

Two Degree Initiative for Food and Agriculture

CGIAR is already on track to help improve the livelihood opportunities of hundreds of millions of small-scale farming families and consumers by 2030 through better, more productive, resilient and sustainable crop, livestock and fish technologies and practices, and improved nutrition.



Doubling down CGIAR’s efforts on climate change through the 10-year “Two Degree Initiative for Food and Agriculture” would help another [200]¹ million small-scale food producers across the globe adapt their farming systems, livelihoods and landscapes by 2030 to weather extremes and climate variability, and be more climate change resilient, as well as put food systems on a low emissions development pathway. The focus needs to be on those living in poverty, women, youth and other marginalised communities.

Achieving such scale must be underlain by deep and successful partnerships, so that practical demand-led science is delivered to change agents, these being national Ministries in beneficiary countries, regional and continental agencies and economic communities (e.g. CEN-SAD, COMESA, IGAD, ECOWAS, SADC, AGRA, NEPAD, ASEAN), multi-lateral and bilateral development agencies (e.g. World Bank, IFAD, GIZ, FAO), policy think tanks (e.g. WRI, Global Centre on Adaptation) and civil society and farmer organisations (e.g. EAFF, SACA, CARE). In addition, there would be strong partnerships with other advanced research organisations (e.g. Wageningen University & Research, CIRAD, IRI, CSIRO) and with national research organisations (e.g. Universities, capacity building networks such as WASCAL), and the national agricultural and extension systems (NARES). Knowledge will be co-produced among partners, with local and traditional knowledge also part of the knowledge system.

The challenge of achieving Zero Hunger in a changing climate: The effects of climate change on food systems are being under-estimated. These include the impacts of increasing frequency and intensity of extreme events, the impacts of variable weather and climate conditions, the effects on the nutritional content of a wide range of commodities, and the ever-rising cost of inaction.

We have 11 years to achieve the UN Sustainable Development Goal of zero hunger – to end all forms of malnutrition and double the agricultural productivity and incomes of small-scale food producers. In many parts of the world that means 11 growing seasons. Lags in the climate system imply that warming of 1.5-2 °C is already locked-in, no matter what happens to greenhouse gas (GHG) emissions in the future.

We urgently need to adapt to a much warmer world, limit GHG emissions from agriculture, and put in place agricultural and land-use systems that remove carbon from the atmosphere through trees, forests and soil organic matter, in addition to other imperatives in the food system (e.g. addressing gender inequality, enhancing nutrition, reducing ecological footprints). The scale of these challenges is difficult to overstate. Agricultural research for development (AR4D) offers real solutions to many of the problems we face; the challenge lies in mobilising the finance, knowledge, tools and policies to catalyse transformational change, across diverse contexts, at massively accelerated speed.

¹ Numbers indicated in brackets are reasonable estimates but awaiting an ex-ante analysis based on budget and finally-selected countries.

The “Two Degree Initiative” is the spearhead of the CGIAR’s efforts to address the risks of climate change and allow the world’s food systems and small-scale food producers to adapt at the speed and scale needed. The initiative draws on the considerable assets of the CGIAR – genebanks, field sites throughout the developing world, expertise in numerous disciplines, hundreds of partners etc. – and focusses them on climate change. Those assets are brought to bear on an initial eight Regional Grand Challenges, selected for their strategic role in climate action.

This initiative would help [200] million small-scale food producers – many of them women, youth and other marginalised persons – adapt to a changing climate faster, making them more resilient to climate-related changes and shocks. Adaptation will de-risk their livelihoods, increase food production while delivering mitigation co-benefits, potentially decrease food import bills (e.g. in Africa), reduce the rate of climate-forced migration, reduce gender inequality and enhance youth employment.

Small-scale food producers in the tropics and subtropics face some of the worst impacts of climate change: floods and droughts; sea-level rise, coastal inundation and salinization in the big river deltas of Asia and the Pacific small island states; considerable shortening of growing seasons in southern Africa and parts of eastern Africa; high temperatures combined with increased weather variability in large areas across West and South Asia and West and North Africa; and increased pressure from pests and diseases. In many of these places, nitrogen and phosphorus flows, land-use change, biodiversity loss, and freshwater consumption either exceed or are close to exceeding safe planetary boundaries.

Concurrently with establishing sustainable adaptation strategies the challenges tackled by the “Two Degree initiative” will also deliver significant additional co-benefits such as: improved nutrition for reduction of anaemia and child stunting; reduced gender inequality; reduced GHG emissions per unit of food produced through sustainable intensification and waste reduction; improved water and nutrient use efficiency; diversification of cropland; release of land for forestry and agroforestry that will sequester carbon from the atmosphere and mitigate GHG emissions; reduced rates of biodiversity depletion, etc.

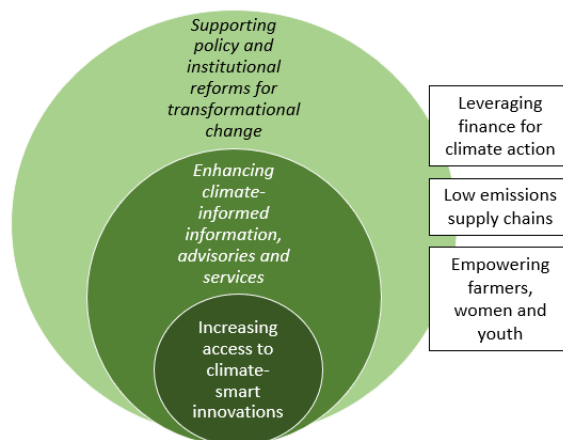
The costs of doing nothing will be devastating. Global progress towards food security and poverty reduction will be reversed. Progress towards the UN Sustainable Development Goals will falter and be undermined. Poor and marginalised groups would bear the brunt at first, but rising social, economic, political and moral costs would leave no-one unscathed. In the poorest and least resilient states, climate impacts would synergise with other drivers and contribute to forced migration, conflict, and state fragility.

Action to build resilience and adapt to and mitigate climate change is not optional. It is an urgent obligation.

“Two Degree Initiative” transformative strategies:

The Two Degree Initiative focuses on eight Regional Grand Challenges that must be overcome to deliver on SDG2 (and other SDGs), and is underlain by the CGIAR’s breeding efforts. The Regional Grand Challenges cover seven geographical hotspots for climate challenges, with the other Regional Grand Challenge covering five city-regions (peri-urban areas). Effort must be prioritised around clearly defined challenges in order to make rapid progress.

The leap forward needed in agricultural and food systems requires CGIAR and partners' ability to provide radical innovations in technology and practice. Yet making new technology available will not suffice alone. Achieving climate smart solutions from agriculture rapidly and at scale will require hundreds of millions of autonomous decisions and investments. Recognising this reality, each Regional Grand Challenge is structured around three inter-linked implementation strategies (i) improving access to **climate-smart technologies and practices**, (ii) enhancing **climate-informed advisories, services and decision support**, and (iii) supporting **policy and institutional reforms** for transformational change, including those linked to the UNFCCC (e.g. NAPs, NDCs). All these strategies imply deep and strategic partnerships with government, the private sector and other development organisations.



We believe that several other cross-cutting themes need to inform and support the Regional Grand Challenges, and contribute to global debates and action:

- a) Leveraging **finance for climate action**. Orders of magnitude more finance will need to drive transformative change for climate action, with this likely to require a major upscaling of public-private partnerships.
- b) Fostering **low emissions supply chains**. Many of the grand challenges focus on adaptation, this being the priority for most low- and middle-income countries. The Two Degree Initiative will have three Regional Grand Challenges that are predominantly mitigation focussed or have a large mitigation component: “Low-emissions sustainable meat and dairy production in Latin America”, “Climate-resilient and nutritious circular bio-economy” (where the focus includes dairy, crop residue management and food loss and waste), and “Asian mega-deltas” (including a focus on methane emissions from rice). However, all Regional Grand Challenges will have a low emissions development vision, as food systems need to contribute significantly to mitigation targets; through soil carbon sequestration, agroforestry and protection of high carbon landscapes. The Two Degree Initiative will also contribute to global thinking on mitigation, including the role of diets in climate change action.
- c) **Empowering food producers, women and youth**. Collective actions by food producers, women and youth, and strong local networks, are considered crucial to all Regional Grand Challenges. The role of women and youth as active agents of change in their communities should be recognized. Actions are needed to create conducive enabling environments that encourage producers, business owners, researchers, investors and policy makers to innovate in ways that promote gender equality and opportunities for youth. Farmers organisations need to be strong in order to share lessons, demand services and get good prices through aggregation and negotiation.

A Global Challenge: Breeding for interacting climate-induced stresses

Various platforms and initiatives of the CGIAR will underlie the Two Degree Initiative. One of the most important will be the **Excellence in Breeding platform** and its **Crops to Beat Hunger Initiative**.

This will involve breeding for key climate-related traits, in particular heat resistance, shade-tolerance (so that trees can be more important in landscapes), biotic stresses, interacting stresses (e.g. combinations

of too much and too little water), and low emissions traits (e.g. enhanced nitrogen uptake). The breeding efforts cannot lose sight of more traditional goals as well: productivity, efficiency, nutrition, taste and gender-related preferences, and will be embedded in participatory processes with food producers and take into account shifting consumer demands. Efforts require a complementary and comprehensive modernization of public sector breeding systems, in line with cutting-edge practices used by the private sector in high-income countries. These approaches have not yet been utilized for crops, livestock and fish that fall beyond the interests of the private sector, but which are critical for food security in many global food insecurity hotspots and climate vulnerable low- and middle-income countries. Public breeding systems have traditionally been underfunded with facilities, in some cases, having not been fully updated for more than 50 years. Despite this, their work is critical for rapidly producing the varieties and breeds needed for vulnerable food producers in low- and middle-income countries to deal with rising temperatures and more variable and extreme climates. A component of this work will involve climate and agricultural modellers helping to set strategies and design appropriate ideotypes through ex-ante analysis. Crucially, the results of this breeding must be driven by farmers needs through deep partnerships with farmers and their organisations, including women’s and youth organisations. The new breeds and varieties must then be available to farmers. This will be partially achieved through the Regional Grand Challenges, with the development of appropriate seed and breed systems, with the CGIAR working closely with NARES, private sector, farmers and consumers.

Regional Grand Challenges

The Two Degree Initiative initially focusses on 8 Regional Grand Challenges, selected because they are strategic in terms of urgent climate action. Through performance management, progress towards the targets of each Regional Grand Challenge will be assessed, with the potential for reducing activity in those where progress is slow or unlikely, and adding other Grand Challenges as societies priorities shift and as knowledge advances.

Global Challenge	→ → Regional Grand Challenges
Breeding for interacting climate-induced stresses	1. One-health platform for climate-driven pests and diseases in West Africa
	2. Building food system resilience to climate shocks in the Sahel
	3. Climate-resilient and water-secure livelihoods for Southern African drylands
	4. Sustainable rural livelihoods to counter fragility in MENA and Horn of Africa
	5. Securing the Asian mega-deltas against sea-level rise, flooding and salinization
	6. Enhancing the resilience of climate-vulnerable households in Latin America
	7. Facilitating a climate-resilient and nutritious circular bio-economy for five major city-regions
	8. Transitioning to low-emissions sustainable meat and dairy production in Latin America.

Grand challenge and activity	2030 outcomes (to be achieved through the coalition of partners)*
<p>1. One-Health platform for climate-driven pests and diseases in West Africa: Support to food producers’ management of bio-risks, cross-government approaches to address climate-driven food-health risks, institutionalized capabilities for early detection of emerging threats and rapid response, new technologies for biocontrol. This region will serve as a model for what can be achieved, prior to scaling to other regions.</p>	<p>Tens of millions of users – from food producers to value chain enterprises – using information services to manage climate-driven food and health risks. Technologies adopted by [30] million food producers. Pests and disease issues fully captured as implementation plans in National Adaptation Plans (NAPs) and Nationally Determined Commitments (NDCs) in [8] countries.</p>
<p>2. Building food system resilience to climate shocks in the Sahel: In line with the ambitious Climate Investment Plan for the Sahel, build the capacity of food producers, women & youth, and enhance institutional resilience to shocks and vulnerabilities to climate change. This would include better access to climate services and agroecological technologies, sustainable management of productive assets, development of resilient agro-silvo-pastoral value chains linked to youth entrepreneurship, and enhanced governance of land and water resources to prevent and manage conflicts.</p>	<p>Technologies adopted by [15] million food producers, with [50] million expected beneficiaries food and nutrition secured. 150 climate-resilient communal development plans; [6] countries capacitated to enhance implementation of their NAPs and NDCs.</p>
<p>3. Climate-resilient and water-secure livelihoods for Southern African drylands: Acceleration of climate resilient technologies, business models and market linkages for managing risk and raising crop-livestock productivity in the prevailingly rainfed and fragile drylands of Southern Africa, complemented by small-scale irrigation. Integrated interventions at farm to landscape/river basin level and for crop, agroforestry, livestock and fish farming systems.</p>	<p>Technologies, business models and market development for enhanced green-water productivity reach [15] million food producers across key basins. [7] countries capacitated to enhance implementation of their NAPs and NDCs.</p>
<p>4. Sustainable rural livelihoods to counter fragility in the Middle East and North Africa (MENA) and Horn of Africa: Scaling out of agroecological and other sustainable technologies coupled with improved seed and water governance in the world’s hottest and driest region, combined with innovative climate risk management (e.g. weather-index agricultural insurance, social protection, and mechanisms for investing remittances into resilience). This needs to include economically viable and diversified systems (crops, trees and animals) that are pathways to greater resilience and employment, and that provide nutrition and food security amongst the urban poor.</p>	<p>Improved access to nutrition for [80] million urban poor; increased uptake of climate-resilient technologies and risk management across [60] million food producers; inclusive and efficient value chains streamlined for societal and climate outcomes; seed and water governance improved across several countries. [18] countries capacitated to implement their NAPs and NDCs.</p>
<p>5. Securing the Asian mega-deltas against sea-level rise, flooding and salinization: Development and scaling of 21st century integrated paddy, agriculture, aquaculture and fisheries systems, stronger information systems for climate variability forecasting, monitoring and response, water resource management and enabling policy environments for</p>	<p>Integrated climate-adapted, low emissions crop-livestock-fisheries systems adopted by [30] million food producers; tens of millions of food producers benefitting from real-time climate advisories and heat/water/salinity</p>

<p>sustainable growth. In strong collaboration with local partners, transforming the mega deltas into resilient and nature-inclusive agricultural landscapes with low-emissions supply chains for high value produce.</p>	<p>management. [5] countries capacitated to implement their NAPs and NDCs.</p>
<p>6. Enhancing the resilience of climate-vulnerable households in Latin America (focussing on the Andes and dry corridor of Central America). Deliver the needed science on climate variability and extreme events so that Latin American food system actors can plan, invest and implement options to consolidate the resilience and food security of climate-vulnerable households. The science on climate variability and extreme events will be linked to promising value chains to inform sustainable business models and innovative finance mechanisms. Innovation systems to develop research-based recommendations for farmers to improve farm management including postharvest practices. Feed-back loops among actors will be developed for capacity development with farmers, farm advisors and researchers</p>	<p>[10] million small-scale food producers increasing productivity through the implementation of options that reduce negative effects of climate variability and extreme events, while reducing the climate change footprint. At least [6] countries strengthen their climatic risk management policies and instruments. At least [10] value chains develop sustainable business models and innovative finance mechanisms.</p>
<p>7. Facilitating a climate-resilient and nutritious circular bio-economy for five major city-regions: Transformations in industrial ecology that improve the cycling and recycling of crop residues, bio-based natural materials and by-products, use of renewable energy, and reductions in food loss and waste, strengthening links between on-farm and off-farm parts of the economy. High-value and nutritious crops and vegetables will be the focus to drive employment and improved nutrition. Relevant peri-urban areas will be selected within the geographical areas of the other Regional Grand Challenges, especially those linked to the C40 initiative.</p>	<p>New circular economy markets and products providing income growth, diversification and improved nutrition, coupled with resource efficiency gains and low emissions, in at least five city-regions. [40] million beneficiaries, including at least [5] million food producers. [5] countries capacitated to implement their city- and food-related actions in NAPs and NDCs.</p>
<p>8. Transitioning to low-emissions sustainable meat and dairy production in Latin America. Link science for improved resource efficiency, business planning and regulatory policy to create incentives for sustainable low emissions livestock supply chains in Latin America. Build a regional technical and business advisory platform and a cadre of entrepreneurs to help implement good practices. Addresses land and pasture degradation, deforestation, food loss and waste and the transition to renewable and more efficient energy use.</p>	<p>[1] million smallholder and medium-scale food producers increase resource efficiency and reduce emissions intensity. At least 2 countries strengthen their capacity to deliver science-based technical packages. At least 10 value chains develop sustainable business models and innovative finance mechanisms.</p>

* In addition to these numbers, it is expected that the stress-tolerant varieties and breeds, as well as associated practices, will be taken up by c. 40 M other food producers in areas outside the Regional Grand Challenges

CGIAR is uniquely placed but with a new partnership model: CGIAR has a clear, multilateral mandate to provide international public goods for eradicating poverty, hunger, and malnutrition and enhancing the environment. With offices in over 50 countries, it is privileged to work at scales from farmers’ fields to national and international policy processes. It has partnerships with public, private and civil society agencies, from local to global levels, but through this initiative a new partnership model will be fostered.

To deliver on targets, coalitions will be fostered for each Regional Grand Challenge, involving a partnership of the key players needed to research and implement actions to deliver on targets.

Next steps:

- Convene bilateral meetings with key partners to discuss and sharpen proposal, and foster partnerships, August-September 2019.
- Convene key stakeholders in each of the Regional Grand Challenges to identify priority targets for each geographic area by February 2020; and
- Report on progress to date, and further donor commitments secured for this effort at the October 2020 Climate Action Summit in the Netherlands.

Annex

Basic statistics for each Regional Grand Challenge

Grand challenge	Potential countries (final selection to be made)	Number of countries	Rural population 2017 millions	Total number of farms (million)	Vulnerability * low **** high	Mitigation potential * low **** high
1. One-Health platform for climate-driven pests and diseases in West Africa	Senegal, Burkina Faso, Niger, Mali, Nigeria, Ghana, Togo, Benin, Cameroon, Ivory Coast	10	200	8.8	**	*
2. Building food system resilience to climate shocks in the Sahel	Senegal, Mauritania, Burkina Faso, Niger, Mali, Chad, Sudan, Eritrea	8	94	5.4	****	*
3. Climate-resilient water-secure livelihoods for Southern African drylands	Zambia, Zimbabwe, Mozambique, Malawi, Madagascar, Botswana, Namibia, Lesotho, Swaziland	9	75.8	10.5	****	**
4. Sustainable rural livelihoods to counter fragility in Middle East and North Africa (MENA) and Horn of Africa	<u>MENA</u> Algeria, Egypt, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Syria, Tunisia, United Arab Emirates, Yemen	18	150.2	15.4	****	*
	<u>Greater Horn of Africa</u> Burundi, Djibouti, Eritrea, Ethiopia, Kenya, Rwanda, Somalia, South Sudan, Sudan, Tanzania, Uganda	11	261.1	28.1	****	*
5. Securing the Asian mega-deltas against sea-level rise, flooding and salinization	Pakistan, Bangladesh, Cambodia, Myanmar, Thailand, Vietnam	6	364.8	46.0	***	****
6. Enhancing the resilience of climate-vulnerable households in Latin America (Andes and dry corridor of Central America)	Peru, Bolivia, Colombia, Guatemala, El Salvador, Honduras, Nicaragua, (Southern) Mexico	8	64.3	12.4	***	*
7. Facilitating a climate-resilient and nutritious circular bio-economy for five major city-regions	Africa: Accra/Dakar, Addis/Cairo Asia: Jakarta, Ho Chi Minh, Latin America: Bogota/Lima	5	c. 70 in the cities		**	***
8. Transitioning to low-emissions sustainable meat and dairy production in Latin America	Brazil, Colombia	2	40.3	7.1	*	****

Rural pop from FAOSTAT. Farm numbers updated from Lowder et al. (2016). Mitigation potential and vulnerability estimates based on expert input (to be quantified prior to stakeholder meetings)