



## Transforming food systems from greenhouse gas sources to sinks (S2S)

Initiative Lead and Co-Lead	Primary CGIAR Action Area	Estimated 2022 - 2024 Budget
Louis Verchot Wei Zhang	Systems Transformation	\$20 - \$25 M

### Challenge

The US\$ 12 trillion global food system produces 21 - 37% of global GHG emissions, including from land-use change, with 72% from the global South. Policy and financial instruments to reduce food systems emissions and enhance sinks focus on subsistence agriculture (e.g. REDD+) or commodity production (e.g. zero-deforestation supply chains) and miss the national/domestic food systems that are primarily responsible for emissions in tropical countries (<https://bittylink.com/aid>). Key challenges include:

- National food systems are not well characterized, emissions are poorly quantified (esp. food loss/waste) and not well linked to nutrition and environmental targets, making it difficult to set intervention priorities, track progress, and report impacts.
- Private sector action is stymied by misaligned incentives and lack of regulatory frameworks for emissions. Transnational companies are only starting to voluntarily green their supply chains and offset emissions in response to consumer pressure, which addresses emissions linked with international but not domestic markets.
- Domestic policies support the private sector pursuit of short-term profits in ways that externalize environmental (i.e. long-term economic) costs of GHG emissions at the expense of long-term food system viability.
- Best practices exist to reduce the GHG intensity of all components of food systems and create or enhance sinks in soils and forests, but scaling these up has been challenging, as the constraints faced by different change actors are poorly understood or difficult to overcome and incentives are missing or misaligned.
- Broader understanding of food systems approaches and their contributions by decision makers is needed to create both policy momentum and investment in food system solutions.

### Objective

- Improve emissions quantification and monitoring systems for: i.) Better intervention targeting through ex-ante impact assessments with disaggregated socioeconomic data; ii.) More efficient use of financial and human resources through better implementation monitoring; and iii.) Enhanced implementation of NDCs and the Global Stocktake through improved reporting.
- Strengthen planning and coordination at local/national scales to integrate food system actions like reduced food loss/waste, efficient supply chains, reduced deforestation, and reduced production-related emissions in ways that incentivize sustainable and agroecological intensification, reduce climate risks, promote regenerative agriculture, and increase sinks through natural ecosystem restoration and conservation, while improving inclusiveness and equity.
- Co-develop innovative emissions reductions and carbon removals programs with communities/jurisdictions through technology- and nature-based solutions (e.g., agroforestry, soil carbon, land restoration, stable forests, irrigation decarbonization, mangrove restoration, sustainable aquaculture), food loss/waste reduction, consumer behavior change, and value chain interventions. Increase public and private sector financing and market-based mechanisms for adoption of mitigation/sequestration measures.
- Create enabling conditions through policy-maker engagement, providing demand-driven studies/analysis, and co-developing tools to enable better informed, coherent decisions in alignment with NDCs and provide trusted advice to governments. The policy analysis will anticipate leakage and tradeoffs, and promote cross-agency collaboration and coordination.
- Foster greater awareness/buy-in of the potential for food system investments to contribute to low GHG emissions climate-resilient development among national policy makers, private enterprises involved in the food system, financial institutions (local and international), civil society, and academics. Countries are proposed based on emissions, NDC commitments, short-term impact potential, and CG strengths.

### Theory of Change

Achieving global and national climate goals requires changes throughout food systems to reduce short- and long-lived greenhouse gas (GHG) emissions, reduce deforestation, and conserve/increase carbon sinks and biodiversity. This Initiative aims to accelerate progress toward meeting the 2.0/1.5 C target through the transformation of food systems of (tentatively) seven partner countries supplemented by trans-national activities through sociotechnological innovations, business models, and policies. GHG mitigation approaches will integrate consumer demand, sustainable production, ecosystem conservation, supply chain efficiency, and food loss/waste reduction into climate action planning. To achieve low GHG emissions, climate-resilient development, local communities (including women, youth), producers, policy makers, private sector, and scientists must act in concert to lower emissions.

This Initiative will facilitate change through CHANGE PATHWAYS: (1) improving transparency, accuracy, completeness, comparability, and consistency of data for planning, monitoring, and reporting; (2) strengthening local and national planning and coordination to integrate socially inclusive food system changes that reduce GHG emissions and create sinks in production systems, improve sinks in stable natural ecosystems, reduce food loss/waste, and reduce the GHG intensity of supply chains; (3) applying food systems approaches in living labs and incorporating lessons into scaling up approaches; (4) scaling up best practices in next generation Nationally Determined Contributions (NDCs) and mitigation actions by creating enabling environments, including sustainable financing opportunities; and (5) fostering greater international and national integration of food system solutions that contribute to GHG mitigation targets. This initiative will reduce food system GHG emissions by 1.18GtCO<sub>2e</sub> y<sup>-1</sup> and enhance sinks by (To Be Determined) (OUTCOME).

As this Initiative is one of only two Initiatives (the other being Levering gender & social equality in agrifood systems) that covers a particular CGIAR Impact Area (climate change mitigation), it will have collaboration across the entire portfolio.

With a common goal on equality and inclusiveness, the S2S Initiative will work closely with the Harnessing equality for resilience in the agri-food system to harness (from its WP1) the evidence that Initiative will gather on institutional barriers, levers, and entry points to the inclusion of women and youth in modern agri-food systems and (from its WP4) best practices and models for boosting gender and youth inclusion, empowerment, and agency in important national-level plans, strategies, and policies relating to climate mitigation (e.g. next generation of NDCs). Specifically, the Initiative will capitalize on the HER+ Initiative evidence and learning to (A) integrate stronger gender inclusion mechanisms into the design of the Living Laboratories in WP3 so that the participation of women and youth is intentionally sought and accommodated, and (B) identify and work with a national CSO/development/advocacy partners to ensure that the voices of women are adequately represented in the planning work in WP2 focused on defining priorities, scopes and goals for low-emission food systems and developing action plans.

The Initiative will work with the Food Systems Transformation for Sustainable Healthy Diets through Food Systems Transformation Diets Initiative to ensure there is complementarity between the Initiatives. Specifically, the Initiative will contribute data that will refine the SHiFT Initiative's trade-off scenario analysis (WP4) designed to steer stakeholders toward decisions or actions that improve diets, reduce emissions, and foster environmental integrity (e.g., win-wins) through nature-positive food crops and value chains. The Initiative will also contribute evidence required by the SHiFT Initiative to support the uptake of practices and technologies for efficient distribution and reduced food loss, thereby contributing to overall climate mitigation goals (one of SHiFT's Impact Area outcomes).

We also anticipate strong collaboration with the initiatives on Building Systemic Resilience against Climate Variability and Extremes (ClimBeR), Transformational Agroecology Across Food, Land and Water Systems Initiative, and Excellence in Agronomy - Solutions for Agricultural Transformation (EiA). Likewise, the initiative will foster thematic and logistical synergies with the Regional Initiatives (Latin America & Caribbean, East & Southern Africa and the Asian mega-deltas) as well as those relevant to specific production systems (resilient aquatic foods, climate-smart livestock, etc.).

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### Highlights

This initiative adopts the logic of the Paris Agreement (PA, Art 2.1), which states that finance flows need to support "low GHG emissions and climate-resilient development." This initiative will demonstrate that targets can be achieved by a food systems approach that reduces emissions and enhances sinks to achieve this vision.

This initiative builds on NDCs and integrates an inclusive living labs (<https://bittylink.com/oyl>) approach to co-creative innovation by testing and demonstrating sociotechnical approaches, business models, and governance arrangements to low emissions pathways (including sinks) under real-world conditions. Rather than strictly enabling technology adoption, this approach tests the desirability/feasibility of certain transformations.

This Initiative builds on accomplishments of ongoing CGIAR investments and external initiatives, and incorporates lessons learned about what has worked and what has not delivered. It combines data generation and modeling, with sequenced actions on the ground for proof of concept and 'quick gains' (2022-2024), upscaling (2025-2027), and outscaling (2028-2030).

Low-emissions climate-resilient development offers ample opportunity for local benefits, but combining objectives adds complexity (<https://bittylink.com/nah>). Mitigation actions may lead to maladaptation if policies and projects fail to incorporate equity and development tradeoffs. This initiative will develop integrated decision-support tools (<https://bit.ly/3wXPiyO>) to inform strategies that balance tradeoffs while achieving emissions reductions.

Despite widespread interest in projects and policies that integrate climate-resilient development and mitigation, few relevant actions have been implemented by organizations engaged in climate finance. This initiative will prioritize mobilizing public/private financing at local and national levels, thereby demonstrating productive pathways for international finance to support low-emissions climate resilient development.

### Work Packages

	Scope of Work	3-year Outcomes
Closing evidence and data gaps	This WP supports subnational, national and global actors, to close data, methods, evidence, and capacity gaps across food system life cycles, assess baselines, monitor safeguards and inclusion criteria, implement accurate higher-Tier GHG accounting, conduct gender-sensitive evaluation of mitigation and co-benefits of food system interventions, and support the Global Stocktake.	Improved transparency, accuracy, completeness, comparability, and consistency (TACCC) of data on food systems and their GHG emissions will be incorporated into national communications to the UNFCCC, reporting lags for GHG inventories will be shortened, and data will be used to target new NDCs (due to be submitted in 2025).
Strategy development and planning	This WP supports country stakeholders across governance levels to define priorities, scopes and goals for low-emission food systems and develop action plans with synergies for conservation, food security, livelihoods, gender equity, youth, and social inclusion. We will co-design, develop and, test, planning tools, including those that provide climate information.	Subnational and national government agencies, civil society, and private sector planners will use tools, data and analyses that were co-designed and developed by this initiative to design inclusive (women and other groups), food-system emissions reductions and sinks initiatives. Several plans will be developed and used for fund raising with local and international financial institutions.
Learning landscapes laboratories	To foster innovations, the WP uses a living labs approach ( <a href="https://bittylink.com/slb">https://bittylink.com/slb</a> ) to conduct participatory action research, including tailoring low-emissions climate-resilient development approaches to specific contexts, adapting best practices, and assessing their contributions to climate mitigation and resilience, biodiversity, and gender/age-responsive livelihoods, thus promoting collective learning, and ensuring inclusive (including women) participation.	At least one living lab per country will be functionally engaged in piloting emission reductions and negative emissions activities (including forest sinks), improving the efficiency of supply chains and reducing food loss with communities/jurisdictions and will have secured public and private sector financing for the adoption of mitigation and carbon sequestration measures.
Scaling low emissions, climate resilient food systems development	The WP analyzes governance structures; finance opportunities; land, water, and resource rights; tradeoffs; and implementation experiences through a political economy lens to support wider adoption of food systems approaches to low emissions, climate resilient development. The WP uses inclusive multi-stakeholder platforms to enhance adoption and innovation, and promote collective learning.	Analyses will have identified specific ways to increase adoption of effective and equitable food system emissions reductions/sinks that increase climate resilience. Multistakeholder platforms will ensure inclusive priority setting and widespread adoption in 7 (tentative) countries. Food system mitigation will be part of national discussions on new NDCs (due in 2025).
Engagement and agenda transformation	This WP engages in regional and global forums (e.g. UNFCCC, Committee on World Food Security) to share innovations and lessons learned; support the evidence-based decision making by governments, private sector, and financial institutions; support national funding-raising for low-emissions climate resilient development; and elevate 1CG's profile in the S2S agenda.	Food systems approaches to low GHG emission climate resilient development will be high on the world's political agenda. Decision-making that affects food systems will be based on solid science and principles of good governance, and reflect the perspectives of developing countries, local communities and marginalized segments of society.

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### Impact Area Contributions

<b>Nutrition, health &amp; food security</b>	This initiative will test and scale innovations that increase awareness of nutritious and low-carbon diets and catalyze transformative social norm changes toward sustainable consumption behavior for ~20% of consumers per country. Our ambition to halve food loss/waste, as a mitigation strategy, will contribute to food security and environmental sustainability.
<b>Poverty reduction, livelihoods &amp; jobs</b>	By selecting innovations with demonstrated potential to achieve socioeconomic co-benefits, and testing and scaling market-based mechanisms that incentivise farmers and other actors in the food system to reduce emissions and conserve/increase sinks, this initiative will target improving food sector livelihoods and employment by 20% from baseline, thus reducing poverty.
<b>Gender equality, youth &amp; social inclusion</b>	Applying a gender-youth-inclusion lens to the diagnostic analysis of target food systems, planning and implementation of innovations, and engagement, this initiative will work with partners to identify and address barriers for women, youth, and other marginalized groups to participate in and benefit from S2S innovations, while contributing to systemic equity and empowerment.
<b>Climate adaptation &amp; greenhouse gas reduction</b>	This initiative will reduce food system emissions (including land-use change) by 1.18Gt CO <sub>2</sub> e y <sup>-1</sup> across 7 countries, representing a 7% reduction in global food system emissions (enhanced sinks calculations TBD). The underlying premise of this initiative is to achieve the emissions objective in ways that support climate-resilient development.
<b>Environmental health &amp; biodiversity</b>	By catalyzing adoption of nature-positive, resource-conserving, and efficiency-enhancing solutions to food system mitigation and promoting sustainable low-emission consumption behavior, this initiative will reduce pressure on forests, wetlands, and other ecosystems, accelerate restoration, and curb pollution, habitat loss and fragmentation, by ~20% from baseline projections, improving environmental health and biodiversity.

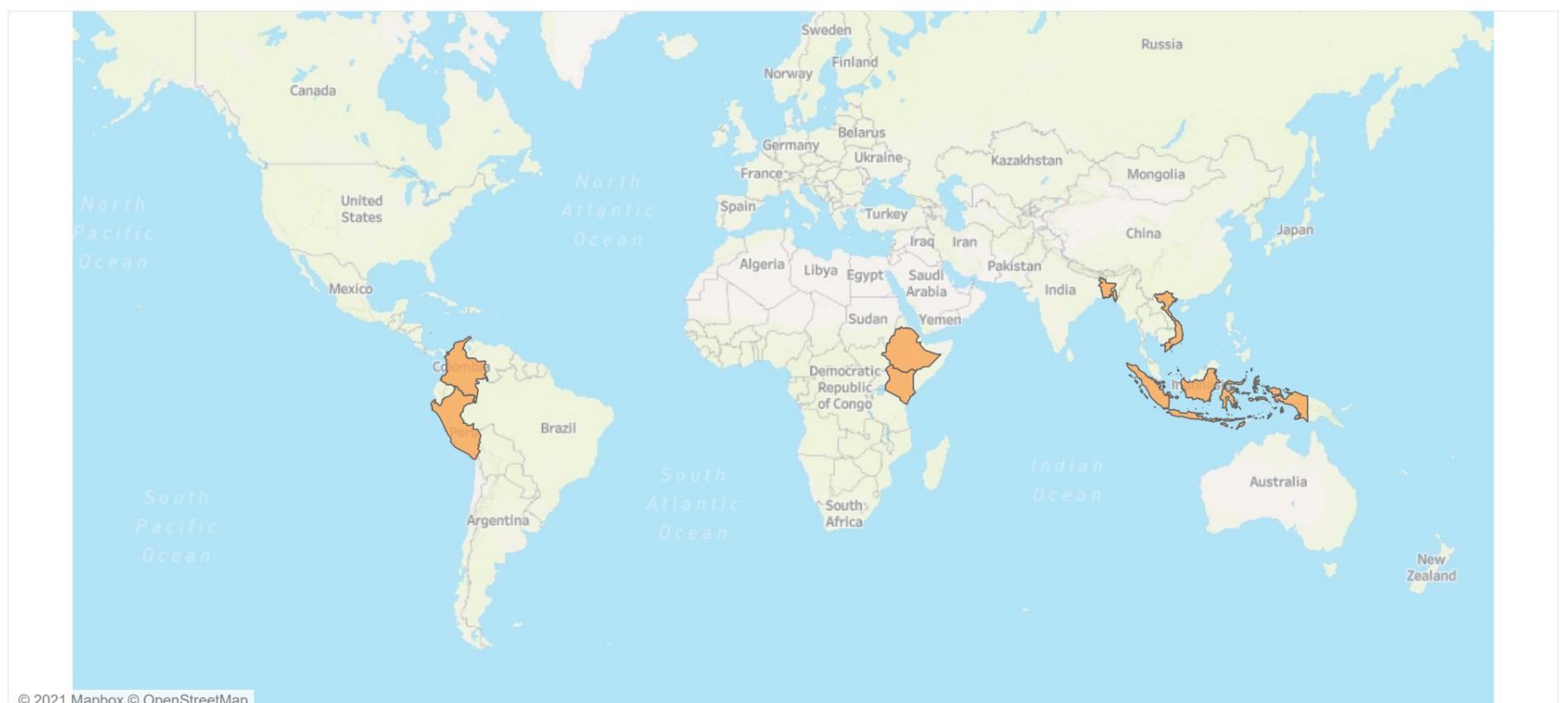
### Impact on SDGs



### Regions

Global East and Southern Africa (ESA), Latin America and the Caribbean (LAC), South Asia (SA), South East Asia and the Pacific (SEA)

### Countries



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### Innovations

Data-driven approaches to planning, implementation, and impact assessment ensure that solutions and plans are supported by factual information, allow for adaptive implementation management and improve the likelihood of achieving targets. Improved data transparency and comparability will improve the global effort to solve the climate change problem.

Linking consumer demand, dietary choices, market incentives, and production, with a systems approach favors engagement with a broader set of actors and institutions in a cross sectorial approach. The opportunity created by a cross-sector, cross-ministry approach is greater sustainability of emission reductions, and forestry and agricultural sinks.

The initiative applies the living lab research concept based on a systematic model of user co-creation, exploration, experimentation, and evaluation of food system GHG reduction and enhanced sinks interventions. The approach simultaneously addresses innovation and governance to facilitate the emergence of sustainable solutions. The approach will be implemented in an inclusive manner.

This project builds on CGIAR and other investments in big data analytics. We will work with governments, private sector and civil society to co-develop tools and applications, build capacity, and pilot applications so that institutions can develop more equitable, effective, and evidence-based approaches to food system efficiency and GHG reductions.

Climate solutions have unique potentials to mitigate societal conflict by improving access to land, water, and resources. Living labs focus on improving governance and strengthening local institutions to transform conflict based on UN safeguards aimed at conflict prevention and securing the rights of indigenous peoples and local communities.

### Key Partners

<b>Demand</b>	Government	Local governmental authorities (e.g. Water Development Boards, subnational technical services, etc.)
		National governments (e.g. Environment, Agricultural, Renewable Energy, Planning, & Finance Ministries)
	International NGO	Regional policy networks (e.g. ASEAN Climate Resilience Network (CRN))
	Private Sector	International private sector organizations (e.g. World Business Council for Sustainable Development)
Producer and exporter organizations (e.g. commodity or regional development corporations)		
<b>Innovation</b>	Academic, Training and Research	Advanced Research Centers in the north and national universities
	Foundation	Local and international development foundations and initiatives (e.g. 4 per mille, Global Research Alliance (GRA), etc.)
	Multilateral	Development agencies (World Bank, USAID, etc.)
	National NGO	Agricultural, environmental, and rural development civil society organizations.
	Private Sector	Financial institutions like asset managers, impact investors, local banks, investor advisory groups (e.g. Carbon Trust), etc.
<b>Scaling</b>	Academic, Training and Research	National research for development agencies
	Government	Government supported policy research institutions
	International NGO	International NGOs (WWF, TNC, WCS, etc.)
		Regional non-governmental organizations
	Other Public Sector	UN Agencies (FAO, UNDP, UNEP, UNFCCC)

