



With
science
we can

Investing in a Food, Nutrition & Climate Secure Future

The Case for Investment, CGIAR 2023
\$4bn for the 2025-2027 Research Portfolio
www.cgiar.org/invest



Tumaini – Protecting banana crops with AI

Climate change has exacerbated the spread of pests and diseases that can decimate entire banana harvests. In 2017, CGIAR researchers at the Alliance of Bioversity International and CIAT, developed a revolutionary app, Tumaini, to help farmers diagnose ailments and determine the correct course of action. Analyzing uploaded images using AI technology with 90 percent accuracy, the app already has over 10,000 users, giving farmers around the world unprecedented access to information that can revolutionize the way they farm.

Highlights

- Food security and climate change – two of humanity's most urgent challenges – are inextricably linked.
- Our agriculture and food systems – the way we produce, transport, process, trade, store and consume food – must be part of the solution to climate change.
- Extreme weather, in combination with conflicts, economic crises and pandemic recovery, is disrupting lives and fueling food and nutrition insecurity, poverty and inequality.
- Hunger and malnutrition are at record highs, reversing recent gains. Around 800 million people faced hunger in 2021. Nearly 350 million people are affected by extreme hunger.
- Global agricultural growth rate has declined by nearly 21 percent in the past 60 years because of climate change. In a world that is 2°C warmer, an additional 189 million people will face hunger. In a 4°C warmer world, an additional 1.8bn people will go hungry.
- Many of the 500 million small-scale farmers, who provide a third of the world's food on 83 percent of the world's farms, live in regions especially affected by climate change, putting their lives and livelihoods at risk.
- With science, we can equip small-scale farmers around the world with the know-how and innovations they need to produce more and better food with fewer resources, adapt to changing and challenging environments and, at the same time, protect natural resources and biodiversity.
- CGIAR is the world's largest publicly-funded agricultural research network, with 10,000 staff working in over 80 countries; translating global science to local solutions. For over 50 years, CGIAR has been at the forefront of agricultural research and innovation.
- The challenges the world faces today – from climate change to pandemics and conflict – are increasingly complex and interconnected.
- Investments of \$4bn in the next CGIAR research portfolio will harness the power of science and innovation to tackle climate change, increase productivity and build more resilient food systems.
- For every \$1 invested in CGIAR agricultural research and development, investors see \$10 worth of benefits to smallholder farmers, vulnerable communities and ecosystems.
- The world simply cannot meet the climate and development goals without transforming food systems.

With science, we can transform food systems from being a source of emissions to a sink for carbon, from fueling environmental degradation to supporting regeneration, and from reducing biodiversity to protecting it.

“Now more than ever we need your efforts to support demand-driven innovations such as those championed by CGIAR”

Ban Ki-moon
8th UN General Secretary and
Co-Chair of the Ban Ki-moon
Centre for Global Citizens

“CGIAR has the people, the presence and the track record of delivering game-changing innovations needed to tackle the greatest challenges of our time. We must transform food, land and water systems to support food, nutrition and climate security for all. With science we can.”

Dr. Ismahane Elouafi,
CGIAR Executive
Managing Director



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Chapter 1:

Food and climate are inextricably linked

Food is the foundation of human life. And agriculture and food systems – that is, the way we produce, transport, process, trade, store and consume food – employ billions around the world, making up an estimated one-tenth of the global economy.

But agriculture and food systems are also major contributors to the climate crisis.

A third of greenhouse gas emissions come from agriculture, forestry, and land use – and this number increases to 70 percent in low- and middle-income countries. Food production represents the biggest disturbance that humans impose on our planet. They are the biggest driver of deforestation and responsible for 60 percent of biodiversity loss. It uses two-thirds of the world's diverted fresh water. And 62 percent of irrigated land is degraded.

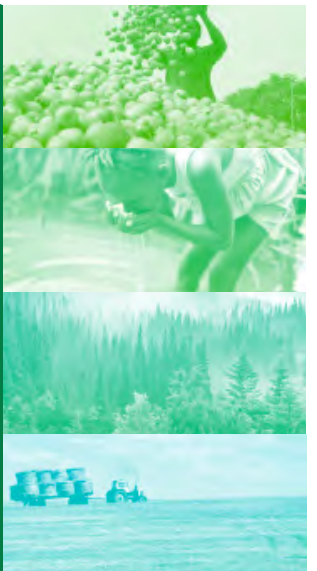
As well as driving climate change, our food systems – and the land and water systems they depend on – are also deeply affected by it, with the most vulnerable people and communities often the hardest hit.

With investment, food systems can solve the climate crisis

Our future is at a crossroads. With the right investment, agriculture has the potential to be humanity's biggest solution to climate change.

Food systems with investment

- Reduce poverty and inequality and raise incomes
- Protect rather than reduce biodiversity
- Support regeneration instead of fuelling environmental degradation
- Become a sink for carbon rather than a source of it



Food systems without investment

- Today **350m** people are affected by extreme hunger
- With a **2+** degree temperature increase **539m** will face extreme hunger
- With a **4+** degree temperature increase **2.1bn** will face extreme hunger



Extreme weather, in combination with conflicts, economic crises and pandemic recovery, are fuelling food and nutrition insecurity, poverty and inequality, political instability and human migration. Food and climate security are intertwined with national, regional and global security issues.

Hunger and malnutrition are at record highs, reversing recent gains. Around 800 million people faced hunger in 2021. Nearly 350 million people are affected by extreme hunger. Consumers around the world are struggling with erratic food supplies and prices.

More than three billion people worldwide cannot afford the healthy diet necessary to human health, wellbeing, and disease prevention. Many of the 500 million small-scale

farmers, who provide a third of the world's food on 83 percent of the world's farms, live in regions especially affected by climate change, putting their lives and livelihoods at risk. Global agricultural growth rate has declined by nearly 21 percent in the past 60 years because of climate change. In a world that is 2°C warmer, an additional 189 million people will face hunger. In a 4°C warmer world, an additional 1.8bn people will go hungry.

The link between food and climate means that our food systems can and must be part of the solution. With science and innovation, we can transform food systems from being a source of carbon emissions to a net sink, from fueling environmental degradation to supporting regeneration, and from displacing biodiversity to protecting it.

Agriculture is also a powerful lever for development outcomes. Lifting sustainable agricultural productivity is the single most effective way to reduce poverty and inequality and raise incomes in low-income countries, directly supporting the Sustainable Development Goals (SDGs).

To minimize climate change impacts, it is crucial to stay within the goal of a 1.5°C to 2°C temperature increase. But the Paris Climate Agreement cannot be achieved without addressing our food systems. We urgently need to transform food, land and water systems to both reduce emissions and help farmers adjust to changing climates.

Agriculture is unique in offering the potential to capture more carbon than it emits through sequestration. This makes it a best bet investment for solving the climate crisis.



action planning and responses. CGIAR scientists at the International Water Management Institute and other CGIAR Centers are also working with governments to develop multi-ministerial, multi-disciplinary action planning, helping avoid responses only being crisis-led. These action plans bundle CGIAR-developed agricultural and water technologies with financial risk instruments that reduce the vulnerability of farmers to these catastrophic water crises and help them recover faster.

The climate crisis is a water crisis

It is through water – too much, too little, too unpredictable – that most people will experience climate change. In 2022, catastrophic flooding in Pakistan claimed 2,000 lives, displaced eight million people, and wiped \$30bn from the economy along with decades of hard-earned socio-economic gains. Droughts, meanwhile, affect more than 20 percent of the world's agricultural areas, jeopardizing food production and increasing global hunger. As the world warms, these extreme water events are becoming the norm around the world. With smallholder farmers largely dependent on rainfall for agricultural production, CGIAR has made water security an urgent priority, developing innovations from crop breeding through farm practices to landscape management that can help farmers withstand floods and droughts and better manage water resources.

Across more than 30 countries, state of the art AI-enhanced drought and flood early warning systems have been co-developed with national and local government agencies to support early

A GIFT of fish

Fish are an affordable source of essential nutrients and less harmful to the environment than many other forms of farming, making aquaculture an important part of the solution to the overlapping climate and hunger crises. CGIAR researchers at WorldFish started the Genetically Improved Farmed Tilapia (GIFT) project in 1988 to breed faster-growing, hardier and more disease-resistant tilapia to help farmers adapt to a changing climate while nourishing their families and communities. Today, GIFT and its derivatives are responsible for more than half of the tilapia production in the world, making it the gift that keeps on giving for farmers and their families.



Vidhisha Samarasekara
CGIAR scientist at IWMI

“Our work on the adaptation of agricultural water management to climate change combines cutting-edge research on nature-based solutions with community-led approaches that ensure local stakeholders are involved from the beginning. Interventions are tailored to specific contexts but we are also developing the procedures and templates that allow us to scale, replicate and adapt the solutions to local circumstances elsewhere.”



Climate-smart crops harness natural diversity

An investment in CGIAR will unlock the full potential of the 713,000 crop, forage and tree collections in CGIAR genebanks to increase heat and drought tolerance, yield, disease resistance, and climate-proof breeding pipelines. It would support the 11 genebanks we hold as international public goods, securing the crop diversity we need to feed and nourish the world and protect it from climate change.

Thanks to genebanks, CGIAR scientists have identified the gene in wild potatoes that can help breed modern varieties to withstand late blight, the world's most damaging disease for potato crops; bred faster-growing, early-maturing crops that extend growing seasons developed drought-resistant maize and wheat, saline-tolerant rice that withstands more extreme and frequent floods and rice that can be sown directly in the ground, reducing the amount of water needed for production.



Chinyere Ekine
CGIAR scientist at ILRI

“Research into the impact of heat stress on smallholder livestock farming in Africa is a critical area of work as it accounts for a substantial portion of agricultural production. Our research has uncovered compelling insights and practical solutions that enhance the productivity, sustainability and resilience of Africa's dairy cattle in the face of rising heat stress challenges. Investment in this critical research supports food security and economic stability for the region.”

With science we can solve the food, land and water challenges of today while building resilience for tomorrow.

From crisis response to resilience

The world needs urgent humanitarian food aid but also science and innovation that build resilience to future crises in our food systems. CGIAR is bridging the gap between the two by helping to predict and prevent crises before they occur. Studies have shown that every dollar spent preventing a crisis saves up to \$34 spent in managing a crisis once it has begun.

We are partnering with humanitarian agencies and NGOs to combine relief work with social safety net programs, and to help governments develop improve food security policies. CGIAR has the expertise to monitor, support better and faster decision making, and rapidly design and implement effective solutions to avert disruptions to food production. Following Russia's invasion of Ukraine, which had significant implications for food security, CGIAR's National Policies and Strategies initiative worked closely with government partners in Egypt, Kenya, and Nigeria to inform policies aimed at mitigating the conflict's impact and respond to each country's needs.

To build resilience in agriculture, we are improving information systems to monitor low emission and climate-resilient solutions, and improving emissions reporting capacities and access to climate services. We are unlocking investment and supporting climate policies and strategies that lead to low-emissions development and climate resilience, with greater attention to social equity. With this, our many innovations, including heat, drought resistant, diverse and fast-growing crop varieties, can be deployed and scaled to increase the sustainable production of healthy and nutritious food at times of need.



Chapter 2:

With science we can



When humanity has faced its greatest challenges, ingenuity and innovation have provided the solutions. Today, the scale, complexity and interconnectedness of the threats we face demand unprecedented responses.

Research and innovation are critical to our ability to understand and stay ahead of the impacts of climate change and environmental degradation, which are felt both locally and globally. Putting research and innovations in the hands of smallholder farmers, producers, policymakers and consumers in low- and middle-income countries is key to both tackling climate change and transforming fragile food systems.

By ending the destruction of natural ecosystems and accelerating the widescale adoption of improved

farming practices, the food and agriculture sector can reduce its emissions by an estimated 20 percent and become a net sink for carbon by 2050.

- **With science we can equip** smallholder farmers with technologies to produce more and better food with fewer resources and adapt to changing environments.
- **With science we can breed** more resilient and nutritious crops, improve farming practices to protect soil and water resources, and reduce food loss and waste.
- **With science we can improve** the lives and livelihoods of those living in poverty, particularly women, youth and other marginalized groups, and limit the human and economic costs of emergencies.
- **With science we can support** innovative, regenerative farming practices that reduce deforestation and change of land use to protect biodiversity.

Our research has humanity at its core, addressing both the opportunities and challenges facing people around the world. It also addresses threats to the land and water systems that sustain life. Through a focus on those most vulnerable to crises – women, children and young people – and the future of food systems, CGIAR efforts to generate evidence and develop solutions are truly future-facing.

With science we can create a world with sustainable and resilient food, land, and water systems that deliver nourishment and prosperity for all.

“Everybody knows we need to do more in terms of productivity, but we have to do it with less resources. There are not many ways to solve this equation. Science, technology, innovation – these are the ways.”

Dr. Mohamed Sadiki, Minister for Agriculture, Maritime Fisheries, Rural Development, and Water and Forests of the Kingdom of Morocco





50 years of achievements

RUST RESISTANT WHEAT

Rust resistant varieties added 6.2 million tons annually to world wheat harvests, an extra amount of grain worth \$1.12 bn a year.

AGROFORESTRY

CGIAR research pioneered change in agroforestry policy and practices to help smallholder farmers and rural people enhance food supplies, incomes, and health.

CROP PEST AND DISEASE SURVEILLANCE NETWORK

Enables the Global South to monitor, predict and prevent the spread of emerging pests and diseases, to help preparedness with integrated insect and disease management.

FERTILIZER MICRODOSING

Microdosing model of strategic fertilizer placement increases efficiency, crop growth and productivity, boosting crop yields up to 120% for smallholder farmers.

CLIMATE-SMART MAIZE

Over 200 climate-resilient maize varieties developed and distributed across 13 countries in sub-Saharan Africa offering 30% greater yields in drought-prone environments.

SOUTH ASIA DROUGHT MONITORING SYSTEM

CGIAR created systems to monitor droughts that can provide faster, better targeted relief and resilience, allowing additional returns up to \$300 per hectare.

CLIMATE-SMART VILLAGES

From 2012-2020, the climate-smart approach was adopted via training programs, recording a 94% increase in rice yield. An impact assessment showed adoption helped producers increase net income \$267 per hectare in climate change-affected conditions.

CLIMATE-SMART RICE

Average yield advantage of drought-tolerant rice varieties is 0.8-1.2 tons per hectare over drought-susceptible ones.

YOUTH AGRIPRENEURS

Within five years, the CGIAR-led model was adopted in over 20 countries, trained 7,000 youths, creating 1.5 million jobs for young people.

POVERTY REDUCTION, LIVELIHOODS AND JOBS

Initiatives in all areas contribute to small farmer stability and resilience, supporting livelihoods and reducing poverty globally.

NUTRITIOUS CROPS

50 million people in smallholder farming families in 41 countries benefit from biofortified crops, with measurable impact on their nutrition, health and development.

ORANGE-FLESHED SWEET POTATO

Over 6.8 million households in Africa and South Asia grow and eat vitamin-A-rich, orange-fleshed sweet potato.

FOOD SECURITY

CGIAR crop technologies cover 221 million hectares – greater than the combined arable land area of USA and Brazil.

AQUATIC FOODS

Genetically improving farmed tilapia fish offer faster growth rates, quicker harvests, increased profitability benefiting small-scale farmers and their communities.

REDUCING INFANT MORTALITY

CGIAR's work on modern crop varieties has been linked to a 30% reduction in infant mortality across the developing world, averting between 3 and 6 million infant deaths each year.

With science and investment we can deliver growing impact

SUSTAINABLE AQUACULTURE

Innovation for sustainable aquatic farming by genetically enhancing more fish species. Refine traits, e.g. resistance to low-oxygen environments, feed efficiency, and tolerance to temperature variabilities to boost climate resilience.

ONE HEALTH

Implement tools in food systems to tackle zoonotic disease, improve food and water safety, and reduce antimicrobial resistance. Better food safety through capacity sharing and policy, improving the health of people, animals and environment.

HEALTHY DIETS

Accelerate plant breeding pipelines and partnerships for 'orphan' and 'future' crops that build resilience and improve nutrition, diversify diets, and help reduce micronutrient deficiencies and child stunting and wasting. Develop the field of alternative proteins. Support smaller businesses to deliver nutritious, safe and affordable food; promote sustainable production of fruits and vegetables.

STATE-OF-THE-ART BREEDING

Increase diversity and access to climate-resilient crops, working with national agricultural research and extension partners across Africa to develop advanced, end-to-end, multi-partner breeding pipelines for major food security crops (maize, wheat, rice, tef, sorghum, millet, beans, lentils, peas, bananas, plantains, cassava, potatoes, yams).

CLIMATE-SMART CROPS

Unlock the potential of 713,000 crop, forage and tree collections in CGIAR genebanks to increase heat and drought tolerance, yield, carbon sequestration and disease resistance, climate-proof breeding pipelines.

CLIMATE POLICY-MAKING

Help policymakers with local climate evidence and data, tools for realizing and reporting national climate commitments, foresight and modeling on the impact of climate change, policies and investments. Enhance enabling environments for scaling low-emission technology.

RESILIENT AND LOW-EMISSION LIVESTOCK

Reduce methane emissions through innovative feed, management, and breeding strategies; build resilience and sustainability in pastoral systems.

FERTILIZER EFFICIENCY

Advance fertilizer efficiency and alternatives to increase soil fertility, build resilience to supply shocks with better management, use cover crops and balanced fertilizer applications including use of digital tools.

SOIL, BIODIVERSITY AND LANDSCAPE

Restore and maintain soil health, biodiversity and ecosystem services in diverse landscapes and small-scale farm systems by evaluating different approaches (sustainable intensification, nature-positive agriculture, etc.) while maximizing the benefits of new technologies and knowledge.

PEST AND DISEASE SURVEILLANCE

Elevate and scale work to monitor, predict and prevent the spread of emerging pests and diseases; facilitate advanced preparedness through integrated insect and disease management across 50 countries.

BUILD RESILIENCE TO WATER RISKS

Develop tools and management systems to anticipate and respond to water risks, scale sustainable solutions to meet growing and competing demands for freshwater within planetary boundaries.

CIRCULAR ECONOMY

Target resource recovery from food waste to reduce emissions, recover plant nutrients, and develop value chains for animal feed, towards a successful circular economy.

MITIGATE CLIMATE RISK

Scale climate services for smallholder farmers; innovative insurance for crops and livestock; planning and management tools for sustainable farming systems; precision irrigation advisories; options for integration of green manures; payment for environmental services mechanisms.

REPURPOSE SUBSIDIES

Establish regional and national policy labs to work with countries on re-aligning policies, incentives/subsidies and finance to support countries to meet the SDGs through food, agriculture, land, water and energy transformations.

HARNESS CLIMATE FINANCE

Increase access for smallholder farmers and unlock climate finance. With national partners, develop evidence-based pipelines of investment opportunities, increasing access to commercially viable, risk-informed financial services and help policymakers find new opportunities.

DEVELOP THE NEXT GENERATION

Build capacity for agrifoods, land and water science and develop talent around the world through a new post-doctoral program that funds 100 PhD fellowships in food, land, and water system transformation.

POWER WOMEN IN AGRICULTURE

Close the gender gap, foster economic empowerment, and address structural barriers that drive gender discrimination by increasing women's access to information, including by closing the digital gender gap; facilitating women's entrepreneurship, including through collective action and women-to-women networks; and enabling women to drive innovation with gender-transformative approaches.

GENDER AND LIVESTOCK

Leverage livestock for women's empowerment and gender equality with new tools and approaches.

YOUTH AGRIBUSINESS AND ENTREPRENEURSHIP

Engage youth in agribusiness as a means of livelihood development, and to support sustainable food systems. Support young people with a special focus on skills development, decent employment, and entrepreneurship opportunities to secure work in agri-food value chains.

REDUCE BURDENS

Bundle social and technological innovations by providing women with labor-saving technologies that work for them, along with access to services, group-based platforms and participatory training.

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Partnering for impact in Africa

The climate crisis is fueling a hunger crisis of unprecedented proportions – in Africa, more specifically, hunger last year regressed to levels not seen since 2005, with almost one in four people going underfed.

But with more funding in research and innovation and stronger collaboration to deliver tested solutions to farmers and businesses, Africa can prevent food insecurity and build resilience.

That's why CGIAR has prioritized partnerships across the continent, including by signing an agreement with the African Development Bank, the African Union Commission, and the Forum for Agricultural Research in Africa, to align efforts on food and nutrition security and deliver tools and resources to those who need them most.

“My experiences have shown me that CGIAR is central to any efforts for developing countries to achieve agricultural growth and food security.”

Dr. Akinwumi Adesina,
President, African
Development Bank



Better beans

Beans are a staple crop for smallholder farmers around the world and provide essential dietary protein for more than 300 million people in sub-Saharan Africa. In 1996, CGIAR scientists at the Alliance of Bioversity International and CIAT formed the Pan-African Bean Research Alliance (PABRA), recognizing the power of better beans to provide farmers with both nutritious food and economic security. Thanks to partnerships with research institutions, governments, communities and the private sector, PABRA's research has led to over 650 varieties of beans and has helped increase production, improve quality, and increase profitability for farmers.



Chapter 3:

CGIAR: science for a food-secure future



For over 50 years, CGIAR has been at the forefront of agricultural research and innovation, helping to improve the way smallholder farmers around the world grow and produce the food that nourishes us. Our impact speaks for itself.

CGIAR is best known for preventing a food crisis across Asia by developing the high-yielding rice variety that drove vital increases in food production in the second half of the 20th Century. Work led by Nobel Laureate Dr. Norman Borlaug and Professor M.S. Swaminathan is credited with averting a global famine, saving a billion lives. We have delivered countless other life-saving, game-changing innovations in our 50 year history. CGIAR's work on modern crop varieties has been linked to a 30 percent reduction in infant mortality across the developing world, averting between three and six million infant deaths each year.

More than 50 million people in smallholder farming families in 41 countries now benefit from biofortified crops, making a measurable impact on human nutrition, health and development. And crops developed by CGIAR to boost food security cover 221 million hectares – greater than the combined arable land area of the U.S. and Brazil.

The challenges the world faces today – from climate change to pandemic and conflict – are increasingly complex and interconnected. No single discipline offers the systems solutions we need.

That's why our research moves beyond a focus on agricultural production and yield improvement to consider a wider range of human needs, social contexts, and planetary wellbeing, creating a complete picture of challenges and opportunities for the future of food. CGIAR's research today tackles multiple global development goals. Our work focuses on outcomes as diverse as reducing poverty, improving nutrition, tackling gender and other social inequalities, and addressing environmental and climate change challenges.

To deliver this, we host the world's largest and most diverse group of scientists from disciplines that range from genetics to water resources, economics to aquaculture, working at all levels from farm to national and global, within and beyond food systems.

With 10,000 staff united in a common mission, and thousands of partners, CGIAR constitutes the largest network of researchers focused on solving these challenges. We also manage the genebanks for the world's most important food crops.

Our intellectual expertise informs diverse scientific bodies and networks, UN agencies and regional and national scientific networks to support decision-making and action. We provide the research and evidence-based inputs that help policymakers and science and business networks shape a better future for people and our planet.



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Orange-fleshed sweet potato

Increased, persistent and intense droughts mean that many sweet potato farmers are struggling to produce adequate crop yields, putting their nutrition and livelihood in jeopardy. CGIAR scientists at the International Potato Center developed new varieties of sweet potatoes that can not only withstand hotter, drier climates but are also biofortified with vitamin A – addressing a critical nutrient deficiency that affects upwards of 30 million children in Africa alone. To date, more than 6.8 million households are growing and eating these sweet potatoes, which have helped reduce child mortality rates by as much as 30 percent.

Since 2022, CGIAR research and innovation has made over 700 contributions to Sustainable Development Goals



Joyce Maru

CGIAR scientist at CIP

“Sweetpotato and potato are increasingly important crops for the development of Africa’s food systems, especially in fragile and humanitarian contexts. Hybrid orange-fleshed sweet potato and biofortified potato varieties – bred in partnership with local African breeding companies – can be game-changing innovations, delivering higher yields and improving access to micronutrients including Vitamin A and Iron. Investment in these crops improves nutrition while enhancing climate resilience and incomes for smallholder farmers.”

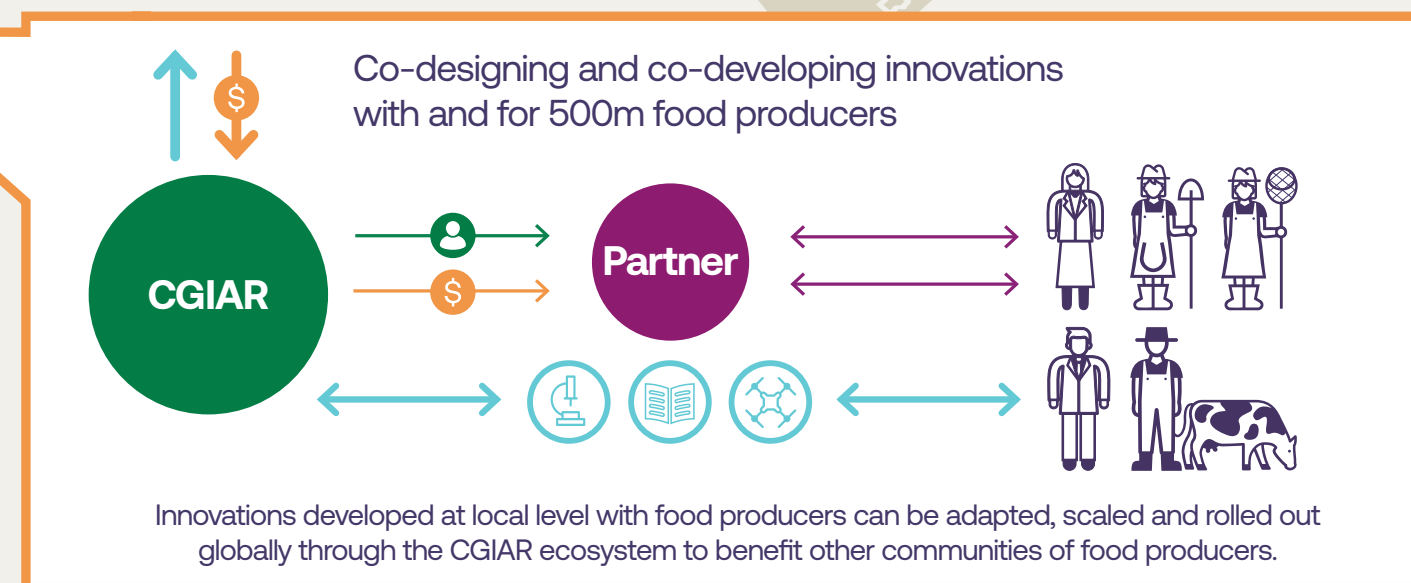
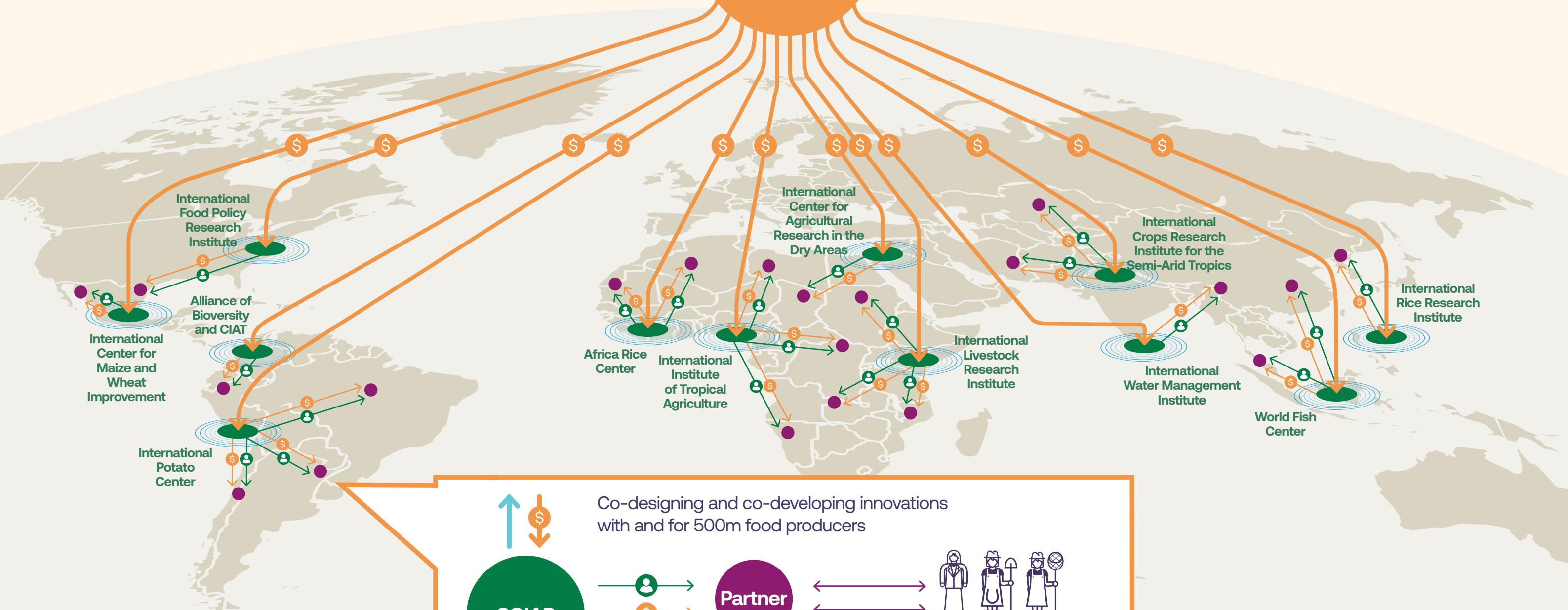
Our global footprint – from Latin America to Africa and Asia – enables us to identify solutions within each setting, while generating insights that can be applied elsewhere.

We co-design and co-deliver solutions with local and regional partners in line with their priorities and with a focus on the growth and exchange of knowledge and skills. Then, to make sure that our solutions reach those who need them, we tap into networks of farmers, rural women, small and large business organizations, and government scaling platforms, working closely with policymakers to support uptake.

- **13** global research centers with 10,000 experts
- **3,000** a network of 3,000 local partners

\$4bn

An investment into CGIAR is a strategic investment into the unparalleled ecosystem of global research Centers and their partners - directly improving the lives of food producers and consumers around the world.



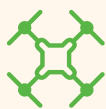
CGIAR works with partners to develop new technologies and with policy-makers to create an environment that enables them to be rolled out at scale.



Developing new and improved plant varieties:



Improve seed varieties, develop new ones to increase yields, and make them more resilient to pests and climate change. Operate genebanks and ensure countries have access to them.



Developing vital farming and landscape management approaches:



Developing farming tools and techniques and landscape management approaches to enable farmers to face extreme conditions.



Supporting country implementation of new policies:



Working with governments and partners to implement new policies that respond to a country's needs.

With science and partnerships we can deliver solutions to solve the food, land and water challenges of today and tomorrow.



Protecting precious biodiversity

Biodiversity and environmental health are the foundation of climate resilient and sustainable food systems. But climate change and unsustainable farming practices are driving changes in land use that erode the natural environment while reducing crop diversity. CGIAR is working with partners to develop innovative practices that protect biodiversity while contributing to equitable and nutritious food systems and improved livelihoods, reducing damage to ecosystems and increasing resilience to climate shocks.



Climate-Smart Villages

In communities like Kenya's Nyando basin, climate challenges such as frequent storms, intensifying fluctuations between flooding and droughts, and changing environments, make it difficult for farmers to plan a successful harvest. CGIAR-supported Climate-Smart Villages use a community-led approach to empower farmers to work together to solve challenges, respond to the environment around them, and introduce climate-smart innovations that build resilience for everyone.

Armed with CGIAR knowledge and technology, villagers in Nyando took ownership of improving their agricultural practices leading to greater food security, and higher incomes. This has helped to secure a brighter future for the villagers, their families, and communities.



Chapter 4:

More investment is needed

Achieving the world's ambitious climate and development goals requires substantial and targeted investments into transforming food, land and water systems in the context of the climate crisis.

The world is underinvesting in the solutions we need to meet the SDGs and climate targets.

- Not nearly enough overseas development assistance – just 7.4 percent in 2021 – is spent on research and innovation that tackle the root causes of hunger and malnutrition. The Ceres 2030 report identifies the need to double investment in agricultural R&D to help end hunger, double smallholder farmer incomes and protect the climate.
- More government spending (\$108bn globally) went to R&D for the energy sector in 2017-2022, reducing emissions by 13 gigatons of carbon dioxide equivalent per year. A significantly lower investment of \$70bn in R&D in the agriculture sector would reduce emissions by 15 gigatons a year.
- Not nearly enough investment – just 1.7 percent in 2018 – reaches the small-scale farmers who are vulnerable to challenges of climate change, despite their critical contribution to global food security and local economic stability.

The cost of inaction is vast. Without serious investment in food, land and water systems R&D, losses could reach almost \$2 trillion by 2030 for low- and middle-income economies, rising to \$9.1 trillion by 2050. This would put increased pressure on already fragile food security.

With additional spending by governments in low- and middle-income countries, an estimated 490 million people will avoid hunger and 31 million people will avoid falling into poverty.

CGIAR is seeking investments of \$4bn over the next three years to stay on course to deliver its 2030 Research and Innovation Strategy. With a current annual budget of approximately \$900 million, CGIAR needs additional investments of \$1.3bn over 2025-2027 to significantly accelerate the development and scaling of innovations.

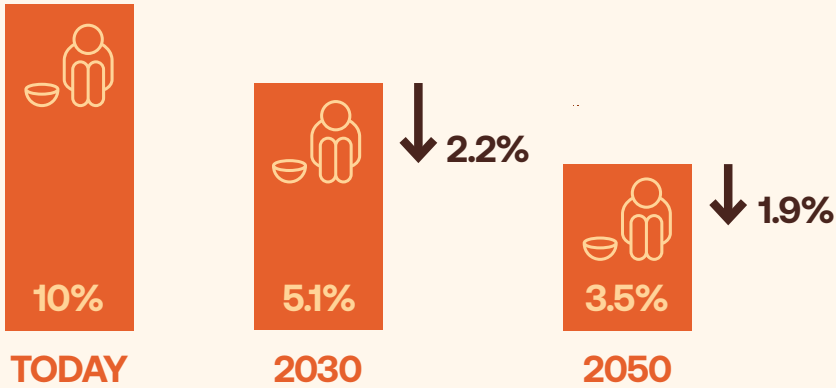


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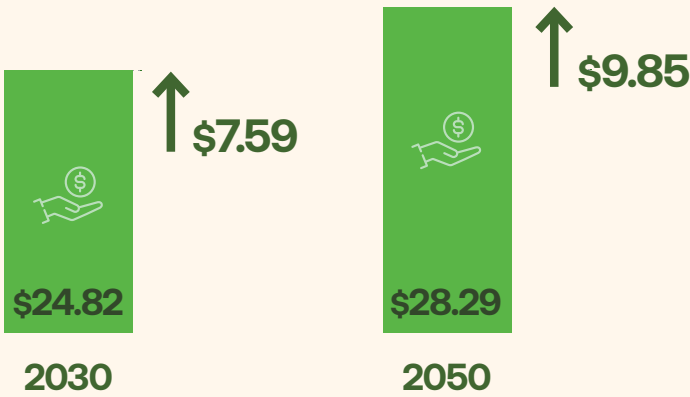
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Investment into food, land and water systems transformation can have a significant impact on global targets

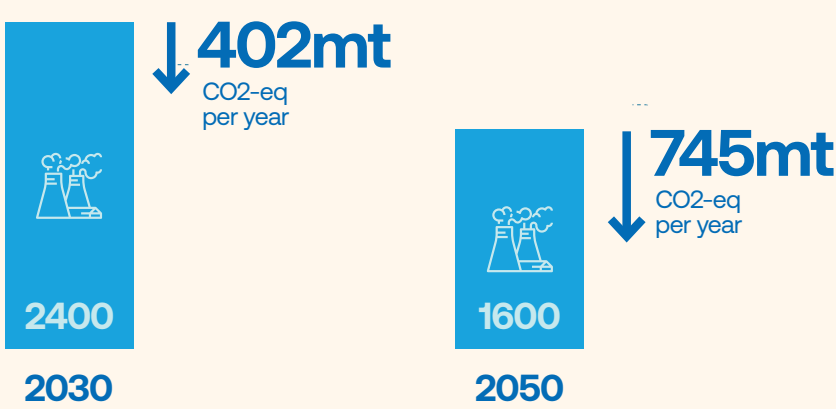
Investment will decrease the percentage of the global population at risk of hunger by 2.2% and 1.9%



Investment can increase per capita incomes from \$17.23 to \$24.82 in 2030 and to \$28.29 by 2050



Investment will reduce projected GHG emissions an estimated 402mt by 2030 and 745mt by 2050



SoAR Report (2020) The Payoff to Investing in CGIAR Research

The climate crisis cannot be solved without women’s leadership

Women can and must play leading roles in addressing climate change. But persistent inequalities in food systems – including in access to resources, services, information, and opportunities – make it harder for them to engage. At the same time, recent research found that providing development interventions to empower women, who make up half of all small-scale producers, would significantly boost the income of 58 million people and enhance the resilience of 235 million. That’s why CGIAR and our partners are working to develop and implement solutions that foster women’s empowerment and enable them to act as champions of climate resilience.



CGIAR scientists at the International Crops Research Institute for the Semi-Arid Tropics developed a new variety of groundnut that is more nutritious and yields larger harvests – with no additional resources. The larger yields have empowered women farmers to sell the surplus or process it into products. With the extra income they earn, these women can support their families and invest in social services that uplift entire communities.

Chapter 5:

Delivering impact for people and our planet

At CGIAR, we have the vision, strategy and track record to transform the way our planet feeds and sustains us all. Now we need the investment to deliver it.



“No other organization is in a better position to create the innovations that will help poor farmers adapt to climate change in the years ahead.”

Bill Gates on CGIAR

CGIAR science and innovation that deliver against global targets



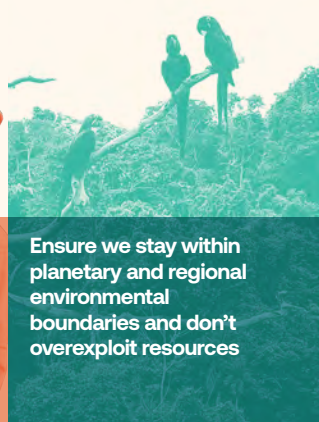
Help 500m smallholder farmers become more climate resilient



Lower greenhouse gas emissions that come from the agricultural sector (decreasing by 1 Gt per year by 2030)



Ensure that Nationally Determined Contributions to climate targets include a target on agriculture



Ensure we stay within planetary and regional environmental boundaries and don't overexploit resources

- Improved seeds and breeding varieties to cope with climate change
- New technologies, techniques and tools
- Integrated and better targeted interventions, including for disadvantaged groups
- Managed genebanks, to maintain genetic diversity to cope with future climates
- Evidence generation and policy advocacy
- Improved seeds and breeding varieties to reduce land use and GHG emissions
- Improved management of land, water and other resources
- New technologies, techniques and tools
- Integrated and better targeted interventions, including for disadvantaged groups
- Evidence generation and policy advocacy
- Working with national governments and agricultural research services to craft relevant policies/strategies
- Supporting governments and investors to measure mitigation policies and activities
- Helping governments unlock innovative finance
- Evidence generation/advocacy to support national focus on agriculture and food systems
- 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 redistribution towards low-input farming systems) and increased use efficiency
- Phosphorus application of 10 Tg per year

← Evidence and knowledge sharing →

Investments in the next CGIAR research portfolio will deliver results across multiple impact areas, from climate adaptation and mitigation to food security, biodiversity, poverty reduction, and inclusion. We are pushing beyond business-as-usual and driving ambitious transformation of global food, land and water systems.

Investing in the next CGIAR research portfolio will contribute to:

- **Equipping 500 million smallholder farmers in the low- and middle-income countries to become more climate resilient**
- **Decreasing greenhouse gas emissions from the agricultural sector by 1 gigaton per year by 2030**
- **Inclusion of an evidence-based target on agriculture in Nationally Determined Contributions towards the Paris Climate Agreement, informed by relevant and localised research and data**
- **Protecting biodiversity, water and land systems and planetary boundaries, limiting resource overexploitation.**

Our work is central to the world's response to climate change. Through close partnership with governments, national research systems, civil society groups, and the private sector, our science and innovation directly contribute to meeting global climate targets and delivering the SDGs.

The return is compelling: external studies have shown a tenfold return on investment in CGIAR's work. For example, in a recent study, the adoption of CGIAR crop technologies in developing countries is estimated to have resulted in cumulative economic benefits of \$1,375-\$1,477bn between 1960 and 2020.

For every \$1 invested in CGIAR agricultural research and development, investors see \$10 worth of benefits in terms of strengthening smallholder agriculture and protecting vulnerable communities. Investments of \$4bn over 2025-2027 will harness the power of science and innovation to address climate change and transform fragile food systems.

Building on many CGIAR breakthroughs from the past 50 years, the next CGIAR portfolio will drive innovation in critical areas of research including: climate-smart crops and breeding; powering women in agriculture; fertilizer efficiency; pest and disease resistance; resilient and low-emissions livestock; sustainable aquaculture; zoonotic diseases; water risk management; biodiversity; circular economy; AI; climate policy and supporting youth in agribusiness.

With evidence-based solutions such as these, we can deliver practical, scalable innovations to combat hunger and boost resilience, nutrition, equity, and environmental health. In partnership, we can meet the defining challenges of our age head on.

**Join us today.
Invest in CGIAR.
cgiar.org/invest**

Every dollar invested leads to a benefit worth \$10+



SoAR Report (2020) The Payoff To Investing In CGIAR Research



“Smallholder farmers around the world urgently need the solutions that CGIAR offers. Equipped with technologies and innovation, they can feed and nourish the world while protecting nature. We must shape a sustainable and healthy future for people and the planet. With science, we can.”

**Professor Lindiwe Majele Sibanda,
Chair, CGIAR System Board
and farmer**



**With
science
we can**

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Combating mangrove destruction and Amazon deforestation

Around the world, forest habitats are being destroyed to make way for farmland. This deforestation is contributing to 15 percent of all GHG emissions, worsening climate change and the rise of extreme weather events.

CGIAR is working with rural communities to protect these vital habitats while improving food supplies, incomes, and health. In Asia, for example, CGIAR is helping to restore mangroves, which are critical for marine biodiversity, food, nutrition and climate security – mangroves are 3-5 times more potent at sequestering carbon than tropical rainforests, offer a breeding ground for nearly 75 percent of tropical commercial fish species, and can amplify nearby fishery yields by up to 50 percent.

In other parts of the world, CGIAR is connecting farmers, businesses, and national partners to design and implement zero deforestation business models, creating sustainable farming opportunities. In Peru, for example, CGIAR has united stakeholders across the cocoa and palm oil industries to prioritize production and commercialization practices that not only prevent land degradation, but also help restore it. This approach will help to improve the lives of farmers and the forests they live in, for today and future generations.



One Health for humans, animals, environment

Pandemics, such as COVID-19 that are zoonotic (transmitted between animals and humans) and antimicrobial resistance are major global health challenges which are on the rise and exacerbated by factors such as environmental degradation, human encroachment on wildlife habitats and intensifying livestock and fish production systems.

Low- and middle-income countries are particularly vulnerable to these challenges, with limited resources and inadequate healthcare systems. They account for most foodborne illnesses and deaths and two-thirds of global antimicrobial use in livestock production.

Working in Bangladesh, Côte d'Ivoire, Ethiopia, India, Kenya, Uganda and Vietnam, the CGIAR One Health Initiative is pioneering an approach that supports collaboration among experts in public health, animal health, environmental science, and social sciences to improve the health of people, animals and the environment. Its food system principles and tools aim to prevent zoonotic disease outbreaks before they happen.



With
science
we can

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CGIAR Research Centers

- Africa Rice Center (AfricaRice)
- International Maize and Wheat Improvement Center (CIMMYT)
- International Center for Agricultural Research in the Dry Areas (ICARDA)
- International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)
- International Food Policy Research Institute (IFPRI)
- International Institute of Tropical Agriculture (IITA)
- International Livestock Research Institute (ILRI)
- International Potato Center (CIP)
- International Rice Research Institute (IRRI)
- International Water Management Institute (IWMI)
- The Alliance of Bioversity International and the International Center for Tropical Agriculture (CIAT)
- World Fish Center (WorldFish)

