CGIAR

INITIATIVE ON
Low-Emission
Food Systems

CGIAR Research Initiative on Low-Emission Food Systems

ANNUAL TECHNICAL REPORT 2022

CGIAR Technical Reporting 2022

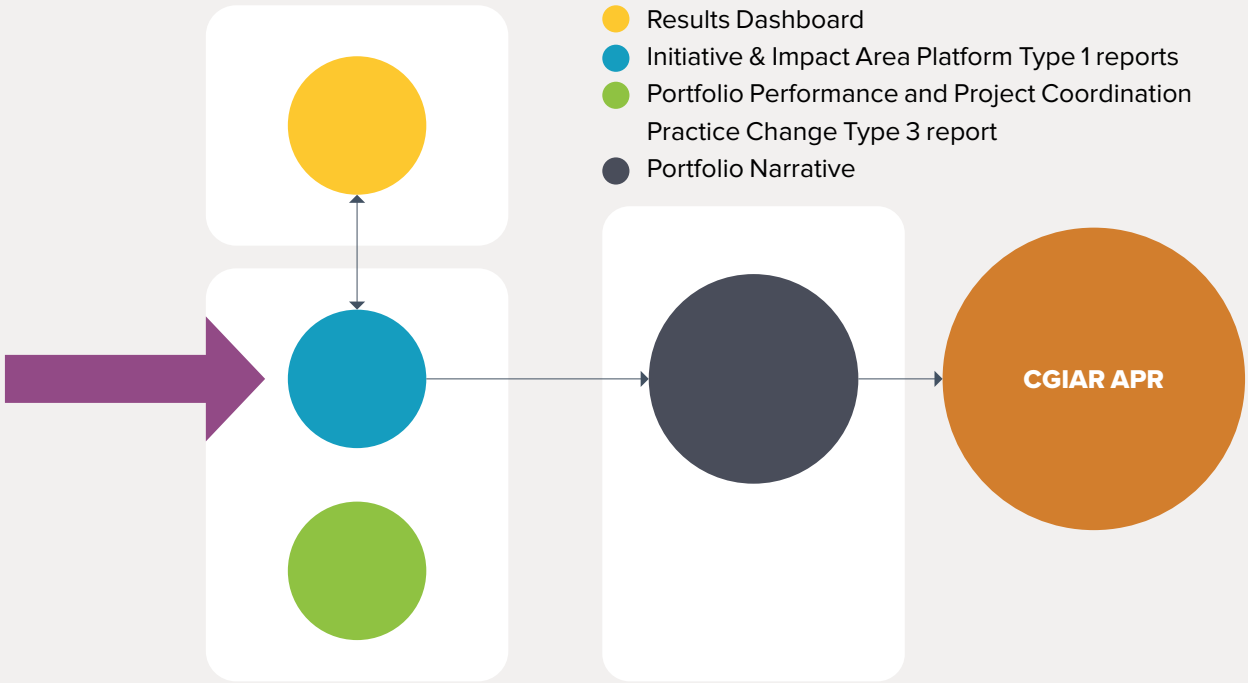
CGIAR Technical Reporting has been developed in alignment with the CGIAR Technical Reporting Arrangement.

This Initiative report is a Type 1 report and constitutes part of the broader CGIAR Technical Report. Each CGIAR Initiative submits an annual Type 1 report, which provides assurance on Initiative-level progress towards End of Initiative outcomes.

The CGIAR Technical Report comprises:

- Type 1 Initiative and Impact Area Platform reports, with quality assured results reported by Initiatives and Platforms available on the CGIAR Results Dashboard.
- The Type 3 Portfolio Performance and Project Coordination Practice Change report, which focuses on internal practice change.
- The Portfolio Narrative, which draws on the Type 1 and Type 3 reports, and the CGIAR Results Dashboard, to provide a broader view on portfolio coherence, including results, partnerships, country and regional engagement, and synergies among the portfolio's constituent parts.

The CGIAR Technical Report constitutes a key component of the CGIAR Annual Performance Report (APR).



US$	2022	2023	2024
Proposal Budget from initial submission	US$9,879,523	US$11,179,342	US$11,941,136
Approved 2022 Budget	US$6,761,536 (disbursement target)		

2022 Disbursement Target based on Approved FinPlan

Section 1 Fact sheet

Initiative name	Research for Low-Emission Food Systems
Initiative short name	Low-Emission Food Systems
Action Area	Systems Transformation
Geographic scope	**Countries targeted in the proposal:** Bangladesh; China; Colombia; Ethiopia; Kenya; Peru; The Socialist Republic of Viet Nam
Start date	01/01/2022
End date	31/12/2024
Initiative Lead	Louis Verchot – l.verchot@cgiar.org
Initiative Deputy	Wei Zhang – w.zhang@cgiar.org
Measurable three-year End of Initiative outcomes	**EOI outcome: Capacity and support for food system greenhouse gas emission reduction strategies** **Description:** Global and national government agencies, civil society, and private sector planners increase their capacity to use co-developed tools, data, and analyses to design at least five inclusive food-system emissions-reduction strategies and/or carbon sink initiatives.
	EOI outcome: Better data for food system greenhouse gas emission monitoring **Description:** Increased rigor and certainty in data, knowledge, tools, and capacity improve food system greenhouse gas emission monitoring and UNFCCC national communications in at least five countries, subsequently improving the global stocktake.
	EOI outcome: Inclusive approaches for low-emission food system transformation in Living Labs for People **Description:** Food system stakeholders and actors in Living Labs for People, with support from the Initiative and partners, establish inclusive frameworks for co-designing, experimenting, and scaling approaches that contribute to sustainable food system transformation that delivers climate mitigation benefit and other SDG outcomes.

	EOI outcome: Scaled up CGIAR low-emission technological solutions **Description:** Interventions targeting carbon sequestration and reduced GHG emissions are scaled up and out via five CGIAR technologies with high potential for climate mitigation
	EOI outcome: Increased awareness of food system approaches to achieve low greenhouse gas emission development **Description:** Food system approaches to achieve low greenhouse gas emission development are high on the world's political agenda. Resources allocated to low greenhouse gas emission food system development increase, stimulating action on mitigation. Informed food system decision-making is based on solid science, good governance, and principles of gender and social equity
OECD DAC Climate marker adaptation score*	**Score 1:** Significant
OECD DAC Climate marker mitigation score*	**Score 2:** Principal
OECD DAC Gender equity marker score*	**Score 1A:** This score is derived from assessing the initiative proposal against adapted OECD gender equality scoring criteria.
Website link	https://www.cgiar.org/initiative/low-emission-food-systems/

*The Organisation for Economic Co-operation and Development (OECD) Development Assistance Committee (DAC) markers refer to the OECD DAC Rio Markers for Climate and the gender equality policy marker. For climate adaptation and mitigation, scores are: 0 = Not targeted; 1 = Significant; and 2 = Principal.
The CGIAR GENDER Impact Platform has adapted the OECD gender marker, splitting the 1 score into 1A and 1B. For gender equality, scores are: 0 = Not targeted; 1A = Gender accommodative/aware; 1B = Gender responsive; and 2 = Principal.
These scores are derived from Initiative proposals, and refer to the score given to the Initiative overall based on its proposal.

A cocoa agroforest inside the Amazon rainforest in Caqueta. Photo credit: MEJ. Villarino/ IKI-SLUS. Alliance of Bioversity-CIAT

Section 2 Initiative progress on science and towards End of Initiative outcomes

Overall summary of progress against the theory of change

The CGIAR Research Initiative on Low-Emission Food Systems aims to foster low-emission development in a manner that does not threaten food production and to support target countries' commitments to the objectives of the Paris Agreement using a food systems approach and through five Work Packages: 1 (National strategy development and planning), 2 (Evidence and data), 3 (Living Labs for People), 4 (Scaling) and 5 (Engagement and agenda transformation). During its first year, the Initiative focused on setting the stage for achieving all End of Initiative (EoI) Outcomes in four of the seven target countries identified in the proposal: China, Colombia, Kenya, and Socialist Republic of Viet Nam. Preliminary work started in Bangladesh, while work in the last two target countries (Ethiopia and Peru) was postponed due to reduced funding compared to the expectations set in the proposal.

Outputs published in 2022 range from peer-reviewed articles (46) to book chapters (3), reports and working papers (8), policy/research briefs (9), blog posts (16) and brochures (3). Forty percent of these products focus on China, Colombia, Kenya, and/or Socialist Republic of Viet Nam; 40% are global in scope; the rest pertain to other countries (products initiated under CRPs and/or research conducted in non-target countries and contributing to the Initiative outcomes). The Initiative also made progress on multiple draft outputs scheduled for publication in 2023.

In terms of capacity strengthening, the Initiative awarded scholarships to 12 young scientists under the Climate, Food and Farming, Global Research Alliance Development Scholarships (CLIFF-GRADS) Programme, which builds capacity for climate-change research in scientific leaders from the Global South. We provided support to the African Group of Negotiators Expert Support (AGNES) Climate Governance, Diplomacy And Negotiations Leadership Program. Several graduate students are

View of forestland in rural Kenya. Photo credit: N. Palmer/Alliance of Bioversity-CIAT

being hosted in CGIAR Centers by Initiative staff and are exposed to scientific advances for decoupling food system development from greenhouse gas (GHG) emissions. The Initiative also provided support to the launching of CGIAR Communities of Practice on gender-transformative research methodologies and multi-stakeholder platforms and to training workshops at global (GenderUp, systematic review methods) and national (NetMapping in Kenya, mechanized rice straw composting business model in Socialist Republic of Viet Nam) levels.

The Initiative contributed to the implementation of policy changes and investments in target countries. In China, a Chinese Academy of Agricultural Sciences-led team contributed to the Ministry of Agriculture's accounting guidelines for GHG emissions of dairy enterprises. The Alliance of Bioversity International and CIAT contributed to the signature of Colombia's dairy value chain zero-deforestation agreement by five new stakeholders. The IRRI technology "Alternate Wetting and Drying" to reduce GHG in rice was included in Socialist Republic of Viet Nam's Nationally Determined Contribution. Also in Socialist Republic of Viet Nam, IRRI started contributing scientific guidance to two new investments of the Australian Department of Foreign Affairs and Trade: a partnership with Rikolto and CarbonFarm aimed at incentivizing low-emission rice-growing techniques using artificial intelligence and satellite technology and a Partnership with Gold Standard to create a platform that enables carbon markets access for smallholder rice producers.

As a first step towards building capacity and support for food system GHG reduction strategies in China, Colombia, Kenya, and Socialist Republic of Viet Nam, progress was made on assessing GHG emissions (using the EDGAR-FOOD, FAOSTAT and EPA databases) as well as the status of GHG emission reduction efforts in these countries. This information is being compiled in "national food systems GHG emission profiles" (sections on GHG emissions related to food waste and loss in China, Colombia, Kenya, and Socialist Republic of Viet Nam already published). The Initiative team engaged with target country governments to assess the usefulness of a food systems approach in national low-emission development planning. For China, COVID-19 restrictions prevented in-country interactions between Work Package leadership and (sub-) national stakeholders; hence coordination occurred through the locally based Country Lead and virtually. The Initiative team developed recommendations for achieving low-carbon development in China through circular agriculture and repurposing agricultural support policies, and recommendations on developing effective, efficient, and equitable forest carbon policies and projects in Socialist Republic of Viet Nam. Collaboration was initiated with the World Bank on developing Marginal Abatement Cost Curves to compare costs and emission reduction impacts of various emission reduction strategies and to help prioritize World Bank investments.

Data gaps on emissions were identified and plans made to bridge these gaps through data collection in target countries. A simplified approach was developed for producing Tier 2 enteric-methane emission factors based on East African smallholder farm data. Recommendations were made to improve Agriculture, Forestry, and Other Land Uses (AFOLU) emissions reporting for developing countries, MRV estimations in the rice sector in Socialist Republic of Viet Nam and data on GHG emissions from livestock systems in Africa.

A synthesis was produced on the effectiveness and economic, regulatory and societal aspects of methane emission mitigation strategies in grazing production systems. Work was carried out with the International Institute for Applied Systems Analysis (IIASA) to improve the representation of the food system GHG emission mitigation potential in IIASA's GLOBIOM model in order to estimate trade-offs between GHG mitigation, food security, and adaptation to climate change. Discussions are ongoing to determine the scope and platform of the future Low-Emission Food Systems Data Portal, including possible linkages with HESTIA or similar platforms.

The development of a conceptual framework for a Living Labs for People (LL4P) approach to sustainable and inclusive food system transformation is ongoing. After consultations with a wide range of stakeholders, an initial set of LL4P sites were selected in the four target countries. The countries have different contexts and starting points and thus moved at different paces. Synergies with existing multi-stakeholder platforms (MSPs) were explored. In Kenya, a local LL4P host institution was identified, a launch workshop with stakeholder and Netmapping exercise were conducted, and a concept note and situation analysis were developed for the LL4P. Capacity needs related to MSP strategy development were assessed and progress was made on building capacity on MSPs and participatory action research methods. In terms of decision-support tools for LL4Ps in Colombia, Kenya, and Socialist Republic of Viet Nam, we conducted preparatory work for land cover/use-based ecosystem service modeling.

To prepare for scaling up and out food system interventions effective at both reducing emissions and promoting sustainable development, the Initiative team developed a draft framework and scoring sheet for identifying innovations with the highest potential and piloted them with stakeholders in Kenya. A list of innovations with high potential to reduce GHG emission intensity in food systems was compiled, some of which have already been tested (e.g. rice in Socialist Republic of Viet Nam and cocoa in Colombia). Seven research articles were published on assessing the determinants of adoption of technologies and/or on the enabling environment for adoption.

The Initiative participated in several high-profile events to outline opportunities and challenges of low-emission food system development, including at COP 27 and through a high-profile dialogue in Colombia. Analysis presented at the G20 Meeting of Agricultural Chief Scientists in Indonesia about the potential for food systems to achieve net zero emissions by 2050 shows that the goal is achievable in many regions by 2030, while beyond 2030 population growth likely pushes the goal out of reach. Sixteen blog posts were published about the Initiative's outputs, as well as a high-visibility article on deforestation policies on Devex.

As of the end of 2022, about 50 CGIAR staff (45% women) were part of the Initiative team and partner agreements had been signed with about 20 external research partners at international or national level. Two all-staff Initiative team meetings were held, in May (in-person) and December (virtual).

A field trip to Reserva Natural El Hatico, familia Molina Durán, near Palmira, Colombia, to take carbon measurements in an area of tropical forest, as part of a CIAT-hosted workshop on REDD+. Photo credit: N. Palmer/Alliance of Bioversity-CIAT

Initiative-level theory of change diagram

This is a simple, linear, and static representation of a complex, non-linear, and dynamic reality. Feedback loops and connections between this Initiative and other Initiatives' theories of change are excluded for clarity.

EOI — End of Initiative outcome

AA — Action Area

IA — Impact Area

SDG — Sustainable Development Goal

- Nutrition, Health, and Food Security
- Poverty Reduction, Livelihoods, and Jobs
- Gender Equality, Youth, and Social Inclusion
- Climate Adaptation and Mitigation
- Environmental Health and Biodiversity

Teams from CGIAR's three Action Areas — System Transformation, Resilient Agrifood Systems and Genetic Innovation — worked to develop an improved set of Action Area outcomes in October 2022. Since this was near the end of the reporting cycle for 2022, it was decided not to update the theories of change based on these new Action Area outcomes.
The exception to this is Genetic Innovation — for this Action Area, as the new outcomes had already been widely discussed among the relevant Initiatives, and with its advisory group of funders and other stakeholders, the decision was made to update their outcomes in time for the 2022 reporting cycle.

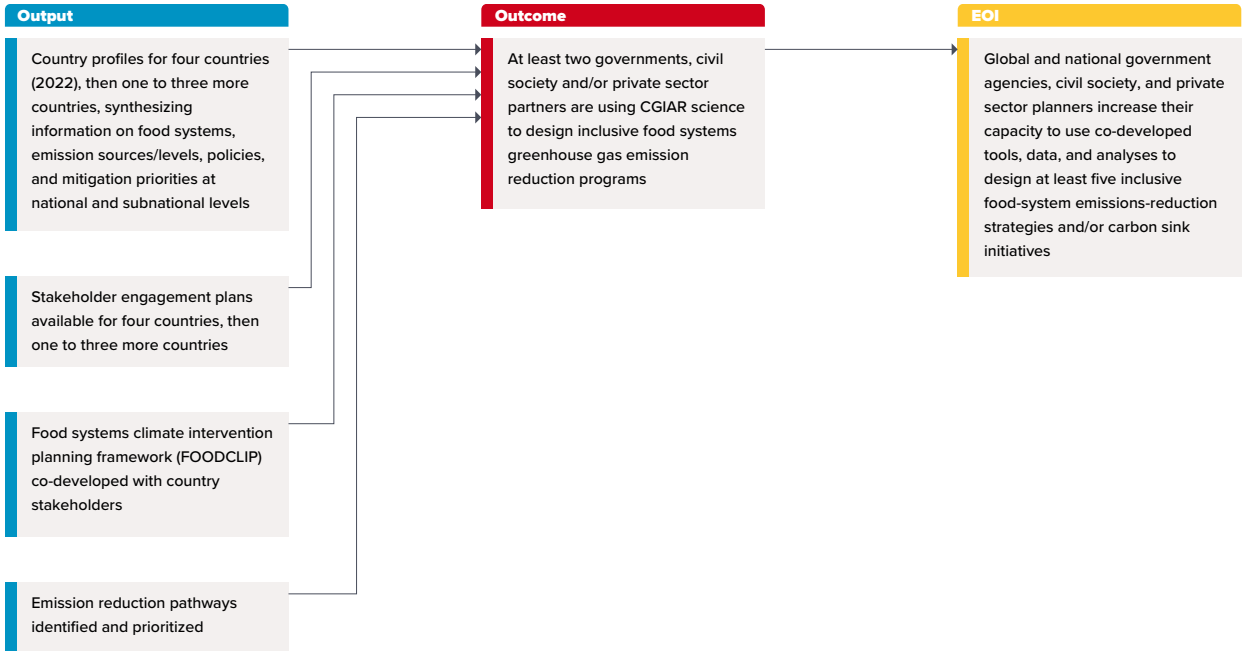
Progress by End of Initiative outcome

End of Initiative Outcome 1	• Draft national food systems GHG emission profiles for Bangladesh, China, Colombia, Kenya, and Socialist Republic of Viet Nam. • Policy recommendations for low-emission food systems in China and Socialist Republic of Viet Nam.
End of Initiative Outcome 2	• Improved representation of the food system GHG emission mitigation potential in Integrated Assessment Models. • Aquatic food systems GHG emission baseline in Socialist Republic of Viet Nam. • Identification of data gaps on GHG emissions in Colombia, Kenya, and Socialist Republic of Viet Nam. • Development of tools for collection of activity data for GHG emission estimates in Kenya and Socialist Republic of Viet Nam. • Measuring, reporting and verification system in Socialist Republic of Viet Nam. • Draft concept of Low-Emission Food Systems Data Portal. • Influencing Thailand and Socialist Republic of Viet Nam Nationally Determined Contributions.
End of Initiative Outcome 3	• Concept note for Living Labs for People (LL4Ps) in Kenya. • Draft Living Lab for People (LL4P) situation analysis for Kenya. • Draft report on aquatic food systems' GHG emissions in Can Tho, Socialist Republic of Viet Nam. • Participatory theory of change development and reflection process. • Publications contributing to a toolbox of interventions for capacity strengthening and learning.

End of Initiative Outcome 4	• Draft framework for identifying CGIAR technology-derived, scaling-ready solutions with high potential to reduce GHG emission intensity in food systems. • Draft list of CGIAR technology-derived scaling-ready solutions (e.g. for rice in Socialist Republic of Viet Nam). • Draft framework for scaling low-emission food systems. • Assessments of adoption determinants and factors enabling or constraining the adoption of technologies. • Studies on institutional arrangements, policy approaches and methodological guidelines to facilitate scaling of technologies. • Signature of Colombia's dairy value chain zero-deforestation agreement by five new stakeholders. • Engagement with partners in scaling carbon market access and incentivising low-emission rice production in Socialist Republic of Viet Nam.
End of Initiative Outcome 5	• Blog posts. • Participation in high-profile global (COP 27, G20) and national (policy dialogue in Colombia) events. • Capacity development through support provided to the CLIFF-GRADS program, training of African professionals on climate change-related development issues and other post-graduate training.

Section 3 Work Package-specific progress

Work Package 1:
Planning for food systems transformation



Work Package 1 progress against the theory of change

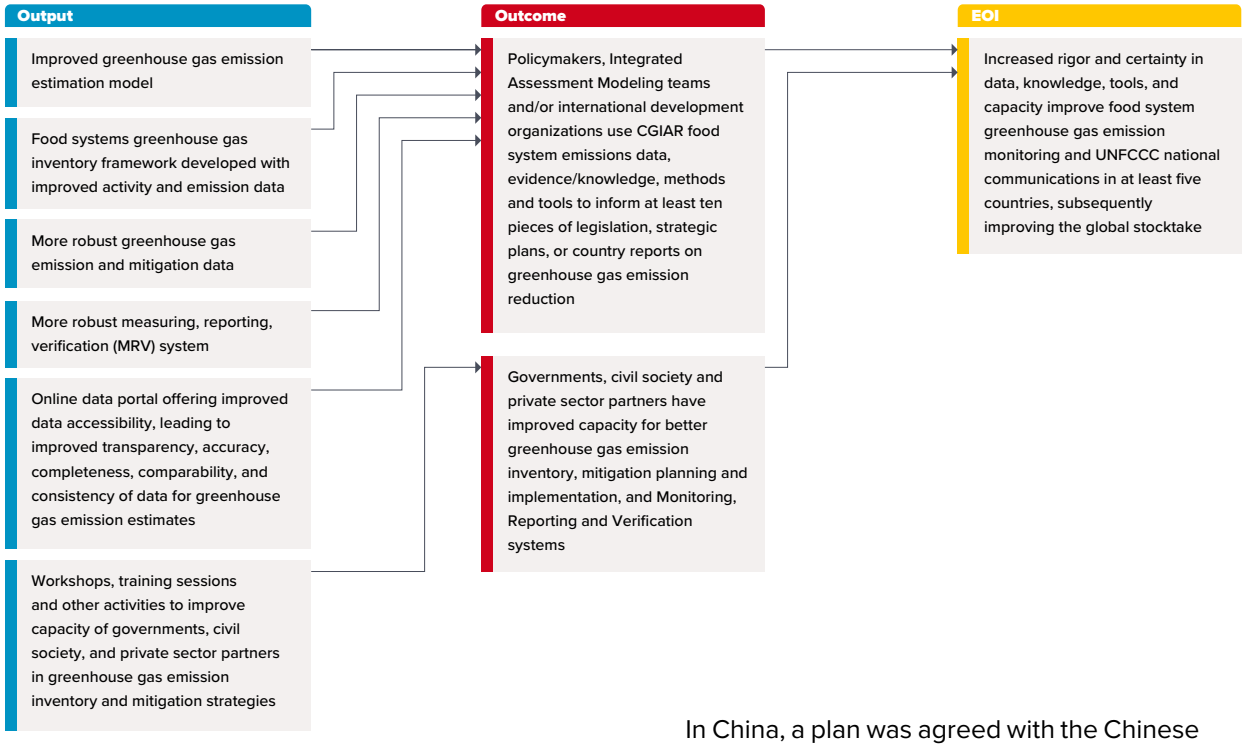
In each country, the Low-Emission Food Systems team conducted stakeholder consultations to inform prioritization of mitigation sectors and measures. The concept of Food System Climate Intervention Planning (FOODCLIP) (user-friendly integrated modeling and planning framework to design emissions reduction and carbon capture initiatives at sub-national and national scale) was favorably received by national stakeholders, and a foresight modeling study investigated the impacts of climate change on Socialist Republic of Viet Nam's fisheries to guide decision making. The idea mentioned in the proposal to set up national clearinghouses on climate-change mitigation in food systems in target countries was dropped owing to lack of demand from stakeholders and concerns on duplication with other activities.

Work is ongoing to produce "target country profiles" that synthesize GHG emission- and climate change-related data at the national level, provide an analysis of key drivers of and contributors to GHG emissions in food systems, and explore the potential and costs of alternative mitigation actions and associated trade-offs, taking into account environmental boundaries and transformational needs. Progress was made on drafting country profiles for Bangladesh, China, Colombia, Kenya, and Socialist Republic of Viet Nam, and briefs on GHG emissions related to food waste and loss were published for China, Colombia, Kenya, and Socialist Republic of Viet Nam.

Recommendations were made to reposition China's agricultural support policies to achieve China's 2060 Carbon Neutrality Goal.

At the global level, Initiative scientists contributed to the UNEP Emissions Gap Report 2022 chapter on Transforming Food Systems, which proposes emission reduction pathways to accelerate transformation.

Work Package 2:
Data, evidence, and tools for food systems transformation



Work Package 2 progress against the theory of change

Stakeholder engagement in each target country resulted in the identification of GHG emission data gaps and plans to collect robust data.

In Colombia, the Initiative started providing support to Instituto de Hidrología, Meteorología y Estudios Ambientales (Ministry of Environment agency responsible for the national Agriculture, Forestry, and Other Land Use GHG inventory) on land-cover monitoring and quantification of emissions from deforestation and reforestation using the Terra-i software. A synthesis of national data for rice was initiated to produce a Tier 2 system for estimating spatially disaggregated emission factors in the country. Field GHG data collection is ongoing for rice, cacao, sugarcane and pasture production systems through collaboration with bilateral projects.

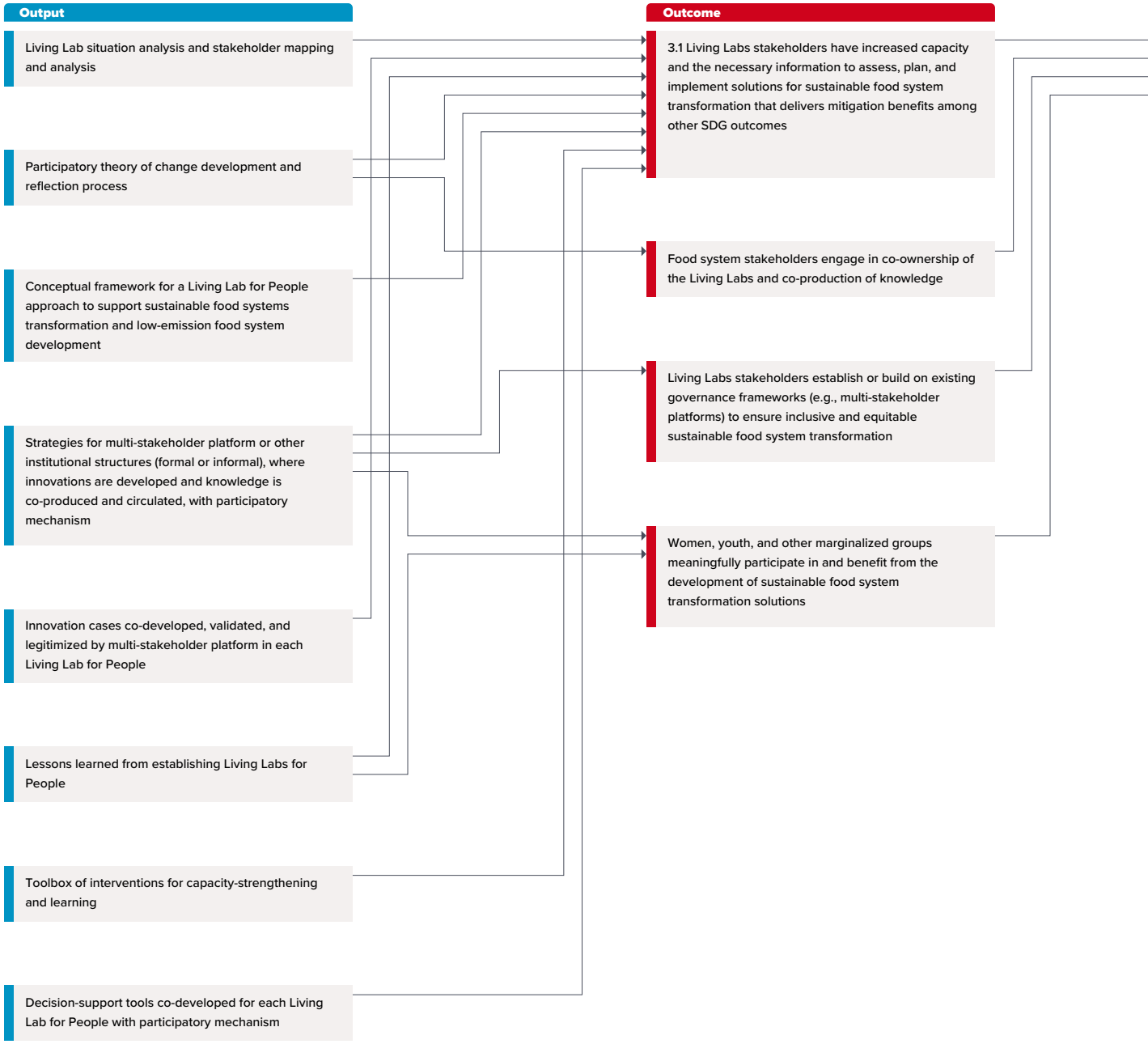
In China, a plan was agreed with the Chinese Academy of Agricultural Sciences to develop carbon GHG inventories at national and provincial levels and to quantify emission and mitigation potentials in the dairy value chain.

In Kenya, activity data collected were compiled for dairy cattle to estimate baseline GHG emissions and assess the potential of low-emission intensification interventions prioritized by the Kenyan government.

In Socialist Republic of Viet Nam, a baseline for GHG emissions from aquatic food systems was established, an updated rice activity data collection tool was developed to be piloted in several provinces in 2023, and recommendations were made to improve Monitoring, Reporting, and Verification estimations in the rice sector.

Several publications explored ways of improving GHG emission and mitigation data using spatial tools (e.g. better estimate global and national forest biomass or map crops using a machine learning approach applied to satellite imagery).

Work Package 3:
Living Labs for People



EOI

"Food system stakeholders and actors in Living Labs for People, with support from the Initiative and partners, establish inclusive frameworks for co-designing, experimenting, and scaling approaches that contribute to sustainable food system transformation that delivers climate mitigation benefits and other SDG outcomes

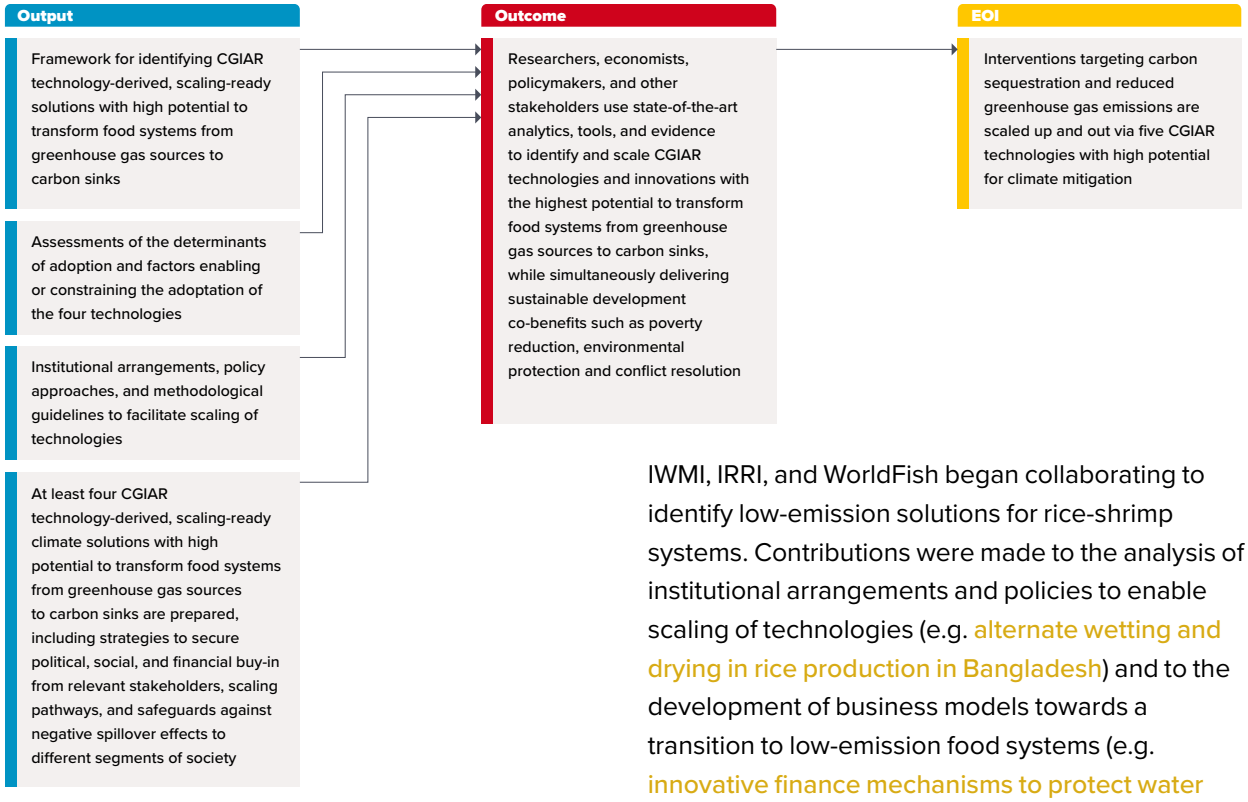
Work Package 3 progress against the theory of change

"Living Labs for People" (LL4P) are spaces for food system stakeholders to co-design and implement socio-technical innovations and associated modes of governance for sustainable food system transformation to achieve climate-change mitigation benefits. The implementation of LL4Ps is supported by capacity building on multi-stakeholder platforms (MSPs), gender transformative research methods, participatory collective visioning methods building on the expertise of CGIAR and external partners, and taking advantage of methodological synergies with other Initiatives including AgroEcology, NATURE+, and NEXUS Gains. In 2022, several publications on experiential learning and behavioral change interventions (example here) paved the way to creating a toolbox for capacity strengthening. A methodological guide was developed to facilitate a theory of change reflection process in LL4Ps.

In China, the team partnered with China Agricultural University to support the National Dairy Industrial Technology System in developing a more inclusive MSP strategy, while continuing to build the capacity of local partners to identify a LL4P site. In Colombia, a consortium with two local universities set up a LL4P in the Caquetá region. In Kenya, inception activities (concept note for the LL4P, cross-Initiative inception workshop, NetMapping workshop, partnerships with Kaimosi Agricultural Training Centre and Nandi Agricultural Value Chain Incubator to host the LL4P) took place in Nandi County. In Socialist Republic of Viet Nam, the Can Tho province was selected as a LL4P site, with rice and aquatic systems serving as entry points for low-emission food system development.

The wording of the WP3 outputs and outcomes was adjusted to reflect the inclusive nature of LL4Ps and the need for stakeholder co-ownership and co-production of knowledge.

Work Package : 4
Scaling low-emission food systems



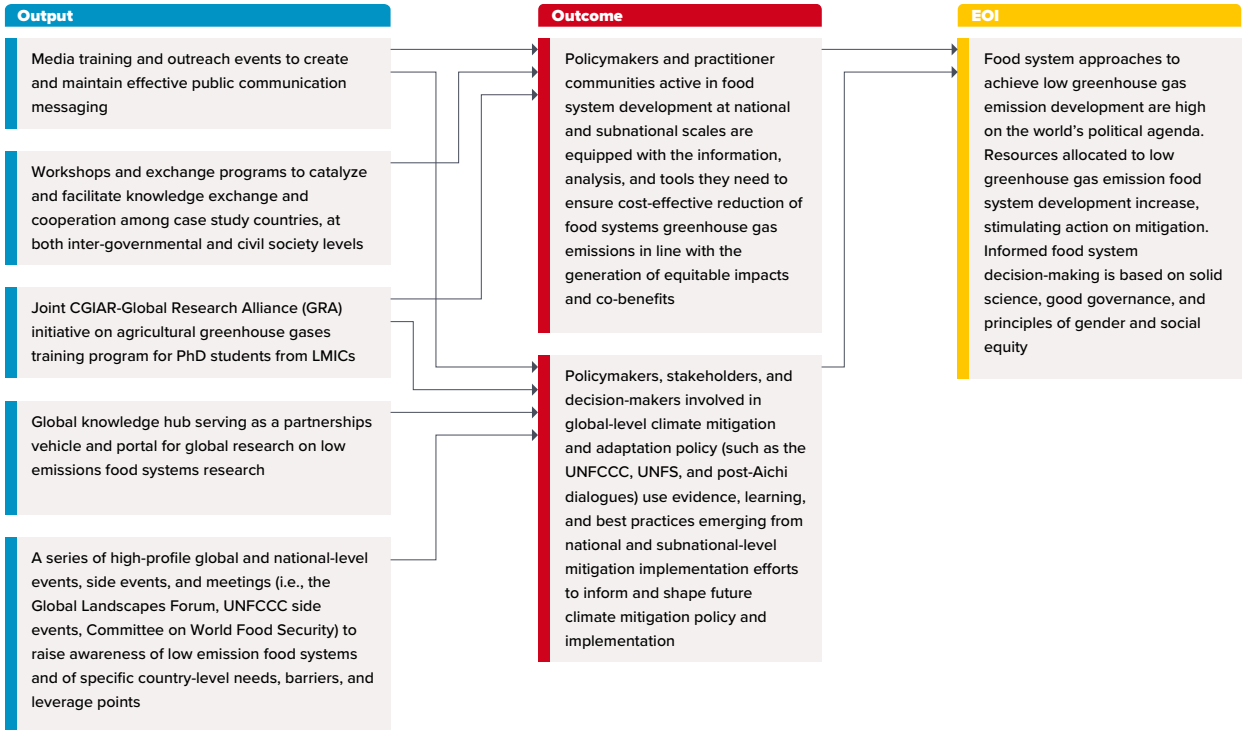
Work Package 4
progress against the theory of change

WP4 aims to create an enabling environment for scaling up selected CGIAR technologies and innovations with high mitigation potential. In 2022, a framework for scaling low-emission food systems and a framework to rank technologies based on stakeholders' perception of their scaling readiness were developed and piloted in Kenya. Technology adoption determinants were studied (examples here and here). In Colombia, work by the Alliance of Bioversity and CIAT on cocoa and livestock, which had started under an IKI-funded project for achieving climate action and peace, expanded. Similarly, in Socialist Republic of Viet Nam, work by IRRI, which had started under CCAFS to scale up mitigation technologies in rice, continued, while IWMI, IRRI, and WorldFish began collaborating to identify low-emission solutions for rice-shrimp systems. Contributions were made to the analysis of institutional arrangements and policies to enable scaling of technologies (e.g. alternate wetting and drying in rice production in Bangladesh) and to the development of business models towards a transition to low-emission food systems (e.g. innovative finance mechanisms to protect water resources and deliver mitigation benefits in China, draft typology of instruments for climate finance in Colombia, China, Kenya, and Socialist Republic of Viet Nam, stakeholder engagement at a roundtable on Public-Private Blended Finance Facility for Climate-Resilient Rice Landscapes in Socialist Republic of Viet Nam). A stakeholder workshop was organized by IWMI in Bangladesh to discuss the policy consequences of shifting away from diesel irrigation pumps.

A sub-national spatial analysis is ongoing to assess the overlap between mitigation priorities and development objectives in China, Colombia, Kenya, and Socialist Republic of Viet Nam.

A gender lens is being applied in the WP's work through adapting the GenderUp for Scaling and Scaling Scan tools to scaling of low-emission solutions and taking into account lessons learned on gender impacts of scaling innovations for agriculture.

Work Package 5:
Engagement and agenda transformation



Work Package 5 progress against the theory of change

At the Food and Agriculture Pavilion at COP 27, the Initiative organized three side events: one that explored the potential for integrating food system approaches in long-term low GHG emission and climate development strategies; one about the CLIFF-GRADS program, which offers early-career scientists from low- and middle-income countries opportunities to learn how to conduct applied research in agricultural GHG emission quantification and mitigation; and one on scaling approaches for achieving low-emission food systems and peace. In addition, the Initiative participated in other COP 27 events, on modeling Africa's energy transition, agricultural transition in Asian Mega Deltas, livestock transitions and mitigation, and sustainable livestock production and climate change. Other high-level events in which the Initiative participated include a policy dialogue on the impact of sustainable land use on reducing deforestation and building peace in Colombia and the G20 Meeting of Agricultural Chief Scientists.

Sixteen blog posts were published about the Initiative's outputs, as well as a high-visibility article about deforestation policies published on Devex.

Twelve Climate, Food and Farming, Global Research Alliance Development Scholarships Programme (CLIFF-GRADS) fellows benefitted from funding support from the Initiative. Support was provided to five African Group of Negotiators Expert Support (AGNES) delegates to participate in the UNFCCC process and attend COP 27. The Initiative also contributed to the delivery of the AGNES Climate Governance, Diplomacy And Negotiations Leadership Program to 60 participants.

Owing to reductions in funding and delays in hiring the WP5 Lead, media training activities were postponed to 2023.

Work Package progress rating

WORK PACKAGE	TRAFFIC LIGHT / RATIONALE	
1		Although progress was achieved on all four outputs, delays in contracting with CIFOR (which hosts the WP1 Lead) prevented completion of some deliverables (including country profiles) in 2022. Team adjustments are planned in 2023 to ensure a quicker pace of delivery.
2		Progress was made on five outputs. The remaining output, on capacity building workshops, will be tackled once more progress has been achieved on the other outputs.
3		Progress was made on seven outputs. The remaining output, on lessons learned is, by nature, expected to be achieved in subsequent years.
4		Progress was made on all WP4 outputs.
5		Despite delays in bringing on board the WP5 Lead, public messaging, implementation of training programs and organization of high-profile events are on track with a view to ensuring that food system approaches to low GHG emission development are high on the world's political agenda.

KEY		
Off track		• Annual progress clearly falls behind Plan of Results and Budget and Work Package theory of change in most/all areas • Deviations/issues/delays/risks do jeopardise success of Work Package
Delayed		• Annual progress slightly falls behind Plan of Results and Budget and Work Package theory of change in key areas • Deviations/issues/delays/risks could jeopardise success of Work Package if not managed appropriately
On track		• Annual progress largely aligns with Plan of Results and Budget and Work Package theory of change • Can include small deviations/issues/ delays/risks that do not jeopardize success of Work Package

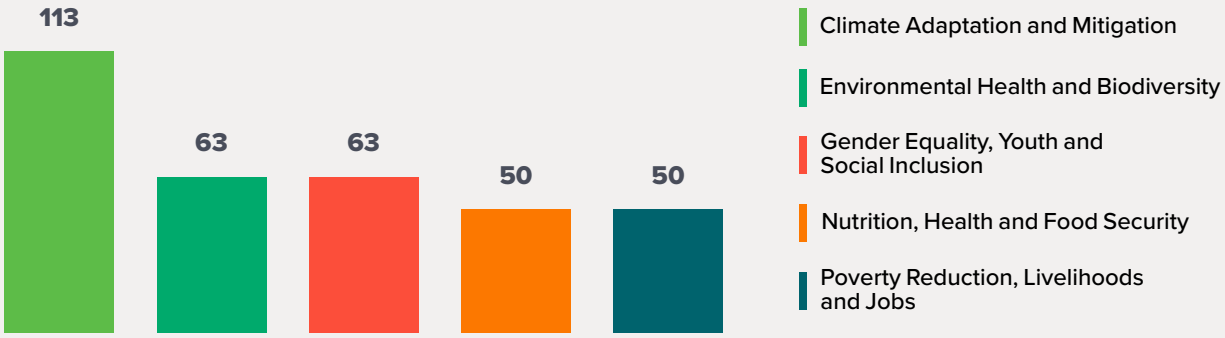
Section 4 Initiative key results

This section provides an overview of 2022 results reported by Low-Emission Food Systems. These results align with the CGIAR Results Framework and Low-Emission Food Systems' theory of change. Further information on these results is available through the CGIAR Results Dashboard.

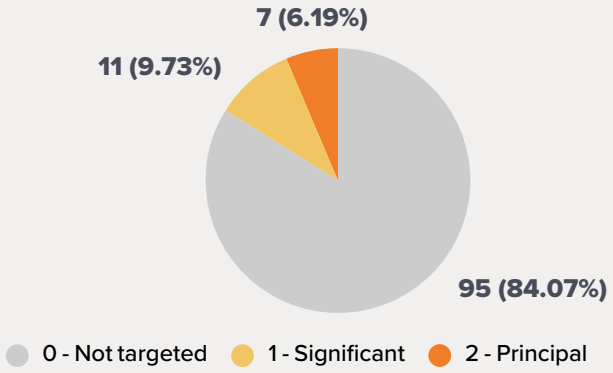
Overview

Results	Outputs			Outcomes		
113	10 Capacity sharing for development	8 Innovation development	88 Knowledge products	1 Innovation use	6 Policy change	13 Centers

Numbers of reported results contributing to each impact area



Number of reported results by gender tag



0 = Not targeted: The result does not target gender equality.

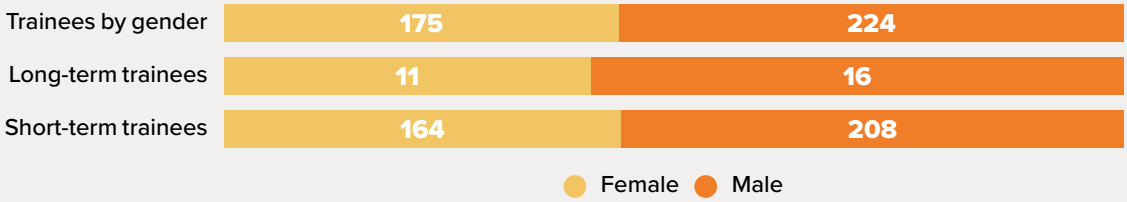
1 = Significant: The result contributes in significant ways to gender equality, even though it is not the principal focus of the activity.

2 = Principal: Gender equality is the main objective of the result and is fundamental in its design and expected results.

Capacity sharing for development

10	126	6	399
Results	Partners	Centers	Trainees

Capacity sharing for development refers to the number of people trained by CGIAR, with the aim of leading to changes in knowledge and behavior.

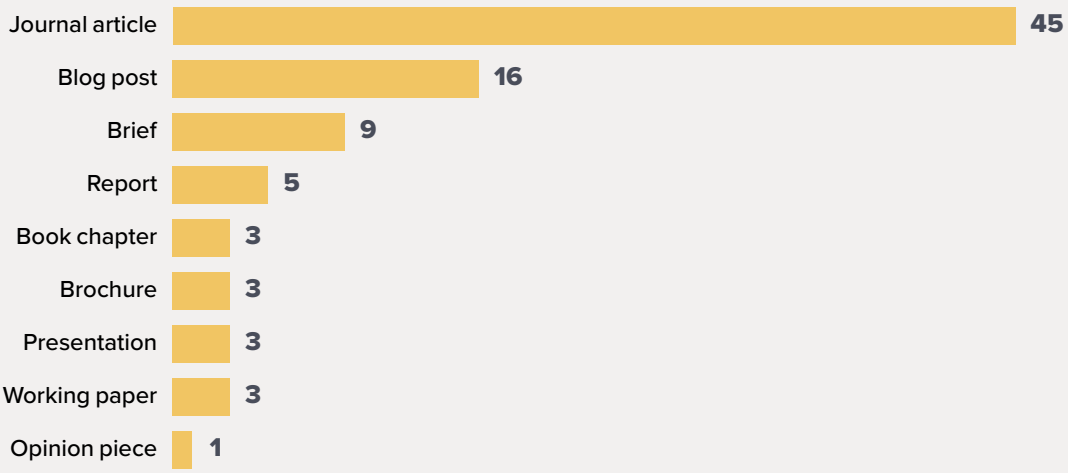


Innovations by readiness level

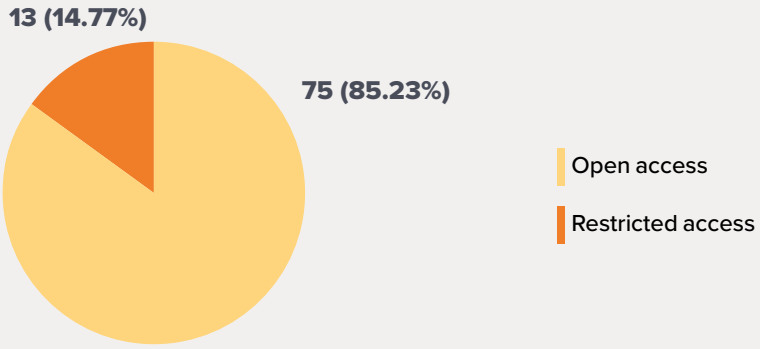
Pipeline overview
Number of innovations

9	PROVEN INNOVATION – The innovation is validated for its ability to achieve a specific impact under uncontrolled conditions	0
8	UNCONTROLLED TESTING – The innovation is being tested for its ability to achieve a specific impact under uncontrolled conditions	1
7	PROTOTYPE – The innovation is validated for its ability to achieve a specific impact under semi-controlled conditions	0
6	SEMI-CONTROLLED TESTING – The innovation is being tested for its ability to achieve a specific impact under semi-controlled conditions	0
5	MODEL/EARLY PROTOTYPE – The innovation is validated for its ability to achieve a specific impact under fully-controlled conditions	1
4	CONTROLLED TESTING – The innovation is being tested for its ability to achieve a specific impact under fully-controlled conditions	1
3	PROOF OF CONCEPT – The innovation's key concepts have been validated for their ability to achieve a specific impact	0
2	FORMULATION – The innovation's key concepts are being formulated or designed	1
1	BASIC RESEARCH – The innovation's basic principles are being researched for their ability to achieve a specific impact	2
0	IDEA – The innovation is at idea stage	2

Number of reported knowledge products by category



Number of reported knowledge products by open access status



Section 5 Impact pathway integration – External partners

Research partners were chosen based on subject matter expertise, complementarity of skills, ability to contribute to WP theories of change and existing successful partnerships with CGIAR. CIRAD, IIASA, and Wageningen University and Research were selected because of modeling expertise complementarity with IFPRI's. GFZ Helmholtz Centre Potsdam brings cutting-edge geospatial analysis capacity.

The partnership with China Agricultural University stems from this institution's long-term role in support of the National Dairy Industry Technology System, which was identified as a LL4P pilot; and the Institute of Environment and Sustainable Development in Agriculture at the Chinese Academy of Agricultural Science was chosen because of its contribution to the government Action Plan on GHG Mitigation and Carbon Sequestration in Agriculture and participation in CCAFS research on low-emission dairy sector development.

To ensure integration in the (sub-)national mitigation landscape, maximize outcomes, and build capacity, agreements are also in place for local partners to conduct field work and stakeholder engagement in other countries: Universidad de la Amazonia and Pontificia Universidad Javeriana (Colombia), Maseno University (Kenya), An Giang and Can Tho Universities, Cuu Long Delta Rice Research Institute, and Institute of Policy and Strategy for Agriculture and Rural Development (Socialist Republic of Viet Nam).

In each country, stakeholder consultations were conducted to identify gaps in GHG emission data and inform prioritization of mitigation sectors and measures. The work of the Initiative is embedded in existing structures (e.g. Kenya Climate Smart Agriculture Multi-Stakeholder Platform, Kaimosi Agricultural Training Centre (ATC), and Nandi Agricultural Value Chain Incubator in Kenya, with ATC serving as LL4P host).

At the regional and global level, a partnership with AGNES fosters engagement in the international climate-change policy discourse. The Initiative China Lead was invited to participate in the Asian Development Bank Climate Change Action Plan Consultation process; and the Initiative's research will inform a World Bank investment program on food system decarbonization.

In total, over 20 partnership agreements were signed in 2022.

A cocoa agroforest inside the Amazon rainforest in Caqueta.
Photo credit: MEJ. Villarino/IKI-SLUS. Alliance of Bioversity-CIAT

Section 6 Impact pathway integration – CGIAR portfolio linkages

Low-Emission Food Systems participated in several portfolio- and initiative-level events: launches of the CGIAR portfolio in Socialist Republic of Viet Nam and Colombia; launch of the Initiative on National Policies and Strategies (NPS) in Kenya; meeting on scaling of climate-change innovations in Kenya organized by the Ministry of Agriculture and Livestock Development, CGIAR and the Global Scaling Community of Practice; joint launch of three CGIAR Initiatives in Nandi County, Kenya; workshop organized by the Foresight and Metrics Initiative on Pathways for Agriculture, Forestry and Other Land Use to integrate GHG considerations into international modeling analyzes.

The locations of the LL4Ps reflect synergies with other CGIAR portfolio efforts: Municipality of Caquetá (Colombia) with the Nature-Positive Solutions and Livestock and Climate Initiatives, and the "Sustainable Land Use Systems for Zero Deforestation Agrifood Value Chains in Conflict-Affected Settings" project led by CIAT; Nandi County (Kenya) with the Initiatives on Gender Equality and Livestock and Climate; Can Tho province (Socialist Republic of Viet Nam) with the Initiative on Asian Mega-Deltas (AMD).

Extensive collaborations were developed with Livestock and Climate (data collection, mitigation strategies, scaling), AgriLAC Resiliente (scaling mitigation solutions, linking climate and peacebuilding efforts in Colombia), and AMD (e.g. support to GHG emission development strategies of governments in Southeast Asia building on the Thai Rice NAMA project implemented by IRRI). Low-Emission Food Systems joined forces with the Initiatives on Agroecology and NEXUS Gains to support research on multistakeholder processes through a resources workshop and community of practice. Interactions started with NPS on policy coherence analysis in Kenya and are progressing with Nature-Positive Solutions on land cover/use-based ecosystem service modeling.

Section 7 Adaptive management

RECOMMENDATION	SUPPORTING RATIONALE
Reduce the number of target countries from seven to four (China, Colombia, Kenya, Socialist Republic of Viet Nam) and adjust End of Initiative outcomes for WPs 1, 2, and 4 accordingly, while still being open to leveraging other resources to make some cost-effective progress in Bangladesh • WP1: Global and national government agencies, civil society, and private sector planners increase their capacity to use co-developed tools, data, and analyzes to design at least **four** inclusive food-system emission-reduction strategies and/or carbon sink initiatives. • WP2: Increased rigor and certainty in data, knowledge, tools, and capacity will improve food system GHG emission monitoring and UNFCCC national communications in at least **four** countries, subsequently improving the global stock take. • WP4: Interventions targeting carbon sequestration and reduced GHG emissions are scaled up and out via **four** CGIAR technologies to demonstrate climate mitigation effectiveness.	The Initiative budget for 2022 was reduced from US$ 9.9M (proposal) to US$ 7.5M (initial budget) and then to US$ 6.7M (final available amount). The initial budget for 2023 is US$ 7.0M compared to US$ 11.2M in the proposal. Keeping the proposal's geographic scope would have spread resources too thin. We prefer to adjust expectations to what can realistically be achieved in the new situation. Countries were prioritized based on cross-regional research design, countries' NDC commitments to actions in the food systems and state of readiness to implement low-emission development, and the state of existing research partnerships.
Increase the level of conceptual coordination within the Initiative through regular cross-WP meetings, science webinars and deliberate efforts to put in place cross-sectoral partnerships to reinforce the food systems perspective and gender transformative approach and ensure that all Centers' and partners' contributions align with the Initiative's objectives.	The Initiative's 2022 work has been built on existing relationships with sectoral government partners and ongoing research activities. However, the Initiative's food system perspective, mitigation focus and gender transformation ambition require new thinking and ways to foster cross-sectoral collaboration, especially in the LL4Ps.
Enhance in-country coordination: 1) between CGIAR scientists and external partners, 2) with more Initiatives (e.g. Excellence in Agronomy on reducing GHG intensity in crop production, Sustainable Healthy Diets on carbon footprints of local diets, National Policies and Strategies on policy modeling in Kenya), and 3) with bilateral projects.	Three among the target countries (Colombia, Kenya, and Socialist Republic of Viet Nam) are CGIAR high-concentration countries, highlighting the need for potential synergies to materialize for efficiency and avoiding partners' fatigue.

RECOMMENDATION	SUPPORTING RATIONALE
Reconfigure the Socialist Republic of Viet Nam WP3 team and LL4P.	In 2022, the focus of the work of the WP3-Socialist Republic of Viet Nam team has been on a specific production system. In 2023 the team will be reconfigured to better incorporate a food system approach.
Reconfigure the WP1 team, reduce the WP1 budget, build on other WPs' contributions to the WP1 FOODCLIP toolbox, put on hold the clearinghouse on mitigation (owing to lack of clear demand from country stakeholders).	Delivery in WP1 is not as high as expected, prompting a need to review the value for money invested in this WP.
Adjust the LL4P (WP3) outputs and outcomes to better reflect the inclusive and participatory nature of the Living Labs and especially the need for stakeholder co-ownership and co-production of knowledge.	For LL4P to be sustainable, co-ownership by local stakeholders is key. It is important that its inclusive nature be explicit in the wording of the related outputs and outcomes.

Section 8 Key result story

As part of his CLIFF-GRADS fellowship, Kofi Konadu Boaten undertakes a field visit to the long-term no-till experimental plots at the USDA-ARS Soil and Water Conservation Research Center, Pendleton, Oregon, USA (2019). Today, Boaten is a Program Associate for Agriculture at the Global Methane Hub, a role he gained through connections he made under the CLIFF-GRADS fellowship program. Photo credit: Wayne Polumsky

Climate change mitigation fellowship program builds the capacity of over 170 early-career Global South agri-climate researchers

The Climate, Food and Farming, Global Research Alliance Development Scholarships Programme (CLIFF-GRADS) – supported by the CGIAR Research Initiative on Low-Emission Food Systems – strives to narrow the capacity gap on climate-change research in the Global South. It offers doctoral students from low- and middle-income countries opportunities to enhance their research skills. A network of 176 researchers from 37 countries has emerged from CLIFF-GRADS; several have taken up roles in international initiatives relevant to climate mitigation in agricultural systems.

Compared to the Global North, the Global South suffers a capacity gap on research in climate change and agriculture [1]. The Climate, Food and Farming, Global Research Alliance Development Scholarships Programme (CLIFF-GRADS) – a joint effort of the Global Research Alliance on Agricultural Greenhouse Gases (GRA) and the CGIAR Research Initiative on Low-Emission Food Systems – aims to help bridge this gap by providing PhD students from low- and middle-income countries with opportunities to strengthen their research skills [2].

The program focuses on the measurement, modeling, and reduction of greenhouse gas (GHG) emissions in agricultural systems and on enhancing carbon sinks in the overall context of improving food security. CLIFF-GRADS awardees undertake applied research on such topics, [2] working with scientists at a research organization outside of their home countries. During a six-month stay at their host organizations, they are exposed to world-leading international expertise, expand their research networks, and receive training that they would not otherwise receive during their PhD in their home countries. The fellows develop specific skills, for example in remote sensing, field and laboratory techniques for measuring GHG

emissions, and evidence synthesis. They also gain international experience, are exposed to new cultures, and sometimes learn a new language.

Since the program began in 2017, there have been five rounds of awardees, with funding from the Ministry for Primary Industries of New Zealand, the CGIAR Trust Fund, and USAID. The investment represents $12,000 per awardee. Today, an alumni network of 176 researchers from 37 countries (41% women) has emerged from CLIFF-GRADS. They have conducted research at 64 host institutes. Twenty-five of these (11 women) graduated in the 2022 cohort. CLIFF-GRADS fellowships have resulted in 35 articles in 28 peer-reviewed journals. Several fellows have taken up roles in international initiatives relevant to climate mitigation in agricultural systems.

Take the case of Kofi Konadu Boaten from Ghana, who participated in a side event organized by Low-Emission Food Systems and the GRA at COP 27 [3]. Kofi works for the Global Methane Hub, an initiative "to scale up cost-effective solutions in methane mitigation and contribute to transformational change in the energy, agricultural, and waste management sectors" [4]. Kofi has indicated that without the CLIFF-GRADS fellowship, he would not have been able to successfully complete his PhD, attributing this achievement to the skills he acquired and mentorship he received under the program. He added that having access to the network of CLIFF-GRADS alumni enabled him to further develop his skills, transfer knowledge to others in his country, and even obtain his exciting role at the Global Methane Hub.

Another speaker at the CLIFF-GRADS COP 27 side event [3] was Titis Apdini from Indonesia. She serves as joint programming officer at Wageningen University & Research, and in this role participates in transnational collaborative partnerships in the areas of the bioeconomy, food, and the blue and green environment [5]. Apdini shares Kofi's views about the added value of the program.

Universities and research institutes have critical roles to play in education, training, and research to achieve the goals of the United Nations Framework Convention on Climate Change (UNFCCC). Article 6 of the UNFCCC seeks to reduce the impact of climate change by enabling society to be a part of the solution. The CLIFF-GRADS program is a key enabler of the human capacity building aspirations of the UNFCCC.

2023 heralds the sixth round of CLIFF-GRADS awards. The continuity in the program contributes to a rapidly growing network of climate-change scientists from low- and middle-income countries, boosting the prospects of shrinking the climate research gap between the Global North and Global South.

"[My] experience . . . gave me a sense of where my research should focus and areas collaborations could be struck in the future. The opportunity that the CLIFF-GRADS fellowship offers is extremely helpful in developing early-career researchers, and I am definitely better for it."

Kofi Konadu Boaten, Program Associate for Agriculture, Global Methane Hub

References

1. https://www.nature.com/articles/s43247-021-00171-1
2. https://globalresearchalliance.org/library/cliff_grads-fellowship/
3. https://cop27foodpavilion.cgiar.org/programme/cliff-grads-building-capacity-for-climate-change-research-in-the-next-generation-of-scientific-leaders-from-the-global-south/
4. https://www.globalmethanehub.org/
5. https://www.jointprogramming.nl/en/jointprogramming/who-we-are.htm

LINKS TO IMPACT AREAS

Primary Impact Area: Climate Adaptation and Mitigation

Other relevant Impact Area(s):): Gender Equality, Youth and Social Inclusion; Environmental Health and Biodiversity


Which collective global targets for the relevant Impact Area(s) from the CGIAR 2030 Research and Innovation Strategy does the key result contribute to?

- Turn agriculture and forest systems into a net sink for carbon by 2050, with emissions from agriculture decreasing by 1 Gt per year by 2030 and reaching a floor of 5 Gt per year by 2050.
- Implement all National adaptation Plans (NAP) and nationally determined contributions (NDC) to the Paris Agreement
- Stay within planetary and regional environmental boundaries: consumptive water use in food production of less than 2500 km3 per year (with a focus on the most stressed basins), zero net deforestation, nitrogen application of 90 Tg per year (with a redistribution towards low-input farming system) and increased use efficiency; and phosphorus application of 10 Tg per year.
- Equip 500 million small-scale producers to be more resilient to climate shocks, with climate adaptation solutions available through national innovation systems.

GEOGRAPHIC SCOPE

Country/ies: Algeria; Argentina; Benin; Brazil; Burkina Faso; Cambodia; Cameroon; Cape Verde; China; Colombia; Cuba; Ecuador; Ethiopia; Ghana; India; Indonesia; Iran; Kenya; Malawi; Mexico; Myanmar; Nepal: Nigeria; Pakistan; Paraguay; Peru; Philippines; Russian Federation; São Tomé and Príncipe; South Africa; South Sudan; Tanzania; Togo; Tunisia; Uganda; Socialist Republic of Viet Nam; Zimbabwe.

KEY CONTRIBUTORS

Contributing Initiative(s): Low-Emission Food Systems
Contributing Center(s): Alliance of Bioversity International and CIAT; CIMMYT; ICRISAT; ILRI; IRRI
Contributing external partner(s):

- Global Research Alliance on Agricultural Greenhouse Gases;
- Ministry for Primary Industries of New Zealand;
- National University of Ireland Galway;
- USAID
- 64 host institutes (list available upon request.)

LINK TO CGIAR RESEARCH PROGRAMS

Yes, the CLIFF-GRADS program benefitted from support from the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).

COVER PHOTO: Farmer uses leaf color chart to decide on appropriate fertilizer dosage for rice crops, thus reducing greenhouse gas emissions and costs. Photo credit: Vishwanathan/CCAFS

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