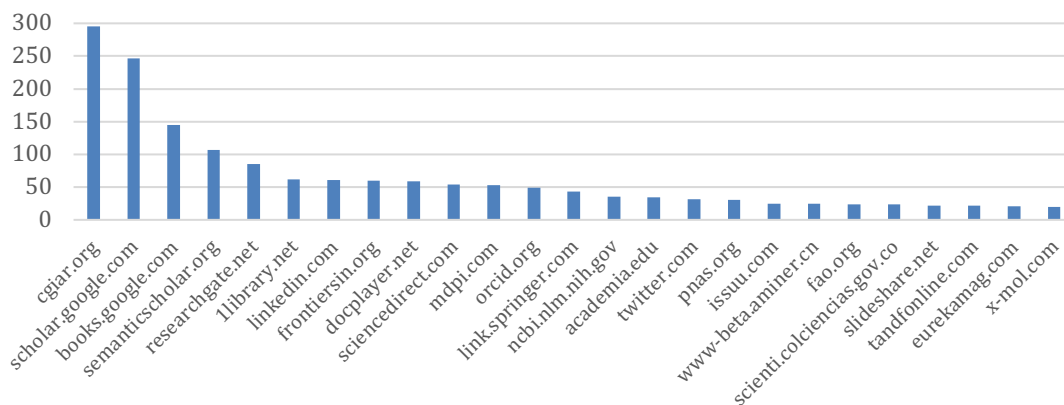

Figure 10 Frequency of domains. Plot contains domains with more than 20 URLs.

Figure 11 shows the overall frequency of Top-Level Domains (TLD), which comprise the last part of the domain name (for instance, .com, .org, etc). This includes International Domain Names (IDN), which are assigned to countries or independent geographic regions and enable some detection of the geographic distribution of CCAFS content. The majority of sites sharing the deliverables produced by Latin American projects are ".com", a TLD generally used by commercial institutions, followed by ".org", which are often used by non-profit organizations. Three other general TLDs are represented in the graph: ".net" (generally used by online service

providers), ".edu" (reserved for educational institutions) and ".gov" (used by government bodies).
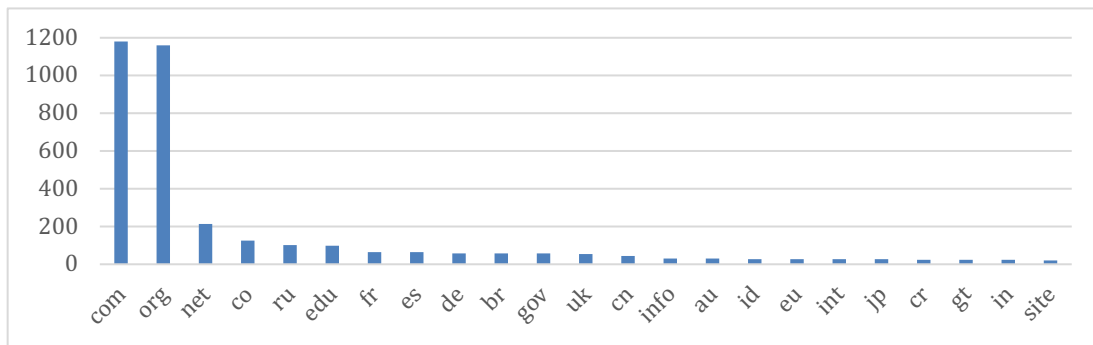

Figure 11 Frequency of Top-Level Domains (TLD). Plot contains TLDs with more than 20 URLs.

Figure 12 represents the country distribution of URLs as detected by the IDN. The countries colored in red contain TLDs with more than 100 URLs; the orange shades are between 40 and 80; and yellow are between 1 and 40[9]. It is possible to see that CCAFS LAM outputs have been distributed to more than 70 countries, reaching beyond Latin America.
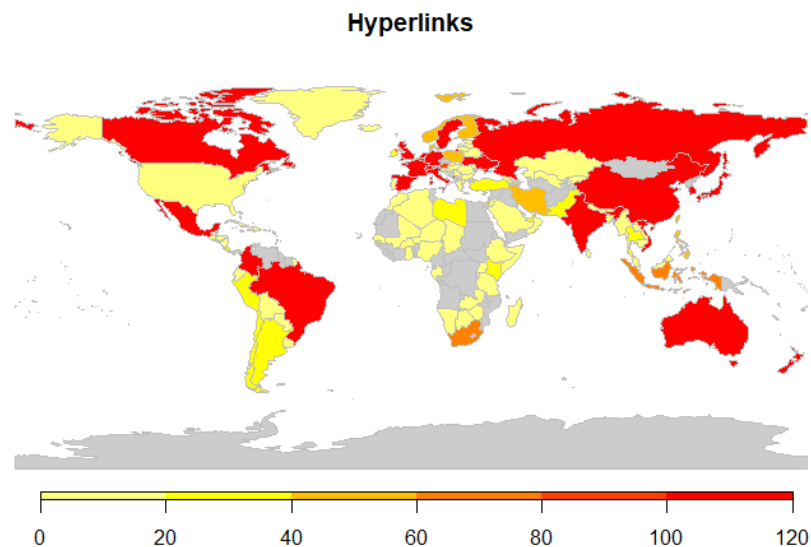

Figure 12 Country detection based on IDN.

[9] The IDN mapping is meant to present a data-driven approximation of geographical distribution, as some countries may be under- or over-represented due to the dynamics of the World Wide Web. For instance, as US-based websites generally do not use their country specific TLD (.us), normally opting for the general TLDs, which results in an under-representation of US domains. Likewise, Russia hosts many data repositories, thus increasing the country frequency.

Conclusions and recommendations

The results in this regional focus study corroborate the main findings from the global evaluation and further unpack the influence of CCAFS in a specific region, in this case, Latin America. As an agricultural research for development program, CCAFS' overall Theory of Change is built on strategic partnerships as key to build evidence, develop institutional capacity, coordinate policy, and inform investments to achieve large-scale CSA (CCAFS, 2016). CCAFS has undoubtedly supported its regional partners to embrace climate adaptation from an agricultural perspective by generating knowledge, raising capacity, and encouraging cooperation. In turn, these direct stakeholders amplify the program's purpose across countries and regions.

The interviews with strategic partners highlight the importance of making climate science accessible to a multitude of stakeholders so it generates impact. They indicate CCAFS has laid the foundations for an agriculture-focused approach to climate change by engaging with partners in the public and private sector at the local, regional, and international levels, who in turn amplify the program's purpose across their networks.

Respondents affirmed that CCAFS has provided solutions to agricultural adaptation by working at all levels: with farmers through applied research on the field, with government bodies through capacity building and institutional support, with international development organizations through strategic partnerships for project design and delivery, and at the regional level through knowledge dissemination. Such an approach, they believe, has had a multiplier effect for the program's reach.

The digital methods analysis supports this first-hand narrative. On Twitter, CCAFS' strategic partners aligned their messaging with the key concepts of the program. There was a significant correlation between the program-level taxonomy developed from the interviews and the institutional communications shared on the platform, which increased by 40% after CCAFS was rolled out in Latin America. When considering the networked nature of social media, this amplified messaging has the potential to reach 4.9 million users on Twitter, based on the sum of partners' followers. More importantly, the heightened climate sensitivity found in the discourse of partners on Twitter supports CCAFS success as an interface between climate science and agricultural institutions.

As a program built on strategic partnerships, locating CCAFS within its network of stakeholders placed it among key regional players in research, development, and policy. Moreover, as a program that leverages in the collaboration between various CGIAR research centers, CCAFS is

a clear bridge between the science generated by these organizations and policy-level institutions in Latin America.

While text mining and network analysis were constrained to program partners, the hyperlink analysis set off from project deliverables to discover their information pathways across the web. It found that knowledge generated through CCAFS projects in Latin America was disseminated across thousands of websites from more than 70 countries, with a strong presence on academic and research platforms, as well as social media, governments, and regional organizations. Nevertheless, the findings from the hyperlink analysis suggest that despite the diverse nature of CCAFS outputs, dissemination is still concentrated within the scientific domain. To enhance its policy-informing role, the program – and its related CGIAR Research Centers – could benefit from further efforts take scientific outputs and adapt them into knowledge products catered to the specific needs of policymakers.

Finally, drawing back on the program's aim for Latin America, our study shows that CCAFS has not only positively contributed to the diffusion of scientific evidence to support climate adaptation, but has also effectively engaged with central actors in the region to embed CSA technologies into agricultural planning and practice.

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Appendix 1 – project partners interviewed

Country	Partner	Acronym	Partner type
Central America	Comité Regional de Recursos Hidráulicos del istmo Centroamericano	CRRH	Regional Organization
Central America	Concejo Agropecuario Centroamericano	CAC	Regional Organization
Colombia	Ganaderia Sostenible	GANSO	Private Sector
Colombia	Ministerio de Agricultura y Desarrollo Rural de Colombia	MADR	Government
Costa Rica	Universidad para la Cooperación Internacional	UCI	University
Guatemala	Instituto Nacional de Sismología, Vulcanologia, Meteorologia e Hidrología	INSIVUMEH	Government
Guatemala	Ministerio de Agricultura, Ganadería y Alimentación	MAGA	Government
Guatemala	Ministerio de Agricultura, Ganadería y Alimentación	MAGA	Government
Guatemala	ASOCIACIÓN REGIONAL CAMPESINA CHORTÍ	ASORECH	National/Local NGO
Honduras	Secretaría de Agricultura y Ganadería	SAG	Government
Mexico	Secretaría de Agricultura y Desarrollo Rural	SADER	Goverment
Regional	Add Value		Private Sector
Regional	World Food Programme/Programa Mundial de Alimentos	WFP/PMA	International Organization
Regional	YAPU		Private Sector

Appendix 2 – interview protocol (Spanish)

Estudio: Un enfoque de análisis web para mapear la influencia y el alcance de CCAFS/CIAT en América Latina.

Objetivos:

1.   Validar y complementar la investigación a través del involucramiento de los actores clave en el trabajo de CCAFS/CIAT y conocer qué influencia ha tenido el programa a nivel institucional / local / beneficiario.

2.   Generar evidencia sobre la efectividad de los esfuerzos de desarrollo de capacidad de CCAFS/CIAT.

Método:

Se realizarán entrevistas semiestructuradas para recopilar historias y narrativas basadas en la experiencia

/ rol / visión de los actores clave acerca del programa.

Preguntas:

1.   Introducción:

1.1.   Describa su rol dentro de su organización y su involucramiento con CCAFS/CIAT

1.2.   ¿Cómo y por qué su organización se convirtió en socio del programa?

1.3.   Describa la participación de su organización en el programa.

2.   Participación / influencia de los actores clave:

2.1.   ¿Su organización ha aumentado / mejorado el conocimiento en Agricultura Sostenible Adaptada al Clima (ASAC) o Agricultura Climáticamente Inteligente? Si es así, ¿puede describir algunos ejemplos concretos?

2.2.   Teniendo en cuenta los proyectos de CCAFS/CIAT en los que ha podido participar, ¿cree que CCAFS influyó en los diversos actores clave para abordar el cambio climático y / o adoptar la ASAC?

Si es así, ¿cuáles actores clave han influido y cómo?

2.3.   Dado que CCAFS/CIAT ha producido una gran cantidad de conocimiento durante la vida del programa, ¿cree usted que este conocimiento ha llegado o llega a las personas adecuadas? ¿Cómo cree que los actores clave se enganchan/involucran con él?

2.4.   ¿Puede recordar situaciones/ejemplos específicos en los que CCAFS/CIAT ha influido en su organización? (ej. establecer políticas, desarrollar capacidades, adoptar nuevas tecnologías).

Si el entrevistado es un funcionario de gobierno:

2.5.   Específicamente con respecto a la política, ¿cuáles de las políticas que se han implementado en su gobierno, se han visto influenciadas por la actividad de CCAFS/CIAT en su país?

3.   Desarrollo de capacidades:

3.1.   ¿Se ha beneficiado su organización de la estrategia de desarrollo de capacidades de CCAFS/CIAT? Si es así, ¿puede describir algún esfuerzo/actividad específica en la que participó? ¿Cómo se mejoró la capacidad a través de estos?

3.2.   Según su experiencia, ¿cuál es su evaluación general de los esfuerzos de desarrollo de capacidades de CCAFS/CIAT? ¿Qué tan efectivos son? ¿Qué aspectos positivos encuentra y qué se puede mejorar?

4.   Inversiones:

4.1 ¿Ha contribuido CCAFS/CIAT a aumentar las inversiones en acciones de adaptación al CC/desarrollo agrícola climáticamente inteligente/adaptado al clima, ya sea por su organización o apalancadas por otras organizaciones? Si es así, ¿puede proporcionar ejemplos concretos?

Appendix 3 – project partner Twitter accounts

Name of Partner	Twitter Account link
Action Contre la Faim	https://twitter.com/achguate_; https://twitter.com/ACF_France
Alqueria	https://twitter.com/alqueriaoficial
Asociación Coordinadora Indígena y Campesina de Agroforestería Comunitaria de Centroamérica	https://twitter.com/ACICAFOCca
Asociacion Nacional del Cafe	https://twitter.com/cafedeguatemala
Asociación Regional Campesina Chortí (ASORECH)	https://twitter.com/ASORECH
Bioversity International	https://twitter.com/BiovIntCIAT_esp; https://twitter.com/BiovIntCIAT_eng
Boyacá se Adapta al Cambio Climático	https://twitter.com/boyacaseadaptac
Centro Agronómico Tropical de Investigaciôn y Enseñanza	https://twitter.com/CATIEOficial
Centro Internacional de Agricultura Tropical	https://twitter.com/BiovIntCIAT_esp; https://twitter.com/BiovIntCIAT_eng
Centro Internacional de la Papa	https://twitter.com/Cipotato
Centro Internacional de Mejoramiento de Maíz y Trigo	https://twitter.com/CIMMYTesp; https://twitter.com/CIMMYT
Centroamérica Resiliente (ResCA)	https://twitter.com/ResilienteCA
Climate Finance Group of Latin America and the Caribbean	https://twitter.com/GrupoGFLAC
Comisión de Acción Social Menonita	https://twitter.com/casm_hn
Comisión Permanente de Contingencias (Honduras)	https://twitter.com/HondurasCopeco
Comite Regional de Recursos Hidraulicos	https://twitter.com/CRRH_SICA
Consejo Agropecuario Centroamericano	https://twitter.com/SE_CAC
Empresa Brasileira de Pesquisa Agropecuária	https://twitter.com/embrapa
Escuela Agricola Panamericana Zamorano	https://twitter.com/EAPZamorano
Federación Nacional de Arroceros	https://twitter.com/FEDEARROZGREMIO
Federación Nacional de Cultivadores de Cereales y Leguminosas	https://twitter.com/FENALCE
Fondo Internacional de Desarrollo Agrícola/International Fund for Agricultural Development	https://twitter.com/IFADespanol
Fondo Latinoamericano para Arroz de Riego	https://twitter.com/arrozFLAR
Fundación EcoHabitats	https://twitter.com/Eco_habitats
Ganadería Sostenible	https://twitter.com/GansoColombia
Global Network of Lighthouse Farms	https://twitter.com/fselighthouse
Iniciativa Andina	https://twitter.com/IniciativAndina
Instituto de Hidrología, Meteorolog´^a y Estudios Ambientales (Colombia)	https://twitter.com/IDEAMColombia
Instituto de Manejo e Certificação Florestal e Agrícola	https://twitter.com/imaflora/
Instituto Interamericano de Cooperacion para la Agricultura (Guatemala)	https://twitter.com/iicanoticias
Instituto Nacional de Innovación Agraria	https://twitter.com/iniaperu
Instituto Nacional de Sismología, Vulcanología, Meteorología e Hidrología de Guatemala	https://twitter.com/insivumehgt
International Development Research Centre: IDRC	https://twitter.com/IDRC_LAC

International Research Institute for Climate and Society	https://twitter.com/climatesociety
Ministerio Ambiente y Recursos Naturales	https://twitter.com/marngt
Ministerio de Agricultura y Desarrollo Rural (Colombia)	https://twitter.com/MinAgricultura
Ministerio de Agricultura y Ganaderìa (Costa Rica)	https://twitter.com/presidenciacr
Ministerio de Agricultura y Riego (Peru)	https://twitter.com/minagriperu
Ministerio de Agricultura, Ganadería y Alimentación (Guatemala)	https://twitter.com/magaguatemala
Ministerio de Comunicaciones, Infraestructura y Vivienda (Guatemala)	https://twitter.com/civguate
Ministerio del Ambiente (Peru)	https://twitter.com/minamperu
Museum Paraense Emilio Goeldi	https://twitter.com/museugoeldi
Nodo regional de Climate Action Network para América Latina y el Caribe	https://twitter.com/CAN_LA_
Organización de las Naciones Unidas Bandera de Naciones Unidas para la Alimentación y la Agricultura en América Latina y Caribe	https://twitter.com/FAOAmericas
Organización de las Naciones Unidas Bandera de Naciones Unidas para la Alimentación y la Agricultura en Colombia	https://twitter.com/FAO_Colombia
Secretaría de Agricultura y Ganadería (Honduras)	https://twitter.com/saghonduras
Secretaría de Seguridad Alimentaria y Nutricional (Guatemala)	https://twitter.com/SecretariaSESAN
Servicio Nacional de Meteorologia e Hidrología	https://twitter.com/Senamhiperu
The Climakers	https://twitter.com/theclimakers
Universidad Autónoma de Yucatán	https://twitter.com/UADYoficial
Universidad de los Llanos	https://twitter.com/unillanos_?lang=es
Universidad de San Carlos de Guatemala	https://twitter.com/atencionusac
Universidad del Cauca	https://twitter.com/unicauca/
Universidad Nacional de Colombia	https://twitter.com/UNALOficial
Universidad para la Cooperación Internacional	https://twitter.com/ucicr
University of Sao Paulo	https://twitter.com/usponline
Visualiti SAS	https://twitter.com/visualiti
World Farmers' Organization	https://twitter.com/worldfarmersorg
World Food Program	https://twitter.com/WFP_es; https://twitter.com/WFP
Young Professionals for Agricultural Development - LAC	https://twitter.com/YPARD_LAC