SCIENCE FOR A FOOD-SECURE FUTURE

Technical Reporting 2024

CGIAR Impacts in Agrifood Systems:

Evidence and Learnings from 2022–2024

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Cover photo: About 150 million farmers across 100 countries rely on rice cultivation. Photo credit: IRRI

Disclaimers

This report has greatly benefitted from the input and review by many CGIAR staff, as well as the revisions and endorsement provided by CGIAR leadership. Nonetheless, any errors or inaccuracies contained herein remain the sole responsibility of the report's authors

Boundaries used in the maps do not imply the expression of any opinion whatsoever on the part of CGIAR concerning the legal status of any country, territory, city, or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Borders are approximate and cover some areas for which there may not yet be full agreement.

This report includes links to PDF documents containing raw data as reported in the Performance and Results Management System (PRMS) by CGIAR Initiatives, Impact Platforms, and Science Group Projects. These documents have been integrated throughout the report to serve as supporting evidence for the information presented. While efforts are ongoing to enhance the user interface and accessibility of these results, the linked data is presented here to provide transparency and substantiate the quality of the reported information.

Acknowledgements

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Pepper plantations in the Central Highlands of Vietnam. Photo credit: Trong Chinh/CIAT

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Glossary

Attribution

Causality between observed (or expected) changes or results achieved, and a specific intervention or output(s) from research or related activity. Attribution refers to both isolating and estimating the *contribution* of a program/project to an *impact*.

Contribution

The part played by a program/project/output/intervention in bringing about a result. Contribution can stand on its own as a sufficient analysis to indicate CGIAR effectiveness (such as is done for *outcomes*) or as a necessary condition for further *attribution* analysis (as is required for *impacts)*.

Empowerment

The process by which those who have been denied the capacity to make strategic life choices acquire such an ability, signifying a change from a state of being disempowered. In this process, disempowered individuals gain access to resources (material, human, and social), develop their capacity for agency (the ability to define and act on their goals), and achieve positive outcomes (valued ways of being and doing), particularly those with the potential to transform existing inequalities.[1]

Impact

A durable change in the condition of people and their environment brought about by a chain of events or change in how a system functions, to which research, innovations, and related activities have contributed.

Impact assessment

The umbrella term used to describe studies that provide information relevant to understanding impacts, including *impact evaluations* and other study designs, such as cost-benefit analyses, reviews and meta-analyses, and measures of the adoption of technologies. Impact assessment studies of CGIAR innovations cover a range of spatial and temporal scopes (from small geographical areas to global analyses, and various timeframes following dissemination of an innovation) and seek to address a range of questions related to impact, including establishing the amount of impact achieved rather than the causality of the impact.

Impact evaluation

A subcategory of *impact assessments*, which use statistical methods (experimental or quasi-experimental) to *attribute* a change in a condition of interest to an intervention.

Outcome

A change in knowledge, skills, attitudes, or relationships, manifested as a change in behavior, to which research outputs and related activities have *contributed*. CGIAR categorizes *outcomes* as related to innovation *use*, policy changes, or others.

Pooled-funded

The financing of CGIAR research activities from the CGIAR Trust Fund. This is in contrast to non-pooled funded activities, which includes finance from bilateral arrangements between Centers and funders, or cases where funders have specified a Center to receive finance from the CGIAR Trust Fund for a specific purpose.

Pooled-funded portfolio

Within the 2022-2024 period, a portfolio of 32 research Initiatives, five Impact Area Platforms, and six Science Group Projects was operated, subject to a centralized management and technical reporting system.

Reach

Exposure to, engagement with, or access to an intervention, regardless of the depth of participation or impact.

Use

Acquisition and adoption of social, institutional, or technological innovations among actors who have been reached.

Foreword

As CGIAR's Executive Managing Director, I am proud to present the first ever whole-of-CGIAR impact report. It reflects both the tangible achievements of our global teams and the profound commitment that drives our mission forward. CGIAR's mission is to transform food, land and water systems in a climate crisis. As the world's largest publicly funded agri-foods research network, we are working for a food, nutrition, and climate-secure future that leaves no one behind. We are aligned to the global Sustainable Development Goals via our focus on five Impact Areas: Nutrition, Health, and Food Security; Poverty Reduction, Livelihoods, and Jobs; Gender Equality, Youth, and Social Inclusion; Environmental Health and Biodiversity; and Climate Adaptation and Mitigation.

This report is not just a record of results – it is a reflection of our shared ambition and accountability. It presents the results achieved by CGIAR, reported within the 2022 to 2024 period, and places them in the context of our wider, long-term impacts.

CGIAR crop technologies have produced a cumulative US$1.34 trillion in economic benefits since the 1960s and they generated US$47 billion per year from 2016 to 2020. Recent studies have found that rice breeding programs in Asia show returns on investment between 7:1 and 115:1, depending on the country. The impact is undeniable. Equally undeniable is our recognition that such achievements require both patience and sustained commitment. Innovations take time to achieve impact at scale, often taking many years to reach the market, farm, or field.

Over the 2022 to 2024 period, CGIAR pooled-funded portfolio reached more than 20 million farmers, reported 471 innovations in use by stakeholders, and supported the registration of 788 new crop varieties. CGIAR research informed US$3.3 billion in third-party investments and 315 changes to governmental or organizational policies. These outcomes were achieved in collaboration with 1,254 partners across governments, the private sector, research institutions, and NGOs.

This report sets out these results and many more in considerable detail, presenting a comprehensive view of the recent evidence of CGIAR's impacts. It demonstrates the enduring value of agricultural research for development – and reaffirms our determination to deliver on the promise of the 2025 to 2030 CGIAR Research Portfolio.

On behalf of CGIAR, I extend my thanks to our partners, investors, and staff for making this work possible – and for continuing to stand with us in pursuit of a food-secure, resilient, and equitable future.

Ismahane Elouafi, MSc, PhD

Executive Managing Director

Executive summary

This report presents the first consolidated assessment of CGIAR's contributions to outcomes and impacts across the global agrifood system. Insofar as evidence is avilable, the whole of CGIAR is covered, including the pooled-funded portfolio 2022-2024, large bilateral projects, and the impacts of prior investments for which evidence has been published during the 2022-2024 window. It draws upon a robust evidence base of 125 impact assessment studies and 1,108 outcome reports to offer a comprehensive narrative of CGIAR's effectiveness. This was enabled by the coherent vision put forward in CGIAR's 2030 Research and Innovation Strategy,[1] and the coherent approach to monitoring, evaluation, learning, and impact assessment applied over this three-year period.[1] While more can be done to measure and communicate CGIAR's impact by 2030, this report is a significant milestone, and such a comprehensive synthesis has not been completed before.

The report is structured around CGIAR's five Impact Areas—Nutrition, Health, and Food Security; Poverty Reduction, Livelihoods, and Jobs; Gender Equality, Youth, and Social Inclusion; Environmental Health and Biodiversity; and Climate Adaptation and Mitigation— and the three focus continents of CGIAR's work – Africa, Latin America and the Caribbean, and Asia and the Pacific.

This report provides the **evidence on CGIAR's outcomes and impacts that was *made available* between 2022 and 2024**. Due to the long time-lag between innovation, adoption, impact at scale, and then impact assessment, many of the impacts were achieved before this period and the evidence has only recently been published. Evidence of impact is synthesized with evidence of outcomes – behavioral changes such as the adoption of new technologies or changes to government policies – which are important precursors to impact. In most cases the outcomes were achieved during the 2022 to 2024 period, although a minority of studies referred to prior outcomes. This report therefore offers **evidence-based assurance that long-term investments in CGIAR have contributed to meaningful impacts, and that recent investments have contributed to meaningful outcomes,** which in time are likely to lead to further impacts.

The rigorous approach to the selection of evidence in this report – all of which is publicly available – means that values presented are inherently **lower bound** estimates: CGIAR's true reach and impact is likely much higher, as we only report outcomes and impact for which strong evidence exists.

A diversity of maize and other vegetables on display at a CGIAR event. Photo credit: Elizabeth Ramirez Perez/CIAT

Global Impacts and Outcomes

Impact assessment studies published between 2022 and 2024 show that CGIAR has meaningfully contributed to global welfare over the last several decades. **CGIAR-supported crop technologies generated US$47 billion annually** in economic welfare gains across low- and middle-income countries from 2016 to 2020.[2] Recent evidence shows that, in 18 African countries in 2015, CGIAR-supported maize generated US$1.1 to US$1.6 billion in economic gains.[3] The net present value of CGIAR-supported rice varieties was calculated to be US$37 billion in the Philippines and Bangladesh from 1990 to 2018.[6] CGIAR innovations also avoided 2.42 billion metric tons of CO_2 emissions - almost equivalent to one year worth of global land use change emissions at present levels - and prevented 713 species extinctions due to reduced land conversion from 1961 to 2015.[8]

From 2022 to 2024, CGIAR influenced global policy and decision-making by strategically framing agendas, providing authoritative science, and convening coalitions that place food, land, and water systems at the heart of multilateral debates—from G20 and G7 summits to UN climate, biodiversity and desertification negotiations—while its leadership roles in platforms such as the Alliance of Champions for Food Systems Transformation translate high-level commitments into actionable national programs. In parallel, CGIAR researchers shaped successive IPCC assessments, led the 2024 Breakthrough Agenda Report on Agriculture,[23] and contributed to the 2023 Breakthrough Agenda Global Report,[24] whose agriculture chapter adopts CGIAR's seven-technology roadmap to guide an equitable, low-emission transformation of global agrifood systems.

CGIAR's Reach

A simple count of all the lives reached by CGIAR innovation does not exist. Rather, various sources of information provide partial reach figures, bounded by specific time periods, geographies, and technology types. Quality assured and substantiated evidence proves that from 2022 to 2024 CGIAR's reach included:

- 300 million people consuming CGIAR-supported biofortified foods by 2024.[9] This is about 10% of the number of people worldwide who cannot afford an adequately nutritious diet.
- 20 million farmers were using innovations developed or disseminated by the 2022 to 2024 pooled-funded portfolio. This is about 4% of all the smallholder farmers worldwide.
- Within a single year, at least 5.8 million households in Ethiopia,[10] 3.7 million in Vietnam,[13] and 8.0 million in Bangladesh[14] used CGIAR-supported technologies which had diffused into national agricultural systems.
- 1.3 million farmers adopted CGIAR-supported improved *Urochloa* forages between 2000 and 2023 (PRMS 9926).
- 0.9 million households through Africa RISING (2015 to 2022)[5] and 0.4 million households through Enhancing Food Security in Arab Countries (EFSAC, 2010 to 2022).[22]
- 221 million hectares sown with CGIAR-supported modern varieties or related crop technologies in 2020.[2]
- 9.5 million hectares sown with improved maize in eighteen African countries in 2015.[3]
- 6.5 million hectares per year sown with CGIAR-derived rice in two Asian countries, between 1990 and 2018.[6]

CGIAR's total reach is likely to be significantly higher, as many focal countries have not been covered here, the impacts of policy measures are generally not included, monitoring of bilaterally funded projects was fragmented, and there was a lack of monitoring of technologies which had diffused into national systems. However, there may be some double-counting across these categories presented, for example households in Ethiopia may have adopted *Urochloa* and thus be included in both the SPIA and study and initiative reporting.

Impacts and Outcomes by Impact Area

CGIAR's alignment to the global Sustainable Development Goals is articulated via the five Impact Areas, which correspond primarily to SDG 1 No Poverty, SDG 2 Zero Hunger, SDG 5 Gender Equality, SDG 13 Climate Action, and 15 Life on Land. Contributions are also made towards various other SDGs via CGIAR's work, most notably to SDG 17 Partnerships for the Goals. Because CGIAR works in an integrated manner, impacts, outcomes, and reach is often mapped to multiple Impact Areas so summing the values for individual Impact Areas results in a value that is larger than CGIAR's total achievement due to this multiple-mapping approach.

Poverty Reduction, Livelihoods, and Jobs

CGIAR innovations supported sustainable intensification and aquaculture while increasing incomes, resulting in an average **economic surplus of US$47 billion per year** from 2016 to 2020.[2] As one example of its work in Bangladesh, CGIAR's training-of-trainers intervention taught local service providers to function as extension agents and successfully improved famers' **incomes by over 40 percent** (US$777 per hectare).[25] CGIAR policy research helped organizations like the World Food Program and national governments improve the targeting of their social protection programs. The pooled-funded portfolio reached nearly **20 million farmers** with innovations intended to benefit the poverty, liveilhoods and jobs impact area.

Nutrition, Health, and Food Security

Nearly **300,000 farmers** used CGIAR-supported aflatoxin control measures across Africa in 2023 (PRMS 3351, 3380, 3386, 3428, 3445, 3674, 3688, 3690, 3771). Biofortified crops improved nutrition and food security for up to **300 million consumers** by 2024[9] - about ten percent of the number who cannot afford an adequately nutritious diet worldwide. Improved farming practices were also linked to nutrition. For example in Tanzania, the adoption of tied ridging and terracing increased **household dietary diversity by 43 percent**, likely through increased production and income.[26] In Nigeria, solar powered cold storage extended the time **food remained fresh by 8 days** and **reduced the share of value lost by 11 percentage points.**[27] The pooled-funded portfolio reached **3.6 million farmers** with nutrition, health, and food security related innovations.

Climate Mitigation and Adaptation

CGIAR climate information services reached over **9 million farmers** and other climate-related innovations from the pooled portfolio were used by **6 million farmers**. CGIAR supported climate-sensitive policy development in Viet Nam, Ethiopia, and several other countries. CGIAR technologies reduced greenhouse gas emissions by **2.24 billion metric tons of CO2** equivalent from 1961 to 2015[6] due to avoided land use change. CGIAR registered **565 climate-resilient crop varieties**. Adopting climate-resilient rice was associated with yield improvements of approximately **20 percent** in India and Nepal.[28,29]

Gender, Youth, and Social Inclusion

CGIAR's approach to measuring women's empowerment in agriculture was adopted by at least **279 organizations in 69 countries**.[30] CGIAR contributed to the FAO's Voluntary Guidelines on Gender Equality and Girl's and Women's Empowerment, which were endorsed by the Committee on World Food Security. This engagement then informed the FAO report on The State of Women in Agri-Food Systems 2023. CGIAR's G+ tool is used by some breeders in the early stages of incorporating gendered preferences into breeding decisions so that new crop varieties meet the needs of both men and women farmers.[31] The pooled-funded portfolio reached **6.8 million farmers** with innovations related to gender, youth, and social inclusion.

Environmental Health and Biodiversity

By reducing the expansion of agricultural land and harmful agricultural practices, CGIAR mitigated the negative environmental effects of agriculture.[8] Through CGIAR's work, **2.9 million households** in Viet Nam used reduced-fertilizer approaches and **1.6 million households** followed reduced pesticide use recommendations in 2023.[13] In Ethiopia in 2021/2022, **8.9 million households** used soil and water conservation techniques, among which **1.6 million** used agroforestry and almost one million used conservation agriculture.[10] Sustainable agricultural practices aimed at improving soil health, reducing inputs, improving the efficiency of water use, and restoring grazing lands were widely integrated into farmer practices and governmental policies, with innovations from the pooled funded portfolio used by **9.5 million farmers**.

Impacts and outcomes by continent

Africa

From 2016 to 2020, CGIAR crop technologies were used on **38.6 million hectares** in sub-Saharan Africa, generating **US$17 billion** in sub-Saharan Africa per year.[2] The adoption of improved maize varieties had an estimated annual economic benefit of **over US$1 billion** and a **benefit:cost ratio of at least 12:1**.[3] In just four African countries, the adoption of CGIAR-supported techniques led to the production of an addition **1.5 million tons of wheat** valued at **US$446 million** and achieved a benefit:cost ratio of 22:1 over 12 years.[22] CGIAR supported improved policies and institutions such as for water management in the Niger River Basin, climate change adaptation in the Horn of Africa, and a national agroecology strategy in Kenya. Reports from the pooled-funded portfolio between 2022 and 2024 included reaching 6.1 million farmers through improved seeds, land management practices, livestock innovations, and other interventions, and informing 125 policy changes and US$2.5 billion of third party investments. A national survey of Ethiopia found that CGIAR-related agricultural innovations reached between 5.8 and 11.5 million households in 2021-2022[10] accounting for 44 to 87 pervent of rural households.

Latin America and the Caribbean

From 2016 to 2020, CGIAR crop technologies were used on **20 million hectares** in LAC, generating **US$4.2 billion** in LAC per year.[2] CGIAR's crop breeding programs proactively involved farmers in crop selection to develop varieties that met farmer preferences and increase crop diversity. This approach has now been replicated in **at least 21 countries.** CGIAR worked extensively with the governments of Guatemala and Honduras to support their natural resource management and climate services, especially focusing on the development of digital solutions. A CGIAR-informed private cattle ranch used Nerole short cycle cattle, improved grasses, rotational grazing, and buffer zones, contributing to **44 percent lower greenhouse gas emissions** compared to other farms in the region. Between 2022 and 2024, the pooled-funded portfolio reached 2.8 million farmers with CGIAR-contributed innovations and informed 24 policy changes and US$14.3 million of third party investments.

Asia and the Pacific

From 2016 to 2020, CGIAR crop technologies were used on **102 million hectares of land**, generating **US$27 billion** per year in Asia and the Pacific.[2] Over an approximately 20-year period, CGIAR's rice breeding efforts generated **benefit:cost ratios of 115:1** in Bangladesh and **7:1** in the Philippines. CGIAR contributed to Bangladeshi rice yields more than doubling in the last four decades, increasing from an average of **1.75 tons per hectare to 4.57 tons per hectare.**[5] CGIAR worked with governments across Asia to support policy development, particularly focusing on water management. Leveraging CGIAR's work, the Viet Nam Government committed to applying this suite of supported practices **over one million hectares** of land by 2030. Between 2022 and 2024, the pooled-funded portfolio reached 11.2 million farmers with CGIAR-contributed innovations, and informed 108 policy changes and US$380 million of third party investments. Nationally representative surveys found that 3.7 to 3.9 million farming households (28 to 30 percent) were reached by CGIAR-related innovations in Viet Nam in 2023,[13] and 8.0 to 9.4 million farming households (53 to 63 percent) were reached in Bangladesh in 2023.[14]

Opportunities for improved impact assessment

Based on the review of the evidence published from 2022 to 2024 conducted for this report, several opportunities to improve CGIAR's impact assessment by 2030 were identified. These will inform the implementation of the 2025-2030 CGIAR Portfolio, and fall into three categories:

- Opportunities to **support impact evidence aggregation** by making changes to the technical reporting processes, tools, and indicators and increasing incentives and enforcement mechanisms for compliance.
- Opportunities to **increase rigorous impact evidence generation**, such as by undertaking strategic portfolio-level assessments of large-sale transformational change, committing to the consistent measurement of defined impacts, and promoting best practices.
- Opportunities to **improve the way that costs are monitored in relation to benefits** achieved, to enable cost:benefit analyses to be conducted on more topics. Improvements in the collection of expenditure data could allow for estimates of CGIAR's value for money.

Conclusion

There is a large body of evidence that CGIAR has made substantial contributions to agriculture and rural development during the 2022 to 2024 period. The strongest evidence is for the impact of crop breeding (and to a lesser extent improved crop management), the benefits of which easily cover the investments made in CGIAR. There is also a large amount of evidence for positive impacts on incomes, nutrition, and climate adaptation, but the studies tend to be localised and not amenable to national or global synthesis. CGIAR's reach is large: the 2022–2024 pooled-funded portfolio engaged over 20 million farmers directly or via partner organisations, testing and applying novel innovations. The true reach of CGIAR contributions comes once technologies have matured and diffused into national systems—in only three countries between 18 and 25 million farmers were found to be using CGIAR-contributed technologies.

This synthesis demonstrates that CGIAR continues to generate measurable, scalable impacts across its strategic goals. It reinforces the value of CGIAR's global research-for-development model and provides a foundation for adaptive management and investment planning as the organization enters its next business cycle. To support continuous learning, CGIAR has committed to developing an Impact Compendium which will regularly compile and provide selected syntheses on outcomes and impact assessments.

Woman using a hand hoe to till the soil on a small farm in Tanzania. Photo credit: Mitchell Maher/IFPRI

How to read this report

Are you a funder or policymaker?

Start with the Executive Summary then read about the Scope of the Report. After this framing, feel free to jump directly to your Impact Area or Continent of interest. If you want to learn more about CGIAR itself and crosscutting impacts, be sure to read the full Introduction and Global View sections.

Are you a researcher?

Orient yourself with the Executive Summary, then dive into our Methods Annex and discussion of the Impact Indicators used by CGIAR before reading our main findings so that you can fully contextualize the results.

Are you an implementer?

Consider jumping directly to your Impact Area or Continent of interest. But be sure to return and read about the Scope of the Report so that you know what is, and is not, included in this report.

Tips on interpretation

When interpreting the outcomes reported, **be cautious about aggregating across data sources (e.g., as Performance and Results Management System [PRMS] and SPIA country studies), Impact Areas, and continents.** Some outcomes are included in more than one of these categories.

Pay attention to the specified time period. The report focuses on evidence *reported* during the 2022 to 2024 period, but outcomes and impacts often developed over much longer periods.

Consider the overall weight of the evidence, not individual pieces of evidence. This report presents a body of evidence, drawing on a variety of different epistemological approaches: outcome evidence, impact evaluations, and other types of information, which collectively provide different insights into CGIARs impact. However, only impact evaluations were assessed for the number of best research practices they used, with a composite score of 0 to 9 assigned based on the number of key components of rigor addressed by the study. While weighted equally in this work, these components do not all have equal implications for overall study quality and are not universally important to all impact evaluations. We present information from studies with lower composite scores when they provide meaningful information that informs the overall body of evidence—but we rely more heavily upon the more rigorous studies. Readers should avoid overinterpreting evidence that is indicative, supportive, or suggestive but not conclusive.

Be precise in the interpretation of the use of causal and non-causal language. Although this report includes multiple types of information, causal language is only used for impact evaluations addressing three or more key components of rigor. Reported numbers of people reached do not necessarily reflect numbers of people adopting an agricultural technique and reported numbers of adopters do not necessarily translate into impact. However, these values provide evidence along the causal chain between innovation and impact.

CGIAR
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Introduction

A mixed crop-livestock farming community near Busia, Kenya, where a research project investigates the disease pathogens circulating in both people and animals. Photo credit: Charlie Pye-Smith/ILRI

The global community faces a confluence of challenges that threaten to undermine decades of progress in development, food security, and environmental sustainability. The world's population is projected to reach 9.7 billion by 2050, with significant growth anticipated in regions already grappling with food insecurity and resource constraints.[22] Climate change intensifies these pressures, bringing more frequent and severe droughts, floods, and extreme weather events that disrupt agricultural productivity and threaten livelihoods.[23] Simultaneously, the rapid loss of biodiversity is eroding critical ecosystem services such as pollination, nutrient cycling, and pest control, which underpin resilient agricultural systems.[24] The COVID-19 pandemic exacerbated these global threats. It reversed gains in poverty alleviation, health, and education, while intensifying food insecurity. **Between 2019 and 2022, the number of people facing hunger rose by 152 million**, reaching approximately 733 million globally.[25]

In this context, the work of CGIAR is more vital than ever. As the world's largest publicly funded agricultural research network, **CGIAR is dedicated to transforming food, land, and water systems in a climate crisis**. Its research generates evidence-based innovations which are taken up by partners across the globe, helping to reduce poverty, improve food and nutrition security, and enhance ecosystem resilience.[2] In the countdown to 2030, CGIAR contributes to the global Sustainable Development Goals (SDGs) via five Impact Areas, which correspond primarily to SDG 1 No Poverty, SDG 2 Zero Hunger, SDG 5 Gender Equality, SDG 13 Climate Action, and SDG 15 Life on Land. Contributions are also made toward various other SDGs via CGIAR's work, most notably to SDG 17 Partnerships for the Goals.

This report aims to provide a comprehensive review of CGIAR's contributions toward these goals between 2022 and 2024. The **main purpose of assembling and synthesizing all the outcome and impact evidence in one place is for accountability purposes**. However, this report also presents key learnings from CGIAR's activities which can inform decision-making. The three-year time period allows for the CGIAR portfolio to have contributed to new outcomes from research outputs and for a number of impact assessment studies to have been completed. This report is part of CGIAR's suite of technical reporting products (see Figure 1), and some of the outcomes or impacts covered in this report were also covered in the annual reports from Initiatives, Platforms, and Science Group Projects. However, this consolidated report allows for a deeper assessment of the whole set of outcomes and impacts, including the development of storylines and the aggregation of quantitative outcomes and impacts.

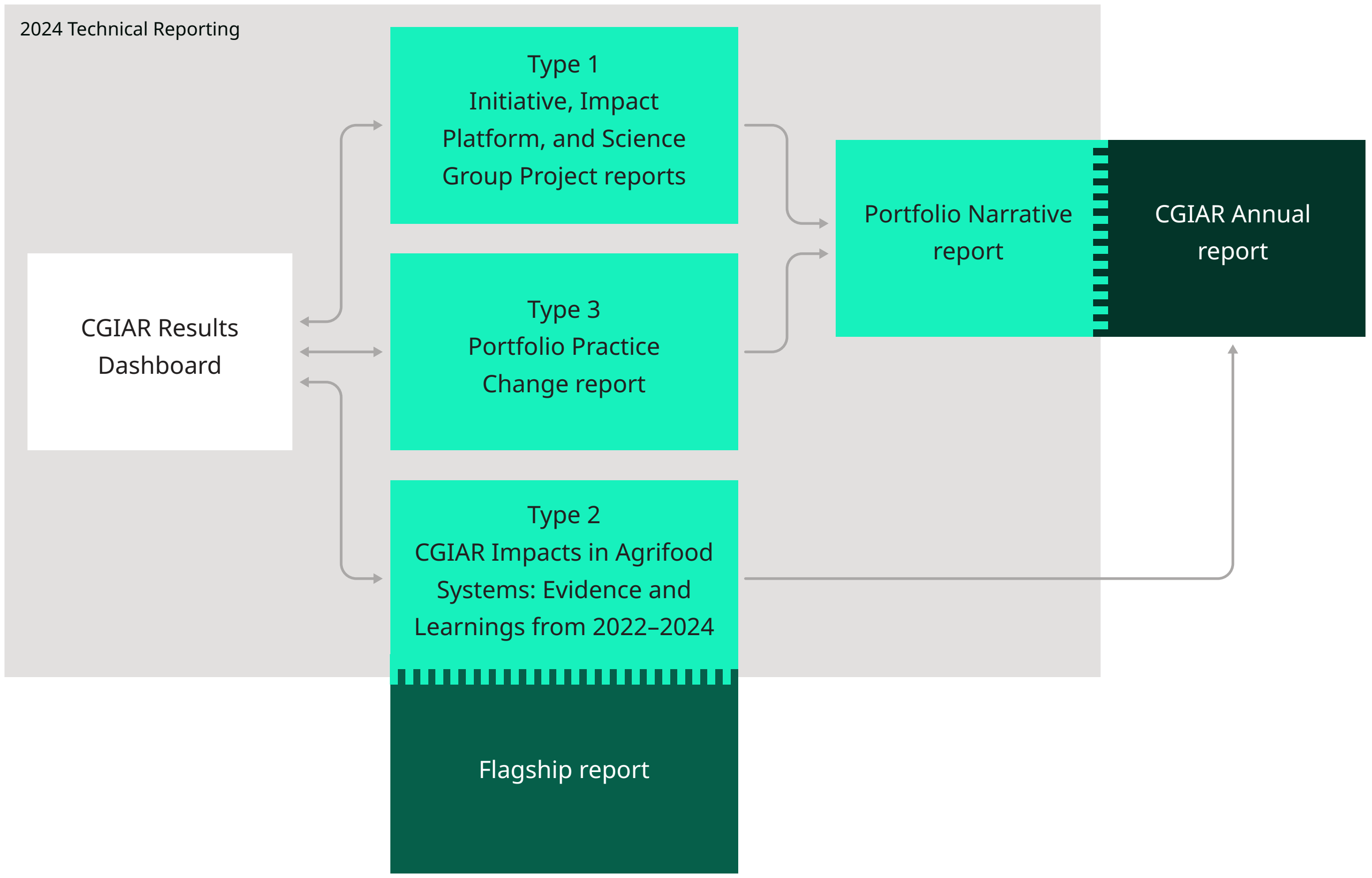

Figure 1. CGIAR's 2024 Technical Reporting components and their integration with other CGIAR reporting products.

The **narrative sections of this report closely follow CGIAR's 2030 Research and Innovation Strategy**.[2] In its Strategy, CGIAR oriented its research to contribute to five Impact Areas—Nutrition, Health, and Food Security; Poverty Reduction, Livelihoods, and Jobs; Gender Equality, Youth, and Social Inclusion; Environmental Health and Biodiversity; and Climate Adaptation and Mitigation.[26] The Strategy presents region-specific challenges for CGIAR and outlines a regional research approach to overcome these challenges. The Strategy also includes a Results Framework containing indicators by which to measure progress. Therefore, in the following sections of the report, CGIAR contributions to outcomes and impacts are organized around Impact Areas and regions and maintain close correspondence to the Results Framework indicators.

Before these rich findings are presented, the scope is clearly outlined (Scope of the Report) and the introductory section reinforces two important points: (1) that CGIAR contributions to outcome and impacts depend significantly on a wealth of partners and partnerships (Working through partnerships) and (2) that CGIAR contributions to outcomes and impacts occur over different timescales and especially in the case of impacts, these timescales are long, often 10 or more years (The long road from research to impact). Thus, **what is presented here should be understood to be joint contributions with many partners and covering research efforts well beyond what was accomplished in the recent 2022 to 2024 cycle**.

Working through partnerships

Partners are essential to the delivery of most, if not all, CGIAR outcomes and impacts. CGIAR partnerships with governments and the private sector are particularly valuable for effectively and sustainably bringing innovations to scale. In 2024, CGIAR reinforced its commitment to strengthening partnerships with the formal approval of the Engagement Framework for Partnerships and Advocacy, Version 2.0 (EF 2.0) by the CGIAR System Board.[27] This updated framework emphasizes leveraging collective resources and expertise, and scaling research innovations through more strategic collaborations. It seeks to move beyond transactional relationships, ensuring partnerships are built on shared goals and contribute to greater impact on food, land, and water systems.

CGIAR has also been developing a Partnership Strategy to refine and systematize how it engages with partners. Developed in consultation with internal and external stakeholders, the Strategy responds to recommendations from the High-Level Advisory Panel[28] and addresses the lack of a unified, organization-wide framework for designing, managing, and evaluating partnerships. By adopting a more structured, strategic, and equitable approach, the Strategy enhances the relevance and scalability of CGIAR's research and innovation efforts. Key shifts under the Partnership Strategy include moving from ad-hoc partnerships to intentional, long-term collaborations; establishing clear success metrics and partnership health assessments; and fostering co-creation with a diverse range of partners, particularly from the Global South. The Strategy also ensures that partnerships are better aligned with national agricultural priorities and deliver measurable value.

Most of the results presented in this report were achieved with and through collaborative efforts, with CGIAR rarely operating independently of other stakeholders. In particular, policy-level outcomes are almost always partnership outcomes. Engaging a public decision-maker, market actor, or scaling broker in the research cycle is related to a doubling of the likelihood of an innovation moving from research and development to implementation (See Comparison with 2017 – 2021).[29]

Through the Initiatives, CGIAR partnered with 1,254 organizations from 2022 to 2024 to generate outcomes. Among the outcomes achieved with partners, 21 percent were governmental bodies excluding national agricultural research and extension systems (NARES), 19 percent were research organizations and universities excluding NARES, 18 percent were private companies, and 13 percent were NARES (Figure 2). Nearly 60 percent of CGIAR's knowledge and innovation outputs during this period were co-developed with partners.

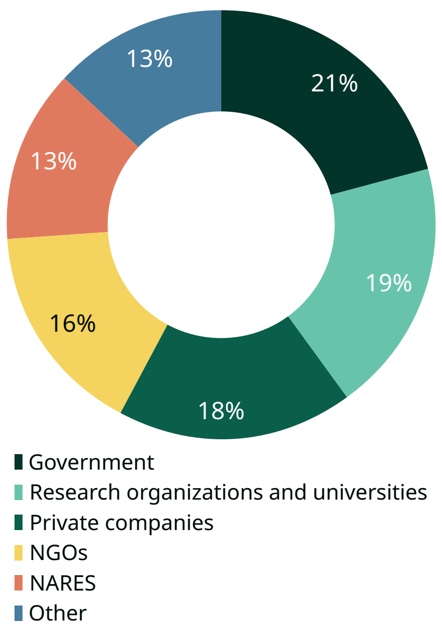

Figure 2: Types of organizations CGIAR partnered with to deliver the pooled-funded portfolio between 2022 and 2024.

Note: Each unique partner is counted once, regardless of the number of times CGIAR partnered with them. While NARES are both governmental partners and research organizations, they are considered their own category of partner and not counted within either group.

Three examples below illustrate the diversity of CGIAR's partnership models and the different pathways through which these collaborations contribute to impact. Each case underscores a unique value proposition and partnership mechanism. Together, these cases reflect the breadth of CGIAR's partnership landscape—from facilitating innovation ecosystems and transforming markets, to leveraging funder consortia for bringing agricultural technologies to a continental scale.

- **Accelerating Impacts of CGIAR Climate Research for Africa (AICCRA)** represents a regional, multi-actor collaboration model. It focuses on innovation, co-creation, and policy uptake to support climate resilience, bringing together CGIAR Centers with national and regional actors to scale climate-smart agriculture and information services across Africa.
- **HarvestPlus** exemplifies a value chain-driven partnership that strategically integrates both supply- and demand-side actors to accelerate the development, distribution, and market uptake of nutrition-enhancing biofortified crops. Its model demonstrates how carefully sequenced engagement in research and scaling across the value chain can expand both reach and impact.
- **Technologies for African Agricultural Transformation (TAAT)** showcases a large-scale, funder-led public-private platform that accelerates the delivery of proven technologies to millions of farmers. This model focuses on rapid dissemination through structured, commodity-based delivery compacts in partnership with national research systems, ministries, private-sector firms, and farmer organizations.

AICCRA brings CGIAR Centers together with national and regional organizations across Africa to deliver climate information services and climate-smart agriculture technologies to millions of smallholder farmers (see Climate information services).[30] Eleven CGIAR Centers participate in AICCRA, which worked with 57 partners in 2023 alone, including government agencies, NGOs, farmers' associations, media groups, private-sector firms, and universities. In the same year, AICCRA helped 82 organizations to access enhanced climate information services and climate-smart agricultural technologies and supported almost 20,000 stakeholders with capacity development. Through partnership, AICCRA reached more than 4.1 million individuals with improved climate information services or climate-smart agriculture technologies, 40 percent of whom were women.

HarvestPlus took an intentional approach to engaging both existing and new strategic partners across the value chain for various biofortified crops in Africa, Asia, and Latin America and the Caribbean (LAC; see Biofortification and improved crops). In its early days from 2003, most of its partners were related to research, but following successful breeding, the number of implementation partners grew much faster. In 2024 alone, HarvestPlus worked with 600 new partners to add to the more than 3,600 partners it has worked with over the years. These included:

- 58 partners supporting varietal development and release (including NARES and private seed companies).
- 800+ partners handling multiplication and distribution, predominantly private and farmer-led seed enterprises.
- 2,507 downstream partners—including aggregators, processors, and retailers—who created markets for the crops.

As scaling continued to gain momentum and production increased, markets for surplus produce became central, too. Schools emerged as an important market for smallholder farmers, as HarvestPlus introduced biofortified crops into school feeding programs, making them more nutritious.

Launched in 2018, the **TAAT** flagship program of the African Development Bank was designed to boost agricultural productivity across the continent by rapidly delivering proven technologies to more than 40 million farmers by the end of 2025. Technologies from CGIAR and its partners feature among those being disseminated through the TAAT program. In addition to CGIAR, TAAT brings together a consortium of partners to deploy proven technologies to millions of farmers in more than 20 African countries through Commodity Technology Delivery Compacts that support the production of maize, rice, wheat, sweet potato, cassava, sorghum, millet, beans, fish, small livestock, soybeans, and vegetables. At the national level, TAAT works closely with NARES, which drive and coordinate the deployment of proven agricultural technologies. The NARES in turn work with ministries of agriculture, private companies, farmers' cooperatives, and NGOs, with CGIAR providing technical support. TAAT has been very successful, having reached 5.3 million beneficiaries by 2021[31] and supporting the adoption of improved wheat varieties in Ethiopia[32] and improved cassava varieties in the Democratic Republic of the Congo,[33] among other achievements.

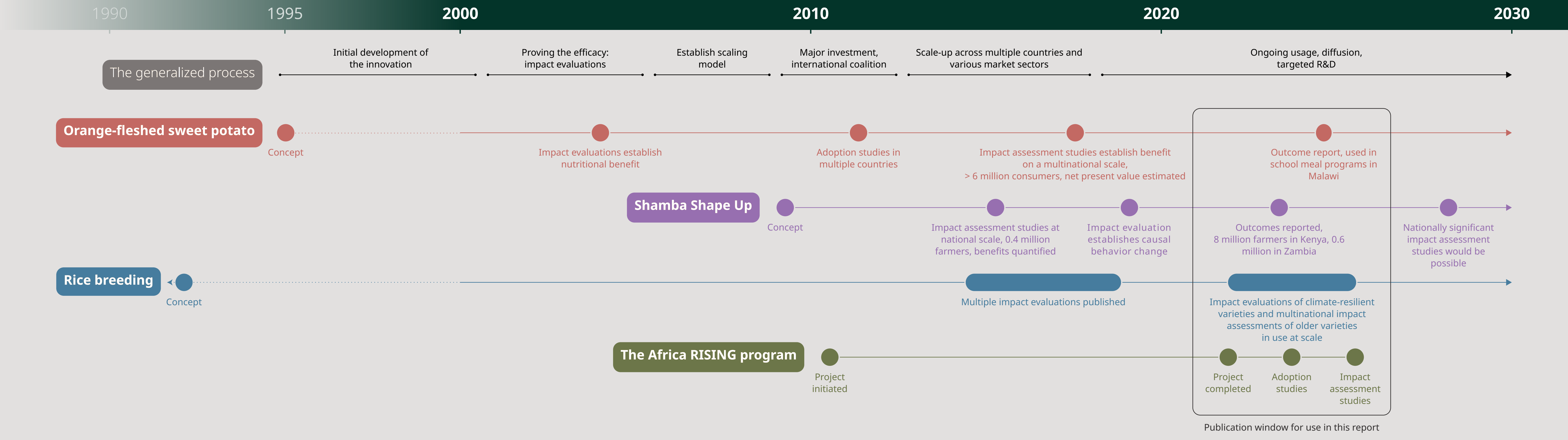

Figure 3: Research-to-impact timeline of four CGIAR activities.

The long road from research to impact

The route from research to impact can take many years, often decades, to bring about widespread change. The research and development of agricultural innovations typically takes 5 to 10 years, at which point a user-ready product may become available. The use of that product gradually (or exponentially) increases until it peaks around 15 to 25 years later.[34] Impact assessments of these technologies often only start once significant uptake has been achieved and take years to execute and publish. As a result, evidence of the impact at scale of an innovation typically becomes available many years after the initial research and development. Along this timeline, multiple funding sources are typically utilized, and a specific innovation may be part of numerous projects, making attribution difficult. Some projects focus more on fundamental research, while others focus on translating proven research into practice or on scaling up the use of well-established innovations. In CGIAR, large bilateral projects (such as AICCRA, TAAT, or AfricaRISING, all described in this report) often focus on scaling up the use of innovations developed under smaller bilateral and pooled-funded work. This synergy between discovery research and scaling projects enables CGIAR to deliver both novel research and development impacts. Four case studies are used to illustrate variations of this research-to-impact pathway and timeline, with particular implications for this report (Figure 3).

Orange-fleshed sweet potatoes, biofortified with vitamin A, demonstrate the journey of an archetypal crop innovation.[35] Orange-fleshed sweet potatoes were first developed in the mid-1990s,[35] and about 10 years later usable varieties were evaluated in real-life settings (such as van Jaarsveld et al., 2005).[36] These impact evaluations garnered sufficient interest that mechanisms to scale up the production and consumption of the sweet potato varieties were developed and tested by an international panel established for that purpose. During the 2010s, various adoption studies were conducted in different countries to understand the number of consumers and the factors influencing adoption (such as de Brauw et al., 2018).[37] In 2020, an impact assessment estimated the total number of consumers who benefited and the net present value of the innovation.[38] This overall trajectory is very close to the theoretical norm of 5 to 10 years for initial development and 15 to 25 years for uptake.[34] Although the breeding, production, and consumption of orange-fleshed sweet potatoes continues, few outcome or impact studies were published during the period of interest for this report (2022–2024), possibly because outcomes and impacts have already been established.

The case of **rice breeding** is different, in that many varieties (innovations) are under development and dissemination simultaneously (see Investments in rice breeding pay dividends). Focused studies on the efficacy and adoption of the most promising new varieties are regularly published, with 18 such studies appearing within the 2022 to 2024 period and more published in the preceding years (see Mishra et al., 2022, for a review).[39] Studies that synthesize the adoption and impact of multiple improved rice varieties at national levels over long periods of time are valuable for understanding the holistic benefit of the breeding programs but are less regularly conducted. One such study was published between 2022 and 2024 and evaluated the value of rice breeding over a 22-year period,[5] with another currently under peer review. The impacts of the rice breeding programs are included in this report.

Africa RISING (Africa Research in Sustainable Intensification for the Next Generation) represents the case of a large bilaterally funded program, rather than an innovation, that co-developed and scaled context-specific farm intensification practices. The fundamental research on sustainable intensification practices had been carried out in earlier work. The program was initiated in 2011, operated in six countries, and closed in 2023. Adoption[11] and impact studies[40] published in 2024 evaluated the achievements of the program over its 12 years. These impacts are included in this report even though they were achieved before this report's focus period (2022 to 2024) because the studies were published during the report period.

A less typical case is CGIAR's involvement with **Shamba Shape Up**, a popular reality television show in Kenya that showcases farmers being visited by agricultural experts who give their farms a makeover, while informing the TV audience about best farming practices and support services. The show began production in 2010 and has been sponsored by a range of commercial, not-for-profit, and public institutions, including CGIAR, which provided content for several episodes. In 2014, adoption and impact were evaluated, establishing benefit to 400,000 famers.[41,42] A causal impact evaluation established the mechanisms of benefit in 2020 but did not evaluate adoption levels.[43] Between 2022 and 2024, CGIAR-supported Shamba Shape Up episodes reached more than 8 million farmers in Kenya (PRMS 9327, 9827). Illustrating scaling-out of successful practices, CGIAR helped establish a Zambian version in 2023, named Munda Makeover, which reached 600,000 viewers in 2023 (PRMS 9753). In this report, we present the numbers of potential beneficiaries from outcome reports but do not claim any impact upon those beneficiaries, because impact evaluations of Shamba Shape Up were published before our focus period.

Scope of the report

This report presents evidence made available from 2022 to 2024[a] describing the contributions of CGIAR to outcomes and impacts, which are terms defined in CGIAR's theory of change (Figure 4). The theory of change entails activities which lead to outputs, such as published knowledge, trained individuals, policy advice, or innovation development. Through engagement with partners, those outputs lead to behavior changes—termed outcomes—such as the use of new technologies by farmers or changes in policy by governments or organizations.[26] Over time, these outcomes translate into durable changes in the condition of people and their environments—termed impacts. Along this impact pathway are costs—costs of generating research outputs, costs of advancing those outputs into use by other actors, and costs borne by those actors to generate impacts. Very few impact studies measured these costs, and it was not possible in retrospect to piece together the relevant costs to link to reported outcomes and impacts. Thus, the report focuses primarily on achievements and benefits and not net benefits or returns to investments.

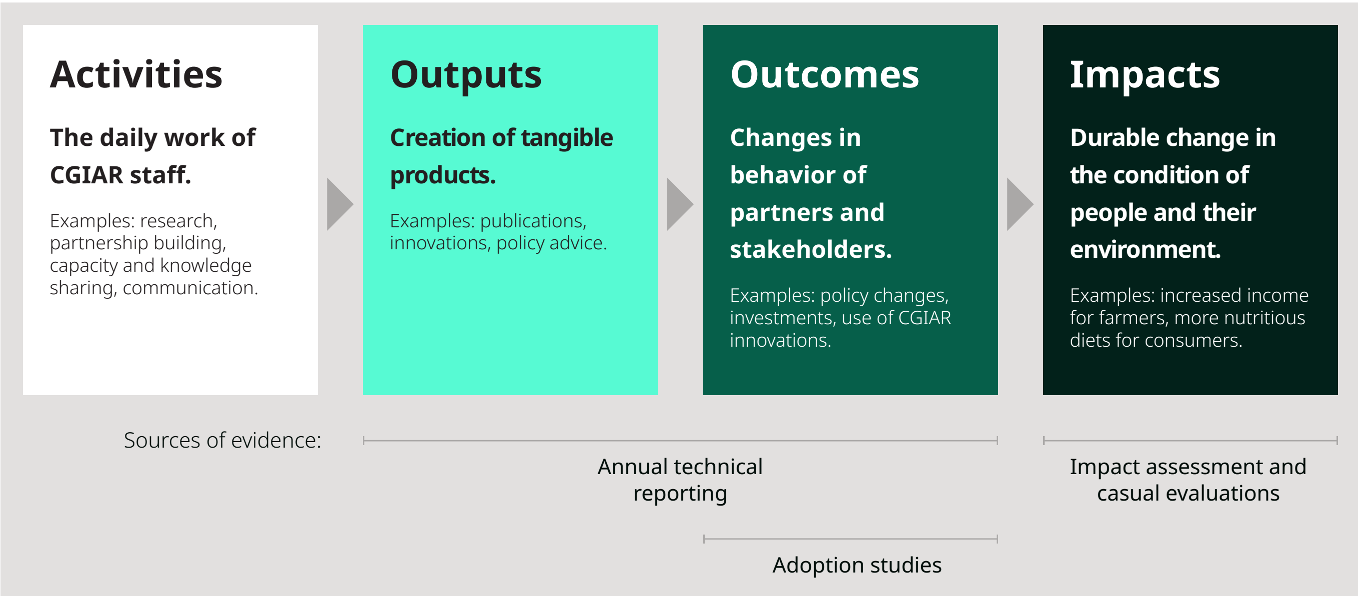

Figure 4: The stages in CGIAR's Theory of Change and the corresponding sources of evidence used in this report.
Notes: This report focuses on outcomes and impacts. CGIAR's annual reports focus on activities, outputs, and outcomes.

The precise definition of the term "outcomes" used here is "change[s] in knowledge, skills, attitudes, and/or relationships, manifested as a change in behavior, to which research outputs and related activities have contributed."[44] "Impact" is defined here as "durable change[s] in the condition of people and their environment brought about by a chain of events or change in how a system functions, to which research, innovations, and related activities have contributed."[44]

Indicators in CGIAR's Results Framework were consistently monitored at the outcome level and are presented in aggregate for the pooled-funded work. At the impact level, it was more common for indicators related, but not identical, to indicators in the Results Framework to be used. This causes challenges in aggregation; therefore, impact results are generally described individually. This is a key point of improvement in implementation of the portfolio 2025–2030 (see The 2022–2024 Results Framework and Annex B. Impact Indicators).

a CGIAR commissioned several studies in mid-2024 to fill evidence gaps identified in preparation of this report which were not published until 2025, although the findings have been included in this report. In addition, outcomes reported through CGIAR's Performance and Results Management System for 2024 were included even though many were not quality assured and published until 2025. In some cases, pre-print versions of documents were shared with the authors in 2024, but the final publication was not made publicly available until 2025. These studies were all included as they are considered to have been made available in 2024.

Methods at a glance

This report provides the evidence on CGIAR's outcomes and impacts that was *made available* between 2022 and 2024. **By combining contemporary reporting of outcomes with evidence of recent impacts, the report provides assurance that investments in CGIAR contribute to achieving impact in agrifood systems**. The majority of outcomes described in this report occurred during the period 2022 to 2024, with the evidence supporting the outcomes published during or immediately after this period. However, a minority of outcomes report on the results of longer-term studies, for example the total number of farmers reached from a 12-year bilateral program in the case of the Africa RISING program. The source of evidence for impacts was publicly available studies published *during* this period. As a result, the impacts generally occurred *before* this period. The time-lag is due to the long time it takes to achieve and then prove impacts, especially large impacts (see The long road from research to impact). The report develops an overall narrative demonstrating how CGIAR is progressing toward its Impact Area goals.

Winnowing rice in Burkina Faso. Photo credit: Andrew McConnell/Panos Pictures

Evidence for outcomes was mainly drawn from the annual technical reporting from the pooled-funded portfolio of CGIAR Initiatives, Platforms, and Science Group Projects active between 2022 and 2024, which is available in CGIAR's PRMS. Throughout the report, outcomes drawn from PRMS are referenced with a numerical code, which allows identification of the specific result in the CGIAR Results Dashboard. These were supplemented by outcome reports from major bilateral projects, as submitted by CGIAR Center monitoring, evaluation, learning, and impact assessment (MELIA) focal points and communications teams, CGIAR's Impact Area Platform Directors, Regional Directors, and Regional Integrated Initiative Leaders. The same stakeholder group submitted some additional evidence on *outcomes* of pooled-funded projects and studies supporting *impacts* published between 2022 and 2024. The authors of this report conducted a search for relevant studies on CGSpace, CGIAR's main document repository. We also endeavored to find studies published by authors from outside CGIAR, though cannot be sure to have located all of them (Annex A. Additional Methods). These publications served as the main sources of information on impacts.

Our submissions-based search strategy highlights results our stakeholders deem most relevant and aligns with the report's purpose: **to present evidence of CGIAR-contributed impacts**. However, it likely overlooks results that stakeholders find less meaningful. We do not aim to present CGIAR average impacts per year or per country. Nonetheless, to support accurate interpretation, key information on null (or negative) results is noted when relevant to the interpretation of positive results.[b]

b For example, when an intervention achieved impact in one area but failed to achieve impact in another, information on both Impact Areas was extracted to ensure that the intervention was not presented as wholly successful.

All impact study submissions were reviewed for potential inclusion into the evidence base of the report. The two primary inclusion considerations were *relevance* and *rigor* (see Annex A. Selection of evidence). Studies were determined to be **relevant** if they considered the outcomes and impacts of CGIAR-supported *interventions*, regardless of the authorship of the study. Outcomes reported into the CGIAR PRMS are quality assessed for relevance (that is, CGIAR's role in the outcome is validated); therefore, none of these reported outcomes were excluded on the basis of relevance. Studies with unclear or misleading methods were excluded on the basis of **rigor**. Studies meeting this threshold of clarity were then classed as "impact assessments" or "impact evaluations."

Impact evaluations were the primary study designs of interest. Impact evaluations are studies that use statistical methods (experimental or quasi-experimental) to quantify the *causal* change in a condition that was achieved by an intervention. Studies using other study designs were included under the umbrella term of impact assessments (including impact evaluations), if they provided information relevant to understanding impacts, such as cost-benefit analyses, reviews of CGIAR work, and measures of the adoption of CGIAR technology. These included the country studies supported by CGIAR's SPIA. While impact *evaluations* are necessary to establish causal change linking intervention and impact, they can be limited in scope due to practical constraints, such as resources and measurement challenges. Other types of impact *assessments* can provide valuable insights into CGIAR's contributions to real-world change in a wider spatial or temporal context; however, they do not establish causality.

Impact *evaluations* were further appraised to determine the number of best practices followed per study. A composite score[45] was calculated to reflect the level of confidence in the findings of a study and to help understand the application of best practices in CGIAR impact evaluation. Nine best practices were identified (see Annex A. Included studies and rigor of evidence), resulting in the composite best-practice score ranging from 0 to 9. Not all the criteria were relevant to all studies, and some studies may have met criteria but did not clearly describe them in the publication.[c] Studies following three or more best practices were featured preferentially in this report (assuming equality in relevance). Details of the method and analysis of the scores are in Annex A. Included studies and rigor of evidence.

Included impact studies

Approximately 500 studies were reviewed for eligibility and 125 studies were included in the primary dataset. Of these, 62 were impact evaluations and 63 were impact assessments which did not attempt to establish the causal effect of an intervention on an impact. Randomized controlled trials (RCT) were the most common impact evaluation design (n = 21), followed by endogenous switching regression (n = 14) and instrumental variables (n = 13). Only one study, an RCT, met all nine of our best practices criteria.[d] Most impact evaluations met two to four of the criteria (n = 40), with 19 studies addressing more than four best practices (Annex A. Included studies and rigor of evidence).

Impact assessments which were not full impact evaluations generally used other quantitative approaches (Table 1, n = 23) to examine changes over time or differences between groups. A smaller set were project summaries (n = 9), adoption studies (n=9), or literature reviews (n = 9). The majority of impact assessments were peer reviewed and published in academic journals (n = 96). A minority were formal studies probably subject to internal review (although this was not possible to verify, n = 19), and a small proportion of the impact assessment studies were more descriptive in nature and unlikely to have been subjected to internal review (n = 10). The various types of evidence used in the creation of this report are summarized in Figure 5.

c This can be common for power calculations. Authors may have conducted power calculations but not reported that they did so in-text. Assessment is based on what is reported in-text, not what may have been done but not reported.
d See Annex A. Included studies and rigor of evidence for details. Criteria related to random sampling and treatment assignment; reporting of power calculation and sensitivity analysis; consideration of attrition, spillovers, and heterogenous treatment effects; and sample representativeness and baseline balance.

	Peer reviewed	Internal review likely	Review unlikely	Grand total
Non-causal impact assessment	**46**	**9**	**8**	**63**
Quantitative	18	4	1	23
Literature review	9			9
Qualitative	6	1		7
Return on investment and projection studies	6			6
Adoption studies	5	4		9
Project narratives	2		7	9
Impact evaluations	**17**	**2**	**2**	**21**
Rigorous impact evaluations	**35**	**10**		**45**
Grand total	**96**	**19**	**10**	**125**

Table 1: Counts of different types of impact assessment studies and the review mechanisms applied.

Note: The non-causal impact assessments were more variable in approach compared to the impact evaluations, hence we separate the different types of impact assessment in this table. Rigorous impact evaluations are considered those addressing more than two key best practices.

Some studies fall into multiple categories because they used several different methods. Therefore, summing the rows results in a value larger than the total number of studies.

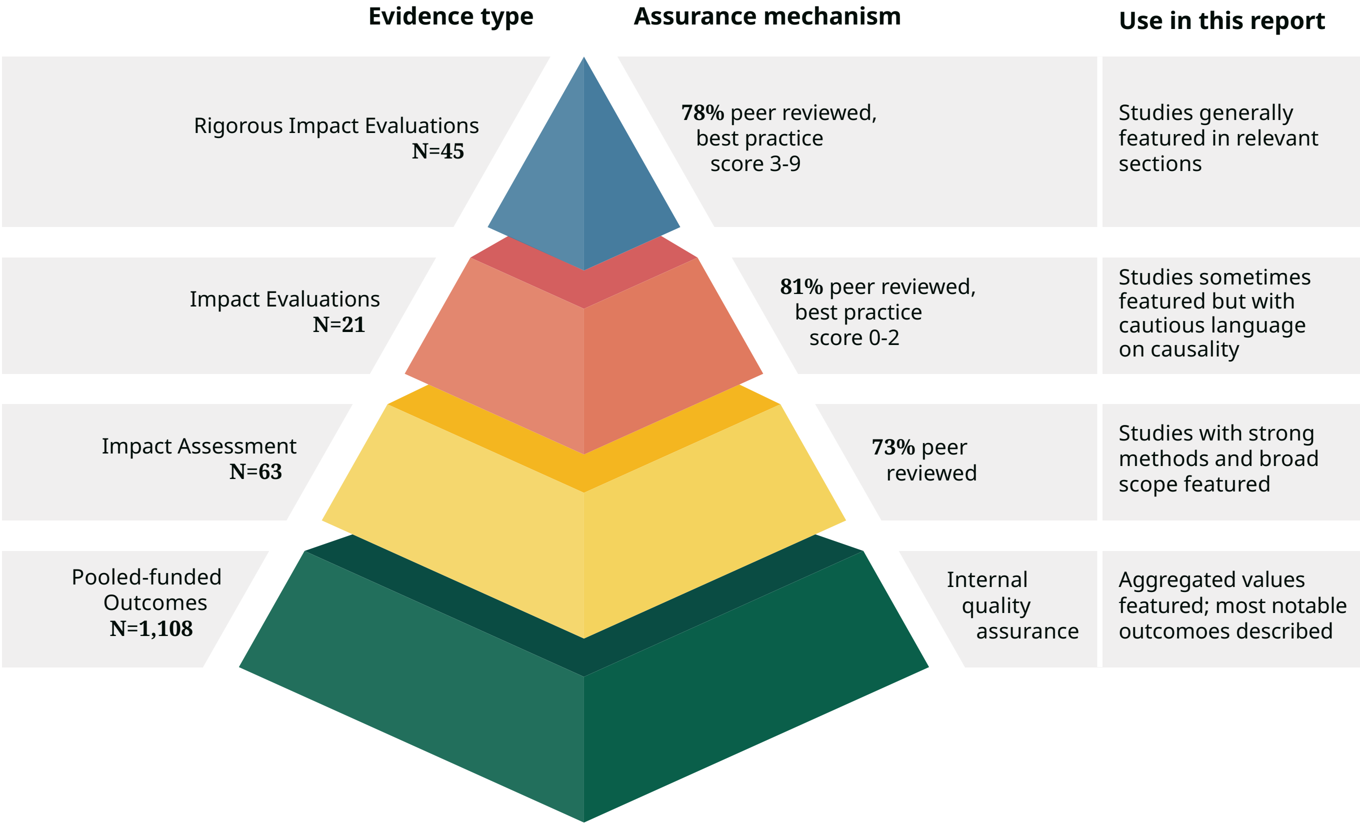

Figure 5: Evidence architecture, including assurance mechanisms and the sue of evidence in the report.

Note that 10 additional outcome reports from non-pooled funded activities were also used, see Additional Outcomes in the References section.

CGIAR
SCIENCE FOR A FOOD-SECURE FUTURE

Impacts and outcomes: **The global view**

Orange-flesh sweet potato vine distribution in Oluch Kimira, Homabay county, Kenya. Photo credit: Muthoni Njiru/ILRI

Extent of the evidence

CGIAR Initiatives reported 1,108 outcomes into PRMS between 2022 and 2024. An additional set of 10 sources provided evidence on outcomes from major bilateral CGIAR projects (see Additional outcomes). These outcomes spanned CGIAR's five Impact Areas and reflected contributions to innovation use, policy change, and other outcomes across 110 countries (Figure 6). These findings collectively highlight CGIAR's role in shaping agricultural and agri-food system innovation and policy globally, with evidence of wide-scale technology use and cross-sectoral influence.

At the impact level, 125 impact assessment studies were published from 2022 to 2024, the large majority authored by CGIAR scientists, with additional studies from SPIA (see Impact assessments). Most impacts stemmed from earlier work but were published during this period. Some studies were based on one- or two-years' worth of data, and other studies were based on data spanning up to four decades (Figure 6). Many of these longer-term studies consider the aggregate effects and net returns of large and longstanding CGIAR work streams. Like the outcomes, measured impacts span all the five Impact Areas, though some Impact Areas are more represented than others.

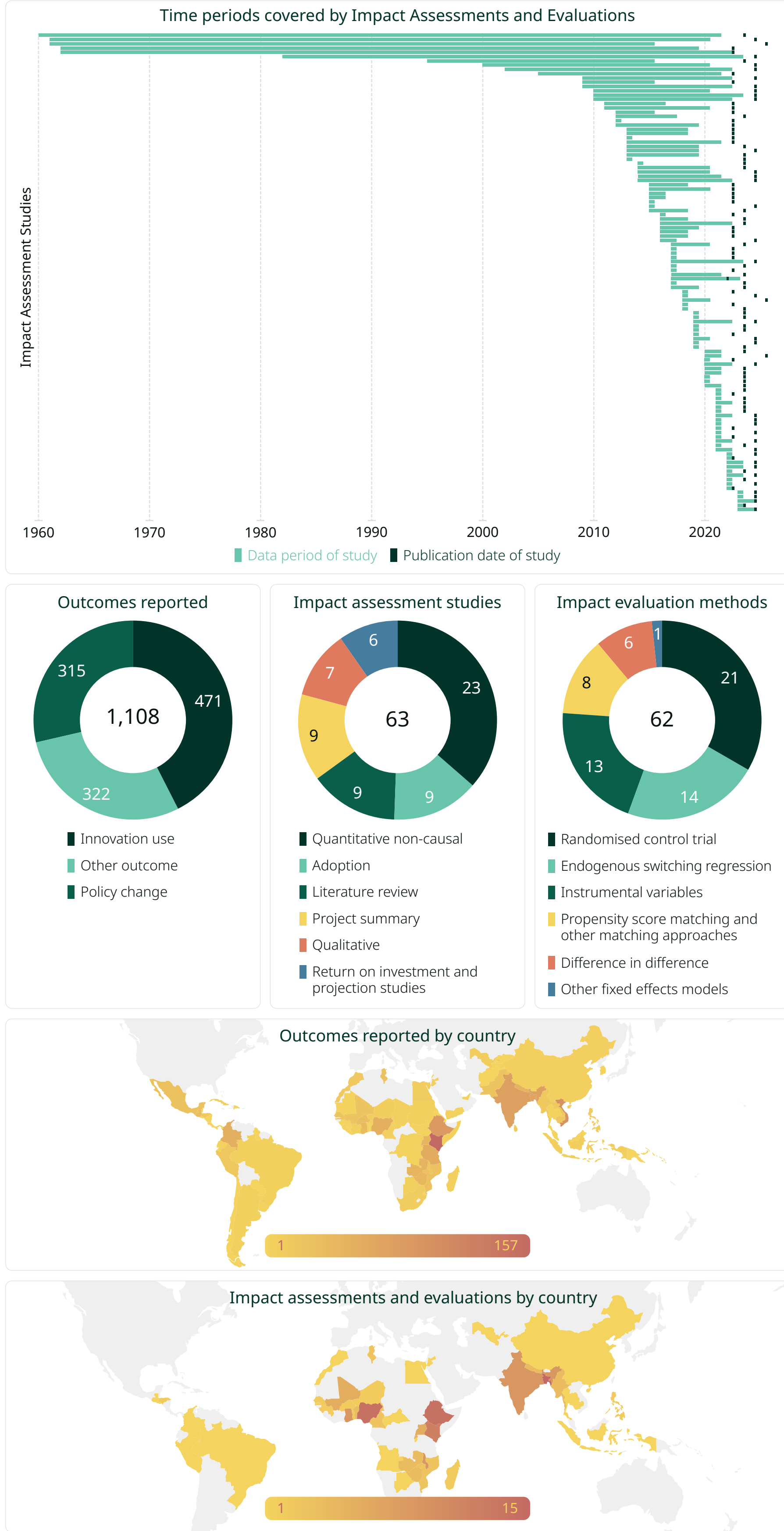

Figure 6. Global evidence base of the impacts and outcomes.

Top panel: 18 impact assessment studies did not specify the dates covered by their data and so are not represented. Where studies used datasets with different time periods for different indicators, each time period is represented by a horizontal bar.

Middle panel: The middle-center panel expresses the methods used by non-causal impact assessment studies, whereas the middle-right panel expresses the methods used by causal impact evaluations. One impact evaluation reported results from both RCT and difference-in-difference methods and hence is included in both categories.

Bottom panel: The map represents 114 impact assessment studies. 11 studies at the global or regional level are not shown, and 12 studies which took place in multiple countries are represented in each country. Most studies were not nationally representative but took place in certain regions or communities.

Technician at work in the ILRI Greenhouse. Photo credit: Susan MacMillan/ILRI

Main findings from impact assessment studies

Recent global-scale studies underscore the breadth and value of CGIAR's work. Fuglie and Echeverria (2024) estimated that, from 2016 to 2020, CGIAR-supported crop improved crop varieties were sown on 190 million hectares[e] across low- and middle-income countries, covering 26% of the land area of those crops.[3] CGIAR-supported pest, water, and soil management techniques were applied to an addition 31 million hectares. This generated US$47 billion annually in economic welfare gains.[3] Building on this, Baldos and colleagues. (2025) found that the adoption of CGIAR-supported technologies contributed to reductions in cropland expansion (9.7-million-hectare reduction), greenhouse gas emissions (2.42 billion metric tons of CO_2e reduction), and biodiversity loss (713 avoided species extinctions) between 1961 and 2015.[6] Krishna and colleagues. (2023) estimated US$1.1 to US$1.6 billion in economic gains from CGIAR-supported maize in 18 African countries in 2015.[4] At that time, 34 percent (9.5 million hectares) of total maize area was cultivated with CGIAR-supported maize varieties released between 1995 and 2015, and an additional 13 percent of the total maize area was cultivated with older CGIAR-supported maize varieties.[4] The net present value of CGIAR-supported rice varieties was calculated to be US$37 billion[5] in the Philippines and Bangladesh from 1990 to 2018, with 6.5 million hectares of rice sown per year (see Rice management for sustainable production).

Two multicountry programs, Africa RISING and Enhancing Food Security in Arab Countries (EFSAC), showed large-scale adoption and productivity gains (see Sustainable land management for farm wellbeing). Africa RISING reached 944,000 households across Ethiopia, Tanzania, Malawi, Ghana, and Mali from 2015 to 2022,[11] while EFSAC benefited 356,000 households directly across Jordan, Egypt, Sudan, Tunisia, and Morocco from 2010 to 2022.[12] Households participating in Africa RISING had higher adoption of sustainable intensification practices and better yields for most target crops than those who did not benefit from the program.[40] Investment in livestock increased in nearly all countries.[40] However, the program did not lead to consistent improvements in nutrition.[40] EFSAC facilitated 1.4 million additional tons of wheat production, estimated to be worth US$446 million.[12]

Outcomes and adoption

Quality-assured outcomes reported by CGIAR pooled-funded portfolio between 2022 and 2024 show that **471 CGIAR innovations were used by 20.1 million farmers**, including 1.5 million adopting a single CGIAR-supported forage variety (PRMS 9926). Innovations were also used by 1,093 policy actors across 62 countries. CGIAR research and innovation informed 315 policies and US$3.3 billion of third-party investment. Supported genebanks distributed 155,000 germplasm samples across 125 countries. CGIAR breeding programs registered 788 new crop varieties, including 565 climate-resilient varieties and 230 biofortified varieties. By 2024, 300 million people had consumed CGIAR-supported biofortified corps.[9]

SPIA country studies published from 2022 to 2024 captured the use of CGIAR innovations at a national scale. These studies provide rich information on the coverage of all CGIAR-supported production technologies thought to have reasonably scaled in the country along with rigorous measurement methods for identifying crop varieties with CGIAR parentage. The studies used nationally representative household samples which, with a few exceptions, enable the estimation of use at population levels. They found that there was significant use of CGIAR-supported technologies and practices among rural households. In Ethiopia, between **5.8 and 11.5 million households** used CGIAR-supported technologies (44-87% of rural households, see Box: CGIAR's work in Ethiopia),[8] while in Viet Nam, between **3.7 and 3.9 million households** used CGIAR-supported technologies (accounting for 28-30% of farming households[47], see Box: CGIAR's work in Viet Nam)[9] and **at least 8 million farming households** used CGIAR-supported technologies in Bangladesh (accounting for 53-63% of farming households[47], see Box: CGIAR's work in Bangladesh).[10]

e. CGIAR-supported crop, pest, and soil management techniques were applied on an additional 31 million hectares.

By the numbers

Outcomes achieved 2022 to 2024

471 CGIAR innovations in use in **62 countries**.

20,114,851 farmers reached with CGIAR innovations from the 2022-2024 pooled-funded portfolio.

1,093 policy actors used CGIAR innovations.

CGIAR partnered with **1,254 organizations** to deliver outcomes, including government, NARES, universities, private companies, and NGOs.

600,859 individuals joined CGIAR **capacity development** sessions.

315 policy changes drawing on CGIAR research.

US$3.3 billion of third-party investment informed by CGIAR research.

Genebanks distributed **155,348 germplasm samples** to 125 countries.

CGIAR breeding programs registered **788 new crop varieties**, including **565 climate-resilient varieties** and **230 biofortified varieties**. (PRMS 347)

Impacts published 2022 to 2024

From 1961 to 2020, **CGIAR crop varieties and related technologies** generated an economic surplus of **US$1.3 trillion**, averaging **US$47 billion per year** from 2016 to 2020.[3]

Reduced cropland expansion over 1961 to 2015 **mitigated 2.42 billion** $\mathbf{tCO_{2eq}}$ and **avoided 713 extinctions**.[6]

CGIAR-improved maize varieties provided an economic benefit of between **US$1.1** to **1.6 billion annually** across 18 African countries in 1995–2015.[4]

CGIAR **rice innovation in Asia** showed **benefit:cost ratios** of between **7:1** (net present value of US$ 3.6 billion) and **115:1** (net present value of US$ 33 billion) depending on the country.[39]

42,737 research articles published 2000–2023, cited 46% more than average in other research, and **cited 300% more than average in policy documents**, placing it firmly within the **top 10 agricultural research organizations worldwide**.

Figure 7: Highlights of the global outcomes achieved 2022 to 2024 and findings of impact assessment studies published 2022 to 2024.

In Uganda, **more than half of maize-growing households** used CGIAR-supported varieties and about one-third of households growing cassava or groundnuts used CGIAR-supported varieties.[46]

Engagement with multilateral processes

CGIAR achieves impact at a global scale through its engagement with global organizations and policy processes. **CGIAR actively participates in international processes** such as the United Nations Food Systems Summits, the United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties (CoP) (PRMS 4361), and the Intergovernmental Panel on Climate Change (IPCC). For example, CGIAR led the 2024 Breakthrough Agenda Report on Reducing Greenhouse Gas Emissions in Agriculture, and CGIAR is hosting the Secretariat of the Alliance of Champions for Food Systems Transformation (ACF), which was launched at Climate COP28. CGIAR's support also extends to regional bodies, as demonstrated by its contribution to the Central American Integration System's Regional Climate Strategy and the policy guidance adopted by the Niger Basin Council of Ministers on water-energy-food-environment nexus approaches.

Furthermore, **CGIAR provides expertise to global bodies**, informing the development of guidelines, strategies, and even international treaties. The Food and Agriculture Organization of the United Nations (FAO) integrated information from CGIAR into their Guidelines on Water Quality in Agriculture (PRMS 8819) and collaborated with CGIAR to develop a monitoring and evaluation framework for the voluntary guidelines on small-scale fisheries (PRMS 10554). The United Nations High Commissioner for Refugees (UNHCR) used CGIAR research in their Strategic Framework on Climate Action (PRMS 10459). CGIAR's Genebanks informed the adoption of supportive text by the Plant Treaty at CoP and the Southern African Development Community (PRMS 4361, 6929). The Convention on Biological Diversity adopted a decision to operationalize multilateral mechanisms for benefit sharing from digital sequence information, which reflected elements CGIAR had advocated for (PRMS 16323).

Shaping the research narrative

A bibliometric study of all 42,737 peer-reviewed articles[f] published between 2000 and 2023 with at least one CGIAR-affiliated author found high levels of influence and leadership in agricultural research, surpassing global averages across multiple citation metrics for quality and quantity of publications.[48] Alignment of research output to the global SDGs was clear, with 17,293 publications meeting the criteria of alignment to SDG 2 Zero Hunger and 20,312 meeting the criteria of alignment to SDG 17 Partnerships for the Goals.

Approximately 80 percent of CGIAR publications were in either Natural Sciences or Applied Sciences, and CGIAR is highly specialized in the fields of Biology; Agriculture, Fisheries and Forestry; Agronomy & Agriculture; and Agricultural Economics and Policy (Figure 8). A full 77 percent of publications entailed international collaboration[g] (significantly higher than the global average) and 60 percent entailed North-South collaborations, which suggests that CGIAR is effective in fostering global research

Climate-smart crops such as improved beans can help farmers manage risks and build resilience. Photo credit: S.Kilungu/CCAFS

partnerships. CGIAR publications have higher than average proportions of female authors (37 percent) and early- to mid-career scientists (78 percent), demonstrating dedication to inclusivity and talent development.

Findings from CGIAR research were cited 46 percent more than the global average, and CGIAR publications were overrepresented among the top 10 percent of highly cited publications, across all Impact Areas. Benchmarking of the citation rates per publication showed that CGIAR was consistently in the top 10 percent of the world's leading institutions with similar specializations; however, other institutions are more frequently among the top 5 percent of most highly cited articles compared to CGIAR. Over recent years, CGIAR publication rates are slowing faster than global averages. Nevertheless, CGIAR published considerably more articles in total than comparable institutions within the subfields of CGIAR's specialization. In addition, **CGIAR's research significantly influenced policymaking, as demonstrated by its high normalized policy citation score** (6.1 compared to a global average of 2.0), indicating that its findings are utilized by policymakers in shaping agricultural policies and practices.

f This review was limited to articles, reviews, and conference papers indexed on Scopus.
g International collaboration is achieved when studies have authors from at least two countries.

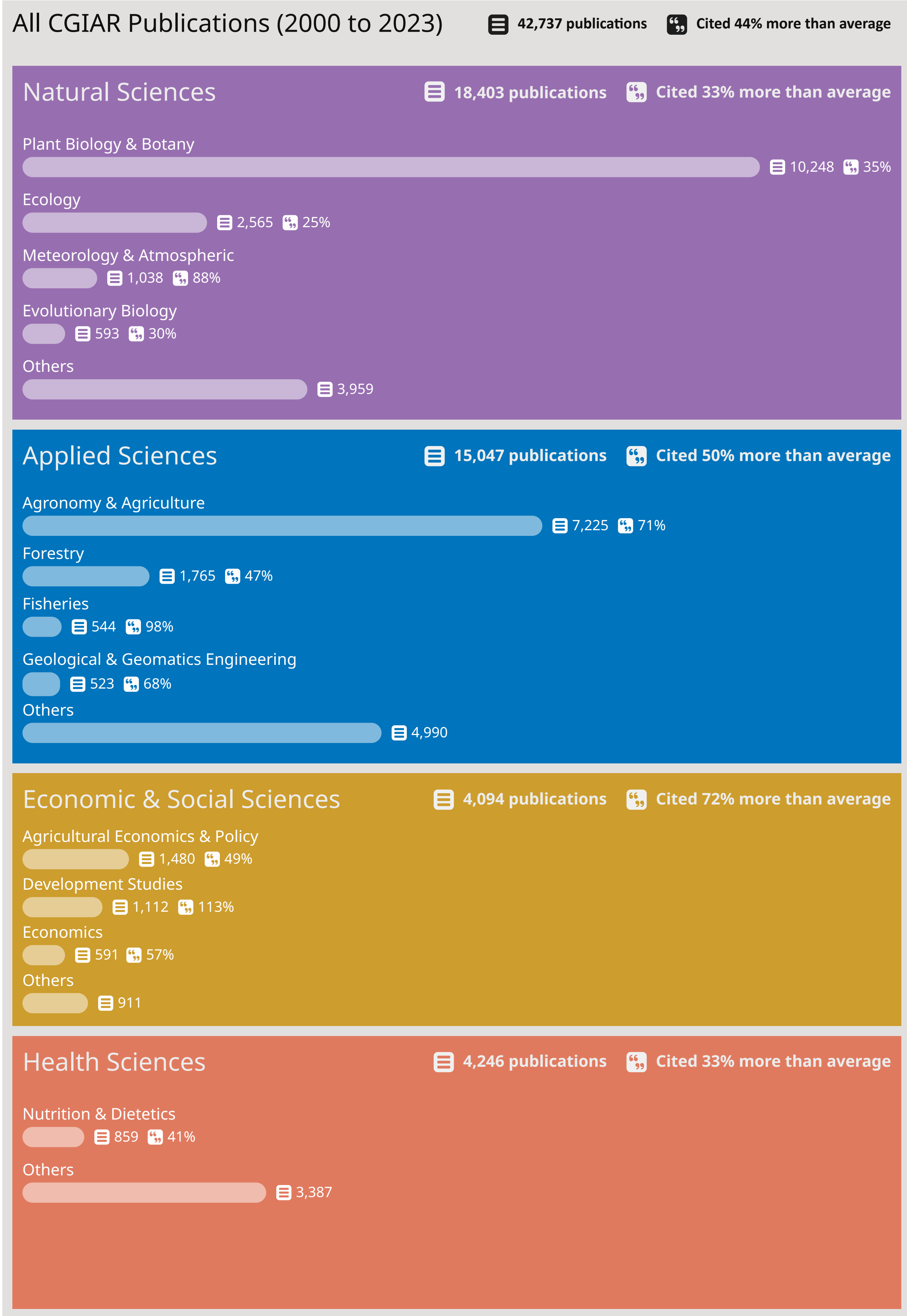

Figure 8: Themes of CGIAR publications from 2000 to 2023.[48]

Impacts and outcomes by Impact Area

In the following sections, we present evidence of the real-world impacts of CGIAR-supported interventions for each CGIAR Impact Area. Each section starts with an overview of current challenges and CGIAR's work in that Impact Area. We then summarize the evidence identified pertaining to the Impact Area. Each Impact Area section focuses on the evidence of impact or outcomes on three to four types of work that CGIAR conducts in that Impact Area. Each section concludes with reflections on areas for future attention in evidence generation to inform decision-making and increase impacts going forward.

The five Impact Areas focus CGIAR's contributions toward the global SDGs, corresponding primarily to SDG 1 No Poverty, SDG 2 Zero Hunger, SDG 5 Gender Equality, SDG 13 Climate Action, and SDG 15 Life on Land. CGIAR also contributed to outcomes aligned to various other SDGs, including SDG 6 Clean Water and Sanitation, SDG 8 Decent Work and Economic Growth, and SDG 12 Responsible Consumption and Production. In most cases, contributions are not measured using SDG indicators but are conceptually aligned. Given CGIAR's significant involvement in fostering partnerships, knowledge exchange, and capacity sharing, significant contributions were also made toward SDG 17 Partnerships for the Goals.

- **Poverty reduction, livelihoods and jobs**
- **Nutrition, health and food security**
- **Climate adaptation and mitigation**
- **Gender equality, youth and social inclusion**
- **Environmental health and biodiversity**

Preparing maize kernels in Danghesta village, Dangila district, Amhara region, Ethiopia. Photo credit: Mulugeta Ayene/WLE

SCIENCE FOR A FOOD-SECURE FUTURE

Poverty reduction, livelihoods, and jobs

1 NO POVERTY

Empowering entrepreneurs to create a future of employment and self-reliance in Uganda. Photo credit: Karin Bridger/USAID

The context

Fisherman in Mongu Harbour, Zambia. Photo credit: Anna Fawcus/WorldFish

The vast majority of people living in extreme poverty today live in rural areas[49] and, therefore, it is no surprise that inclusive agricultural development is two to three times more effective at reducing poverty than investment in other sectors.[49] Agricultural development also addresses other needs such as food security and, indirectly, health and education.[49]

CGIAR supports poverty reduction, livelihoods, and jobs by developing and bundling innovations that are attractive to poor smallholder farmers and by conducting policy research and engagement across food systems to enhance access to resources, knowledge, finance, and markets, thereby improving agricultural policies, social protection programs, and employment opportunities.[50] It develops tools to help interventions successfully reach and address the unique needs of the poor and most vulnerable. **CGIAR's solutions aim to strengthen resilience, risk management, and competitiveness**, particularly benefiting small-scale farmers, women, and youth. CGIAR innovations include productive and resilient crop varieties and livestock and fish breeds for farmers, as well as innovations that improve market access and value chains and reduce risks in agrifood systems for small- and medium-sized enterprises. In this way, much of CGIAR's work on poverty reduction also supports sustainable agriculture and resilient food systems.

By the numbers

Outcomes achieved 2022 to 2024	Impacts published 2022 to 2024
221 policy changes made drawing on CGIAR research.	From 1961 to 2020, CGIAR technologies generated an average economic surplus of **US$47 billion per year** from 2016 to 2020.[3]
US$2.9 billion of third-party investment informed by CGIAR research.	**CGIAR-improved maize** varieties provided an economic benefit of **US$1.1** to **1.6 billion** across 18 African countries in 2015.[4]
356 CGIAR innovations in use in **60 countries**.	
19,760,529 farmers reached with CGIAR-informed innovations.	

Figure 9. Highlights of outcomes achieved 2022 to 2024 and findings of impact assessment studies published 2022 to 2024 for the poverty reduction, livelihoods, and jobs Impact Area.

Evidence on poverty reduction, livelihoods, and jobs

There were 79 impact assessments of CGIAR interventions to support poverty reduction, livelihoods, and jobs published from 2022 to 2024. These were concentrated in Bangladesh and Nigeria. The highest number of quality impact evaluations took place in India and Nigeria. Studies generally focused on the effect of agricultural interventions on yield and/or income. Given the number of studies identified, our discussion focuses on income as a common and integral indicator linked to poverty reduction, livelihoods, and jobs.

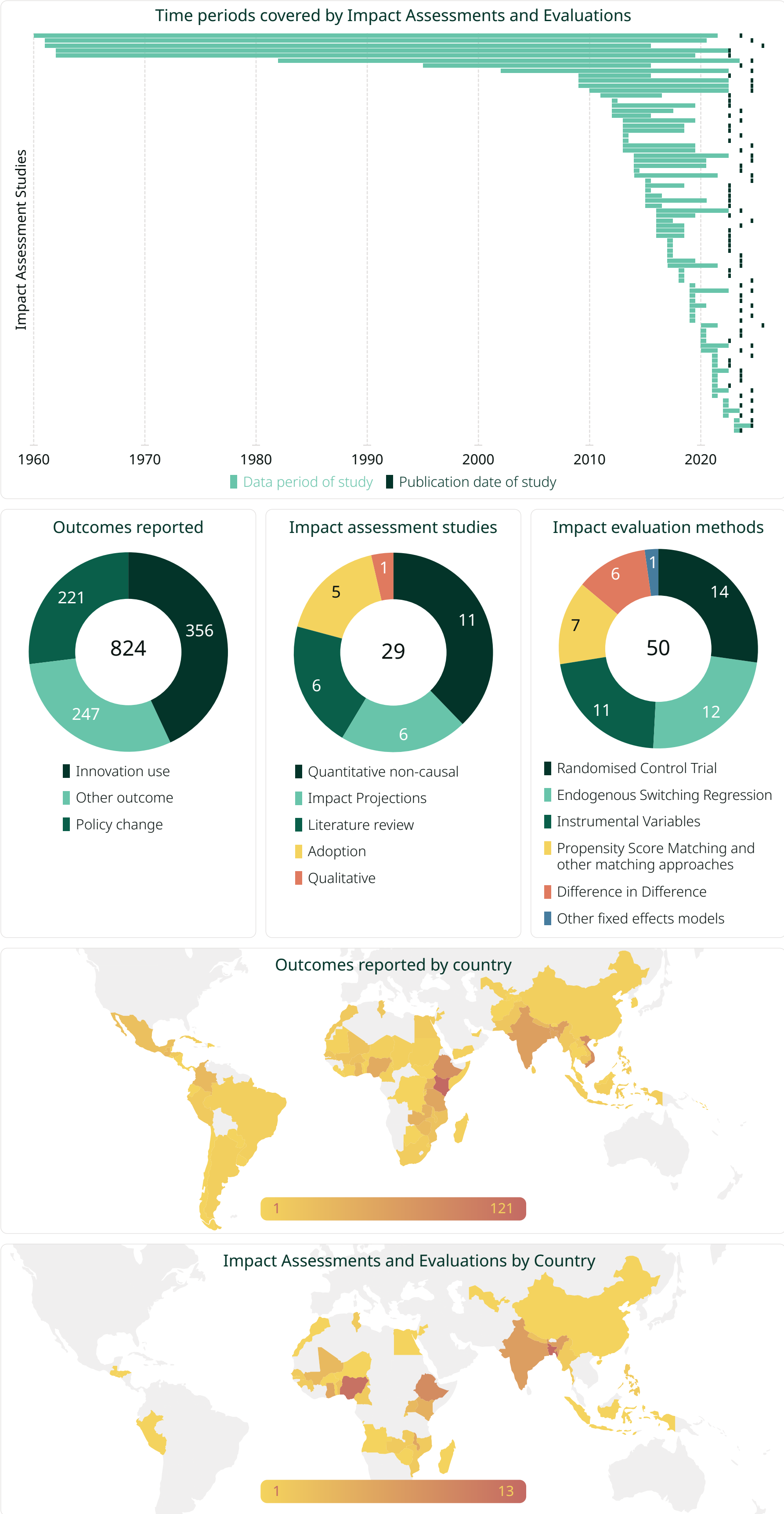

Figure 10. Evidence base of the impacts and outcomes for the poverty reduction, livelihoods, and jobs Impact Area.

Top panel: Four impact assessments did not specify the dates covered by their data and so are not represented. Where studies used datasets with different time periods for different indicators, each time period is represented by a horizontal bar.

Middle panel: The middle-center panel expresses the methods used by non-causal impact assessment studies, whereas the middle-right panel expresses the methods used by causal impact evaluations. One impact evaluation reported results from both RCT and difference-in-difference methods and hence is included in both categories.

Bottom panel: The map represents 70 impact assessment studies. Nine studies at the global or regional level are not shown, and six studies which took place in multiple countries are represented in each country. Most studies were not nationally representative but took place in certain regions or communities.

Precision measurements for soil nutrient management when establishing coffee crops in Central America. Photo credit: Daniela Arce/CIAT

Sustainable intensification for inclusive income growth

Agriculture is increasingly expected to deliver multiple impacts, including more favorable environmental outcomes; however, productivity and income gains for farmers remain as vital as ever, especially in Africa.[h] Based on evidence from **1995 to 2015, CGIAR-improved maize varieties provided an economic benefit of US$1.1 to US$1.6 billion across 18 African countries in 2015.**[4] Globally, from 2016 to 2020, **CGIAR-supported crop technologies accounted for US$47 billion of annual economic welfare gains each year.**[3] From 2022 to 2024, 26 studies were published suggesting that CGIAR agricultural interventions contributed to improvements in income and 28 studies were published showing CGIAR agricultural interventions were related to increased yield. However, further meta-analysis would be necessary to reach conclusions regarding the average effects of CGIAR interventions. Across Ethiopia, Uganda, and Viet Nam, most CGIAR innovations were adopted at similar rates by wealthier and poorer families, indicating that CGIAR innovations are attractive to poor households at least as much as wealthier ones.[8,9,46]

CGIAR successes in Tanzania and Nigeria demonstrate how sustainable agricultural intensification[i] can increase income and welfare. In Tanzania, adopting CGIAR-supported soil and water conservation techniques increased household income by 7 percent and food security by 41 percent (see Nutrition-sensitive intensification for resilient diets).[85] However, effects were larger among wealthier households. Providing Nigerian farmers with site-specific nutrient management recommendations and information on expected returns improved the proportion of farmers who adopted optimal fertilizer use and increased income over the two-year program period.[52] Also in Nigeria, access to cold storage for market agents reduced horticulture crop loss by 11 percentage points and increased their revenue by 69 percent, thus strengthening value chains and offering high income potential for smallholders.[17]

h Productivity of major staple crops stagnated or decreased across Ethiopia, Malawi, Mali, Niger, Nigeria, and Tanzania from 2008 to 2019.[51]
i Defined as the increase in production of agricultural commodities while decreasing or holding constant the amounts of inputs required so that the social, environmental, and economic costs of production decrease.

Targeting social protection for the most vulnerable

CGIAR research played a pivotal role in informing the design and delivery of World Food Program (WFP) policies and interventions, particularly in Africa (PRMS 18678, 18708). CGIAR's work focused on optimizing financial and food resource allocation, improving livelihood outcomes, and ensuring long-term resilience in vulnerable communities.

CGIAR provided the WFP with data to understand community needs and strengthen aid prioritization in fragile and conflict- and migration-affected communities. For example, the WFP leveraged CGIAR's research on fragility, conflict, and migration in its community-based targeting of aid in Ethiopia to ensure that it reached those most in need while enhancing the safety and effectiveness of delivery (PRMS 19108). CGIAR and the WFP developed a dataset covering 400,000 households across the Sahel to understand the interaction between shocks—political violence, food price anomalies, and climate stressors—and household food security responses. **Leveraging CGIAR-supported data, the WFP adjusted its policies and interventions to support more effective, evidence-based programming in fragile contexts.** This research also informed the development of targeted food security assessments, allowing for the identification of at-risk populations (PRMS 18708).

CGIAR and the WFP **collaborated with the governments of Kenya and Somalia to improve the allocation of their social protection programs** (PRMS 19128, 18701). In Kenya, they leveraged real-time data for coordination and improved resource mobilization, leading to increased funding while building institutional capacity (PRMS Policy 19128). In 2024, the program in Somalia covered 1.2 million individuals and prioritized the specific needs of vulnerable populations, such as mothers with children under five (PRMS 18701).

Improved income through aquaculture

Aquaculture has the potential to increase income and access to a nutritious diet. CGIAR works with farmers to help them improve their small-scale aquaculture businesses so that they can provide nutritious food for themselves and their communities. In Bangladesh, **CGIAR's training-of-trainers intervention taught local service providers to function as extension agents and successfully improved famers' incomes by more than 40 percent** (US$777 per hectare).[15] Sustainable pond water management and chemical fertilization in Myanmar increased fish productivity by 25 percent and income by 9 percent.[53] After participating in a two-year program to improve aquaculture management practices, total household income increased by approximately US$708 in 2019 for participants in Shan State, Myanmar; however, the results were not statistically significant in Sagain Region.[54]

CGIAR also works with the private sector and governments to support local aquaculture systems. In Zambia, more than 40,000 farmers benefited from a CGIAR private-sector accelerator grant, which provided them with access to fingerlings and premium-priced fish markets while supporting the adoption of improved fishpond designs resilient to drought and flood, and providing regular weather updates to support pond management planning (PRMS 2482). CGIAR worked with a private-sector company to transfer more than 50,000 genetically improved farmed tilapia to Nigeria, where they were raised and distributed to small hatcheries and farmers (PRMS 2328). CGIAR's work on aquaculture influenced national aquaculture policies in Nigeria, Ghana, and Egypt, suggesting the possibility of widescale impact (PRMS 2492, 3529, 16063).

Areas for future attention

Most impact assessments measuring productivity or income were based on cross-sectional observational data. Although study authors employed techniques to overcome that limitation, in the future it will be important to have more experimentally designed studies or use panel observational studies to better attribute impacts to innovations. On productivity itself, almost all the studies measured land productivity (that is, yield). Other productivity measures, such as labor productivity or total factor productivity, were far less common. Thematically, economic impact assessments of livestock systems were also limited. A few studies looked at variation in adoption and impacts by farmer poverty levels, but more evidence would help to determine whether CGIAR innovations are reaching and impacting the poor. Most studies consider short time periods, which are insufficient to determine whether interventions truly lifted people out of poverty or only temporarily increased income.

A farmer carries a wooden plough out to his fields with two oxen near Wenchi town, in the Ethiopian highlands. Photo credit: Stevie Mann/ILRI

CGIAR
SCIENCE FOR A FOOD-SECURE FUTURE

Nutrition, health, and food security

2 ZERO HUNGER

Children eating a meal at their school in southern Madagascar. The dry season was made worse by drought related to the El Nino weather pattern. Photo credit: Sven Torfinn/Panos Pictures

The context

Increasing urbanization, changing consumption patterns, market concentration in the agrifood system, environmental degradation, climate change, geopolitical instability, and growing inequalities are all eroding dietary diversity and contributing to poorer nutrition outcomes globally.[55] Conflicts and supply chain disruptions in conflict-affected areas strain already fragile systems.[55,56] Rapid urbanization drives demand for affordable, nutritious diets while amplifying the "dual burden" of undernutrition and obesity. More than 40 percent of urban populations in low- and middle-income countries lack access to healthy diets, worsened by the availability of ultra-processed foods.[56]

Innovative technologies and shifting global health priorities have the potential to overcome these negative forces and support a nutritious, sustainable, and resilient agrifood system.[55] Public policies, particularly subsidies for healthy foods and restrictions on the marketing and sale of unhealthy foods (such as food and drinks high in sugar), trade policies, and public procurement programs (such as school meal programs) can support diverse and resilient agrifood systems, but best practices in their design and implementation remain uncertain.

CGIAR works across the food system to support nutrition, health, and food security by advancing research, innovation, and policy solutions that promote sustainable, healthy diets. It provides evidence-based options for improving diets through food system interventions targeting consumer behavior, urban markets, and social protection. By accelerating agronomic, livestock, and fishery innovations, CGIAR aims to enhance dietary diversity, food safety, and resilience while addressing zoonotic diseases and antimicrobial resistance. Its research spans diverse food and farming systems, including vegetables, insects, and urban agriculture, emphasizing affordability and perishability. Additionally, CGIAR prioritizes dietary diversity and quality by breeding nutrient-dense crops, improving livestock and fish productivity for animal-source foods (see Enhancing nutrition, productivity, and resilience with livestock), supporting safe food processing and storage, and providing nutrition information. CGIAR actively engages with relevant international actors and initiatives as the United Nations Food Systems Summit process, Nutrition for Growth, Climate Change CoP, UN-Nutrition, and the Scaling-up Nutrition (SUN) Movement.

Livestock supply nutrient-dense foods to the world's poor, and the sale of animal products also serves as a major source of income. Photo credit: Stevie Mann/ILRI

By the numbers

Outcomes achieved 2022 to 2024	Impacts published 2022 to 2024
162 policy changes made drawing on CGIAR research.	In Tanzania, the adoption of tied ridging and terracing **increased household dietary diversity by 43%**, likely through increased production and income.[85]
US$2.5 billion of third-party investment informed by CGIAR research.	In Nigeria, solar-powered cold storage **extended the time food remained fresh by 8 days** and **reduced the share of value lost by 11 percentage points**.[17]
254 CGIAR innovations in use in **55 countries.**	
3,626,717 farmers reached with CGIAR-informed innovations.	

Figure 11. Highlights of outcomes achieved 2022 to 2024 and findings of impact assessment studies published 2022 to 2024 for the nutrition, health, and food security impact area.

Evidence on nutrition, health, and food security

There were 51 impact assessments of CGIAR-supported interventions across Asia, Africa, and Latin America published from 2022 to 2024 that considered nutrition, health, and food security, with studies concentrated in South Asia and sub-Saharan Africa. The more rigorous impact evaluations occurred in Latin America and South Asia. Studies often focused on the effects of integrated farming systems on staple crop (such as maize, rice, legumes) production. Aquaculture and biofortified varieties (such as orange-fleshed sweet potato, high-zinc rice) were also commonly evaluated in Asia and Africa. Most studies considered food security outcomes, such as household dietary diversity, food consumption scores, and the Household Food Insecurity Access Scale. About one-quarter of the studies also considered income or yield, largely evaluating how nutrition interventions affected these outcomes.

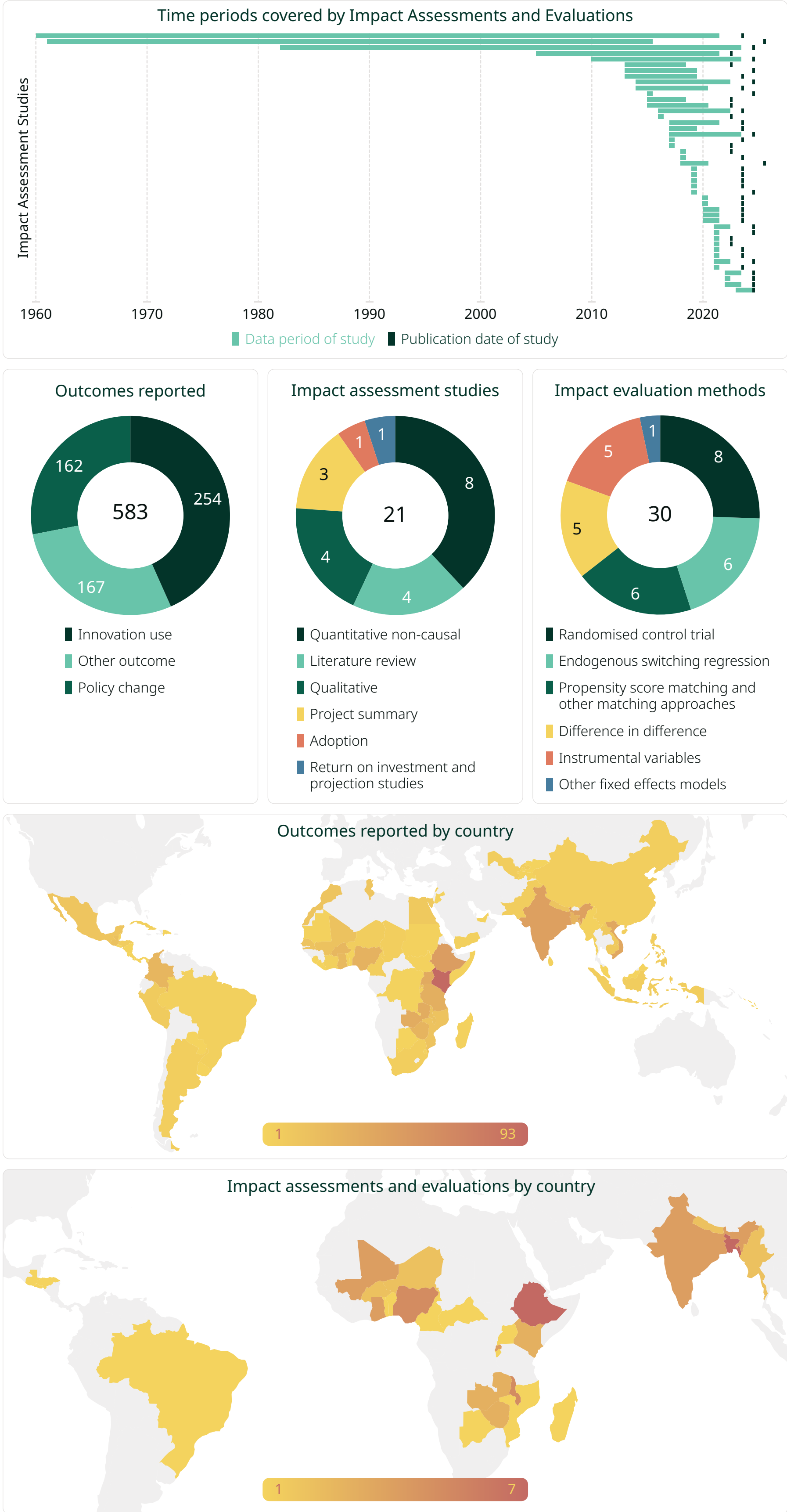

Figure 12. Evidence base of the impacts and outcomes for the nutrition, health, and food security Impact Area.

Top panel: Eight impact assessments did not specify the dates covered by their data and so are not represented. Where studies used datasets with different time periods for different indicators, each time period is represented by a horizontal bar.

Middle panel: The middle-center panel expresses the methods used by non-causal impact assessment studies, whereas the middle-right panel expresses the methods used by causal impact evaluations. One impact evaluation reported results from both RCT and difference-in-difference methods and hence is included in both categories.

Bottom panel: The map represents 46 impact assessment studies. Five studies at the global or regional level are not shown, and five studies which took place in multiple countries are represented in each country. Most studies were not nationally representative but took place in certain regions or communities.

Biofortification and improved crops

Farming biofortified and improved crops could support local nutrient production and access, insulating families from the harmful nutritional effects of disruptions in the agrifood system. This pathway was well demonstrated through a series of studies in Nigeria. There, adopting improved groundnuts increased their consumption by 13 percent and improved food security.[57] Adopting improved cowpeas was associated with increased consumption of cowpea by 46 percent,[58] and cultivating stress-tolerant maize[j] was associated with improved food security.[59] As of 2021, 3 to 5 percent of Nigeria's 40 million women ages 15 to 49 reported that they consumed biofortified cassava and sweet potato, and 14 percent consumed biofortified maize in the previous 30 days.[60]

Given that smallholder farmers eat what they produce across much of the world, HarvestPlus worked to increase access to biofortified seeds as a means of improving dietary quality. From 2010 to 2024, HarvestPlus supported the release of 458 biofortified and improved crop varieties across 40 countries.[7] **Partners of HarvestPlus catalyzed public-, private-, and farmer-led seed businesses to produce nearly 273,000 metric tons of biofortified seeds of grain crops across Africa and Asia in 2024 alone and millions of households accessed or planted these seeds.**[k,7] An additional 5.7 million bundles of vitamin A cassava was produced in the same year. As many as 300 million individuals have consumed biofortified foods they produced or purchased through markets.

CGIAR takes a systems approach to expanding access to biofortified and improved crop varieties. By integrating breeding innovations with farmer training, postharvest support, and nutrition education, CGIAR seeks to support widespread adoption of nutrient-rich crops, strengthening food security and resilience. For example, sweet potato vine dissemination, participatory farm trials, nutrition sensitization, and postharvest training in Malawi increased the planting of orange-fleshed sweet potatoes among participants and non-participants alike.[61] Training women farmers on the use of high-zinc rice and nutrition increased the adoption of high-zinc rice.[62] More than 617,000 people were trained on the production of biofortified crops through face-to-face or contact training in 2024.[7] Nearly 60 million additional people were provided technical information to strengthen production and utilization of biofortified crops through the use of digital and other media, such as radio.[7]

Influenced by CGIAR's advocacy efforts, 24 countries now include biofortification in national nutrition, food security, or school feeding strategies.[7] The African Union has a declaration on scaling food fortification and biofortification[63] and the Kampala Declaration on building resilient agrifood systems includes a specific activity for the promotion of nutrient-rich and biofortified foods.[64]

Fish powders

Fish powder made from micronutrient-rich small fish has been incorporated into India's Integrated Child Development Scheme and Timor-Leste's school food programs to improve child nutrition outcomes. In Assam, India, CGIAR conducted a series of mass awareness programs to increase the consumption of small fish rich in micronutrients. In 2022, small fish powder was included in the Integrated Child Development Scheme Supplementary Nutrition Program, known locally as Matsya Paripusti. The following year, approximately 1,000 preschool children (ages 3–6) and 2,300 lower primary children (ages 7–10) consumed small fish powder three times per week in India (PRMS 3525). Then, in 2024, the Kamrup district administration, with technical support from CGIAR, submitted a proposal to the government of India that sought to expand the program, aiming to combat malnutrition, improve cognitive and physical development, and align with national food security goals. In Timor-Leste, 35,000 school children were supplemented with more than 6 tons of fish powder in 2023 alone (PRMS 9281).

j This study considered a range of maize varieties that were resilient to stresses such as *Striga*, drought, and poor soil fertility.
k Note that there are some differences in estimates between currently published values and those under development but not yet published. Here, we cite published values and will consider how to bring these into alignment with revised estimates when they are published.

Improved avocado varieties have been established in the Ethiopian highlands. Photo credit: Apollo Habtamu/ILRI

Nutrition-sensitive intensification for resilient diets

Land degradation, erratic rainfall, and low soil fertility threaten stable food production, caloric sufficiency, and dietary diversity. In contrast, healthy soil and water access enable more diverse on-farm production (see Sustainable intensification for inclusive income growth), supporting improvements in dietary diversity and micronutrient intake. CGIAR supports climate-smart and sustainable agricultural intensification to improve environmental, climate, and nutrition outcomes simultaneously, with notable effects on nutrition. In Zambia, adoption of sustainable intensification practices, such as minimum tillage and rotation, was related to increased household dietary diversity, likely due to increased production diversity and crop diversity.[65] **In Tanzania, the adoption of tied ridging and terracing increased household dietary diversity by 43 percent, likely through increased production and income.**[85] Participatory farming research supporting integrated soil fertility management in northern Tanzania was associated with a 216 percent rise in per capita protein production and an increase in calorie availability by 139 percent.[66] An intervention supporting maize, legume, and livestock production in Malawi increased household dietary diversity, while a similar intervention in Tanzania avoided almost a full month of food shortfall and lowered stunting prevalence by 16 percent.[40] However, other nutrition indicators did not change in response to these interventions and similar interventions in Mali and Ghana failed to achieve statistically significant changes in nutrition. These variable findings demonstrate that the relationships between production interventions and consumption impacts are complex and context dependent.

CGIAR leverages agricultural extension programs and business initiatives to provide farmers with sustainable agricultural intensification messages and ways to improve nutrition. In 2024, CGIAR used digital technology to reach almost 22,000 farmers with information and decision-making tools supporting sustainable agriculture and nutrition outcomes across Guatemala, India, Nigeria, Tanzania, and Ghana (PRMS 17420, 18090, 15944, 10256, 10362, 18290). Some of CGIAR's efforts combined digital extension tools with in-person training to support sustainable agricultural intensification and nutrition, such as work in Ethiopia that reached 11,068 farmers in 2024 (PRMS 1151). The same year, CGIAR reached almost 16,000 farmers across Zambia and Malawi with an accelerator grant to support climate-smart aquaculture businesses across those countries (PRMS 2482).

Postharvest storage, food safety, and One Health

Effective and safe food storage, processing, and market-level hygiene can foster consumer trust, reduce economic losses, and unlock safer diets for both rural and urban populations. Foodborne disease is a major public health risk in low- and middle-income countries, comparable in scale to malaria[67] and is a key intervention point to improve human nutrition. The One Health approach recognizes the interconnectedness of human, animal, and environmental health and takes an integrated stance on planetary health. In doing so, it prioritizes safe and effective postharvest food storage and hygiene to maintain the nutritional value of food while mitigating the environmental impacts of the agrifood system.

CGIAR-supported postharvest processing and storage interventions improved food security and safety across sub-Saharan Africa. Solar-powered cold storage extended the time food remained fresh by eight days and reduced the share of value lost by 11 percentage points in Nigeria.[17] Aflatoxin control measures were associated with reduced food contamination.[68] Effects of the provision of hermetic bags and training on food storage varied, with the storage of food intended for market increasing while the storage of food for own consumption remained the same.[69] Some of these approaches were widely adopted, with nearly 300,000 farmers using CGIAR-supported aflatoxin control measures across Africa in 2023 (PRMS 3351, 3380, 3386, 3428, 3445, 3674, 3688, 3690, 3771). Maize, groundnuts, and sorghum treated with these measures have lower contamination than untreated crops.[68]

CGIAR works with governments to support the implementation of One Health. One Health Units supported by CGIAR bring government human-health, animal-health, and natural-resource officers together at common service points or along scheduled pastoral routes to deliver integrated care for people, livestock, and rangelands. By pooling staff from multiple sectors, One Health Units reach vulnerable pastoralist and agropastoralist communities that conventional services seldom cover, offering synchronized treatment, vaccination, water, and environmental-protection support in a single visit (PRMS 11887). To facilitate the widespread implementation of food safety policies, CGIAR worked with the governments of Viet Nam and Ethiopia to develop and implement food safety interventions and policies through Food Safety Technical Working Groups (PRMS 11609).[70] As a simple example of how food safety interventions can work, training on food safety in markets was related to improved self-reported behaviors of vendors[71,72] and consumers.[73]

Nutrition education and behavior change for healthier communities

Although CGIAR's nutrition-sensitive agricultural interventions have been effective at improving nutrition, nutrition-specific educational and behavior change interventions remain useful to support healthy food choices. Effective integrated interventions sometimes include nutrition education components to ensure that improvements in food production or increases in income are accompanied by improvements in food consumption. In Kenya, a trader-focused training program on orange-fleshed sweet potatoes, combined with maternal nutrition outreach, increased orange-fleshed sweet potato consumption by 1.4 days per month among vulnerable households.[74] In Myanmar, farmer training programs that integrated better pond management with nutrition education increased weekly fish consumption by 1 kilogram and improved household food consumption scores.[54] In India, distributing millet–pulse–groundnut mixes with maternal nutrition counseling was associated with a nearly 2-kilogram increase in child weight gain and improvements in height, mid-upper arm circumference, and hemoglobin levels.[75]

In Uganda, CGIAR took its behavior change communication work to scale. It worked with the Ministry of Health to integrate information on animal source foods into Ministry-supported behavior change communication materials (PRMS 17635). Then, 927 community health workers were trained to use the materials and 2,160 farmers were provided with nutrition education using these materials (PRMS 17628).

Areas for future attention

CGIAR works across the food system, from food production to processing and storage and then consumer behavior to support nutrition, health, and food security. A few studies have shown some positive associations between sustainable agricultural intensification and nutrition outcomes; however, additional impact assessments to better understand the mechanisms and conditions under which these positive impacts occur are needed. In addition, few impact assessments considered interventions that affect the food environment with the goal of affecting food choices and consumption.

Long-term evaluations that follow cohorts beyond the intervention window and include biochemical markers to confirm reductions in micronutrient deficiencies remain scarce, as do studies of food-safety and foodborne-disease outcomes. Instead, studies often evaluated immediate nutrition outcomes, such as dietary diversity and consumption, but did not consider nutritional status, health, and wellbeing. More work is also needed to understand how proven interventions can be integrated into policy and scaled. National policy reforms to which CGIAR has contributed have seldom undergone rigorous impact evaluation, leaving a critical evidence gap. In addition, there is relatively little work in LAC.

Climate mitigation and adaptation

13 CLIMATE ACTION

A farmer tends to his sorghum crop in Kenya. Sorghum is a versatile and drought-tolerant crop, useful in adapting to climate change. Photo credit: Chris de Bode/CGIAR

The context

High temperatures, erratic rainfall, droughts, floods, and rising sea levels threaten global food production, livelihoods, and nutrition. A 2°C increase in global temperatures is expected to result in almost 200 million more people facing hunger by 2050. If the increase reaches 4°C, nearly 2 billion additional people will experience hunger.[76] Rising temperatures and shifting weather patterns are increasing pest and disease pressure on the agrifood system.[76] Smallholder farmers, who often rely on rainfed agriculture, are especially vulnerable to climate shocks.[77] Simultaneously, agrifood systems produce globally significant amounts of greenhouse gas emissions—yet they could be a global carbon sink. Supporting vulnerable small-scale producers to adapt to climate change and to reduce greenhouse gas emissions from agrifood value chains is essential for sustaining food systems and ensuring food and nutrition security.

To mitigate the agrifood system's effect on climate while also adapting to climate change's effects on the agrifood system, **CGIAR aims to facilitate a shift to sustainable agricultural practices that balances productivity, conservation, and resilience**. The organization helps farmers adapt to climate change by developing, testing, and scaling climate-smart agriculture, agro-climate information services, locally appropriate extension advice, financial services, and digitally enabled delivery models. CGIAR's breeding programs develop climate-resilient crops that improve food production during droughts, floods, and heatwaves.[77] These mitigate the negative effects of the agrifood system on the climate by developing and disseminating low greenhouse gas emission practices and technologies that enable farmers and food value chain actors to reduce emissions while increasing production efficiency.[77] Such practices and technologies include crops that use nutrients more efficiently, animal management practices that reduce greenhouse gas emissions, sustainable intensification, and food loss and waste reduction.

CGIAR also supports climate strategies and policies from local to global levels. CGIAR provides tools, metrics, and evidence to support national adaptation plans and nationally determined contributions. CGIAR engages with global processes, such as the UNFCCC negotiations and its CoP meetings, the IPCC reports, and greenhouse gas emission measurement guidelines. CGIAR led the 2024 Breakthrough Agenda Report on Reducing Greenhouse Gas Emissions in Agriculture.[13]

By the numbers

Outcomes achieved 2022 to 2024

247 policy changes made drawing on CGIAR research.

US$3.3 billion of third-party investment informed by CGIAR research.

363 CGIAR innovations in use in **62 countries**.

15,013,313 farmers reached with CGIAR-informed innovations.

565 climate-resilient crop varieties developed with CGIAR support. (PRMS 347)

Impacts published 2022 to 2024

CGIAR technologies reduced greenhouse gas emissions by **2.24 billion metric tons of CO_2** equivalents from 1961 to 2015.[6] This is 5.3% of total greenhouse gas emissions for 2019.

Climate-resilient rice were associated with yield improvements of approximately **20 percent** in India and Nepal.[18,19]

Across Mali, Malawi, Tanzania, and Ghana, the adoption of a package of improved farm management techniques, including climate-smart approaches, **improved many measures of income and yield.**[40]

Figure 13. Highlights of outcomes achieved 2022 to 2024 and findings of impact assessment studies published 2022 to 2024 for the climate mitigation and adaptation impact area.

Evidence on climate mitigation and adaptation

There were 32 impact assessments of CGIAR-supported climate mitigation and adaptation interventions published between 2022 and 2024. The most impact evaluations took place in Nigeria, and the highest quality impact evaluations were in Nigeria and Kenya and Ethiopia. Studies focused on the effects of climate-stress-tolerant crop varieties used on farm, usually reporting changes to yields and income. A small number of studies considered the effects of farm management techniques (such as agronomy, soil and water managent, and input use) on climate outcomes. A third body of literature focused on the effects of behavioral and financial interventions to reduce the risk of catastrophic climate shocks, such as drought or crop failure.

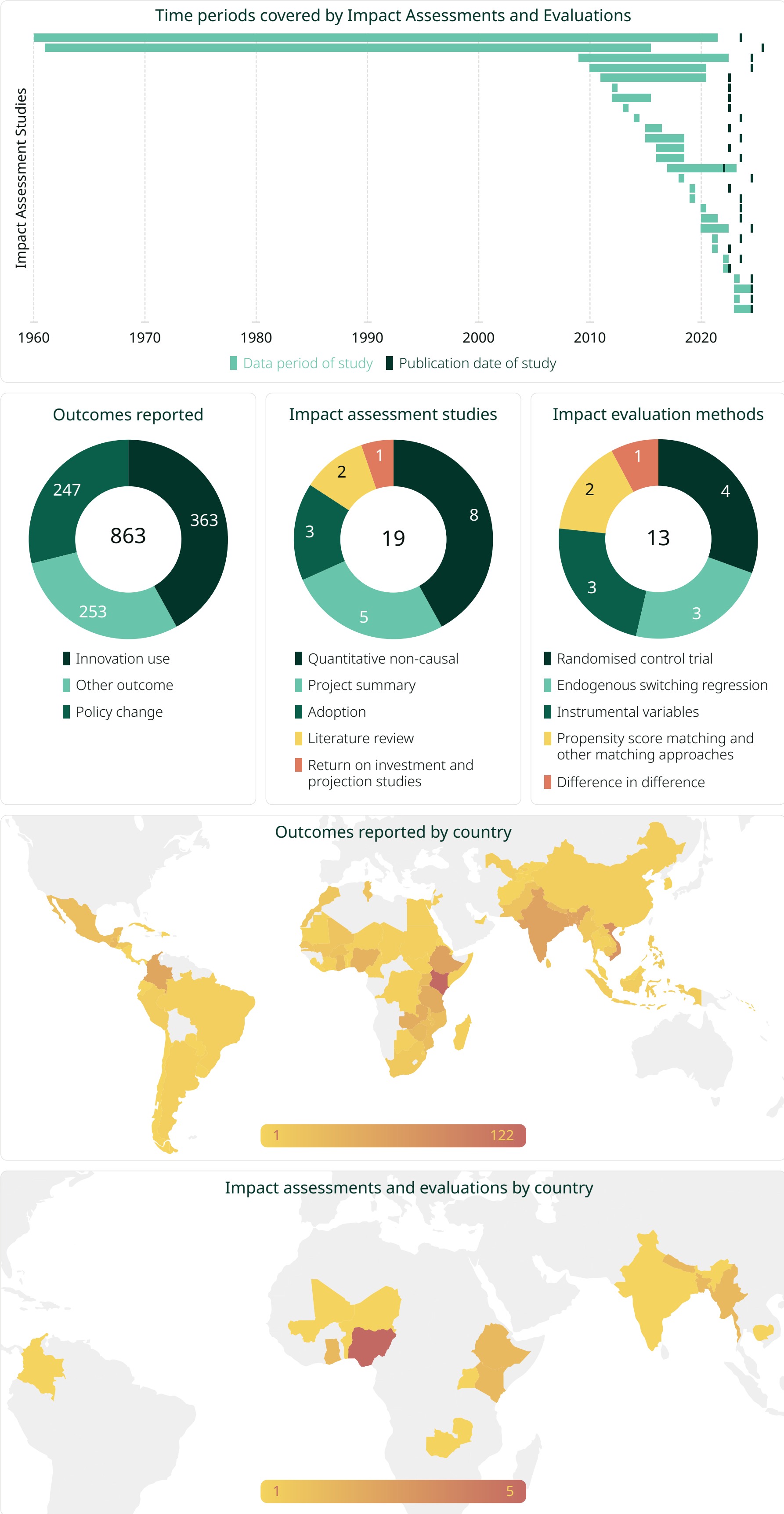

Figure 14. Evidence base of the impacts and outcomes for the climate mitigation and adaptation Impact Area.

Top panel: Five impact assessments did not specify the dates covered by their data and so are not represented. Where studies used datasets with different time periods for different indicators, each time period is represented by a horizontal bar. One of the impact assessment studies modelled greenhouse gas emissions over the period 2017-2023, and was published in 2022. Hence the publication date is within the time period covered by the study.

Middle panel: The middle-center panel expresses the methods used by non-causal impact assessment studies, whereas the middle-right panel expresses the methods used by causal impact evaluations.

Bottom panel: The map represents 29 impact assessment studies. Three studies at the global or regional level are not shown, and one study which took place in multiple countries are represented in each country. Most studies were not nationally representative but took place in certain regions or communities.

Climate-resilient crops

To mitigate the negative effects of climate variability on the agrifood system, CGIAR co-developed **565 climate-resilient crop varieties with more than 600 partners** which were registered from 2022 to 2024 (PRMS 347). These new varieties of 19 major CGIAR food crops, including grains, roots, tubers, and legumes, are better able to cope with heat, droughts, floods, water and soil salinity, and climate-related pests and diseases. In India and Nepal, **drought- and flood-tolerant rice were associated with improved yields of approximately 20 percent** (19 percent in India and 23 percent in Nepal[18]), with positive effects on income in India (48 percent increase[19]). In Bangladesh, drought-tolerant rice increased yields by 29 percent and incomes by 3 percent. Improved varieties were related to reduced probability of crop failure by 80 percent in Nepal[18] and an additional month of food in Bangladesh.[78] Drought-tolerant maize was associated with increased yields of 30 percent[79] in Uganda, and heat-tolerant maize increased yields 12 percent[80] in Nepal, also resulting in a 30 percent increase in income.[80]

However, adoption of these varieties remains low in many locations,[19,78–81] suggesting substantial opportunity for wider impact through additional outreach.[82] Both making improved seeds easily recognizable in informal markets and providing reliable information to farmers in flood-prone regions continue to be a major challenge.[82] Nonetheless, a 2021 study suggested that 7 percent adoption of a single flood-tolerant rice variety in India provided an annual benefit of more than US$100 million.[83] If adoption increased to 41 percent, the annual benefit could be more than US$500 million.[83] These levels of uptake are attainable: adoption rates of 17 to 44 percent were found in six districts of Bangladesh for submergent-tolerant and drought-tolerant rice varieties[84] and the adoption of drought-tolerant maize reached 40 percent in Ethiopia.[8]

A harvested head (panicle) of sorghum. Photo credit: S.Kilungu/CCAFS

Farm management for climate adaptation

Reliable access to innovative technologies empowers local communities to withstand and adapt to climate change. CGIAR supports rural people to adapt by developing and disseminating soil-water conservation measures; intercropping; crop rotations; integration of forages; tree, fish, and water management; and improved nutrient and pest management. Adopting climate-smart agriculture increased income and food security in Tanzania and was associated with increased income in Mali.[86] Similarly, **across Mali, Malawi, Tanzania, and Ghana, the adoption of a package of improved farm management techniques improved many measures of income and yield.**[40] In the program in Malawi, implementers established demonstration plots for farmer groups to test innovations, such as intercropping and sustainable intensification innovations. Farmers who implement selected approaches on their own fields experienced increased income, with inconsistent but generally positive effects on yield.[87] Engagement with another participatory action research program, which supported crop diversification, pest and disease control, and soil and water conservation, was associated with increased per capita calorie, mineral, and protein production by more than 100 percent each in Tanzania.[66] However, adoption rates of conservation agriculture approaches in some contexts remained low,[88] reflecting opportunity for additional impact through improved seed systems, market access, information dissemination, and farmer training and support services.

Climate information services

CGIAR develops mechanisms for distributing climate information, such as digitally enabled site-specific agroclimatic advisories, to raise awareness and knowledge of climate adaptation techniques. From 2022 to 2024, CGIAR provided content for television, short message services (SMS), and interactive voice calls that reached more than 9.3 million farmers in nine countries[l] (PRMS 9753, 7868, 17420, 15326, 18090, 15245, 15246, 15325, 15248, 18335, 9462, 17538, 15244, 16517, 8674, 17912, 18303, 8086). The AICCRA project reached 4 million farmers with cliamte information servcies and climatre smart farming techniques.[30] Although impact evaluations of climate information services are still in their early stages,[89] site-specific nutrient information services increased yield and nutrient efficiency use in Nigeria.[52,90] There is a robust body of evidence on the use of site-specific nutrient management advisories,[91] which illustrate a path to sustainable agriculture through technology and innovation that does not rely heavily on the continuous supply of resources and funding.

Digital agriculture and advisory services in Ethiopia

The government-endorsed Digital Agriculture Extension and Advisory Services (DAEAS) Roadmap coordinates the implementation of digital agricultural extension initiatives and scales digital platforms to deliver real-time agronomic advice, market information, and climate services to Ethiopia's smallholder farmers. CGIAR supports the Roadmap by providing evidence and technical advice to move the country toward a coordinated, policy-backed extension system. The Coalition of the Willing, launched with CGIAR and GIZ support, created Ethiopia's first open agricultural data repository and guidelines for data standardization and sharing, now used by public agencies and private platforms alike. Early results show both significant reach and use of digital innovations informed by CGIAR:

- **7 million** unique users and **67 million** calls for accessing agronomic advice with the 8028 Farmers' Hotline.
- **5.3 million** callers to the 6077 Market Hotline seeking real-time price data.
- **3.3 million** farmers—31 percent women—exposed to Digital Green's community videos.
- More than **2 million** subscribers receiving Precision Development's mobile advisory in dairy.
- Up to **12 million** listeners reached by Farm Radio programs in five regions.
- **83,500** farmers using Lersha's agro-climate advisory in 85 woredas, supported by **4,175** development agents.
- NextGen Agroadvisory scaling up in wheat-growing areas since 2023, reaching about **72,000** farmers.

Source: A Portfolio Performance Unit (PPU)-commissioned study by IFPRI to follow up on digital policy outcomes in Ethiopia achieved during 2017 to 2021 for inclusion in this report. At the time of publication, the study is not yet available online.

Managing climate risks

Governments and large institutions are responsible for reducing the risks faced by the 3.6 billion people in regions acutely vulnerable to climate impacts.[92] CGIAR supports institutions mitigating risks for their constituents by delivering actionable insights to decision-makers and designing, evaluating, and refining social protection models.

In response to an expressed need from the Vietnamese government in 2017, CGIAR Centers developed a participatory Climate-Smart Mapping and Adaptation Planning (CS-MAP) process. Forty-one provinces co-produced risk maps for local climate hazards and recommended agricultural adaptations. The approach was adopted by government policy in 2022 (PRMS 421). **CGIAR-supported recommendations were used at the provincial, district, village, and farm levels**[9] **across Viet Nam, affecting 3.25 million farmers by the end of 2023** (PRMS 8687). In one region, 27 percent of farmers followed the planting advisory from CS-MAP during 2023.[9] CS-MAP was scaled to Cambodia in 2024 (PRMS 17852).

CGIAR partners with the private sector to develop insurance models to protect rural people against climate-induced crop and livestock losses. By 2022, 40,000 index-based livestock insurance policies were purchased by individuals and 109,000 were purchased by the Kenyan government.[93] In 2024, an additional 150,000 policies were supplied to Ethiopian pastoralists as part of the World Bank's DRIVE (De-Risking, Inclusion and Value Enhancement of pastoral economies in the Horn of Africa) program (PRMS 19380).[94] **Households insured with CGIAR-supported index-based livestock policies keep their children in education longer**, and there was some evidence of a shift to keeping more large livestock and fewer small ruminants in Kenya and Ethiopia.[95] This effect was likely achieved through a reduction in perceived risks associated with rearing large livestock rather than direct insurance payouts. Another novel insurance product, relying on farmer-submitted photos of crops for payouts, had higher uptake than traditional crop insurance, particularly among women and farmers in dry landscapes in study sites in Kenya and Ethiopia.[96,97] Both traditional and photo-based insurance increased fertilizer use, but insurance companies were more willing to underwrite picture-based insurance due to the targeted payout structure.[97]

Areas for future attention

Substantial evidence on the efficacy of climate-resilient crop varieties, agricultural practices, and financial buffering mechanisms was published between 2022 and 2024. However, the literature revealed critical gaps. Few studies quantified greenhouse gas mitigation linked to CGIAR-supported practices or assessed the extent to which CGIAR's efforts enhanced farmers' adaptive capacity—areas that could benefit from more systematic evaluation. A small number of studies evaluated the adoption of these measures at a national or regional scale, but more should be done to establish adoption rates. Monitoring the use of climate-stress-tolerant crop varieties, potentially through national seed systems, would strengthen the evidence base as well. Agroclimatic information services were widely rolled out during the 2022 to 2024 period but have not yet been subject to rigorous impact evaluations. The impacts of decision support to institutions and policymakers remain underevaluated, as was also the case prior to the 2022 to 2024 Portfolio (52 percent of CGIAR outcomes reported from 2009 to 2021 were related to policy support or investment decisions and were generally not impact assessed).[20,98-100]

A beneficiary of Takaful livestock insurance in Wajir, northern Kenya. Payouts are linked to drought-induced shortages in animal feed. Photo credit: Riccardo Gangale/ILRI

l Bangladesh, Cambodia, Guatemala, Kenya, Myanmar, the Philippines, Senegal, Viet Nam, and Zambia

CGIAR
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Gender, youth, and social inclusion

5 GENDER EQUALITY

Trader in her shop in the market of Mamura village in Arusha, Tanzania.
Photo credit: Deepika Nath/UN Women

The context

The empowerment and inclusion of women, youth, and other socially marginalized groups is increasingly viewed as a global good and human rights requirement. Women, youth, and disadvantaged social groups play a critical role in agriculture, yet their access to resources, rights, and services remains significantly constrained. Across low- and middle-income countries, women constitute approximately 43 percent of the agricultural labor force and represent two-thirds of the world's 600 million poor livestock keepers.[2] Despite this, they continue to face systemic barriers that hinder their ability to fully participate in, and benefit from, agricultural economies, let alone in broader food system employment.[2] Growing youth populations in rural areas continue to be predominantly employed in agriculture and face challenges accessing land, education, and off-farm employment opportunities. Achieving productive, resilient, and equitable agrifood systems requires deliberate efforts to close gender gaps, empower youth, and ensure greater social inclusion.[102]

Supporting these efforts, **CGIAR promotes gender equality, youth empowerment, and social inclusion through research-driven interventions designed to transform agricultural systems.**[2] Through the generation of evidence on the main challenges faced by marginalized groups and what works to close socioeconomic gaps in agrifood systems, as well as the development of tools to better measure empowerment and social norms, CGIAR aims to enhance equitable access to, and control over, resources, to challenge harmful social norms, and to promote sustainable agrifood systems.[103] A major portion of this work is advancing the measurement of women's empowerment in agriculture and identifying barriers to technological adoption. CGIAR then collaborates with implementation partners to design and test transformative approaches to overcoming obstacles preventing progress toward gender equality. CGIAR also develops improved crop varieties and livestock breeds that are affordable and accessible to marginalized groups, agribusiness training and support, and social safety net programs. By addressing sociopolitical barriers and assessing solutions to expand equitable access to financial, informational, and legal services, CGIAR fosters enabling environments for inclusive agricultural transformation.[2] These efforts not only promote gender equality but also contribute to sustainable development by facilitating lasting systemic change.

By the numbers

Outcomes achieved 2022 to 2024	Impacts published 2022 to 2024
315 policy changes made drawing on CGIAR research.	CGIAR's approach to **measuring women's empowerment in agriculture was adopted by at least 279 organizations in 69 countries.**[20]
US$2.7 billion of third-party investment informed by CGIAR research.	Light-touch interventions, such as viewing videos with gendered messages, can have **immediate effects on gender dynamics.**[99,100]
254 CGIAR innovations in use in **52 countries.**	
6,790,589 farmers reached with CGIAR-informed innovations.	

Figure 15. Highlights of outcomes achieved 2022 to 2024 and findings of impact assessment studies published 2022 to 2024 for the gender, youth, and social inclusion impact area.

Evidence on gender, youth, and social inclusion

Measuring gender, youth, and social inclusion impacts remains complex due to the qualitative nature of social change. Only 22 studies assessing the impacts of CGIAR work on gender, youth, and social inclusion published between 2022 and 2024 were identified. Studies were concentrated in sub-Saharan Africa and South Asia, with the most rigorous impact evaluations in India and Kenya. Studies generally considered (1) the effects of agricultural programs on women's empowerment or (2) the effects of programs supporting women's empowerment in agriculture on women's empowerment outcomes. Few studies considered the effect of women's empowerment interventions on poverty, nutrition, climate, or environment outcomes.

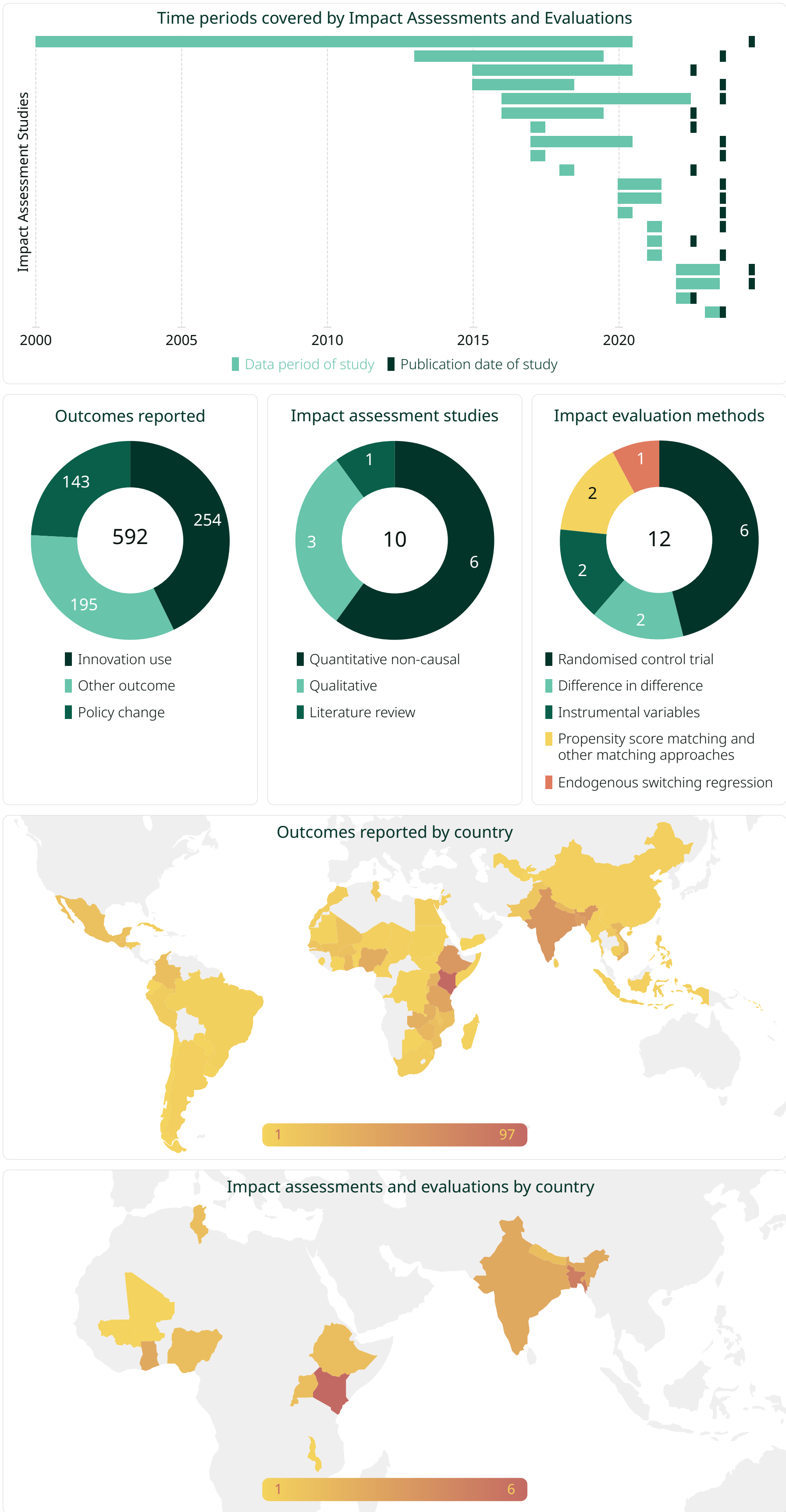

Figure 16. Evidence base of the impacts and outcomes for the gender, youth, and social inclusion Impact Area.

Top panel: Three impact assessments did not specify the dates covered by their data and so are not represented. Where studies used datasets with different time periods for different indicators, each time period is represented by a horizontal bar.

Middle panel: The middle-center panel expresses the methods used by non-causal impact assessment studies, whereas the middle-right panel expresses the methods used by causal impact evaluations. One impact evaluation reported results from both RCT and difference-in-difference methods and hence is included in both categories.

Bottom panel: The map represents 22 impact assessment studies. One study at the global level and is not shown, and two studies which took place in multiple countries are represented in each country. Most studies were not nationally representative but took place in certain regions or communities.

Youth entrepreneurs to creating a future of employment and self-reliance in Uganda. Photo credit: Karin Bridger/USAID

Policy contributions

CGIAR has informed global guidelines (PRMS 8133, 17334) and national (PRMS 838) and subnational (PRMS 15836) strategies aimed at promoting gender equality in food security and nutrition. For example, CGIAR contributed to the FAO's Voluntary Guidelines on Gender Equality and Girl's and Women's Empowerment, which were endorsed by the Committee on World Food Security (PRMS 8133). This engagement then informed the FAO report on The State of Women in Agri-Food Systems 2023 (PRMS 17334). Kenya's official submission on progress, challenges, gaps, and priorities in implementing the UNFCCC Gender Action Plan recognized CGIAR's contributions to the country's progress (PRMS 16357).[108]

Women's Empowerment in Agriculture Index

Traditional development programs often assumed that increasing women's access to resources and opportunities would naturally lead to empowerment. However, empowerment in agriculture is a complex, multidimensional process involving agency, decision-making power, and participation in value chains. Without effective measurement tools and targeted interventions, efforts to promote gender equality in agriculture risk being superficial or short-lived.

To support effective measurement and decision-making, CGIAR has played a leading role in the development of the Women's Empowerment in Agriculture Index (WEAI) and various tailored versions of the index.[104] WEAI transformed how agricultural programs address gender dynamics by providing a standardized measure of empowerment that facilitates the development of overarching conclusions regarding the effectiveness of interventions to support women's empowerment in agriculture. **As of March 2025, WEAI had been adopted by at least 279 organizations in 69 countries.**[20] More than 60 operational units within the United States government used the WEAI in program design, monitoring, or evaluation.[105] WEAI was also used extensively by the FAO in its 2023 publication on the Status of Women in Agrifood Systems.[106] The Bill & Melinda Gates Foundation encouraged grantees to actively track the effectiveness of their agricultural interventions at supporting women's empowerment using the pro-WEAI.[m,107,108]

A study of 11 research projects that used WEAI showed that agricultural programs aimed at empowering women were generally related to better improvements in women's abilities to take action and work together than to changes in gender norms.[109] The study found that projects need to focus explicitly on empowering women rather than assuming that reaching and benefiting women will automatically lead to their empowerment.

m The pro-WEAI is an adapted version of the WEAI appropriate for the measurement of project-level outcomes.

Technology adoption among women farmers

Structural inequalities, including lack of access to land, credit, and extension services, can prevent women from benefiting from agricultural innovations at the same rate as men. For example, women had little influence over decisions related to the adoption and use of solar irrigation pumps in Nepal.[110] In Nigeria, the adoption of improved soybean varieties was related to a large gender gap in income, despite a relatively small gender gap in yield, due to variation in access to markets.[111] In Malawi, gendered variation in the adoption of intercropping, use of improved varieties, crop rotation, residue retention, manure use, and minimum tillage resulted in a significant production gap between men and women.[112] Credit and loan programs could actually reduce women's decision-making power and increase domestic tension.[113,114] In India, personalized agricultural advisory services based on farmer-submitted images and artificial intelligence reduced men's hired labor and increased women's family labor.[96] These cases demonstrate that simply making technology available is not enough—interventions must address underlying power dynamics within households and communities to effectively empower women. Therefore, CGIAR works with private-sector companies to help them increase adoption of technologies among women. For example, CGIAR supported an insurance company in Kenya to develop a gender strategy to proactively address barriers in technology design and implementation in order to effectively engage women with digital advisory services (PRMS 19166).[99,100,109,115–117]

Gender-responsive breeding of roots, tubers, and bananas is one approach to addressing underlying gender disparities in technology adoption and access. The novel G+ tool demonstrated that women tend to value traits related to cooking and home preparation more than men, who value traits related to yield and marketability across much of sub-Saharan Africa.[21,118,119] **CGIAR's G+ tool is now being used by some breeders in the early stages of incorporating gendered preferences into breeding decisions so that new crop varieties meet the needs of both men and women farmers.**[21]

Ultimately, overcoming barriers to technology adoption requires structural changes that empower women within agricultural systems. Contributing to the achievement of these changes, CGIAR is working to understand the gendered impacts of agricultural technologies with an eye to developing agricultural technologies that mitigate gender disparities in the future.

A trainer in the Southern Nations, Nationalities, and Peoples' Region, Ethiopia. Photo credit: ILRI

Enhancing women's empowerment through behavioral change communication

While gender-sensitive programming can be effective at improving women's empowerment, it is by no means a silver bullet.[109] Many interventions fail to achieve sustained impacts, or affect some outcomes and not others. For example, a CGIAR-supported ecosystem pond intervention that addressed women's empowerment improved women's control of income and productive assets but did not address broader structural inequalities.[115]

Nonetheless, behavior change communication approaches challenging gender norms can increase women's empowerment and support equitable decision-making. In Bangladesh, woman-led nutrition training was associated with an increase in women's decision-making power and men adopting traditional activities of women, such as working in garden homesteads.[116] Targeting Rwandan fathers to promote child consumption of animal-source foods was related to increased odds of their consumption by children.[117] **Even light-touch interventions, such as viewing videos with gendered messages, can have immediate effects on gender dynamics.**[99,100]

Supporting youth in agribusiness

Young people in low- and middle-income countries have rising aspirations for economic advancement.[101] However, rural youth face significant challenges in accessing essential resources such as land, finance, technology, knowledge, and markets, hindering their ability to establish sustainable agriculture or agribusiness ventures.[101] These constraints are compounded by increasing competition for land and limited access to finance.[101]

An ENABLE-TAAT program,[n] implemented across six African countries, equipped young people with the skills and resources needed to start and grow agribusiness enterprises. From 2018 to 2021, it engaged 4,398 young people, providing a combination of hands-on training, business incubation, and access to technical support through a six-week intensive program.[120] Three years after completing the program, **youth participants had 33 percent more entrepreneurship income and improved their food security by 75 percent compared to their peers who did not participate.**

Beyond income generation, the program helped shift perceptions of agriculture among youth, positioning it as a viable and profitable career path rather than a last resort.[120] However, there is a need for continued support beyond initial training, and access to capital may be important for achieving impacts. Future youth agribusiness programs will need to integrate financial mechanisms that provide young entrepreneurs with the resources needed to scale their businesses.

CGIAR is working with national governments to design programs and plans to support sustainable agribusinesses for youth and other marginalized groups. The Tanzania Ministry of Livestock specifically requested CGIAR's input into plans for "Building a Better Tomorrow," a national program promoting entrepreneurship and employment for youth and women, based on piloted programs (PRMS 9403). This model, co-developed by CGIAR, was promoted by policymakers and development partners in 2023 and was factored into United States Agency for International Development and United States Department of Agriculture investments for scaling in Zambia and Lesotho. Based partially on evidence provided by CGIAR, the Ministry of Fisheries and Aquaculture Development in Ghana committed to expanding its Aquaculture for Food and Jobs program, which will integrate youth-led fish cage production to enhance employment opportunities (PRMS 17697).

Photo credit: Daniela Arce/CIAT

Areas for future attention

CGIAR-supported impact evaluations related to gender and youth inclusion remain limited in number and scope. Future investment should grow the evidence base on the effectiveness of CGIAR-related gender, youth, and other empowering interventions to mitigate barriers to effective participation of socially marginalized groups in the agrifood system. They can also consider the effects of CGIAR empowerment and inclusion interventions on non-empowerment outcomes, such as income, nutrition, and wellbeing. There is also a need for studies that explicitly evaluate how gender-transformative interventions can scale cost-effectively and how their reach can be monitored.

n TAAT refers to Technologies for African Agricultural Transformation, which is funded by the African Development Bank. ENABLE is one of TAAT's six Enabler contracts and charged with opening agribusiness opportunities to youth across all of TAAT's value chains. It is not an acronym.

Environmental health and biodiversity

15 LIFE ON LAND

Cattle grazing in a semi-arid region covered by the index-based livestock insurance project. Photo credit: Apollo Habtamu/ILRI

The context

Agriculture has a large environmental footprint due to unsustainable crop and livestock practices, insufficient natural resource management, and food loss and waste.[121] Agriculture often leads to land degradation, biodiversity loss, water resource depletion and pollution, aquifer overexploitation, off-site pollution, fish stock depletion, and greenhouse gas emissions.[121,122] As a result, one-third of the world's soils are degraded. Poor soil management and excessive fertilizer use threaten planetary boundaries, pushing nitrogen cycles beyond sustainable limits while depleting phosphorus reserves.[2] Agriculture is the biggest driver of forest and biodiversity loss, including the loss of plant and animal diversity crucial for healthy diets.[2] However, if managed effectively, agriculture can regenerate ecosystems, improve soil health, and enhance biodiversity while maintaining food security.

Mitigating agriculture's negative effects on the environment will require a fundamental shift to sustainable agricultural practices that integrate productivity, conservation, and resilience. Recognizing the urgency of balancing agricultural development with ecological integrity, **CGIAR works on and off farms to support sustainable natural resource management and biodiversity preservation, to increase incomes, and to improve access to nutritious foods, all while mitigating agriculture's negative effects on the planet.**

Through targeted research and implementation, CGIAR supports soil conservation practices such as conservation agriculture, terracing, and laser-land leveling to reduce soil erosion and chemical runoff. CGIAR champions organic fertilizers and other soil amendments while advocating for the wise and judicious use of chemical inputs and testing various integrated soil fertility management practices. It promotes crop and livestock diversification to increase resilience and reduce pest and disease pressure through cover crops and forages such as nitrogen-fixing legumes and crop rotation practices. At the farm and community level, CGIAR supports agroecological and other nature-positive solutions.

CGIAR pioneers innovative water management practices to optimize resource use, such as alternative wetting and drying in rice fields to reduce water consumption without sacrificing yields. Solar-powered irrigation systems and groundwater recharge mechanisms aim to help communities in water-scarce regions and sustain agricultural production while reducing pressure on natural water reserves. Community engagement activities encourage changes in mindsets about common resource management.

CGIAR promotes participatory rangeland management to enhance resilience against climate variability while maintaining ecosystem balance. Improved grazing strategies

By the numbers

Outcomes achieved 2022 to 2024

175 policy changes occurred with CGIAR contributions.

US$970 million of third-party investment informed by CGIAR research.

292 CGIAR innovations in use in **57 countries**.

9,549,267 farmers reached with CGIAR-informed innovations.

Impacts published 2022 to 2024

From 1961 to 2015, productivity gains from CGIAR-improved varieties reduced cropland expansion into natural habitats by **9.68 million hectares** and avoided the extinction of **713 vulnerable plant and animal species**.[6]

2.6 million farming households in Ethiopia used drought-tolerant maize in 2021/2022.[8]

491,000 coffee farming households used water conservation techniques in Viet Nam in 2023.[9]

Figure 17. Highlights of outcomes achieved 2022 to 2024 and findings of impact assessment studies published 2022 to 2024 for the environmental health and biodiversity impact area.

and drought-resistant forages are expected to reduce land degradation and support pasture productivity.

CGIAR's work extends into environmental policy and governance, shaping institutional frameworks that support long-term sustainability. Through collaborations with national governments, regional bodies, and global organizations, CGIAR helps integrate biodiversity conservation and sustainable agriculture into global actions and national policies. Research on the circular economy informs policies to reduce food loss, improve waste management, and create sustainable value chains.

Evidence on environmental health and biodiversity

CGIAR-supported environmental health and biodiversity interventions were assessed in 37 publications from 2022 to 2024, with the most and highest quality studies concentrated in sub-Saharan Africa. Studies generally considered (1) adoption of environmentally beneficial practices, (2) the impact of environmental interventions on non-environmental outcomes, or (3) the effects of interventions without an environmental focus on the environment. Most often, studies of environmental innovations assessed their impacts on productivity, income, or nutrition.

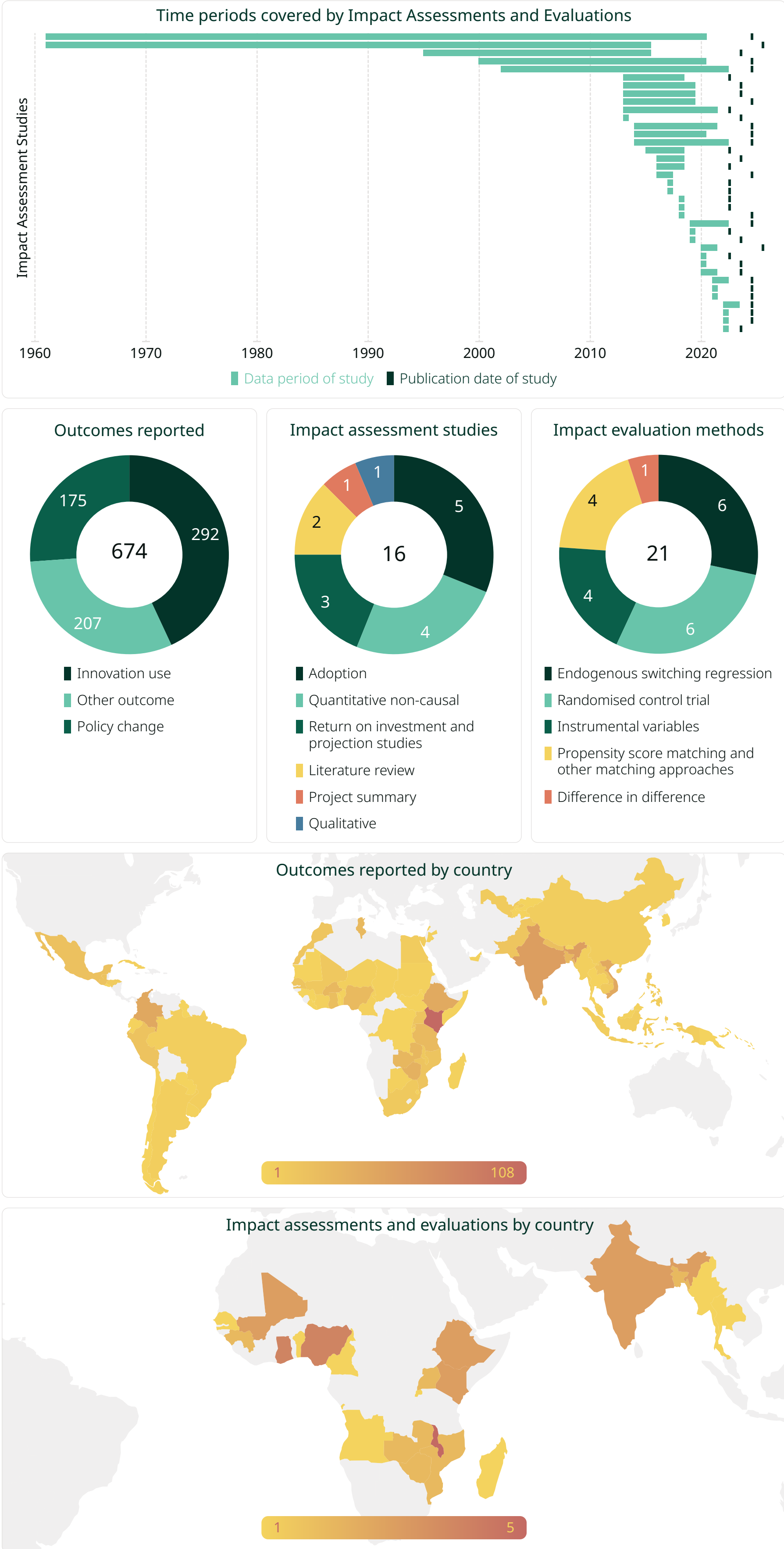

Figure 18. Evidence base of the impacts and outcomes for the environmental health and biodiversity Impact Area.

Top panel: Four impact assessments did not specify the dates covered by their data and so are not represented. Where studies used datasets with different time periods for different indicators, each time period is represented by a horizontal bar.

Middle panel: The middle-center panel expresses the methods used by non-causal impact assessment studies, whereas the middle-right panel expresses the methods used by causal impact evaluations.

Bottom panel: The map represents 33 impact assessment studies. Four studies at the global or regional level are not shown, and four studies which took place in multiple countries are represented in each country. Most studies were not nationally representative but took place in certain regions or communities.

Innovations in water management in Asia

India faces both severe flooding and frequent water shortages. In response, CGIAR piloted the Underground Transfer of Floods for Irrigation in 2015 in Rampur District. This method diverts excess floodwaters into underground reservoirs using ponds, small dams, and recharge wells. The stored water is later used for irrigation and domestic purposes. Based on its recognition as an effective solution, the Indian government integrated the Underground Transfer of Floods for Irrigation into the Amrit Sarovar program. More than 300 recharge ponds were established in Rampur alone, with groundwater availability increasing by up to 8 percent in some areas (PRMS 13818).

Pakistan, particularly Punjab Province, is facing a severe water crisis due to over-extraction, contamination, and climate change. Groundwater, which supports 50 percent of the country's agriculture and 90 percent of rural drinking water needs, is being rapidly depleted. Historically, the Punjab Irrigation Department lacked real-time data to manage groundwater effectively. To support evidence-based decision-making, CGIAR researchers developed a Groundwater Management Information System. Initially tested in Rahim Yar Khan District, the Groundwater Management Information System collected data from 80,000 tubewells, identifying groundwater depletion hotspots. Forty new piezometers with submersible data loggers were installed for real-time monitoring, linking groundwater levels with usage patterns. Following successful trials, the Groundwater Management Information System is being expanded across Punjab, providing a framework for sustainable groundwater use. The system enables data-driven water management by integrating information on rainfall, surface water, and groundwater. It is also being tested in Sindh and Baluchistan, with support from international agencies (PRMS 16618).

Efficient water use for maximum agricultural productivity

Agriculture accounts for 70 percent of the world's freshwater withdrawals.[2] Competition for water resources between agriculture and other uses is expected to increase as populations grow.[2] Agricultural zones across the Global South now experience chronic water shortages. As a result of the great demonstrable need and CGIAR's decades of work on water governance and management, many of CGIAR's innovations to enhance water use at the farm, water basin, and national levels are now widely adopted. **An estimated 2.6 million farming households in Ethiopia used drought-tolerant maize[8] in 2021/2022, while 491,000 coffee farming households used water conservation techniques in Viet Nam in 2023.**[9] In Tanzania, adopting tied ridging and terraces, an important water conservation technique, increased income, dietary diversity, and food security.[85]

Much of CGIAR's work on smart water use occurs at the policy level:

- The Niger Basin Council of Ministers formally adopted policy guidance on the water-energy-food-environment nexus approaches to developing new programs (PRMS 3099).
- CGIAR's work informed the Limpopo Watercourse Commission Transboundary Water Management Plan (PRMS 828, 18431), FAO's Guidelines on Water Quality in Agriculture (PRMS 18012), and Bangladesh's National Adaptation Plan (PRMS 2098).
- Groundwater management systems and methods supported by CGIAR were used in Zambia (PRMS 9304), Nepal (PRMS 3090), Punjab India (PRMS 16618), Pakistan (PRMS 16618), Morocco (PRMS 18012), and Honduras.[123] The water management system in Honduras supported decision-making across 3,104 micro-watersheds.[123]
- CGIAR supported cooperation on water issues in Morocco with the League of Arab States and Egypt (PRMS 18267, 18269, 18295, 18528).

Sustainable farms through soil health improvement and reduced inputs

Healthy soil is necessary to sustain agricultural productivity and support a growing population for decades to come (see Sustainable intensification for inclusive income growth). Rational use of agricultural inputs can mitigate agriculture's negative environmental effects without reducing productivity. Through CGIAR's work, **2.9 million households (38 percent) in Viet Nam used reduced-fertilizer approaches and 1.6 million households (21 percent) followed reduced-pesticide-use recommendations** in 2023.[9]

In **Ethiopia in 2021/2022, 8.9 million households used soil and water conservation techniques, among which 1.6 million used agroforestry and almost 1 million used conservation agriculture.**[8] CGIAR's Africa RISING program led to almost 1 million households adopting sustainable agricultural practices across Africa, mostly in Ethiopia.[11] A set of four impact evaluations and one longitudinal study showed that these practices can increase yield, income, and food security in sub-Saharan Africa.[40] However, the effects on household dietary diversity and food consumption scores were inconsistent (see Nutrition-sensitive intensification for resilient diets). In Ghana, adopting *Striga*-resistant maize with mineral fertilizer increased yields (872 kilograms per hectare) more than the use of either technology on its own (545 kilograms per hectare for maize alone and 402 kilograms per hectare for fertilizer alone).[124]

Through support from CGIAR, the governments of Kenya (PRMS 838), Ucayali Peru (PRMS 998), and Viet Nam (PRMS 7247, 658) developed strategies that promote agroecology or other sustainable agricultural practices. E-agrology tools were used by private-sector actors across Mexico, such as Pepsi and Kellogg, to support the use of sustainable practices by their suppliers from 2022 to 2024 (PRMS 3767, 3940, 17589, 10020).

Restoring grazing lands and sustainable livestock management

Livestock rearing remains a vital livelihood among the poor and animal-source foods are often promoted as part of a nutritious diet in low- and middle-income countries. However, animal husbandry can lead to overgrazing, land degradation, and greenhouse gas emissions. The development and dissemination of productive livestock forages can mitigate these adverse effects. One such forage, ***Urochloa* (also known as *Brachiaria*) hybrids, developed by CGIAR, has been used by 1.3 million farmers across 70 countries** (PRMS 9926). Other forages and feed varieties also rapidly scaled up in Ethiopia where they were estimated to be grown by 2.6 million households in 2021/2022.[8] These forages were often adopted for sale rather than own use (to support crisis relief) but benefit the environment at the same time as they alleviate poverty.

A diverse upland farm in Central America, with maize, coffee, banana, and more. Photo credit: Daniela Arce/CIAT.

CGIAR successfully influenced governments and market actors to adopt policies supporting grazing land restoration and sustainable livestock management. Through CGIAR contributions, a significant area of rangelands came under improved management plans from 2022 to 2024, including 1.2 million hectares in Kenya (PRMS 531), 340,000 hectares in Ethiopia (PRMS 532), 50,000 hectares in Tunisia (PRMS 522), and 44,000 hectares in Tanzania (PRMS 519). In addition, tenure rights on 50,000 hectares of rangelands were secured for pastoral communities in Tanzania (PRMS 533). Ethiopia and Tanzania (PRMS 4149, 19382) adopted national policies formalizing community-led grazing land restoration, improving ecosystem resilience and pasture productivity. In Tanzania, several pastoral communities took steps to improve degraded lands (PRMS 9544). Participatory rangeland management was also adopted in Baringo County, Kenya (PRMS 2396). The Intergovernmental Authority on Development launched a manual on scaling participatory rangeland management across East Africa and the Horn of Africa in 2024. In Colombia in 2022, zero-deforestation commitments within dairy supply chains (PRMS 2261) and certification systems for sustainable livestock products (PRMS 4418) set new standards for climate-conscious livestock farming. These advancements demonstrate that integrating livestock management with conservation efforts can balance food production and ecological integrity.

A farmer watering his fodder crops. Photo credit: Apollo Habtamu/ILRI

Areas for future attention

CGIAR has developed principles and practices to improve soil health, including integrated approaches that balance current productivity against longer term sustainability. However, additional evidence is needed to understand how sustainable agricultural practices affect environmental outcomes once they are scaled.[122] As one example, given CGIAR's vast research on soil health practices, the lack of assessment of soil indicators in impact evaluations is striking. In addition, studies of the impacts of environmental innovations are fragmented and uncoordinated, with limited external validity for extrapolation to wider areas. Furthermore, few impact assessments integrated environmental trade-offs with productivity or economic metrics, which is critical for understanding system-wide sustainability. Future investments should prioritize integrated impact evaluations that combine biophysical and socioeconomic data, expand geographic coverage beyond East Africa, and assess cumulative and landscape-level impacts. More attention is also needed on the long-term effects of interventions and the scalability of environmentally positive practices under real-world conditions.

Impacts and outcomes by continent

In the following sections, we present evidence of the real-world impacts of CGIAR-supported interventions in Africa, LAC, and Asia. In these sections, we engage with regional priorities and demonstrate how CGIAR acts through multiple workstreams to achieve impact. Each section starts with an overview of current challenges and CGIAR's work on a continent. We then summarize the evidence identified on the continent. Each continent section primarily focuses on the evidence of impact on three or four regional priorities and CGIAR's engagement with national governments. Each section concludes with reflections on areas for future attention in impact-evidence generation to inform decision-making and increase impacts going forward.

Africa

Latin America and the Caribbean

Asia and the Pacific

Tending to cassava grown in the green house at the BecA-ILRI Hub, Nairobi. Photo credit: Tim Hall/ILRI

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SCIENCE FOR A FOOD-SECURE FUTURE

Africa

Drought resistant kounouz barley in Tunisia. Photo credit: Udo Rudiger/ICARDA

The context

Africa is a continent with a wealth of natural resources, but it also faces extreme challenges. It has the highest poverty rates of any continent[125] while hosting a quarter of the world's forcibly displaced people[126] and half the world's internally displaced people.[127] Africa is undergoing rapid urbanization, with an expected doubling of its urban population from 2018 to 2043.[128] Its rapidly growing population results in the overexploitation of natural resources, increasingly fragmented farms, and high youth unemployment.

Relying heavily on agriculture for economic production and food security, the continent is particularly vulnerable to the negative effects of climate change. Growing seasons are increasingly becoming shorter and less reliable, particularly in the Sahel. The continent's highly variable ecology means that some regions are experiencing droughts while others experience floods, and some experience both within short time periods.

The cultural and climatic variations across the continent make it impossible to develop a single, consistent approach to supporting the continent's agrifood systems. CGIAR modifies all its work to adapt to the unique socioecological contexts in which it functions. Broadly, **CGIAR emphasizes sustainable agriculture, economic transformation, and nutrition-sensitive interventions in Africa. It supports water management, including solar irrigation, water catchment, and terracing, to mitigate the effects of droughts and floods while advocating for environmentally sustainable and climate-resilient approaches to improve soil health and reduce greenhouse gas emissions.** CGIAR develops improved crop varieties that respond to the growing number of biotic and abiotic stressors affecting the continent. It also develops new livestock and fish breeds and supports the adoption of improved animal management practices. The organization engages in value chain development and economic

Genebanks in Africa

The region hosts the IITA genebank for cassava, yam, banana, soybean, and cowpea; the AfricaRice genebank for rice; and the ILRI genebank for forages.

- 23,205 samples were distributed to 35 countries in Africa during the 2022 to 2024 period.
- 133,574 accessions were safety-duplicated within the collections.
- 169 genebank tours took place in AfricaRice, ICARDA, IITA, and ILRI involving 2,638 participants.

By the numbers

Outcomes achieved 2022 to 2024

125 policy changes made drawing on CGIAR research.

US$2.5 billion of third-party investment informed by CGIAR research.

6,051,311 farmers reached with CGIAR-informed innovations.

Innovation users were from **5,382** organizations, **17 percent** of which were private companies.

Impacts published 2022 to 2024

From 2016 to 2020, CGIAR crop technologies[i] were used on **38.6 million** hectares in sub-Saharan Africa, generating **US$17 billion** in sub-Saharan Africa per year.[3]

The adoption of CGIAR-supported techniques led to the production of an addition **1.5 million** tons of wheat valued at **US$446 million** over 12 years in four African countries.[12]

i. Most technologies considered were improved crops.

Figure 19. Highlights of outcomes achieved 2022 to 2024 and findings of impact assessment studies published 2022 to 2024 for the Africa region.

transformation for poverty reduction through interventions aiming to increase agricultural yield, digital extension and market services, and solar-powered cold storage. In addition to traditional training on nutrition topics, CGIAR advances the development of a nutritious food system in Africa by helping farmers plant, raise, process, and sell more nutritious foods for their families and communities.

CGIAR has four Centers headquartered in Africa: the Africa Rice Center (AfricaRice), the International Institute of Tropical Agriculture (IITA), the International Livestock Research Institute (ILRI), and the World Agroforestry Centre. CGIAR collaborates with the Forum for Agricultural Research in Africa, Sustainably Growing Africa's Food Systems (formerly the Alliance for a Green Revolution in Africa, AGRA), the African Development Bank, and many regional and national agricultural research and extension systems across the continent. From 2022 to 2024, CGIAR collaborated intensively with the Kenya Agricultural and Livestock Research Organization, the Ethiopian Institute of Agricultural Research, and the Institute de l'Environment et de Recharges Agricoles in Burkina Faso. CGIAR also works closely with the private sector and farmer associations across Africa.

Evidence in Africa

From 2022 to 2024, 68 impact assessments were published on CGIAR-supported interventions in Africa. Interventions generally focused on the provision of improved crop varieties and introduction of new agricultural practices. Studies often considered indicators related to yield, income, and food security, while only a few studies examined environmental and climate metrics, such as greenhouse gas emissions, pesticide use, and nitrogen

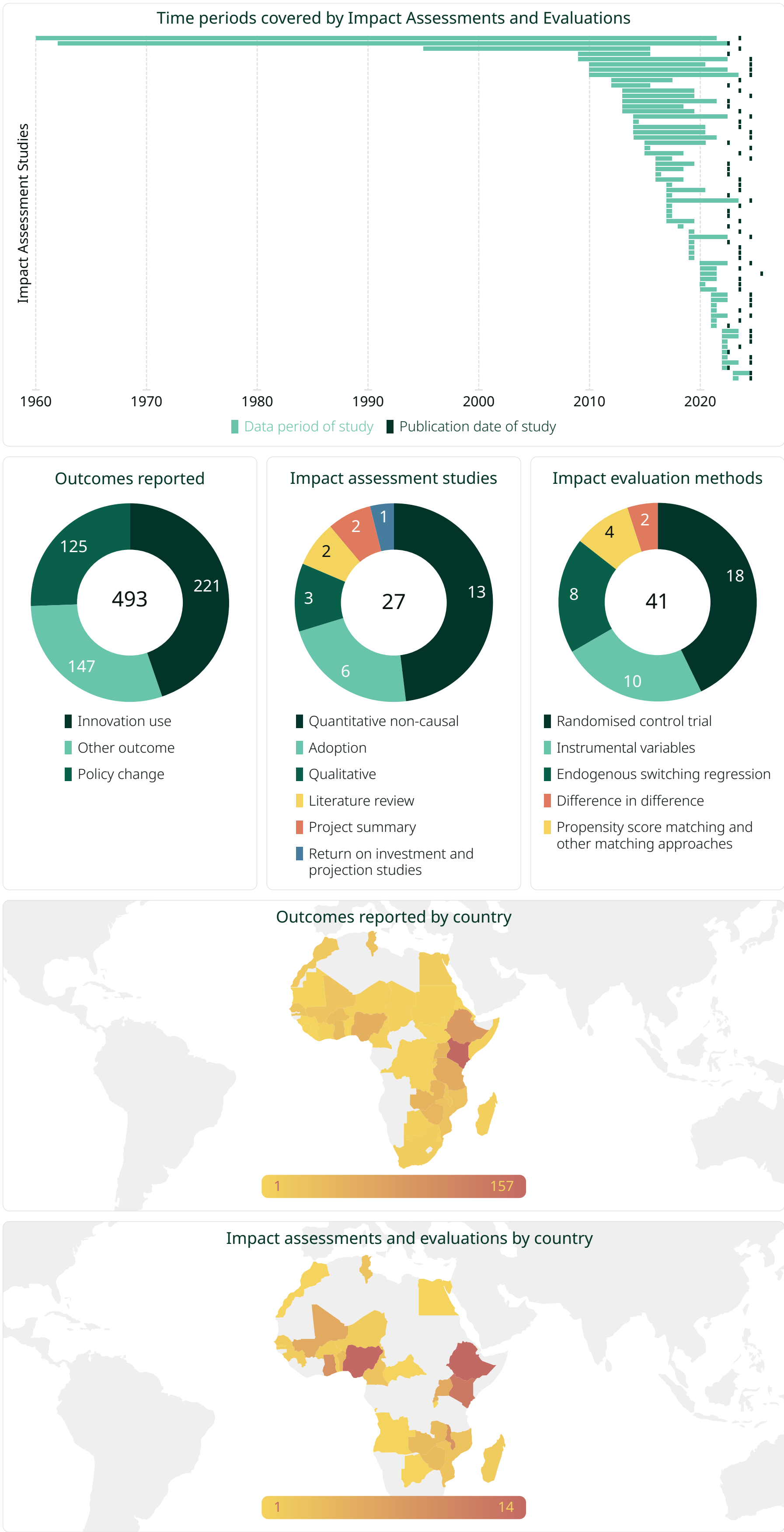


Figure 20. Evidence base of the impacts and outcomes for the Africa region.

Top panel: Ten impact assessments did not specify the dates covered by their data and so are not represented. Where studies used datasets with different time periods for different indicators, each time period is represented by a horizontal bar.

Middle panel: The middle-center panel expresses the methods used by non-causal impact assessment studies, whereas the middle-right panel expresses the methods used by causal impact evaluations. One impact evaluation reported results from both RCT and difference-in-difference methods and hence is included in both categories.

Bottom panel: The map represents 67 impact assessment studies. 1 study at the regional level is not shown, and 8 studies which took place in multiple countries are represented in each country. Most studies were not nationally representative but took place in certain regions or communities.

application rates, as well as social indicators, such as women's empowerment and decision-making. Recent studies of CGIAR's interventions in Africa are shifting toward digital data collection and more sophisticated statistical methodologies.

Improved seeds driving higher yields and food security

CGIAR-supported improved crop varieties are designed to help farmers overcome a variety of challenges: droughts, floods, poor soil quality, and high disease pressure (see Climate-resilient crops). They effectively and consistently increased yield, income, and food security (Table 2). Some, such as Green Super Rice,[129] had particularly high yield advantages in adverse conditions. Furthermore, improved groundnuts and Green Super Rice were more likely to be adopted by women-headed households than by men-headed households,[57,129] indicating that they may meet the unique preferences of women. However, adoption rates of some improved varieties remain low across Africa,[129] suggesting the potential for broader impacts if messaging and supply chain challenges can be overcome. Nonetheless, in Uganda, adoption of CGIAR-supported cassava varieties was 35 percent, groundnut varieties 37 percent, and maize 58 percent in 2020/21, reflecting the possibility of widespread adoption.[46]

CGIAR's work in Ethiopia

CGIAR along with Ethiopian partners leveraged 55 unique innovations in Ethiopia to support its agrifood system. According to CGIAR's SPIA, building on the fifth wave of the Ethiopia Socioeconomic Panel Survey in 2021/2022, between 5.8 and 11.5 million households (up to 87 percent of rural households) in Ethiopia used CGIAR-supported innovations, including more than 8.9 million households in the country using improved soil and water conservation methods supported by CGIAR.[8] The use of improved maize varieties, notably drought-tolerant maize, increased significantly compared to 2018/2019. Animal-owning households increased their adoption of poultry crossbreeds from 5–13 percent to 18 percent over this period. The share of households using improved forages nearly quadrupled from 2.7 to 9.8 percent. The widespread adoption of these technologies may continue to increase due to recent policy work by CGIAR, with Initiatives reporting that they influenced 44 policies from 2022 to 2024.

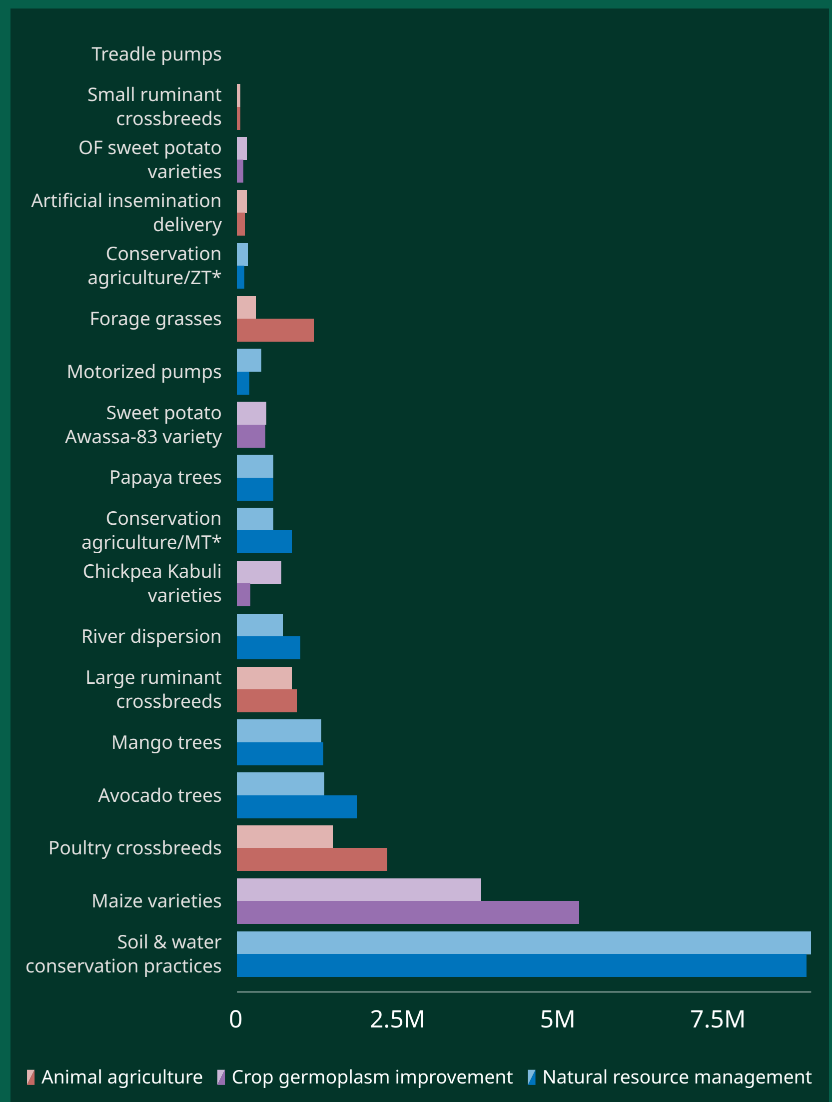


Figure 21: Number of rural households adopting each CGIAR-related innovation in Ethiopia in 2018/2019 (lighter bars) and 2021/2022 (bold bars).

Note: Calculation based on longitudinal weights. For Chickpea Kabuli varieties comparison is between 2015/2016 (ESS3) and 2021/2022 (ESS5). Redrawn with permission from the authors.[8]

Country	Improved crop	Yield	Income	Food security
Nigeria[130]*	Soybean	+26%	+32% net revenue	
Nigeria[58]	Cowpea	+177%		+46% consumption of cowpea
Nigeria[57]	Groundnut	1,312 kg/ha	+ ₦224,000 in net returns	+13% consumption of groundnut -22 percentage point risk of being food insecure
Mozambique[129]*	Green Super Rice	+10%	+26% cost-efficiency	
Cameroon[131]*	Rice	+45%	+25% farm income	
Guinea[132]	Rice	+26%	+45% net income	
Egypt[12]*	Wheat	+407,115 tons	+US$127 million in value (2022)	
Morocco[12]*	Wheat	+461,559 tons	+US$114 million in value (2022)	
Sudan[12]*	Wheat	+234,927 tons	+US$106 million in value (2022)	
Tunisia[12]*	Wheat	+273,189 tons	+US$70 million in value (2022)	

Table 2: Association between adopting CGIAR-supported improved seeds and yield, income, and food security.
Notes: * indicates studies that used methods to fully establish causal impact.

Maize for food security, poverty alleviation, and climate resilience

Maize is a dominant staple crop and food across much of Africa. CGIAR supports the diversification of maize-based production systems and efforts to increase maize productivity to improve food security while also reducing poverty and increasing the continent's climate resilience. Across 18 African countries, 58 percent of the new maize varieties released from 1995 to 2015 had CGIAR heritage (Figure 22).[4] In Nigeria alone, from 2006 to 2020, CGIAR collaborated with national agricultural research centers to develop 36 new hybrid maize varieties and 42 open-pollinated varieties, with yield advantages of 20 to 30 percent.[59] From 2010 to 2023 in Uganda, 47 CGIAR-related maize varieties were released.[46] At least 28 million hectares (46 percent of the total area cultivated with maize) in Africa were planted with CGIAR-supported maize varieties in 2015.[4] In Ethiopia, 40 percent of households used CGIAR-supported drought-tolerant maize varieties in 2021/2022.[8] Similarly, in Uganda in 2020/2021, 58 percent of households growing maize used improved maize varieties.[46]

Largely through increased yield, the **adoption of improved maize varieties had an estimated annual economic benefit of more than US$1 billion and a benefit:cost ratio of at least 12:1.**[4] In Ethiopia, a 1 percent increase in the amount of land allocated to improved maize varieties reduced the probability of living on less than US$1.9 a day by 0.5 percent[133] at a time where nearly half of all farmers used CGIAR-supported improved maize varieties.[4] In Nigeria, where most improved maize was co-developed with national agricultural research centers and CGIAR, improved varieties generated an average of 927 kilograms per hectare more than unimproved varieties.[59]

CGIAR's improved maize varieties are not just high yielding; some are specifically engineered to withstand environmental challenges, making them crucial for climate resilience in Africa. In Ghana, joint adoption of *Striga*-resistant maize varieties and mineral fertilizer increased maize yield by 872 kilograms per hectare, food consumption scores by 17 points, and consumption per adult equivalent by 38 kilograms per hectare.[124] Effects were inconsistent when adopting *Striga*-resistant maize or mineral fertilizer alone. In eastern Uganda, farmers who cultivated drought-tolerant maize achieved 30 percent more yield than they would have with non-drought-tolerant hybrids.[79] Farmers who grew non-drought-tolerant modern and local maize would have had 32 and 54 percent more yields, respectively, if they instead had adopted drought-tolerant maize.[79]

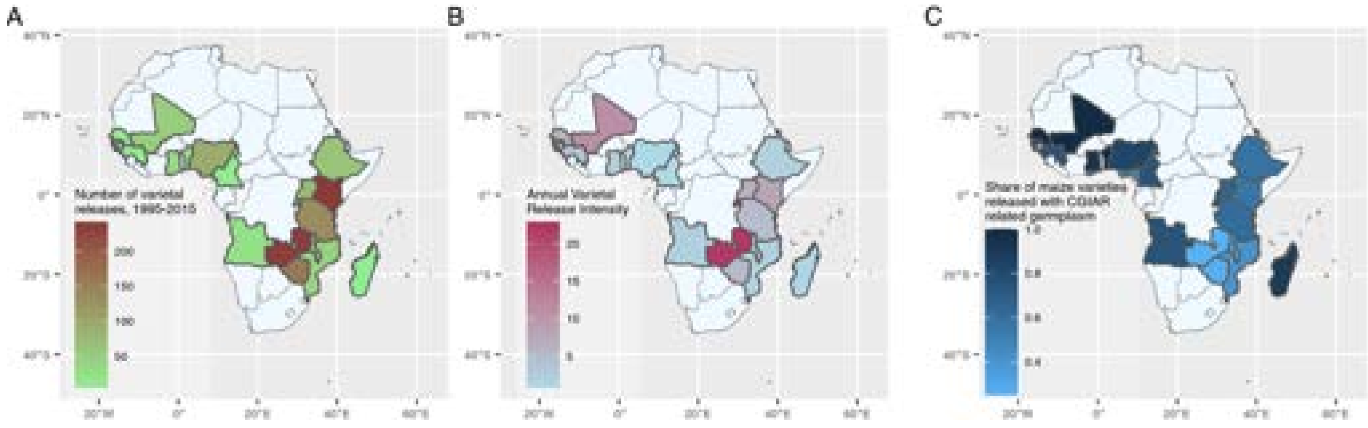


Figure 22: Number and intensity of maize varietal releases and the share of CGIAR-related germplasm in Sub-Saharan Africa. Reprinted with permission from the authors.[4]

Sustainable land management for farm wellbeing

Increasing population pressure and extractive land management approaches have resulted in degraded landscapes and reduced crop productivity across Africa. CGIAR's work on sustainable land management aims to reverse trends in land degradation and crop productivity. In Ethiopia alone, 8.9 million households used CGIAR-promoted soil and water conservation practices, almost 1 million households used minimum- or zero-tillage techniques, and 1.6 million households took action to support reforestation in 2021/2022.[8] In 2020/2021 in Uganda, 43 percent of households farming either coffee or bananas were practicing coffee-banana intercropping.[46] Sustainable land management practices have been associated with improved dietary diversity as well, possibly by supporting production and crop diversity.[65]

CGIAR engages in multicountry initiatives to transform land management across large portions of Africa (see Restoring grazing lands and sustainable livestock management). The Africa RISING program advocated for and promoted the use of country-specific sustainable agriculture techniques, such as intercropping, crop rotation, and reduced pesticide use. The program contributed to almost 1 million households adopting sustainable practices across six African countries, with especially high adoption in Ethiopia.[11] The EFSAC project across North Africa and the Middle East supported improved nitrogen fertilizer use, irrigation, seeding rates and varieties, planting dates and methods, crop rotation, tillage, weed control, and harvesting dates, particularly in wheat systems. It directly benefited more than 356,000 households and led to 24 percent of the land being farmed with at least three supported agricultural techniques in Egypt, Jordan, Morocco, Tunisia, and Sudan.[12] **The adoption of these CGIAR-supported techniques led to the production of an additional 1.5 million tons of wheat valued at US$446 million over 12 years. Every dollar spent on the project is estimated to have generated an additional US$22.**[12]

Despite its proven benefits, studies have found that much more is needed to support sustained adoption of conservation agriculture. In Zambia and Zimbabwe, farmers exposed to agriculture extension demonstration plots and targeted

CGIAR's work in Uganda

SPIA integrated questions into the 2021/2022 Uganda Harmonized Integrated Survey and Uganda National Study on Objective Measurement in Agriculture to capture information on the use of 22 different innovations supported by CGIAR and its partners.[46] CGIAR-related bean varieties were found in plots belonging to 26.5 percent of bean-growing households sampled, and CGIAR-related maize varieties were found in plots belonging to 57.8 percent of maize-growing households. Disease-resistant cassava varieties reached around one-third of cassava-growing households in the sample and about one-third of groundnut-growing households cultivated an improved variety that was released after 1995. Less common was the growing of biofortified varieties, found in 6 percent of bean-producing households and 3 percent of sweet-potato-growing households. Tropical fruit trees were planted by 3.5 percent of rural households across Uganda, of which 11 percent report having planted an improved variety of fruit.

CGIAR's work in Kenya

CGIAR works extensively in Kenya, with 1.8 million innovation users reported in the country from 2022 to 2024. During that period, CGIAR Initiatives submitted 148 outcomes pertaining to Kenya—63 on innovation use and 37 on policy changes. More than a third (58) of the reported outcomes reflect multicountry interventions, demonstrating CGIAR's widespread work in Africa. CGIAR innovations in Kenya related primarily to improved seed systems and agronomy; agroecology and nature-positive solutions; livestock and mixed crop-livestock systems; participatory development, scaling, finance, and credit; digital innovations; and gender equality and social inclusion. Policy outcomes also followed many of these same thematic areas. Examples of specific policy contributions included strengthening seed certification regulations for vegetatively propagated materials, contributing to a National Agroecology Strategy under the leadership of Kenya's Ministry of Agriculture and Livestock Development, and supporting national and local responses to climate change.

Many outcomes were relevant to more than one Impact Area, each of which is well represented by the outcomes, showing CGIAR's integrated approach to food systems transformation. Most outcomes (90 percent) reported partnering with at least one institution, with county governments the most frequently reported national partner followed by Kenya's Agriculture and Livestock Research Organization (KALRO, Figure 23).

Outcomes align well with Kenya's Bottom Up Economic Transformation Agenda (BETA), the National Climate Change Action Plan, and the Agriculture Sector Investment Plan, among other Kenyan policies. Many of the priority value chains in BETA are covered among CGIAR outcomes and impact assessments, though there are some gaps. Geographically, CGIAR outcomes and impact assessments include a large number of counties, but the more arid areas away from Nairobi have fewer results.

While there are solid partnerships with national institutes in the generation of outcomes and impacts, there is limited cross-initiative collaboration in generating outcomes and limited cross-CGIAR Center collaboration in impact assessment studies.

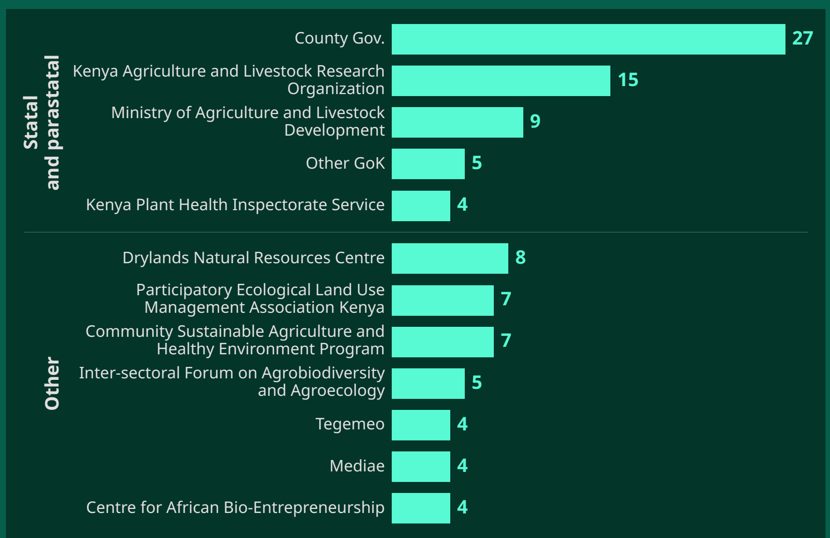


Figure 23: Local partners contributing to CGIAR outcomes.

Source: A PPU-commissioned study by IFPRI to evaluate the combined outcomes achieved in Kenya 2022-2024 and how to study their potential for impact. At the time of publication, the study is not yet available online. Redrawn with permission from the authors.

incentives for conservation agriculture generally took four years to adopt these approaches.[134] In Malawi, dis-adoption of conservation agriculture was high, with rates dropping from 57 percent two years after an intervention to 12 percent seven years after the intervention.[135] Adoption decisions were driven by access to extension agents and credit, labor availability, education, weed and pest pressure, legal protection from grazing, and costs of herbicides, pesticides, or fertilizers.[134,135]

CGIAR helps national programs across Africa overcome these challenges and support the adoption of sustainable land management at scale. The organization contributed to Kenya's National Agroecology Strategy in 2024, which emphasized the importance of sustainable land management, gender, and social inclusion (PRMS 838). CGIAR also supported World Vision International, CARE, and the Organization for Rehabilitation and Development in Amhara, Ethiopia, to collaborate with Ethiopia's Productive Safety Net Program and provide a package of sustainable land management tools and training for poor women specifically or women and men jointly (PRMS 19205). In Zambia, a CGIAR-supported TV show, Munda Makeover, reached more than 2 million viewers with agro-advisories and nutrition information services.[o,136] Finally, CGIAR supported the development of a digital tool to provide site-specific fertilizer recommendations for staple crops in Rwanda, which has been integrated into the country's national digital platform, connecting farmers with subsidized fertilizer distributors (PRMS 17839).

o This value was not reported into CGIAR's PRMS and a smaller value of 650,000 viewers is included in the total reach numbers in the box at the beginning of the Africa section (PRMS 9753).

One of the beneficiaries of the Accelerated Chicken Genetic Gain project in Kalu district, Ethiopia. Photo credit: Apollo Habtamu/ILRI

Enhancing nutrition, productivity, and resilience with livestock

Livestock play a vital role in African food systems—providing protein, micronutrients, income, and resilience to millions of rural households. In recent years, CGIAR Centers and partners pioneered nutrition-sensitive, gender-transformative livestock interventions to ensure that animal-source foods improve dietary outcomes, economic resilience, and gender equity (Figure 24).[137]

Africa RISING successfully demonstrated that efforts to increase livestock ownership and improve livestock practices can increase income.[40] In Malawi, the program increased net household income by US$584 purchasing power parity annually, while the program increased livestock income by US$352 purchasing power parity annually in Tanzania. Effects were more modest in Ghana, where the program increased annual net income by nearly US$40 a year in purchasing power parity, and in Mali, where the program increased per capita daily expenditure by US$1.3 in purchasing power parity.[40]

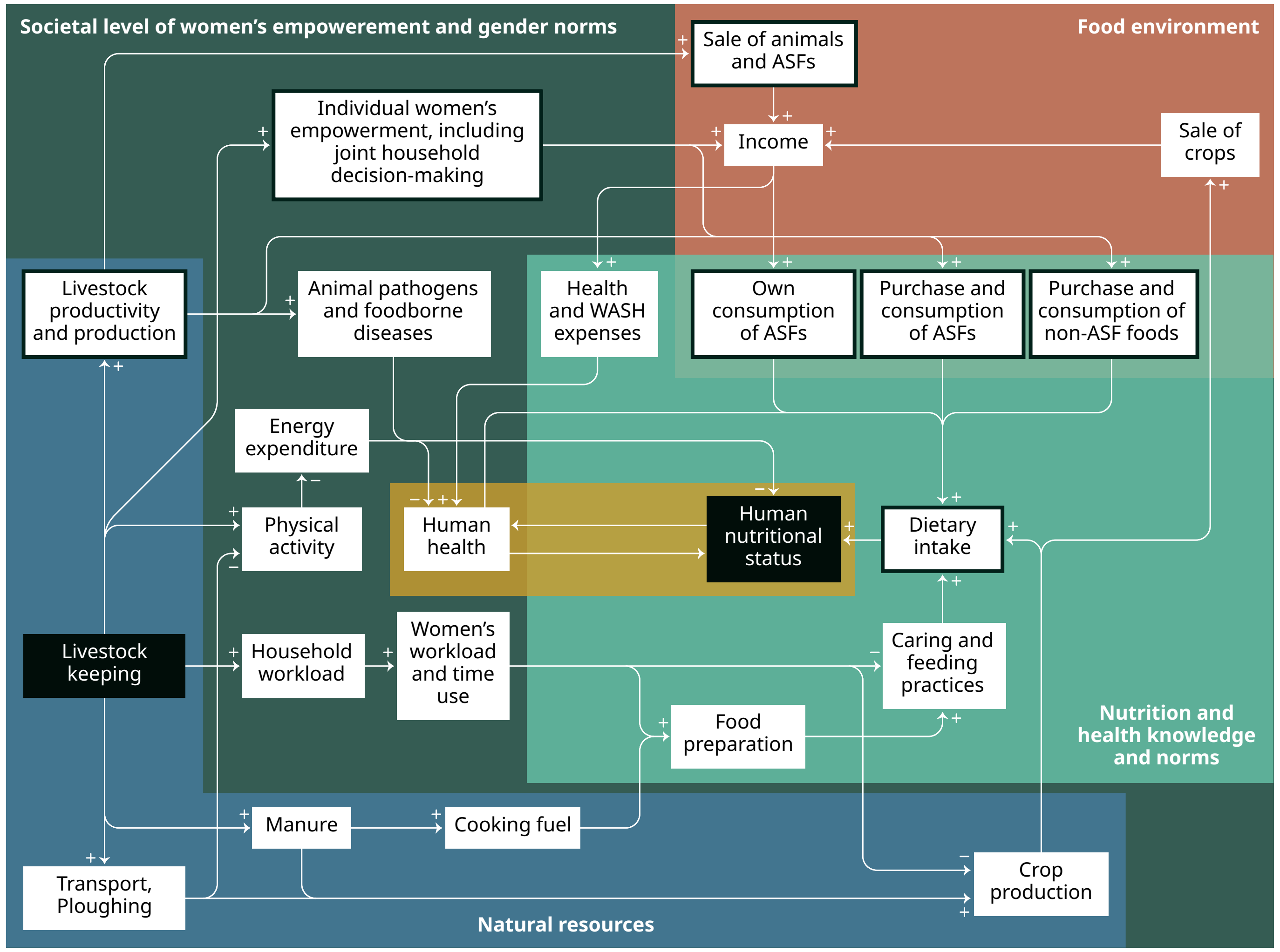


Figure 24: Livestock pathways framework. The colored boxes in the background of the diagram show the contextual domains, which are important underlying factors that influence constructs within the framework and that nutrition-sensitive livestock programs frequently seek to modify. The pluses and minuses on the arrows indicate whether a construct positively or negatively impacts a neighboring construct in the diagram. Constructs that are part of the three main livestock-to-nutrition impact pathways—own-consumption, income, and women's empowerment—have lines around them.

Notes: AFS – animal source foods. WASH – water, sanitation, and hygiene. Redrawn with permission from the authors.[137]

Combining livestock management interventions with nutrition education can increase the consumption of animal-source foods, improving dietary quality.[137] In Rwanda, the targeted engagement of fathers in nutrition campaigns to increase children's intake of animal-source foods was associated with their children consuming more animal-source foods.[117]

CGIAR places community engagement and empowerment at the center of its livestock work. Through Pioneer Positive Deviance initiatives in Ethiopia and Kenya, CGIAR encouraged farmers to identify and test farmer-led solutions to climate change (PRMS 19305, 19301). From 2022 to 2023, 16,490 households in Ethiopia entered CGIAR's community-based breeding programs (PRMS 9751). A previous evaluation of this program found that it improved genetic gains and that members increased their animal sales, animal consumption, and income relative to non-members.[138]

CGIAR works closely with pastoralists and governments to support sustainable rangeland management (see Restoring grazing lands and sustainable livestock management). Joint village land-use planning and participatory rangeland management aim to protect natural resources and facilitate the sharing of these resources across village boundaries. Supported by policy and legislation, these approaches support the sharing and management of grazing land, water, forests, or conservation areas between villages through land-use agreements. Working with the government of Tanzania, CGIAR secured the joint management of 2,365 hectares for shared grazing, benefiting 10,167 livestock keepers (PRMS 19548). Through CGIAR programs, more than 1 million hectares of rangeland in Kenya and 340,000 hectares of rangeland in Ethiopia were covered by community rangeland management plans (PRMS 19733, 19734). CGIAR pioneered index-based livestock insurance, which uses satellite data for drought-related payouts. A private-sector company started taking up the approach and covered 150,000 pastoralists in Ethiopia in 2024 (PRMS 19380). The Kenyan Integrated Agricultural Management Information System (PRMS 19625) and the Kenya Agricultural Observatory Platform (PRMS 19364) leveraged a CGIAR-supported digital platform (KAZNET) to provide real-time livestock market intelligence and rangeland and market monitoring through citizen contributors and mobile dissemination.

Digital tools developed by CGIAR reach millions of farmers with information to improve risk management, market linkages, and decision-making for livestock keepers. In Ethiopia, a digital marketing system supported by CGIAR in collaboration with a private enterprise connected small ruminant producers to markets (PRMS 10489). SMS, voice messages, and mobile tools were used by Jokalante in Senegal to deliver gender-sensitive climate information to nearly 900,000 pastoralists in 2024 alone (PRMS 17907). Meanwhile, iShamba in Kenya reached more than 2 million farmers through a television show on climate and financial literacy (PRMS 17712).

A child drinking milk produced by the family cow. Photo credit: Apollo Habtamu/ILRI

Capacity development session in one of the BecA-ILRI Hub laboratories. Photo credit: ILRI

Engagement with national governmental bodies

CGIAR's impact across Africa was substantially amplified through strategic partnerships with national governments. By providing its expertise to national planning processes, CGIAR translates research into actionable policies. In addition to examples previously mentioned, CGIAR research informed:

- Ethiopia's food-based dietary guidelines (PRMS 247) and food systems transformation agenda (PRMS 6632)
- Kenya's climate action strategies (PRMS 7994)
- Morocco's efforts to mainstream conservation agriculture into national strategies (PRMS 17173)
- Rwanda's Strategic Plan for Agricultural Transformation (PRMS 17043)
- Zambia's National Green Growth Strategy (PRMS 17975)

CGIAR's modeling tools informed multiyear investment plans in Tanzania (PRMS 17039) and Rwanda (PRMS 17043), shaping investment decisions based on measurable outcomes such as GDP growth and poverty reduction. CGIAR also informed public sector investment plans in Madagascar and Senegal (PRMS 8060, 18082) and the development of public-private partnerships in Mali (PRMS 948). CGIAR's agronomy-as-scale solutions, which focus on conservation agriculture, are incorporated into national strategies and Africa-wide declarations such as the Rabat Declaration by 3ACCA and reinforced by private-sector support (PRMS 4279).

Areas for future attention

Future impact assessments should try to follow the effects of interventions all the way down the causal chain, building up quality impact evidence from documentation of innovation use (such as drawing from SPIA evidence on innovation use). More evidence on gender dynamics and the differential access to, and benefits from, CGIAR innovations is needed. Efforts should be made to understand not only how innovations function under climatic extremes but also how they can reduce the environmental effects of agriculture. Given the region's rich agrobiodiversity, investment in evaluating the role of indigenous crops—such as sorghum, millet, and African leafy vegetables—could enhance food and nutrition security. Additionally, rigorous, regionally representative studies that assess the long-term and system-wide effects of interventions are needed to guide scalable solutions.[139]

CGIAR
SCIENCE FOR A FOOD-SECURE FUTURE

Latin America and the Caribbean

A young man works on a fruit stall at the Zapote Farmer's Market, San José, Costa Rica. Photo credit: Ben Roberts/Panos Pictures

The context

Latin America and the Caribbean (LAC) hosts 30 percent of the world's biodiversity and is the world's largest food-exporting region, consistently achieving food production surpluses.[2] At the same time, 53 million people in the region are hungry,[140] biodiversity is under threat, and climate change is causing shorter growing seasons, higher peak temperatures, and flash floods. Widespread degradation of forests and pasture across the region is exacerbating climate risks.[2] These all result in US$28 billion in crop and livestock production being vulnerable to climate risks.[141]

Aiming to nudge the LAC food system toward a more sustainable, equitable, and nutritious balance, CGIAR co-develops and tests context-specific solutions with local and national actors from various sectors.[141] **CGIAR advocates for climate-, water-, and nutrient-smart agricultural practices while enhancing market competitiveness. It supports the integration of digital services into agriculture and agri-entrepreneurship to promote diversified, remunerative value chains, local economies, stability, and community resilience.** CGIAR emphasizes support for women, youth, and other socially marginalized groups to play meaningful and satisfying roles as informed food consumers, producers, vendors, and processors.

CGIAR has three Centers based in the region: the International Maize and Wheat Improvement Center (CIMMYT) in Mexico, the International Potato Center (CIP) in Peru, and the Alliance of Bioversity and the International Center for Tropical Agriculture (Alliance of Bioversity and CIAT) is in Colombia. In addition, the International Food Policy Research Institute (IFPRI) is located in in the USA. CGIAR maintains long-standing crop breeding programs and genebanks for maize, wheat, potatoes, and tropical forages in the region. CGIAR cultivates partnerships with many national and international actors in the region, including the Brazilian Agricultural Research Corporation, FAO, and World Bank regional offices in LAC, and the Interamerican Institute for Cooperation in Agriculture.

Genebanks in Latin America and Carribean

The region hosts the CIMMYT genebank for maize and wheat, the CIP genebank for potato and other roots and tubers, and the Alliance of Bioversity and CIAT genebank for banana, plantain, fruits, forages, and beans.

- 14,801 samples were distributed to 25 countries during the 2022 to 2024 period.
- 35,330 accessions were safety-duplicated within the collections.
- 583 genebank tours took place in CIAT and CIP involving 11,476 participants.

By the numbers

Outcomes achieved 2022 to 2024	Impacts published 2022 to 2024
24 policy changes made drawing on CGIAR research.	From 2016 to 2020, CGIAR crop technologies[i] were used on **20 million** hectares in LAC, generating **US$4.2 billion** in LAC per year.[3]
US$14.3 million of third-party investment informed by CGIAR research.	A CGIAR-informed private cattle ranch uses Nerole short cycle cattle, improved grasses, rotational grazing, and buffer zones, contributing to **44 percent** lower greenhouse gas emissions compared to other farms in the region.[139]
2,833,777 farmers reached with CGIAR-informed innovations.	
Innovation users were from **1,028** organizations, **46 percent** of which were private companies.	

i. Most technologies considered were improved crops.

Figure 25. Highlights of outcomes achieved 2022 to 2024 and findings of impact assessment studies published 2022 to 2024 for the Latin America and the Caribbean region.

Evidence in Latin America and the Caribbean

Relative to other continents, CGIAR conducted fewer impact assessments of its work in LAC from 2022 to 2024. Only six studies specific to the LAC region were identified. These related to improved seeds and fertilizers, a government digital platform, and a novel approach to farmer engagement. However, many global evaluations of crop breeding programs contained analyses relevant to the LAC region, and CGIAR Initiatives reported outcomes of significance in the region.

Crop breeding

Responding to the incredible genetic biodiversity in the region, CGIAR prioritizes crop breeding in LAC. The preservation of genetic diversity, including wild relatives of modern crops, is essential for future breeding efforts and a major public good. CGIAR has a long history of crop breeding in Latin America, from the pioneering work of Norman Borlaug and colleagues developing high-yielding wheat in Mexico in the 1950s and 1960s, to the widespread adoption of improved *Urochloa* forage in the 1990s, to the more recent work preserving and promoting under-utilized Andean tuber crops.[142] CIAT played a leading role in the development of biofortified foods in the early 2000s.[140]

From 1960 to 2020, the cumulative value of CGIAR-supported improved varieties in LAC was approximately US$120 billion.[3] Across the LAC region, **20 million hectares were planted with CGIAR-supported improved varieties from 2016 to 2020, generating an additional average annual revenue of about US$5.4 billion** (in 2025 dollars).[3] Breeding *Urochloa* forage alone was estimated to generate US$550 million

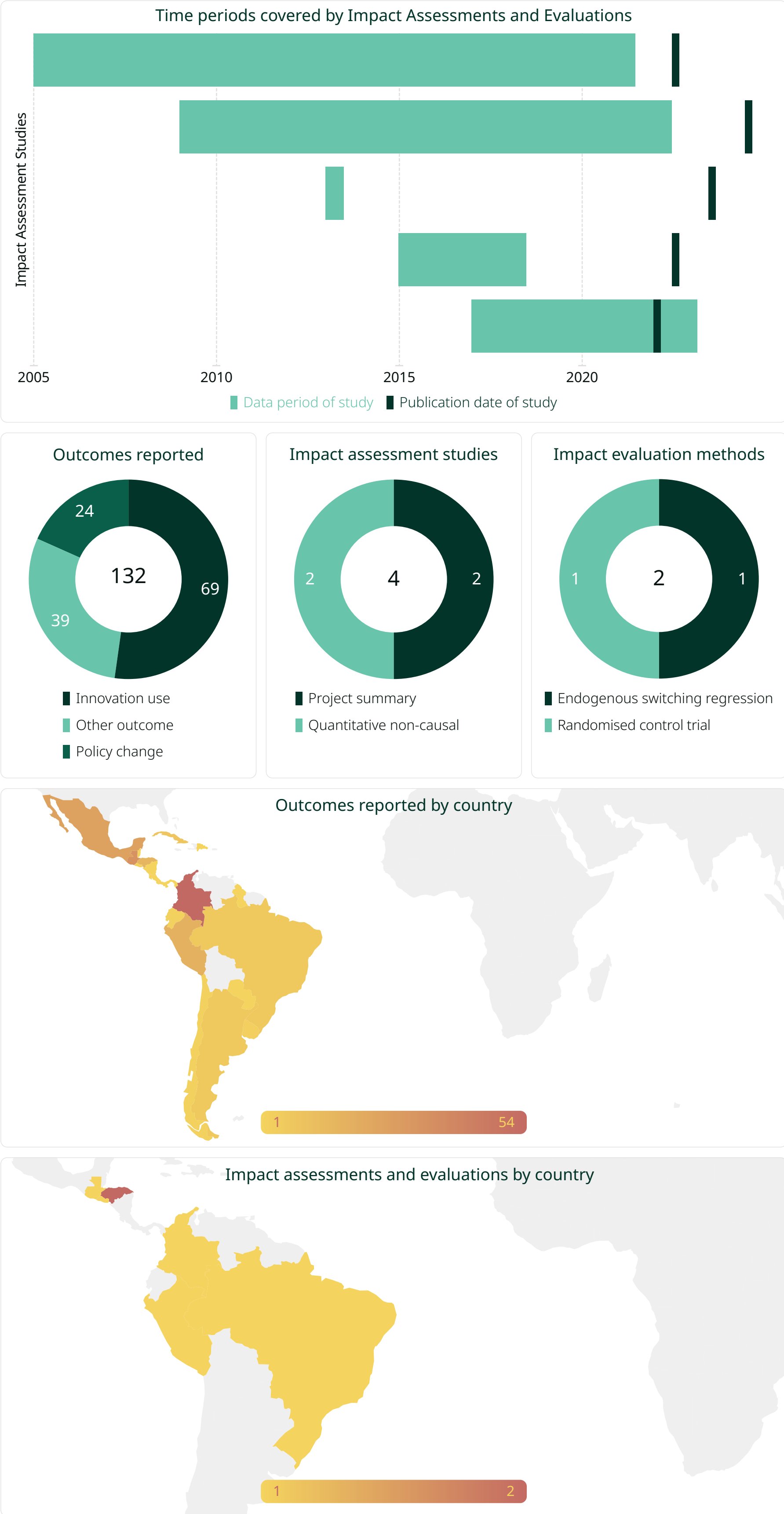


Figure 26. Evidence base of the impacts and outcomes for the Latin America and the Caribbean region.

Top panel: One impact assessment did not specify the dates covered by their data and so is not represented. Where studies used datasets with different time periods for different indicators, each time period is represented by a horizontal bar. One of the impact assessment studies modelled greenhouse gas emissions over the period 2017-2023, and was published in 2022. Hence the publication date is within the time period covered by the study.

Middle panel: The middle-center panel expresses the methods used by non-causal impact assessment studies, whereas the middle-right panel expresses the methods used by causal impact evaluations.

Bottom panel: The map represents all six impact assessment studies. One study which took place in multiple countries is represented in each country. Most studies were not nationally representative but took place in certain regions or communities.

per year and to cover 1.5 million hectares of land (PRMS 9926).

According to a recent review, CIMMYT and ICARDA are the primary sources of improved wheat varieties used across the global South.[143] The varieties developed by these Centers and hundreds of partners via the International Wheat Improvement Program, which CIMMYT coordinates, increased yield, stability, and disease resistance.[143] Use of improved wheat varieties reduced fungicide, fertilizer, and irrigation requirements and often improved nutritional and culinary characteristics. The breeding programs also averted emerging threats caused by plant diseases, such as rust and blast, which have increased due to climate change.[143]

To support robust, sustainable local seed systems and local infrastructure, CGIAR collaborates with national research partners, the private sector, community organizations, and farmers. CGIAR worked with national research and implementing organizations in Guatemala, Honduras, and Colombia to distribute and diffuse biofortified maize and bean seeds in 2022 and 2023 (PRMS 1911, 1912, 10291, 1908, 10297, 10299). CIMMYT alone issued 383 licenses to 239 public and private partners from 2017 to 2022, allowing partners to use CGIAR-derived maize varieties in commercial breeding programs (PRMS 8075). To build self-sufficient systems in Guatemala in 2024, CGIAR supported trainings for local organizations on the production of quality-certified biofortified seeds (PRMS 14274,14315). CGIAR worked with farmers to increase adoption of the improved varieties that became available through CGIAR-strengthened seed systems (see the next section).

A coffee farmer who intercrops with pepper, at her farm in Cauca, southwestern Colombia. Photo credit: Neil Palmer/CIAT

Citizen science and innovation

Farmers are an important part of any seed system, ultimately making the decisions over which varieties to plant every season. Acknowledging the centrality of farmers in seed systems, CGIAR employs "participatory variety selection," which is the intentional inclusion of farmers in the testing and selection of crop varieties suited to farmer needs and context.[144] Participatory variety selection is also an important channel for farmers to deliver feedback to breeding programs, ensuring their voices are represented in the development of new varieties.

A novel form of digitally enabled participatory crop variety selection, the Tricot system, facilitated more farmers to participate at lower costs, increased information flow back to breeding programs, and achieved similar levels of increased farm diversity compared to more intensive in-person approaches.[145]

The Tricot approach was developed in Latin America, then rapidly scaled out to other locations worldwide, and applied to other crops. A 2021 evaluation of Tricot in India found increased varietal diversity, crop productivity, and capacity to adapt to agricultural shocks.[146] The **Tricot approach was replicated in at least 21 countries**, with recent work in Nigeria and Cameroon applying the method to cassava breeding programs.[147] Tricot was used in Uganda to accelerate the registration of a new potato variety.[148]

To support locally led development, CGIAR invests in the innovation capacity of the agrifood system. Building on years of partnerships and approaches, such as Climate-Smart Villages and Agroclimatic Technical Committees, multisectoral Innovation Hubs were established in Mexico, Guatemala, and Honduras.[149,150] The hubs bring together agricultural professionals, market actors, extensionists, farmers, and scientists to exchange knowledge and best practices and to deliver co-learning programs. Twenty-five institutions are represented in the Guatemalan hubs, 14 institutions in the Honduran hubs, and more than 20,000 farmers receive support through the Mexican hub.[150] Across all three countries, the program reached more than 100,000 farmers with information services to support resilient agriculture.[150]

Managing natural resources

CGIAR works with governments and communities across LAC to aid the sustainable management of the rich natural resources. The benefits of these practices are not only environmental but often improve the wellbeing of those stewarding the land.

Since 2016, CGIAR has worked with the government of Honduras on the Agua de Honduras digital platform. In three successive phases, the organizations built a digital platform that informs water resource management at various levels of decision-making and now covers 44 percent of the country.[151] Through the platform, 110 watershed management councils were legalized, empowering local communities in their own water governance. In one case, the digital platform informed the design of a new aqueduct in Yarushin, which facilitated the resettlement of 1,080 people affected by climate change. Leveraging the aqueduct, 50 homes were constructed with utilities and a water storage tank, supporting a more resilient community among this vulnerable population.

Extensive cattle grazing is a major land use in the LAC region, covering more than 1.5 million square kilometers, and has been one of the causes of deforestation, biodiversity loss, and greenhouse gas emissions. Since 2019, CGIAR has supported a ranch in Colombia to develop and demonstrate an alternative and more sustainable approach.[152] **The Hacienda San Jose uses Nerole short cycle cattle, CIAT's improved *Urochloa* grasses, rotational grazing, and buffer zones (PRMS 19582), all of which contributed to 44 percent lower greenhouse gas emissions compared to other farms in the region.**[139] This led to a US$7.5 million investment in the ranch to expand the approach from 8,800 hectares to 180,000 hectares in 2022 (PRMS 4228). Such investments provide the opportunity to develop environmentally and economically sustainable cattle ranching businesses at the transition zone around the ecologically fragile Amazon forest.

Other examples of CGIAR's contributions to natural resource management in LAC include expanding the number of signatory organizations to Colombia's dairy value chain zero-deforestation agreement (PRMS 2261), developing the Cacao Sustainability Strategy for the Amazon-frontier regions of Colombia (PRMS 10547, 10558), and contributing to the Central American Integration System's Regional Climate Strategy (PRMS 10458).

A participant in CGIAR's AgriLAC Resiliente initiative shows off a large corn cob. Photo credit: Daniela Arce/CIAT

Maize kernals harvested and dried from a field trial plot. Photo credit: Daniela Arce/CIAT

Engagement with national governmental bodies

CGIAR's collaboration with the Guatemalan government has significantly advanced the country's efforts to establish a National Framework for Climate Services, transforming how climate information is generated, delivered, and used (PRMS 18263). By conducting a comprehensive assessment of Guatemala's meteorological and hydrological systems, CGIAR scientists helped identify critical service gaps and guided the creation of a strategic, costed action plan—laying a structured foundation for coordinated national action. In parallel, CGIAR co-developed "last-mile" mechanisms with the Ministry of Agriculture to reach farmers with tailored, actionable climate information (PRMS 18388). One mechanism, Participatory Integrated Climate Services for Agriculture, has proven compelling, securing more than USD$1.4 million in funding from WFP-linked projects to scale these services across five departments and 176 communities. Through this integrated approach—policy-level frameworks and farmer-focused delivery—CGIAR has helped the Guatemalan government position climate services as a tool for both institutional resilience and day-to-day risk management.

Areas for future attention

CGIAR is testing and expanding many promising agricultural technologies and approaches in the LAC region; however, their impacts on farmer income, health, and wellbeing have not yet been fully established. The impacts of priority region-specific initiatives and innovations, such as *Urochloa* forages and policy-institutional work, should be better understood to improve the targeting of CGIAR investments. CGIAR contributions to policy change, particularly on sustainable land and water use, are rarely subjected to impact evaluation. Given the invaluable and unique bioecology of the region, more evaluations of the effectiveness of interventions at mitigating climactic and environmental harms could support conservation efforts. Future work should also consider Indigenous communities, gender dynamics, and environmental externalities.

Asia and the Pacific

Farmer weeding vegetable crop near Hanoi. Photo credit: Chris de Bode

The context

Asia and the Pacific cover an enormous land area and host almost 60 percent of the world's population. The region's agrifood system faces formidable challenges in poverty reduction, climate change, and envrionmental degradation in order to provide adequate and affordable diets and decent livelihoods to the vast population. Social, economic, and geographic inequalitites create barriers to equitable inclusion in the agrifood system, preventing farmers from accessing markets, extension services, and irrigation, and resulting in the region's poor people increasingly consuming unhealthy diets.[153] Rapid urbanization and rural outmigriation, especially among youth, are resulting in labor scarcity, increasing production costs, and disrupting the agrifood supply chain. At the same time, the region continues to recover from the COVID-19 pandemic and rapid increases in global food and energy prices, with women and rural areas disproportionately affected.[155]

Asia produces 58 percent[156] of the world's rice, and more than half of the calories consumed in the region come from rice.[157,158] Heavy reliance on rice for food security and growing populations make rice of great economic and social importance in the region. However, the predominantly rice-based farming system is vulnerable to biotic and abiotic shocks while threatening biodiversity and ecosystem services.

Across Asia, climate change and envrionmental degradation jeopardize the agrifood system. Southeast Asia and the Pacific are increasingly affected by droughts, floods, temperature extremes, pest and disease outbreaks, and rising sea levels.[155] In South Asia, natural resource degradation, low resource use efficiency, and agriculture-based air pollution threaten the sustainability of the agrifood system and human and planetary health.[154]

Genebanks in Asia

The region hosts the IRRI genebank for rice; the ICRISAT genebank for sorghum, millet, chickpea, pigeon pea, and groundnut; and the ICARDA genebank for barley, wheat, lentils, chickpeas, faba beans, and other dryland crops.

- 96,869 samples were distributed to 34 countries in Asia during the period 2022 to 2024.
- 33,549 accessions were safety-duplicated within the collections.
- 598 genebank tours took place in ICARDA, ICRISAT, and IRRI involving 5,116 participants.

By the numbers

Outcomes achieved 2022 to 2024	Impacts published 2022 to 2024
120 policy changes occurred with CGIAR contributions.	From 2016 to 2020, CGIAR crop technologies[i] were used on **123 million** hectares of land, generating **US$27 billion** per year in Asia and the Pacific.[3]
US$380 million of third-party investment informed by CGIAR research.	Over an approximately 20-year period, CGIAR's rice breeding efforts showed **benefit:cost ratios** of **115:1** (net present value of USD 33 billion) in Bangladesh and **7:1** (net present value of 3.6 billion) in the Philippines.[5]
11,229,686 farmers reached with CGIAR-informed innovations.	Rice yields in Bangladesh more than doubled in the last four decades, increasing from an average of **1.75 tons per hectare** to **4.57 tons per hectare**.[5]
Innovation users were from **1,079** organizations, **54 percent** of which were private companies.	

i. Most technologies considered were improved crops.

Figure 27. Highlights of outcomes achieved 2022 to 2024 and findings of impact assessment studies published 2022 to 2024 for the Asia and the Pacific region.

CGIAR works with and supports national and regional partners to achieve sustainable and resilient food, land, and water systems in alignment with the Association of Southeast Asian Nations' (ASEAN) Vision and Strategic Plan for Cooperation in Food, Agriculture, and Forestry 2016–2025; the ASEAN Community Vision 2025; and as part of the ASEAN-CGIAR Innovate for Food and Nutrition Security Regional Program. CGIAR has five Centers with headquarters in Asia: the International Center for Agricultural Research in the Dry Areas (ICARDA), the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), the International Water Management Institute (IWMI), the WorldFish Center (WorldFish), and the International Rice Research Institute (IRRI). CGIAR's most frequent partners in generating outcomes in Asia are the Indian Council of Agricultural Research and the Ministry of Agriculture and Rural Development of Viet Nam.

Evidence in Asia and the Pacific

From 2022 to 2024, 44 impact assessments were published on CGIAR-supported interventions in Asia and the Pacific. Most interventions supported the introduction of new agricultural technologies, particularly improved crop varieties. Interventions generally targeted poverty reduction, livelihoods, and food security, often through efforts to increase the yield of staple crops, although fish, meat, and behavioral interventions were also evaluated. Rice is by far the most commonly targeted crop. Interventions targeting climate mitigation and adaptation; environmental health and biodiversity; and nutrition, health, and food security were also common.

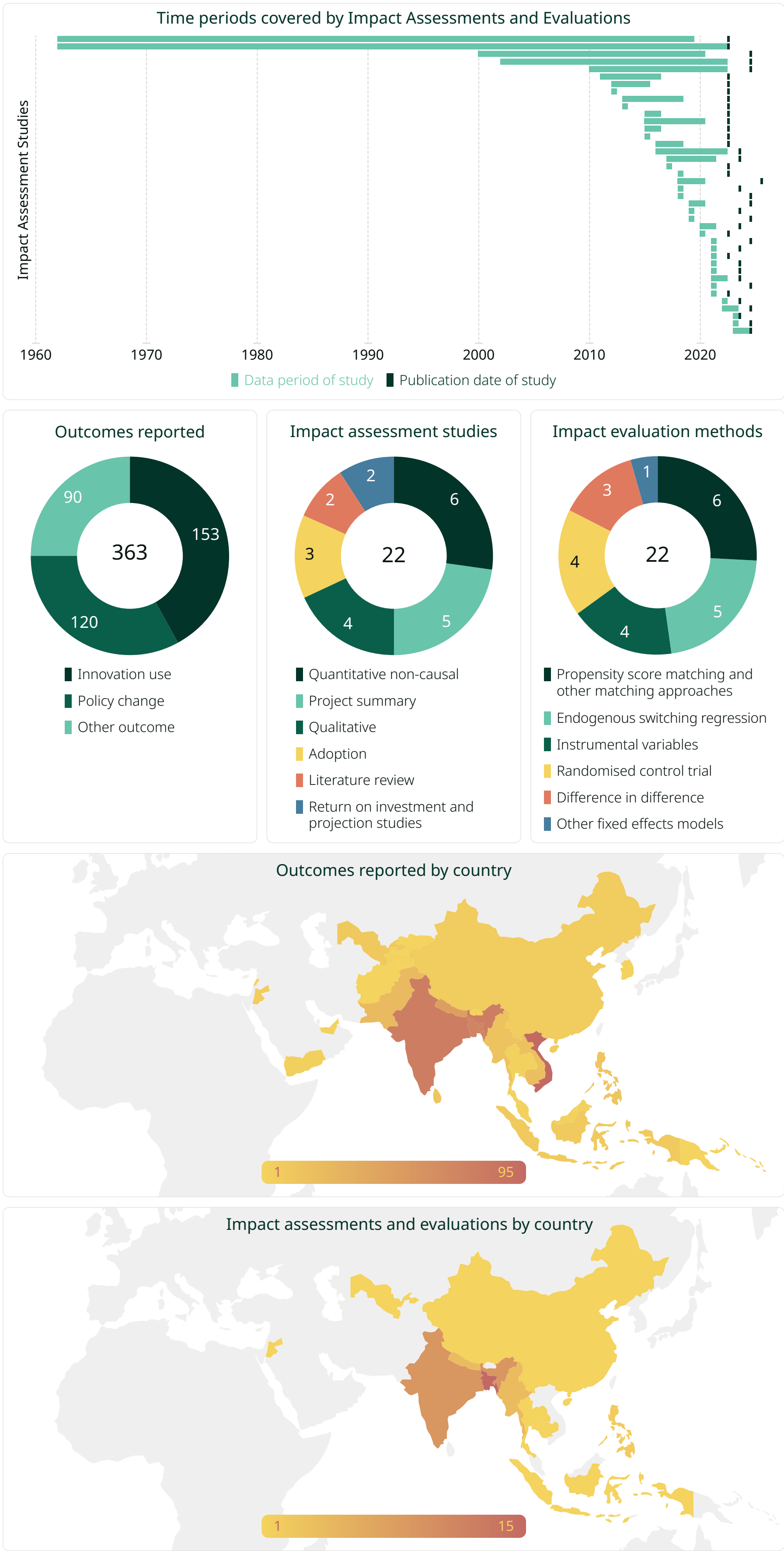


Figure 28. Evidence base of the impacts and outcomes for the Asia and the Pacific region.

Top panel: Seven impact assessments did not specify the dates covered by their data and so are not represented. Where studies used datasets with different time periods for different indicators, each time period is represented by a horizontal bar.

Middle panel: The middle-center panel expresses the methods used by non-causal impact assessment studies, whereas the middle-right panel expresses the methods used by causal impact evaluations. One impact evaluation reported results from both RCT and difference-in-difference methods and hence is included in both categories.

Bottom panel: The map represents 42 impact assessment studies. Two studies at the regional level are not shown. Most studies were not nationally representative but took place in certain regions or communities.

Investments in rice breeding pay dividends

Given the importance of rice to the agrifood systems of Asia, CGIAR has long-term investments in improving rice productivity through the preservation of rice variety genetics, breeding programs, and engagement with partner networks to test and disseminate improved varieties. More recently, CGIAR introduced flood-, saline-, and stress-resilient rice varieties to strengthen the resilience of rice production to climate change. Over an approximately 20-year period, **CGIAR's rice breeding efforts achieved highly favorable benefit:cost ratios of 115:1 in Bangladesh (net present value of US$33 billion) and at least 7:1 in the Philippines (net present value of approximately US$4 billion)**.[5] International Rice Genebank and partners' efforts to combat rice blast fungus achieved a benefit:cost ratio of 24:1 in Bangladesh from 2013 to 2020, with CGIAR's germplasm health unit's phytosanitary actions alone providing a 112:1 ratio.[159] These studies demonstrated the long-term nature of research investment and showed that returns were achieved over the course of decades, not two- to four-year project cycles.[5,159] They also highlighted the importance of CGIAR's partnerships with national breeding programs and NARES. CGIAR did not develop and scale these varieties on its own but worked in collaboration with partners to leverage investments and achieve such positive returns.

Rice yields in Bangladesh more than doubled in the last four decades, from an average of 1.75 tons per hectare to 4.57 tons per hectare, with IRRI supporting the development of 87 of the 89 leading rice varieties.[5] Varieties drawn from the IRRI Genebank tended to perform better than other varieties and provided a net-aggregated benefit of US$8.6 million in 2015.[160] In eastern India, CGIAR-supported flood-tolerant rice was associated with a 19 percent increase in yield over traditional varieties,[19] while improved rice in Indonesia increased yields by 11.5 percent and incomes by 12.1 percent.[161] Germplasm health units in Bangladesh achieved yield savings of 9 to 16 percent.[159]

CGIAR's work in Bangladesh

CGIAR's SPIA conducted a comprehensive stocktaking of all CGIAR-supported innovations in Bangladesh, including commissioning the fourth round of the nationally representative Bangladesh Integrated Household Survey.[10] These innovations reached between 8 and 9.4 million households in Bangladesh in 2023/2024. The most used innovations in the major Boro and Aman production seasons are improved rice varieties. DNA tests reveal that CGIAR-related varieties were found in the plots of 52 percent of rice-growing households in the irrigated Boro season, with average varietal year of release of 2004. In the rainfed Aman season, 39 percent of rice growers reported adopting CGIAR-related varieties with a weighted varietal release year of 2001. Newer stress-tolerant rice varieties are starting to be adopted at scale but have not yet displaced older releases. In addition, CGIAR-related varieties are cultivated by approximately 60 percent of wheat-growing households, 42 percent of lentil-growing households, and 34 percent of peanut-growing households. These crops are of minor importance when compared to rice but still deliver reach in the hundreds of thousands of households. Aquaculture innovations, particularly the recently released G3 Rohu strain, continue to grow in importance as well.

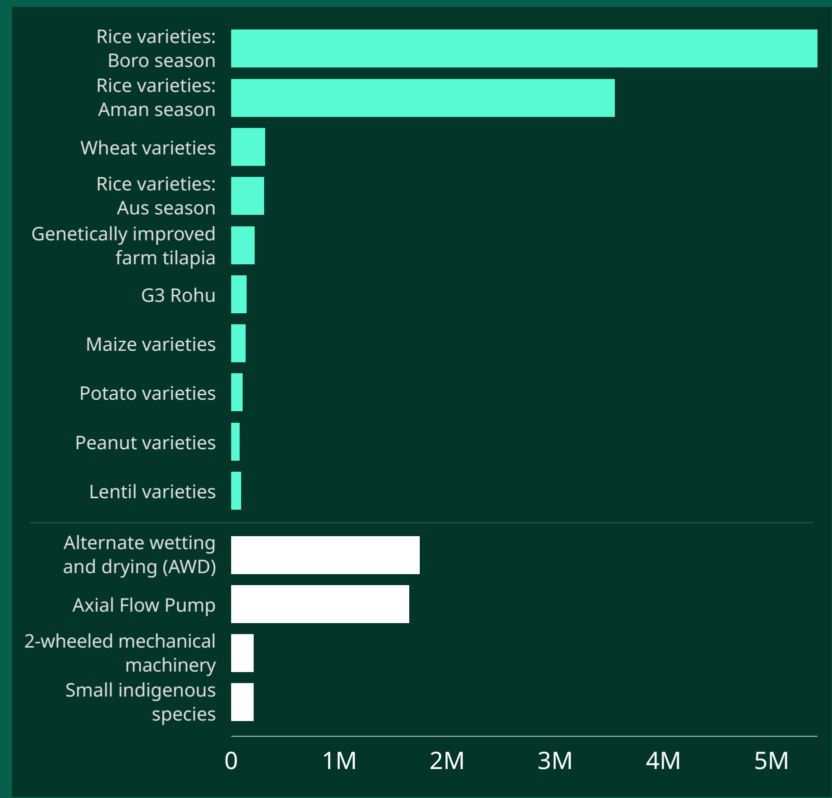


Figure 29: Use of CGIAR-related innovations in Bangladesh in 2024 (millions of households).

Source: SPIA Bangladesh Report 2025. Redrawn with permission from the authors.[10]

Bangladeshi girl walks through rice fields with her school books. Photo credit: Suja N/IRRI

Rice management for sustainable production

CGIAR complements its efforts to improve rice varieties with investments in rice management: agronomy, mechanization, irrigation, value chains, postharvest technologies, the policy environment, and farmer support systems, including information and communication technology. A wide range of these have been found to be effective at improving yields and incomes across the globe,[39] motivating CGIAR's support of these beneficial practices across Asia. With the German Agency for International Cooperation (GIZ) and Helen Keller International, CGIAR supported the scaling of mechanized direct seeding by training 105 agricultural cooperatives in Cambodia (PRMS 9389). CGIAR also championed environmentally friendly[162–164] alternatives to burning rice straw postharvest, a cause of severe air pollution and nutrient loss. Such alternatives include mechanized collection and composting (PRMS 255), cattle feed (PRMS 15751), mushroom cultivation (PRMS 255), and mulching in potato and vegetable systems (PRMS 18488, 17855).[165] At the policy level, CGIAR worked with the government of Bangladesh to integrate alternate wetting and drying techniques into the country's National Adaptation Plan for 2023–2050 (PRMS 2098).

Rice management for climate adaptation and mitigation in the Mekong Delta

The Mekong Delta is a center of rice production, export, and innovation but is very vulnerable to climate change. The region faces challenges due to drought, salinity, and other climate change risks; overuse of nitrogenous fertilizer and pesticides; excessive methane emission; rice straw burning causing air pollution; and losses at harvest and postharvest due to inappropriate planting methods. Recognizing the need for high-quality, high-productivity, low-greenhouse-gas-emission rice, Viet Nam's Ministry of Agriculture and Rural Development requested CGIAR to develop solutions.

CGIAR supported the combined implementation and adoption of improved varieties with multiple rice innovations to increase yield, decrease emissions of greenhouse gases and particulates, and alleviate climate risk. Alongside partners, it developed climate risk plans at the regional and district levels. It also supported the adoption of alternate wetting and drying in Viet Nam, which is now used by 1.16 million farmers (PRMS 8680) and successfully reduces greenhouse gas emissions.[166] This was augmented by a carbon credit system to account for and monetize the resulting carbon credits (PRMS 8702). CGIAR also championed appropriately scaled mechanized direct seeding of rice combined with deep placement of fertilizer and site-specific nutrient management, which reduced the need for inputs and pollution.[164] Rice straw value chains were developed for composting, cattle feed, and mushroom cultivation, providing more lucrative alternatives to in-field burning.[162] Early-stage trials of the combined suite of technologies including rice management and improved varieties showed significant improvements in income and production and decreased greenhouse gas emissions and pollutants.

Leveraging CGIAR's work, the Viet Nam government committed to applying this suite of practices more than 1 million hectares of land by 2030 (PRMS 15060, 15061), approved the "Sustainable Development of One Million Hectares of High-Quality and Low-Emission Rice Associated with Green Growth in the Mekong River Delta by 2030" program, and issued technical guidance to meet this objective. The program entails significant reorganization of the production system along the rice value chain and is expected to enhance production, economic efficiency, and livelihoods for farmers, as well as contributing to the fulfilment of Viet Nam's international greenhouse gas mitigation commitments.[p]

CGIAR's work in Viet Nam

CGIAR's SPIA conducted a nationally representative study of all CGIAR-supported agricultural innovations and practices in Viet Nam, in partnership with the country's General Statistics Office.[9] Ten innovations showed promise of adoption on a large scale, with between 3.7 and 3.9 million Vietnamese households using them, indicating significant potential impact on rural communities (Figure 30). In 2023, improved rice varieties reached close to 2 million households. Sustainable intensification practices, including "Three Reductions, Three Gains" and "One Must Do, Five Reductions," alternate wetting and drying, and sustainable water use for coffee production, also showed significant adoption. Some innovations were more evident in the commercial sector, such as genetically improved farmed tilapia, which appeared in a few farming household ponds but showed high presence in hatcheries. This highlights the crucial roles of national agricultural research systems, public-sector dissemination efforts, and private-sector markets in facilitating the decade-long diffusion and adoption of these innovations.

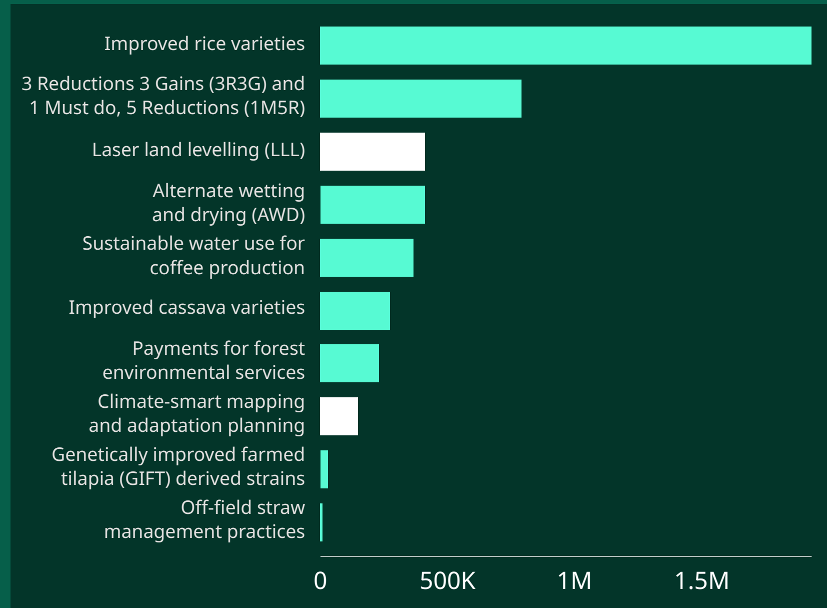


Figure 30: Number of households adopting each CGIAR-related innovation in Viet Nam in 2023.

Note: Innovations in **teal** are included in the lower bound of CGIAR reach. To calculate the upper bound of CGIAR's reach, study authors include innovations in **white**. Redrawn with permission from the authors.[9]

p Approved and endorsed by DCP, MARD of Vietnam, Decision No 145/ QĐ-TT-CLT dated 27 March 2024, Vietnamese version and English version.

Enhancing aquaculture and fish consumption

Aquatic foods account for 17 percent of all animal-source foods consumed worldwide,[167] with consumption concentrated in Asia.[168] Therefore, the sustainable management of aquatic resources is important for both nutritional and ecological reasons. Given the longstanding work of CGIAR to support aquaculture and fisheries, most recent evaluations focus on finetuning aquaculture systems rather than establishing broad-scale impact. In Bangladesh, CGIAR-supported approaches to the ecological management of small and underutilized ponds increased productivity, diversity, income generation potential, and certain dimensions of women's empowerment but had no effect on household food security.[115] Also **in Bangladesh, a novel model for aquaculture extension through local service providers significantly increased fish productivity by 17 to 25 percent and income by 40 to 43 percent.**[15] Similarly, in Myanmar, trainings on aquaculture management and nutrition improved dietary diversity, fish consumption, and income.[54] Effects increased when training was extended to a second year, suggesting that longer-term training may lead to better impacts. The combination of integrated farming systems (aquaculture, rice, vegetable, fruit, and livestock) and the use of additives to improve water quality increased production per unit area of land and reduced nutrient loss in Myanmar as well.

Production from global aquaculture overtook production from capture fisheries for the first time in 2022,[169] partly due to the contributions that CGIAR has made over the decades. In support of global aquaculture, CGIAR facilitated the release of genetically improved farmed tilapia in 1994, resulting in tilapia becoming the most farmed fish in 2017, with more than half being derived from CGIAR genetically improved breeds according to evidence from 2020.[170] In 2024, genetically improved Rohu Carp, which grow 37 percent faster than existing commercial strains, were distributed to 59 hatcheries in Bangladesh (PRMS 9525). In Myanmar and Bangladesh alone, 1.3 million small-scale fish producers received digital advisories, trainings, and microfinance opportunities from CGIAR and its partners between 2022 and 2024 (PRMS 8648, 17539, 3534, 15244, 3554, 3593). Alongside the government of Odisha, India, CGIAR supported the training of 50,000 women in fishery-based businesses in 2023 (PRMS 9859). CGIAR supported the government of Timor-Leste in the execution of its National Aquaculture Development Strategy (PRMS 17845) and the Department of Fisheries in Bangladesh in its commitment to sustainable and inclusive canal water management (PRMS 18734).

Genetically improved Rohu Carp in Bangladesh. Photo credit: Worldfish

CGIAR supports sustainable fisheries through global monitoring and databases underpinning policy support work. For example, it supports PeskAAS (Automated Analytics System for small-scale fisheries) in Timor-Leste, which was used by the government in decision-making for fishery management (PRMS 1788, 10266). The digital tool and data contributed to capacity building, partnerships and collaboration, and sustainable resource management. It catalyzed collaborations between government departments and between government and community groups, although it has not yet led to any direct policy formulation. CGIAR also supported the government of the Solomon Islands with its Community Based Coastal and Marine Resource Management Strategy (PRMS 2522).

Food systems transformation for a healthy continent

CGIAR acts at several points along the agrifood system to support healthier, more nutritious diets. Much of CGIAR's work incentivizes the production of diverse, nutritious crops. CGIAR-supported improved lentils contributed to an increase in Bangladesh's national supply of lentils by 8.8 million tons (6 percent) through increased yields (an additional 181 kilograms per hectare) while also supporting increased farmer gross margins (US$169 per hectare).[171] In addition, it supported the release of five high-yielding, high-zinc rice varieties in Pakistan and India in 2023. Nutrition training was a key factor in driving adoption of high-zinc rice varieties in Bangladesh, but seed supply and perceived lower yield inhibited sustained adoption, highlighting the need for continued breeding and outreach programs that address local contextual needs.[62]

CGIAR also specifically targets dietary improvements for young children across the continent. It successfully collaborated with the government of Telangana State, India, to integrate nutrient-dense, ready-to-eat meals and snacks formulated with underutilized, climate-resilient crops (millet, sorghum, groundnut) into state-sponsored community food banks for women with young children. This initiative was related to improved child anthropometric outcomes, including weight, height, and mid-upper arm circumference.[75] In Bangladesh, a CGIAR-supported initiative that provided behavior change messaging about food allocation and child feeding successfully achieved mindset shifts in how food was allocated and prioritized.[116] The inclusion of husbands and mothers-in-law was thought to be particularly important to the shift in cultural norms achieved by this intervention.[171]

A healthy diet is not only nutritious but also free of foodborne pathogens (see Postharvest storage, food safety, and One Health). Foodborne illness continues to be a major public health concern.[67] To reduce foodborne illness, **CGIAR supports the National Food Safety Technical Working Group in Viet Nam, which comprehensively analyzes food safety policies, identifying key constraints and opportunities.**[70] The task force improved Viet Nam's capacity to manage food safety through an improved decision-making process that integrated scientific risk assessment into national food safety management. As part of its work in Viet Nam, CGIAR has a longstanding initiative across the country's pork value chain to improve hygiene practices. One of its efforts successfully reduced contamination by introducing light-touch interventions: a stainless-steel grid to elevate the pig carcass and new hoses and taps.[173] Consumers in the country are willing to pay 20 percent more for pork of a high hygienic standard.[174] CGIAR's approach to collaborating with the Vietnamese Food Safety Technical Working Group is now being translated to the Ethiopian context (PRMS 11609).[175] CGIAR also supports the Food Security and Nutrition technical working group in Cambodia (PRMS 7245).

Improved wheat in Uzbekistan

While most of CGIAR's work in Asia is concentrated in South and Southeast Asia, it also works in Central Asia and the Middle East. As an example, collaboration between national agricultural research systems and CGIAR has been instrumental in the development and introduction of new improved wheat varieties and enhancement of varietal diversity and varietal adoption in Uzbekistan.[172] Around 65 percent of the wheat-cultivated area nationally was planted with improved varieties in 2022, up from less than 50 percent a decade earlier. Improved varieties supported 1.5 million tons of additional wheat being produced annually, representing a 20 percent increase in wheat production. The adoption of improved wheat varieties contributed an estimated US$740 million annually in extra national wheat income.

The widespread adoption of improved wheat varieties likely played a significant role in enhancing Uzbekistan's food security, increasing farm incomes, and boosting national wheat self-sufficiency, with the country producing 95 percent of its domestic wheat consumption needs by 2022. Farmers adopting improved varieties saw an increase in net income from wheat cultivation by up to 30 percent, likely through higher yields and reduced losses from pest and disease pressure. Adopters of improved varieties, on average, consumed about 33 percent more wheat compared to non-adopting farmers.

Engagement with national governmental bodies

CGIAR's partnerships with national governmental bodies across Asia extend well beyond its work in Viet Nam (see Rice management for sustainable production). For example, the Department of Water Resources in Nepal consistently requests information from CGIAR on the water-energy-food nexus and has indicated that this information will inform action planning to implement policies (PRMS 16519). Through the Thai Rice NAM project, CGIAR influenced the inclusion of alternate wetting and drying in Thailand's Long-Term Low Emissions Strategy and its Nationally Determined Contributions—marking agriculture's debut in Thailand's formal greenhouse gas mitigation agenda (PRMS 1758, 7239). In the Philippines, the Department of Agriculture, the Philippine Crop Insurance Corporation, and CGIAR collaborated to test area-based yield index insurance for rice using satellite data (PRMS 7702).

CGIAR supports the development of digital tools used by governmental partners in decision-making. In Nepal, CGIAR developed a web- and android-based platform that allows the Ministry of Agriculture and Livestock Development to manage dairy buffalo genetics (PRMS 15750). In Sri Lanka, CGIAR collaborated with the Department of Agrarian Development to develop an online program that improves the accuracy of financial support allocated to 1.42 million farmers (PRMS 19027). The platform also supported the dissemination of climate information. The Philippine Department of Agriculture adopted a CGIAR-supported georeferencing protocol to improve the accuracy of farm parcel mapping, which should improve precision agriculture, enhance resource allocation, and strengthen decision-making (PRMS 19231).

Areas for future attention

There is a lack of evidence on approaches to improve crop outcomes other than rice in Asia. While rice is culturally important and appropriate for the Asian context, diverse diets, especially the use of local underutilized crops, could support a healthy and resilient diet for the population. Assessment of greenhouse gas abatement from rice interventions could improve climate mitigation efforts, particularly if these assessments measured the effects of these interventions at scale. Tracking policy changes and their impacts would be valuable as these policies have the potential to generate widespread impacts. In addition, efforts to help communities at risk of climate-related threats to adapt to the new realities of increased variability and rising sea levels, which are particularly impactful in Asia and the Pacific Islands, could be evaluated as these threats continue to worsen.

Scientist uses the Plantix app to diagnose plant diseases based on an AI interpretation of photographs taken in the field. Photo credit: Chris de Bode

Crop-livestock systems in Vietnam.
Photo credit: Hung Nguyen/ILRI

Learnings

This review of CGIAR's real-world outcomes and impacts provides valuable insights into how CGIAR generates and reports evidence. The experience of developing this report provided valuable learning opportunities to strengthen CGIAR's evidence-generation and -aggregation processes so that future versions of this report may provide additional evidence. These insights are presented by topic.

Household vegetables for sale in the Himalayan foothills of northern India. Photo credit: Susan MacMillan/ILRI

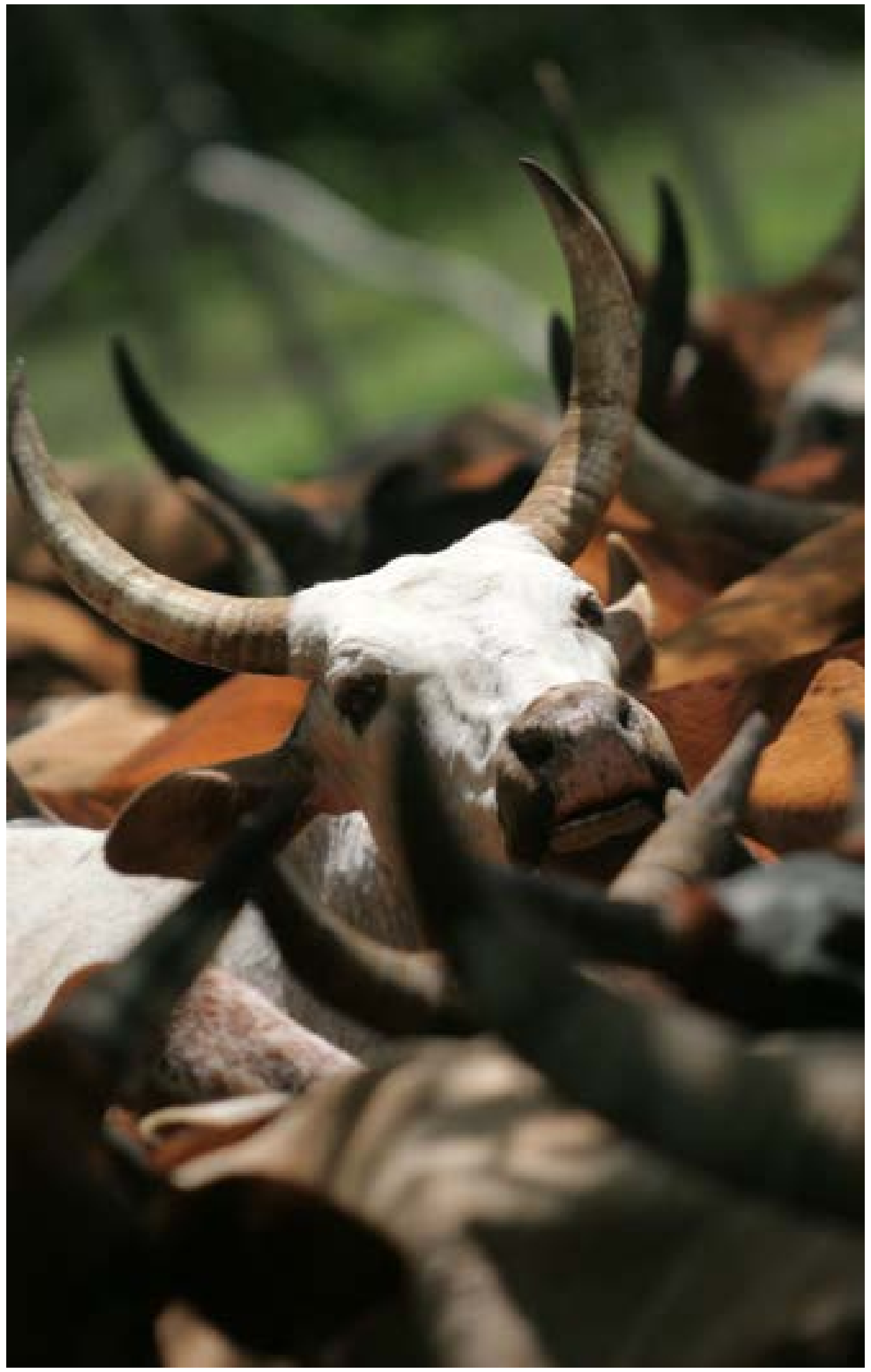
The 2022–2024 Results Framework

At the outcome level, CGIAR Initiatives and Platforms report three types of outcomes: innovation use, policy change, and "other" outcomes. Although relatively few "other" outcomes were expected, well over 300 (28 percent) were reported. These correspond mainly to external engagement. In the future, **consideration should be given to defining additional categories to reduce the number of "other" outcomes**.

In addition, CGIAR's three Science Groups formulated a few key outcomes for their theories of change to which reported outcomes were mapped. In theory, providing an analysis of these mappings could show areas of strength and weakness, but in practice, the Science Group outcomes evolved during the period, inhibiting such an analysis. Thus, when attempting to synthesize outcomes related to the same themes, apart from very high-level tagging to Impact Areas, this was a laborious exercise. In the future, applying artificial intelligence will help, but there will still be a need to **ensure common terminology across the reporting units**.

At the impact level, there were 19 indicators across the five Impact Areas. The frequency of reporting against exact indicators is very low (18 percent of indicators assessed match those in the Results Framework; Annex B. Impact indicators). In addition, there is an imbalance across Impact Areas and indicators in the frequency with which 2022 to 2024 studies attempt to measure those indicators. There were many impact assessments that measured yields or income related to the poverty indicators, and relatively few that looked at environmental, climate, or gender indicators. This is consistent with what Templeton (2023)[176] found in her review of evidence used to support the impact claims made by the CGIAR Research Programs between 2017 and 2021. Thus, there remains a huge challenge to **define feasible indicators for CGIAR impact-level results and to ensure that they are used in impact assessments.**

In addition, disaggregating outcomes by sex and age is necessary for reporting of some indicators. However, results are not consistently reported in a disaggregated manner allowing for the systematic interrogation of outcomes and impacts benefiting vulnerable groups. In the future, **more systematic reporting of results for key subgroups** could inform decision-making.



Cattle in Ethiopia's Upper Ghibe Valley. Photo credit: Stevie Mann/ILRI

Impact Area indicator quantification

Given these limitations and opportunities, the Portfolio Performance Unit (PPU) commissioned subject matter experts for each Impact Area to review the Impact Area indicators and the aligned outcomes and impacts reported, with a view to assessing the feasibility of aggregating the reported results to inform on total progress toward the Impact Area indicators during the 2022 to 2024 period. This was very challenging, and partial quantification was attempted in three of the Impact Areas but was not feasible in the remaining two. Several common observations and recommendations emerged from across the different studies:

- The **Impact Area indicators used in CGIAR's Results Framework were generally not sufficiently specific, measurable, achievable, relevant, or timebound** (SMART).[177] They used ambiguous terms such as "benefiting" and "improved management." Functional units and methods of measurement were often not prescribed, and time or geographic bounds were often not applied.
    - Potential solution: Revise the Impact Area indicators to ensure full SMART compliance, define methods and tools to be used in data collection, and roll these out through the CGIAR Programs and Accelerators.
- The **stage along the impact pathway assessed by each Impact Area indicator is highly variable**, and different measurements apply at different stages along the impact pathway. For example, in the Poverty Impact Area, an indicator of the *ultimate* goal is the number of people assisted to exit poverty, but the most common means through which CGIAR affects poverty is by enhancing agricultural productivity, which could be defined as a more *proximate* goal.
    - Potential solution: Define proximate and ultimate Impact Area indicators, which relate to stages in the impact pathways and include more studies that attempt to demonstrate the relationships between the two. Defining common impact pathways used in CGIAR programming would also be beneficial.
- There is **fragmentation in the indicators measured in impact evaluations and the Impact Area indicators required in the Results Framework**. There is also a disconnect between studies that measure innovation use and studies that assess their impacts, especially regarding the ongoing use of innovations. These two issues make aggregation of CGIAR's progress toward Impact Area indicators challenging. There are very few examples where highly reliable evidence of innovation use is coupled with rigorous impact evaluation evidence.
    - Potential solution: Integrate impact evaluation into the annual reporting of innovation use, with requirements to use Impact Area indicators in those evaluation studies. More system-level approaches are needed to plan and finance complementary monitoring and impact efforts, especially monitoring ongoing use (or dis-adoption) of impactful innovations.

Three of the Impact Area studies identified indicators, developed methodologies, and tested them using examples of CGIAR innovations to try to estimate aggregate CGIAR effects. These preliminary methods are in the proof-of-concept phase and still under internal review. However, the methods explored through these processes and the limitations identified will provide valuable learnings to increase CGIAR's ability to report on its real-world impacts in the next version of this report.

Comparison with 2017–2021

Retrospective analysis of CGIAR's 2017 to 2021 reporting cycle provides a reference point for assessing progress in outcome reporting and portfolio management under the current Results Framework. While differences in the reporting systems limit direct comparability, several structural patterns from the previous cycle remain relevant.

Policy outcomes

Learnings from CGIAR's 2017 to 2021 reporting cycle demonstrate that policy outcomes were mostly oriented toward policies and strategies (75 percent), and the rest influenced budget and investment decisions or legal instruments.[29] The majority reflected early uptake of research results, but 39 percent of policy outcomes were concrete decisions, policies, or programs taken or enacted. In the current 2022 to 2024 cycle, there was a slight **increase in the percentage of reported policy changes that were actual policies or programs put into place (43 percent of policy outcomes)**. Moreover, the type of policy outcome differed, with the percentage of policy outcomes leading to modified programs or investments jumping to 29 percent. The thematic and geographic orientations of policy outcomes are similar across the two periods, generally displaying CGIAR effectiveness in all of its priority countries and across most of its Impact Areas. However, the percentage of policy outcomes which were aimed primarily at gender equality was low in both periods.

Partners were critical to CGIAR's success in informing policies. Critical partners included national and subnational governments, civil society organizations, private sector, regional bodies, and international organizations. The review of 2017 to 2021 policy outcomes also revealed that very few were evaluated for their impacts, yet many appeared to be significant. Some examples of those are in Table 3. Impacts of CGIAR's policy research remain underanalyzed.

Policy outcome type	What the evidence shows	Illustrative cases	
		CGIAR partners	Outcomes
Policy and strategy outcomes, mainly at national level	60% of outcomes were national and 37% reached formal enactment—often when a ministry or regulatory body was part of the design team	Ethiopian Ministry of Livestock	Scaling of a Livestock Master Plan with US$365 million in investment and benefiting 2.3 million households.[178]
		The Ministry of Health and the Ministry of Agriculture and Rural Development of Viet Nam	Development of a risk-based surveillance system covering 94 million consumers through Viet Nam's Food-safety Task Force.[179]
Legal or budgetary outcomes, mainly at national level	Legal or budgetary outcomes (approximately 20% of total), often required additional partners	National Agricultural Seed Council of Nigeria	Adoption of a web-based seed tracker tool by the government to act as an e-certification platform and facilitate the production and use of certified seed.
		State utilities in Gujarat India and farmer cooperatives	Co-development of a blueprint for India's US$21.5 billion plan to increase farmer income by providing irrigation and reducing dependence on diesel fuel in agriculture (KUSUM).[180,181]
Cross-country or regional-level policy outcomes	Cross-country or regional platforms accounted for 25% of all policy outcomes and built on regional bodies to accelerate replication across borders	Nine country governments across Asia	Facilitation of seed exchange across nine countries in Asia through a Seeds without Borders Agreement.[182–186]
		Common Market for Eastern and Southern Africa (COMESA) fish inspection facility and regulations	Harmonization of fish-trade standards which now guide regulations in 15 coastal and inland states.[187–189]

Table 3: Examples of significant policy outcomes from 2017 to 2021.

Innovation outcomes[190]

The "ready for uptake" innovation bottleneck: Between 2017 and 2021, 45 percent of innovations reached the stage "ready for uptake," but only 10 percent progressed to the stage of "in use" by external partners. This underscores the **need to work with partners to actively understand their demands and to co-develop innovations that meet their needs**.

Innovation packages accelerate outcomes: When innovations were reported as "in use," they were usually clustered with other innovations into "packages" deployed through common partners. When innovations were "ready for uptake," they were more frequently reported as stand-alone innovations. Evaluation of the outcomes achieved and the scope for impact also showed that innovations that were part of a package tended to have higher adoption, be applied over larger land areas, achieve more income change, and have more potential for impact compared to stand-alone innovations. This demonstrates the **need to design packages of innovations with scaling in mind from the beginning, as reflected in CGIAR's new Scaling for Impact Program**.

Priority innovations for impact assessment: Fewer than four in ten of the innovations "in use" were linked to studies that quantified impacts. The majority of those studies were local in scale. Analysis of the 2017 to 2021 portfolio found that 2.4 percent of all the innovations reported (59 innovations) should be considered for a large-scale impact assessment study. A systematic approach to prioritizing innovations for large-scale impact assessment was lacking in the last reporting period and **further efforts are needed to continue developing a more systematic approach in the future**.

Innovation management starts with monitoring: The innovation monitoring system in place from 2017 to 2021 did not allow for finegrained analysis of the development of innovations. Only 6 percent of innovation reports were updated after initial submission, making it impossible to understand the rate at which innovations developed and matured into use. Since 2022, a revised system for innovation management has been in place, with annual innovation updates and a more nuanced scale to measure development, packaging, and innovation use. These **improvements support accurate tracking of innovation trajectories and support the prioritization of innovations for future assessment**.

Bottom-up versus top-down impact assessment planning

The primary reason for the variations in reporting against CGIAR's Results Framework is that, apart from the SPIA country studies, other internal and external studies are designed in an uncoordinated bottom-up way. Because such studies are undertaken to meet specific information needs, opportunities to learn through synthesis or aggregation are missed due to the differences in indicators used and measurement approaches employed. For example, impact assessments are rarely connected with data on innovation use, preventing case study results from being used to extrapolate possible large-scale effects. Thus, moving forward, two areas for improvement are: (1) to **collectively undertake strategic impact assessments that will answer high-priority impact assessment questions** and (2) to **develop and enforce the use of a core set of common indicators and measurement methods**[q] that should be used in impact assessment studies regardless of who initiates them.

In addition, during the 2022 to 2024 period, Initiatives defined targets for outcomes and made commitments to measuring and reporting on those outcomes. They did not have a similar plan or commitment to measuring impacts. As CGIAR evolves to longer-term programs covering the whole of CGIAR, there should be **commitments to the consistent measurement of impacts.** However, this has been an ongoing challenge within the organization, with similar recommendations from a review of the 2017 to 2021 portfolio.[176]

Rigor of the evidence

All impact evaluations identified were assessed for their rigor based on criteria established by Rao 2025.[45] The most common score was a 4 of 9 key elements being present, suggesting moderate overall quality and room for improvement. A high number of impact evaluations used rigorous methods to infer causality between a CGIAR innovation and impacts (see Annex A. Included studies and rigor of evidence). However, many failed to consider heterogeneous treatment effects or report power calculations. Most of the impact evaluations used experimental or quasi-experimental designs with two or more measurement periods. However, a sizeable group of the studies were based on cross-sectional (single measurement) studies. While they are peer-reviewed and employ recommended methods of controlling for unobservable variables to enhance the likelihood of a causal inference, there remain limitations to such designs.

In addition to rigor, this study paid attention to the relevance of the studies. Often, studies employing less rigorous, cross-sectional methodologies were able to provide evidence more relevant to policymaking and decision-making because they considered larger scale or more complex interventions that had been disseminated for a longer period and more closely represent the types of interventions implemented outside of a research context. On the other hand, many experimental studies were positioned to assess innovations for their potential to scale up. However, effects measured by these evaluations may not be maintained once interventions are implemented at scale. Thus, there is a need to **improve the rigor of studies of innovations that have scaled up.** This aim is included in the country plans for SPIA and similarly should be promoted more widely in CGIAR.

q This would not prohibit the use of other indicators, just encourage the use of core indicators *in addition to* other indicators of interest.

Tradititional rice variety in Ilagan, Isabela, the Philippines. Photo credit: Miguel Mamon/CIAT

The costs of achievement of outcomes and impacts

With some notable exceptions, the evidence presented here is focused on the benefits (such as the number of actors using innovations, the impacts accruing from innovation use) without comparison to, or even discussion of, the costs involved in achieving those benefits. The challenges in doing so are obvious: (1) costs involved in achieving impacts involve many organizations beyond CGIAR (the aforementioned "exception" studies generally do not include external costs) and (2) there are long lag periods between research and impacts, which necessitate compiling financial information over long periods of time. CGIAR financial systems have not been set up to match expenditures to specific innovations, so these data are not available historically.

With data on costs available, it would be possible to consider calculating variables such as benefit:cost ratios or returns on investment for specific innovations or components of the portfolio. This then points to another challenge: the estimation of the full benefits as a result of the costs or investments. Relatively few studies have calculated benefits across multiple Impact Areas and none have considered more indirect effects on the economy (such as farm-level productivity effects on wider food system revenue and jobs). These gaps need to be overcome to estimate an objective benefit:cost ratio or return on investment.

Moving forward, **improvements in the collection of expenditure data could improve the ability of CGIAR to provide reasonable estimates of its own costs**. Costs of other organizations would also need to be estimated. Given that CGIAR works with many of the same organizations for a wide range of innovations (such as with national extension systems for most innovations targeted to farmers), such an undertaking may be feasible. The integration of data on costs and overall returns on investment will be discussed in the development of the new Technical Reporting Arrangement.

Frequency of synthesizing outcome and impact evidence

The authors of this report found that the three-year period for collecting evidence on CGIAR outcomes and impacts provided a rich set of evidence, around which compelling storylines could be created. It is doubtful that this could be accomplished in a shorter time period. On the other hand, it is also recognized that three years is a long time for funders and other stakeholders to wait to receive synthesized evidence on outcomes and impacts. Thus, the PPU is developing an **Impact Compendium to compile and provide selected syntheses on outcome and impact assessment studies in the intervening years**. Similarly, three years is a long time to identify challenges and to address them, as this section has done. Therefore, it is proposed that analyses of monitoring data and impact assessment studies and plans be undertaken on a continuous basis.

Conclusion

Overall, we believe that this first-of-its-kind report presents compelling evidence that CGIAR meaningfully improved the lives of people in low- and middle-income countries from 2022 to 2024 and in preceding years. The evidence is strongest for outcomes and impacts related to poverty reduction, livelihoods, and jobs and to nutrition, health, and food security.

Farmer leads his sheep and goat to market, Menz, Ethiopia. Photo credit: Zerihun Sewunet/ILRI

Globally, CGIAR innovations from the pooled-funded portfolio 2022–2024 reached more than 20 million farmers and informed US$3.3 billion in third-party investments. Studies of CGIAR innovations which had diffused into widespread use in the agricultural systems of three countries found between 18 and 24 million farmers using those innovations.[8,9,10] More than 1,100 outcomes were reported and 125 impact assessments were made available during the 2022 to 2024 reporting period. CGIAR-supported maize contributed to US$1.1 to US$1.6 billion in economic gains in 18 African countries in 2015.[4] The net present value of CGIAR-supported rice varieties was US$37 billion in the Philippines and Bangladesh from 1990 to 2018.[5] CGIAR-supported technologies contributed to a 9.7-million-hectare reduction in cropland expansion, 2.42 billion metric ton reduction in CO_2 emissions, and avoided 713 species extinctions between 1961 and 2015.[6] The annual benefit of CGIAR crop technologies was calcualted to be US$47 billion per year between 2016–2020.[2]

Conclusions by Impact Area

Poverty reduction, livelihoods, and jobs

CGIAR poverty reduction, livelihoods, and jobs innovations from the pooled-funded portfolio reached more than 19 million farmers and informed US$2.9 billion in third-party investment from 2022 to 2024. Based on 79 impact assessments and 824 outcomes, CGIAR has demonstrated contributions to income growth through sustainable intensification (Sustainable intensification for inclusive income growth) and aquaculture projects (Improved income through aquaculture). It also supported the development of targeted social protection programs (Targeting social protection for the most vulnerable).

Nutrition, health, and food security

CGIAR nutrition, health, and food security innovations from the pooled-funded portfolio reached more than 3.6 million farmers and informed US$2.5 billion in third-party investment from 2022 to 2024. Based on 51 impact assessments and 583 outcomes, CGIAR contributed to improved nutrition and food security through biofortification and improved crops (Biofortification and improved crops), nutrition-sensitive intensification (Nutrition-sensitive intensification for resilient diets), postharvest storage and food safety initiatives (Postharvest storage, food safety, and One Health), and nutrition education (Nutrition education and behavior change for healthier communities).

Climate mitigation and adaptation

CGIAR climate mitigation and adaptation innovations from the pooled-funded portfolio reached 15 million farmers and informed US$3.3 billion in third-party investment from 2022 to 2024. Based on 32 impact assessments and 863 outcomes, CGIAR supported climate adaptation by breeding climate-resilient crops (Climate-resilient crops), disseminating innovative farm management approaches (Farm management for climate adaptation), providing climate information services (Climate information services), and supporting climate risk mitigation initiatives through partnerships with governments and private-sector actors (Managing climate risks).

Gender, youth, and social inclusion

CGIAR gender, youth, and social inclusion innovations from the pooled-funded portfolio reached 6.8 million farmers and informed US$2.7 billion in third-party investment from 2022 to 2024. The evidence base on impacts in this area is somewhat limited, with only 22 impact assessments available. However, 592 outcomes were reported. Much of CGIAR's work in this area relates to measuring progress toward women's empowerment (Women's Empowerment in Agriculture Index) and understanding drivers of technology adoption (Technology adoption among women farmers). CGIAR has worked with international agencies, governments, and private companies to support policies that advance gender and social equity (see examples throughout Gender, youth, and social inclusion).

Environmental health and biodiversity

CGIAR environmental health and biodiversity innovations from the pooled-funded portfolio reached 9.5 million farmers and informed US$970 million in third-party investments from 2022 to 2024. Based on 37 impact assessments and 674 outcomes, CGIAR contributed to the large-scale adoption of sustainable agricultural practices (Sustainable farms through soil health improvement and reduced inputs) and informed a range of water (Efficient water use for maximum agricultural productivity) and land (Restoring grazing lands and sustainable livestock management) management policies and strategies.

Conclusions by continent

Africa

CGIAR innovations from the pooled-funded portfolio reached 6.1 million farmers in sub-Saharan Africa and informed US$2.5 billion in third-party investment in the region. Based on 68 impact assessments and 493 outcomes, CGIAR has improved crop yields and incomes through its crop breeding programs (Improved seeds driving higher yields and food security), supported the adoption of sustainable land management (Sustainable land management for farm wellbeing), and contributed to improved income and nutrition through better livestock management (Enhancing nutrition, productivity, and resilience with livestock).

Latin America and the Caribbean

CGIAR innovations from the pooled-funded portfolio reached 2.8 million farmers in LAC and informed US$14.3 million in third-party investments in the region. The evidence base on impacts and outcomes is somewhat limited in the region, with only six impact assessments and 132 outcomes. CGIAR's contributions on the continent focused on managing natural resources (Managing natural resources). Much of the organization's crop breeding efforts occur in LAC (Crop breeding), and CGIAR effectively engages with local farmers to design crops that match their needs (Citizen science and innovation).

Asia and the Pacific

CGIAR innovations from the pooled-funded portfolio reached 11.2 million farmers in Asia and the Pacific and informed US$380 million in third-party investments in the region. Based on 44 impact assessments and 363 outcomes, CGIAR's contributions to the region were largely achieved by breeding improved rice varieties (Investments in rice breeding pay dividends) and supporting rice management practices (Rice management for sustainable production). Investments in improved rice varieties achieved benefit:cost ratios of 7:1 to 115:1, depending on the country. However, CGIAR supports whole-of-food systems transformation across the continent (Food systems transformation for a healthy continent), with a particular focus on aquaculture (Enhancing aquaculture and fish consumption) in addition to rice.

Continuous improvement in impact assessment

The evidence provided by this report speaks directly to several key evidence gaps identified by a recent systematic analysis of impact evaluations available on food security and nutrition interventions in international development.[191] That analysis identified key research gaps regarding cost evidence, agricultural insurance, food storage, and educational approaches within the food value chain, all of which are extensively researched and contributed to by CGIAR. While many of the studies included in this report would not be eligible for that analysis, they all provide valuable, decision-relevant information to help policymakers understand CGIAR's contributions to these key topics for agrifood systems transformation.

This initial technical report on CGIAR contributions to outcomes and impacts represents a step forward in understanding the whole-of-CGIAR impact. Learnings obtained (see Learning) will improve monitoring and impact assessment practices in coming years. Further reports will take advantage of these learnings and improvements. Among the improvements we anticipate are that: (i) the execution of SPIA's country workplan will deliver new outcome and impact insights, (ii) there will be a continued increase in the level of rigor in impact assessment studies undertaken within CGIAR, (iii) there will be more coordination in identification and implementation of high-priority impact assessments, and (iv) a new "impact compendium" will enable access to impact studies as they are released, accumulating the larger pool of impact studies from previous years.

A recent returnee from the Netherlands, leads an agricultural workshop with former combatants. Photo credit: Aubrey Wade/PANOS

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In the department of Chiquimula, Guatemala, a group of women testing a new bean varieties for culinary properties. Photo credit: Adriana Varón/CIAT

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Additional outcomes

Below is a list of the outcome studies cited in text that were not drawn from PRMS and did not meet the criteria for impact assessments. These also appear in the full reference list above.

Title	Section where referenced
Strides in Sustainable Agricultural Intensification: Contributions of the Africa RISING Program (2011–2023)[11]	Global impacts, Environment, Africa
Variety Release and Adoption Figures, 2010-2024[7]	Nutrition
African Union (AU) Declaration on Scaling-Up Food Fortification and Biofortification[63]	Nutrition
CAADP Kampala Declaration[64]	Nutrition
Uncovering More than a Decade of WEAI Use in USAID Projects[105]	Gender
The Status of Women in Agrifood Systems[106]	Gender
Women's Empowerment in Agriculture Index (WEAI)[104]	Gender
Countries Using WEAI[20]	Gender
Global Agricultural Development - Investing in Transformation and Innovation[107]	Gender
Advancing Water Resources Management in Honduras: Agua de Honduras Platform's Comprehensive Impact and Nationwide Institutional Adoption[123]	Environment

Table 4: Additional outcomes.

Impact assessments

Below is a list of the impact assessments identified as eligible for this report. Those preceded by an asterisk (*) are referenced in the main report and also appear in the above reference list. The obelus (†) denotes the top 25% of impact evaluation studies which applied the most rigorous practices in their methodology.

Reference	Methods
Adéchian, S.A., Baco, M.N., and Tahirou, A. 2023. Improving the Adoption of Stress Tolerant Maize Varieties Using Social Ties, Awareness or Incentives: Insights from Northern Benin (West-Africa). *World Development Sustainability* **3**, 100112. https://hdl.handle.net/10568/138909	Other quantitative
* Adeyanju, D., Mburu, J., Gituro, W., Chumo, C., Mignouna, D., and Mulinganya, N. 2023. Impact of Agribusiness Empowerment Interventions on Youth Livelihoods: Insight from Africa. *Heliyon* **9**, e21291. https://doi.org/10.1016/j.heliyon.2023.e21291	Impact evaluation
Aju, S., Kramer, B., and Lilian, W. 2022. Edutainment, Gender and Intra-household Decision-making In Agriculture: A Field Experiment in Kenya. Washington, D.C.: International Food Policy Research Institute (IFPRI). https://idl-bnc-idrc.dspacedirect.org/server/api/core/bitstreams/10c4eddb-77d8-4e2e-9399-ab6fbc86f297/content	Impact evaluation
* Alemu, S., Ambel, A., Khanal, A., Kosmowski, F., Stevenson, J., Taye, L., Tsegay, A., and Macours, K. 2024. SPIA Ethiopia Report 2024: Building Resilience to Shocks. CGIAR Standing Panel on Impact Assessment (SPIA). Rome: Standing Panel on Impact Assessment (SPIA). https://hdl.handle.net/10568/163773	Adoption
Amjath-Baby, T.S., Shahrin, S., Shahriar, S.M., Hasan, M.K., and Krupnik, T.J. 2023. Can Digital Climate Services Help Avert Agricultural Losses and Damage? Insights from a Social Experiment with Women Farmers in Bangladesh. Research Note 18. Dhaka, Bangladesh: CGIAR Initiative on Transforming Agrifood Systems in South Asia (TAFSSA) and the International Maize and Wheat Improvement Center (CIMMYT). https://repository.cimmyt.org/bitstream/handle/10883/22984/67149.pdf	Impact evaluation
* Amrullah, E.R., Takeshita, H., and Tokuda, H. 2024. The Productivity and Income Effects of Adopting Improved Rice Varieties by Smallholder Farmers in Indonesia. *Journal of Agribusiness in Developing and Emerging Economies Vol. ahead-of-print, No. ahead-of-print.* https://doi.org/10.1108/JADEE-11-2023-0282	Impact evaluation
* Arango, J., Bastidas, M., Costa Jr., C., González, R., Marin, A., Matiz, N., Ruden, A., and Villegas, D. 2022. Carbon Footprint and Mitigation Scenarios for Hacienda San Jose: Identifying Opportunities and Challenges Using a Consolidated Modelling Framework. Final Report. Cali, Colombia: International Center for Tropical Agriculture (CIAT). https://hdl.handle.net/10568/121105	Other quantitative
* Arcos-Pineda, J.H., Del Río, A., Bamberg, J., Vega-Semorile, S.E., Palta, J.P., Salas, A., Gómez, R., Roca, W.M., and Ellis, D. 2024. An International Breeding Project Using a Wild Potato Relative *Solanum commersonii* Resulted in Two New Frost-tolerant Native Potato Cultivars for the Andes and the Altiplano. *Frontiers in Plant Science* **15,** 1358565. https://hdl.handle.net/10568/140690	Other quantitative
Arouna, A., Aboudou, R., and Ndindeng, S.A. 2023. The Adoption and Impacts of Improved Parboiling Technology for Rice Value Chain Upgrading on the Livelihood of Women Rice Parboilers in Benin. *Frontiers in Sustainable Food Systems* **7**, 1066418. https://hdl.handle.net/10568/130637	Impact evaluation
* † Arouna, A., Barry, M.L., Kamano, P. , and Yabi, J.A. 2024. Does Adoption of Improved Variety Encourage Farmers to Invest in Modern Inputs and Use Good Practices? Evidence from Rice Farmers in Guinea. *Journal of Agricultural and Applied Economics* **56**(4), 597–620. https://hdl.handle.net/10568/170088	Impact evaluation
* Aryal, J.P., Rahut, D.B., and Acharya, S. 2022. Managing Drought Risks with Drought-stress Tolerant Rice Varieties and Its Impacts on Yield and Production Risk: A Case of Nepal. *Environmental Challenges* **7**, 100503. https://doi.org/10.1016/j.envc.2022.100503	Impact evaluation
* Aung, Y.M., Khor, L.Y., Tran, N., Akester, M., and Zeller, M. 2023. The Impact of Sustainable Aquaculture Technologies on the Welfare of Small-scale Fish Farming Households in Myanmar. *Aquaculture Economics and Management* **27**, 66–95. https://hdl.handle.net/20.500.12348/5067	Impact evaluation
* Awotide, B.A., Ogunniyi, A., Olagunju, K.O., Bello, L.O., Coulibaly, A.Y., Wiredu, A.N., Kone, B., et al. 2022. Evaluating the Heterogeneous Impacts of Adoption of Climate-smart Agricultural Technologies on Rural Households' Welfare in Mali. *Agriculture* **12**, 1853. https://hdl.handle.net/10568/125568	Impact evaluation
* Baldos, U.L.C., Cisneros-Pineda, A., Fuglie, K.O., and Hertel, T.W. 2025. Adoption of Improved Crop Varieties Limited Biodiversity Losses, Terrestrial Carbon Emissions, and Cropland Expansion in the Tropics. *Proceedings of the National Academy of Sciences* **122**, e2404839122. https://doi.org/10.1073/pnas.2404839122	Return on investment and projection studies

Reference	Methods
Bandumula, N., Rathod, S., Ondrasek, G., Pillai, M.P., and Sundaram, R.M. 2022. An Economic Evaluation of Improved Rice Production Technology in Telangana State, India. *Agriculture* **12**, 1387. https://doi.org/10.3390/agriculture12091387	Impact evaluation
* † Barrett, C., Jensen, N., Morsink, K., Noritomo, Y., Son, H.H., Banerjee, R., and Teufel, N. 2024. Long-run Effects of Catastrophic Drought Insurance. https://hyukhson.github.io/files/Long_run_Effects_of_Catastrophic_Drought_Insurance.pdf	Impact evaluation
Birol, E., Foley, J., Herrington, C., Misra, R., Mudyahoto, B., Pfeiffer, W., Diressie, M.T. and Ilona, P. 2023. Transforming Nigerian Food Systems Through their Backbones: Lessons from a Decade of Staple Crop Biofortification Programing. *Food and Nutrition Bulletin* **44**. https://doi.org/10.1177/03795721221117361	Project summary
* Bonkoungou, S., Dagno, K., Basso, A., Ekanao, T., Atehnkeng, J., Agbetiameh, D., and Neya, A., et al. 2024. Mitigation of Aflatoxin Contamination of Maize, Groundnut, and Sorghum by Commercial Biocontrol Products in Farmers' Fields across Burkina Faso, Mali, Niger, and Togo. *CABI Agriculture and Bioscience* **5**(1): 106, 1–21. https://hdl.handle.net/10568/168895	Other quantitative
* Bryan, E. and Mekonnen, D. 2023. Does Small-scale Irrigation Provide a Pathway to Women's Empowerment? Lessons from Northern Ghana. *Journal of Rural Studies* **97**, 474–484. https://hdl.handle.net/10568/139982	Impact evaluation
Bouis, H., Foley, J., Lividini, K., Jumrani, J., Reinke, R., Van Der Straeten, D., Zagado, R., Boy, E., Brown, L.R., Mudyahoto, B. and Alioma, R. 2024. Biofortification: Future Challenges for a Newly Emerging Technology to Improve Nutrition Security Sustainably. *Current Developments in Nutrition* **8**, 12. https://doi.org/10.1016/j.cdnut.2024.104478	Literature review
* Bryan, E. and Mekonnen, D. 2023. Does Small-scale Irrigation Provide a Pathway to Women's Empowerment? Lessons from Northern Ghana. *Journal of Rural Studies* **97**, 474–484. https://hdl.handle.net/10568/139982	Impact evaluation
Bullock, B., Mieiri, P., and Lopez, D.E. 2022. Participatory Rangeland Management: Understanding Women's Engagement and Implications for Social Change. AICCRA Working Paper 05. Nairobi, Kenya: International Livestock Research Institute (ILRI). https://hdl.handle.net/10568/119791	Qualitative
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* Saikat, D., Victor, A.-S., Aravazhi, S., Priyanka, D., Anitha, S., Tamilselvi, N., Nancy, G.D., et al. 2024. Effectiveness of Millet–pulse–groundnut-based Formulations in Improving the Growth of Pre-school Tribal Children in Telangana State, India. *Nutrients* **16**, 819. https://doi.org/10.3390/nu16060819	Other quantitative
* Sisang, B.B. and Lee, J.I. 2023. Impact of Improved Variety Adoption on Rice Productivity and Farmers' Income in Cameroon: Application of Propensity Score Matching and Endogenous Switching Regression. *Journal of Agricultural, Life and Environmental Sciences* **35**, 26–46. https://www.jales.org/articles/article/zyJq/	Impact evaluation
Swaans, C. and Khaung, Y. 2024. Digital Climate Advisories Aid 5,000 Monsoon Rice Farmers in Myanmar. Rome, Italy: Bioversity International; Cali, Colombia: International Center for Tropical Agriculture (CIAT). 4 p. https://hdl.handle.net/10568/141963	Project summary
Swaans, C. and Khaung, Y. 2024. Benefiting 5000 Fish Farmers in Myanmar: Digital Climate Advisories with Microfinance. Rome, Italy: Bioversity International; Cali, Colombia: International Center for Tropical Agriculture (CIAT). 4 p. https://hdl.handle.net/10568/141965	Project summary

Reference	Methods
Swaans, C. and Kim, K.H. 2023. Over 100,000 Laotian Farmers Use the Seasonal Climate Forecasts and Weekly Agro-advisories Disseminated via Laos Climate Services for Agriculture to Improve Crop Management. Rome, Italy: Bioversity International; Cali, Colombia: International Center for Tropical Agriculture (CIAT). 3 p. https://hdl.handle.net/10568/132413	Project summary
Swaans, C. and Le, T.T. 2024. Agro-Climatic Bulletin: Empowering 221,000 Vietnamese Farmers against Climate Change.Rome, Italy: Bioversity International; Cali, Colombia: International Center for Tropical Agriculture (CIAT). 4 p. https://hdl.handle.net/10568/141964	Project summary
Swaans, C. and Soksophors, Y. 2024. Scaling Climate Resilience: Local Agro-climatic Committees Reach 6,000 More Cambodian Farmers. Rome, Italy: Bioversity International; Cali, Colombia: International Center for Tropical Agriculture (CIAT). 4 p. https://hdl.handle.net/10568/148757	Project summary
* Takeshima, H., Yamauchi, F., Edeh, H.O., and Hernandez, M.A. 2023. Solar-powered Cold-storage and Agrifood Market Modernization in Nigeria. *Agricultural Economics* **54(2)**, 234–255. https://hdl.handle.net/10568/129209	Impact evaluation
Tabe-Ojong, M.P. Jr., Ibarra, L.M., Andrade, R.S., and Labarta, R. 2023. Soil Conservation and Smallholder Welfare under Cassava-based Systems in Thailand. *Land Degradation & Development* **34,** 1795–1805.	Other quantitative
Tilley, A., Lam, R.D., Lozano, D., Lopes, J.D.R., Da Costa, D., Belo, M., Da Silva, J., Da Cruz, G., and Rossignoli, C. 2024. The Impacts of Digital Transformation on Fisheries Policy and Sustainability: Lessons from Timor-Leste. *Environmental Science and Policy* **153**, 103684. https://hdl.handle.net/10568/139908	Qualitative
Timu, A.G., Shee, A., Ward, P.S., and You, L. 2023. Evaluating the Gendered Credit Constraints and Uptake of an Insurance-linked Credit Product among Smallholder Farmers in Kenya. *Journal of Development Studies* **61**(3): 336–356. https://hdl.handle.net/10568/155239	Other quantitative
* † Valera, H.G.A., Antonio, R.J., Habib, M.A., Puskur, R., Pede, V., and Yamano, T. 2025. High-zinc Rice and Randomized Nutrition Training among Women Farmers: A Panel Data Analysis of Adoption in Bangladesh. *Q Open* **5**, 1, qoaf001. https://academic.oup.com/qopen/article/5/1/qoaf001/7954130	Impact evaluation
* Villanueva, D., Enriquez, Y., and Capilit, G.L. 2022. The Impact of the International Rice Genebank (IRG) on Rice Farming in Bangladesh. *CABI Agriculture and Bioscience* **3**, 45. https://hdl.handle.net/10568/126982	Other quantitative
* Wossen, T., Menkir, A., Alene, A., Abdoulaye, T., Ajala, S., Badu-Apraku, B., Gedil, M., Mengesha, W., and Meseka, S. 2023. Drivers of Transformation of the Maize Sector in Nigeria. *Global Food Security* **38**, 100713. https://hdl.handle.net/10568/132302	Impact evaluation
* Yamano, T. Diffusion of Submergence-Tolerant Rice in South Asia. 2023. In: Estudillo, J.P., Kijima, Y., Sonobe, T. (eds) *Agricultural Development in Asia and Africa*, 49–62. Emerging-Economy State and International Policy Studies. Singapore: Springer Nature Singapore. https://doi.org/10.1007/978-981-19-5542-6_4	Literature review
Yamauchi, F. and Takeshima, H. 2022. Solar Power to Transform Food Systems and Rural Livelihoods: Evidence from a Solar-powered Cold Storage Intervention in Nigeria. In: Estudillo, J.P., Kijima, Y., and Sonobe, T. (eds.). *Agricultural Development in Asia and Africa*. Pp. 329–341. https://hdl.handle.net/10568/127232	Impact evaluation

Reference	Methods
Yamauchi, F., Dauda, B., Balana, B., Edeh, H., and Shi, W. 2024. Cool Transportation in Nigeria: Intervention, Baseline and Randomized Controlled Trial. CGIAR Initiative on Rethinking Food Markets Technical Report. Washington, D.C.: International Food Policy Research Institute (IFPRI). https://hdl.handle.net/10568/163635	Other quantitative
Yigezu Y., Bishaw, Z., Niane, A.A., and Nurbekov, A. 2022. *Political Economy of the Wheat Sector in Uzbekistan Seed Systems, Variety Adoption and Impacts*. Beirut, Lebanon: International Center for Agricultural Research in the Dry Areas (ICARDA). https://hdl.handle.net/10568/127918	Impact evaluation
* Yigezu, Y.A., Rahman, M.W., El-Shater, T., Alene, A., Sarker, A., Kumar, S., and Frija, A. 2022. Plot-level Impacts of Improved Lentil Varieties in Bangladesh. *PLOS ONE* **17**, e0262146. https://hdl.handle.net/10568/119470	Impact evaluation
* Yigezu, Y.A., El-shater, T., Sweidan, R., Saleh, E.A., Maaroufi, H., Ibrahim, A.M.M., and Boughlala, M. 2024. Enhancing Food Security in Arab Countries Project: Adoption and Impacts of Project Interventions and Returns on Investment in Egypt, Jordan, Morocco, Sudan, and Tunisia. ICARDA Working Paper 15. Beirut, Lebanon: International Center for Agricultural Research in the Dry Areas (ICARDA). https://mel.cgiar.org/reporting/downloadmelspace/hash/ea954d2e2ea21566735845c4e908c4d3/v/c189cc668274d372ff9aafac2d8c9f88	Impact evaluation
† Yitayew, A., Abdulai, A., and Yigezu, Y.A. 2022. Improved Agricultural Input Delivery Systems for Enhancing Technology Adoption: Evidence from a Field Experiment in Ethiopia. *European Review of Agricultural Economics* **49**, 527–556. https://doi.org/10.1093/erae/jbac006	Impact evaluation
Yitayew, A., Abdulai, A., Yigezu, Y.A. 2023. The Effects of Advisory Services and Technology Channeling on Farm Yields and Technical Efficiency of Wheat Farmers in Ethiopia. *Food Policy*, **116**, 102436. https://hdl.handle.net/10568/138727	Impact evaluation
* Zakari, S., Manda, J., Germaine, I., Moussa, B., and Abdoulaye, T. 2023. Evaluating the Impact of Improved Crop Varieties in the Sahelian Farming Systems of Niger. *Journal of Agriculture and Food Research* **14**, 100897. https://doi.org/10.1016/j.jafr.2023.100897	Other quantitative
Zerfu, T.A., Tareke, A.A., Genye, T., Bayable, M., Muleta, A., Getu, Z., and Negese, T. 2024. Revolutionising Multi-sectoral Nutrition Policy: Insights from the Ethiopian National Information Platform for Nutrition (NiPN) Approach. *Journal of Global Health* **14**: 03041. https://doi.org/10.7189/jogh.14.03041	Qualitative

Table 5: Impact assessments.

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Annexes

A rich diversity of maize for sale at a market in Central America. Photo credit: Elizabeth Ramirez Perez/CIAT

A. Additional methodological details

Study identification, data extraction, and synthesis were not discrete steps, but an iterative and ongoing processes.

Selection of evidence

Identification of sources

The search process was intended to identify all outcomes and evidence of impacts achieved across the CGIAR portfolio from 2022 to 2024.

In January 2024, a single reviewer conducted a search for published impact assessments on CGSpace, Web of Science, and Google. She documented the studies identified, determined the eligibility of articles based on their relevance to providing evidence on use or impacts of CGIAR research, and extracted relevant information for inserting into a template in Excel. A second reviewer reconsidered the articles identified for inclusion against the framework in Table 6 (both included and excluded articles) and confirmed the extracted data. They discussed any disagreements to reach final inclusion decisions. PPU staff continued to search for relevant studies within and outside CGIAR during the remainder of 2024. A snowball sampling approach was used in which submitted articles, both included and excluded, were used to identify other sources.

The Impact Assessment Focal Points from each of the CGIAR Centers were asked in mid-2024 to share publications related to outcomes and impacts of Center research. The publications submitted by these focal points before March 2025 were screened by CGIAR's PPU against the framework in Table 6. From October to November 2024, representatives from each CGIAR Impact Area, Regional directorate, Regional Integrated Initiative, and CGIAR Center, as well as representatives of key CGIAR Research Initiatives, were invited to submit "Big Achievements" through a standardized reporting template.[r] These were narratives explaining how lines of research, partnerships, and other activities led to impacts, including provision of evidence of those elements. These were reviewed by a single reviewer for eligibility and the supporting evidence was extracted into the Excel template as applicable.

When necessary, authors of the identified studies were contacted to request additional information. The information requested generally related to CGIAR's involvement in the interventions described to ensure that the outcomes and impacts reported were relevant to CGIAR work. Sometimes, additional information on the research methods was requested. Following the 2024 reporting into the PRMS by Initiatives, Platforms, and Science Group Projects, a database of all reported and quality-assured outcomes was compiled for use in the report. To complement this, in early 2025, the Monitoring and Evaluation focal points of the Centers were asked to share major outcomes that would not have been reported by Initiatives into the PRMS. Selected bilateral projects were also contacted (such as HarvestPlus).

Two main reviews were conducted during the preparation of this report. In the first, staff who had been approached to provide input to the report were invited to review. This included representatives from each CGIAR Impact Area, Regional directorate, Regional Integrated Initiative, and CGIAR Center MELIA focal persons, as well as representatives of key CGIAR Research Initiatives. In the second review, senior leadership from CGIAR Centers and the System Organization were invited to provide input. In both cases, additional impact assessment or outcome studies could be submitted. These articles were similarly screened by a single reviewer for inclusion.

Inclusion criteria

For CGIAR to claim an **outcome**, CGIAR must show evidence that (1) the outcome occurred and (2) that CGIAR contributed to the outcome. Both of these criteria are checked through a quality assurance process during the annual reporting process for PRMS. For CGIAR to claim an **impact**, it must establish attribution by both isolating the contribution made by a CGIAR program or project and estimating its particular contribution to an impact. A study must accompany the impact contribution claim.

A PICOS (population, intervention, comparator, outcomes, and study design) framework was used to structure the inclusion criteria for impact assessments presented in this report (Table 6). Inclusion criteria were differentiated between impact evaluations (top panel) and non-causal impact assessments (bottom panel). These non-causal impact assessments included literature reviews, cost-benefit analysis, and non-causal longitudinal studies. They were considered important for providing a holistic picture of CGIAR outcomes, impacts, and opportunities; however, care is taken in this report to distinguish between causal and non-causal studies. Non-causal impact assessments were excluded, if they used unclear or misleading methods, regardless of the analytical approach used. These were defined as methods descriptions for which the reviewers could

r While a standardized reporting template was used, some submitted "Big Achievements" as text documents or chose to simply share articles via email. These were accepted as well.

not determine what was done or conclusions based on a fundamental misinterpretation of reported results.

A few studies provided valuable contextual information regarding the interpretation of included impact assessments but were not impact assessments themselves. These studies were not included in the literature database used to develop the narrative of this report but are presented in the narrative to contextualize findings. Examples of such studies include descriptions of novel methodologies and willingness-to-pay studies.

AfricaRice genebank in Mbe, Cote d'Ivoire. Photo credit: Neil Palmer/Crop Trust

	Include	Exclude
Impact evaluation inclusion criteria		
Population	Any	None
Intervention	Interventions that were at least partly co-developed by CGIAR and implemented in real-world settings. Real-world settings were defined as settings that could reasonably be expected when a project or scaling up effort is implemented outside of a research context.	Interventions are not co-developed by CGIAR or evaluated only in highly controlled (not real-world) settings.
Comparator	Any comparator, so long as one exists.	None
Outcome	Outcomes must reflect behaviors or effects external to CGIAR and relate to any of CGIAR's Impact Area indicators in an intervention's theory of change.	Outcomes are unrelated to any of the Impact Area indicators (such as educational attainment).
Study design	Ex-post impact evaluation—randomized controlled trial (RCT), difference-in-difference method (DID), matching, synthetic control, independent variable (IV), fixed effects. Qualitative impact evaluations	Cross-sectional studies that do not establish impact. Studies that consider the effects of one *outcome* on another *outcome* (such as consideration of the effect of women's empowerment on nutrition in the absence of an intervention).
Other	Published within the 2022–2024 period and preprint manuscripts shared in 2024 and published before June 2025.	Published before 2022 or after 2024 without a shared preprint.
Non-impact evaluation, impact assessment inclusion criteria The inclusion criteria for impact assessments were broad, with the primary decision for inclusion made based on whether the study provided meaningful information on the impact(s) and/or outcome(s) achieved. The following are the primary types of studies included and excluded.		
Literature reviews	Systematic and non-systematic literature reviews whose primary focus was the effects of CGIAR interventions specifically.	Systematic and non-systematic literature reviews that mention CGIAR interventions but for whom these are not the focus and thus the effects of CGIAR research could not be distinguished. Where reviews cited studies that took place within the 2022–2024 time period and clearly indicated that their focus was CGIAR interventions, the underlying papers were included.
Return on investment and projection studies	Cost-benefit analyses and modeling studies that attempt to quantify the large-scale benefits and reach of CGIAR interventions using structured analytical approaches.	Studies using unclear methods or non-generalizable data.
Longitudinal studies	Longitudinal studies showing the evolution of outcomes over time in the context of a CGIAR intervention *without* establishing impact (such as studies that consider changes in production before, during, and after a CGIAR intervention without a counterfactual).	Cross-sectional studies, such as studies that compare production in intervention and non-intervention sites but do not employ statistical approaches to ensure that the non-intervention sites represent a valid counterfactual.
Use/adoption studies	Studies that quantify the extent of use of a CGIAR technology or the characteristics of the adopters or environs associated with use of the technology.	
Summaries, lessons learned, and output reports	Project summaries, lessons learned, and output reports that discuss relevant outcomes.	

Table 6: Inclusion criteria for impact assessments.

Women collecting wheat samples, Ciudad Obregon, Mexico. Photo credit: Peter Lowe/CIMMYT

Data extraction

Data on outcomes from CGIAR's PRMS first underwent CGIAR's standard quality assurance process. Outcomes were then manually reviewed using keywords and filters to identify outcomes on similar topics and numbers were aggregated, taking care to focus on specific countries and years to limit the possibility of double-counting participants, beneficiaries, and adopters.

Data from included studies were systematically extracted into an Excel-based template. Extracted data related to:

1. *Study characteristics:* author, year of publication, type of publication, study objectives, geography, relevant Impact Area.
2. *Interventions:* activities conducted, crops targeted, partners, CGIAR Center, etc.
3. *Outcomes/impacts:* indicator measured, effects or changes reported, relevant Impact Area indicator.
4. *Study design:* methodological approach, key limitations, sample size, years covered by the evaluation.
5. *Use and reach:* information on adoption rate, factors driving adoption,[s] number of individuals and households benefiting from the intervention, and the number of people contacted by the intervention.

For about half of the studies, data were extracted by one reviewer and reviewed by a second, with the remaining half of studies extracted by a single reviewer. A third reviewer conducted a quality assessment on all the impact evaluations.[t,45] The quality assessment reviewer verified the methods and impact estimates extracted for all impact evaluations and a random sample of approximately half of the other included studies.

Synthesis and narrative development

Members of CGIAR's PPU were assigned to review impact assessments related to specific Impact Areas and geographies. They then grouped these into themes (which became subsections in this report) based on their knowledge of CGIAR's workstreams. They reviewed submissions from CGIAR Center staff as well as PRMS to add nuance to the identified themes and supplemented this information with their own professional knowledge to develop narratives about CGIAR's real-world impacts. These narratives tried to feature the most compelling, holistic set of evidence on real-world change, not necessarily the largest real-world changes achieved (that is, preference was given to compelling examples of incremental change over suspect examples of large-scale change). This approach to the development of themes to feature is, therefore, rooted in the studies identified through the Selection of Evidence (see Selection of evidence) process, but not strictly limited to those studies. Furthermore, data extraction (see Data extraction) on the rigor of evidence informed decisions on which studies to feature in the narrative, but no hard cut-offs were applied.

s This was not extracted for all studies as it was added part-way through the data extraction process.
t More specifically, the reviewer evaluated the rigor of each indicator measured within a study (Annex A. Included studies and rigor of evidence).

Validation of findings

An extensive engagement process was leveraged to ensure that the findings presented here accurately reflect the full breadth of CGIAR work. This process included soliciting evidence from CGIAR's Impact Areas and regions, circulating early drafts of this report to the individuals contacted for contributions, and engaging with CGIAR's Standing Impact, Monitoring, and Evaluation Committee (SIMEC). However, the overriding consideration was strength of evidence and only secondarily an interest in balance across CGIAR's breadth of work.

Included studies and rigor of evidence

Using this approach, 125 unique studies were identified: 62 impact evaluations and 63 supplemental studies.[u] While the most common impact evaluation design was RCTs, a significant portion used endogenous switching regression and instrumental variable approaches to determine the effects of interventions in contexts where observational data were used (Figure 31). RCTs were used to understand the effects of specific CGIAR interventions. Endogenous switching regression and instrumental variables were often used to understand the effects of adopting specific CGIAR technologies, employing observational data in non-experimental studies. These approaches have distinct uses; for example, while an RCT might be used to evaluate the effects of CGIAR-supported farmer field schools that teach soil and water conservation techniques on yield and income, an endogenous switching regression evaluation might be used to consider the effects of farmers *adopting* the supported soil and water conservation techniques on the same yield and income outcomes. These represent different steps in the theory of change connecting CGIAR to targeted impacts. An evaluation may find that *adopting* a specific agricultural technique has positive effects but an *intervention* supporting that agricultural technique has null effects. This most often happens when interventions fail to induce significant adoption, so only a small fraction of participants realize the benefits of adopting and, on average, participant outcomes do not improve.

While statistical methods that can establish causality are a defining component of an impact evaluation, the use of these methods does not guarantee that an impact evaluation is rigorous in all respects. We therefore conducted a rigor assessment, which considered the following criteria:[45]

1. Did the study employ (partial) random sampling?
2. Was statistical power considered?
3. Was attrition considered?
4. Is the sample representative of the target population?
5. Were spillover effects considered?
6. Were heterogenous treatment effects estimated?
7. Was there (partial) random assignment to treatment?
8. Was baseline balance between treatment and control groups reported and addressed statistically if needed?
9. Were sensitivity checks conducted?

Composite scores were then developed reflecting the number of these criteria (0–9) that were fulfilled. These criteria combine established scoring methods with a modified approach that is appropriate for a wide variety of evidence types. They are grounded in widely recognized best practices for transparency, causality, and methodological rigor and build on validated frameworks successfully applied in prior high-quality meta-analyses of international agricultural research. All criteria were given equal weight, although, future studies may wish to consider whether some of these criteria should be considered necessary or less influential in an aggregate measure of overall rigor. Because these criteria are somewhat high-level and not universally applicable to all impact evaluations, we did not use these to exclude studies, only to inform decisions about which to highlight in this report. In cases where study designs did not rigorously establish causation, we reverted to associational language or simply included the studies in Impact assessments references and not in the main text.

The 62 impact evaluations serving as the basis of this report were generally rated as being moderately rigorous, with a rating of 4 being the most common score but many studies scored 2 and 3 as well (Figure 31). The most common methodological issues raised related to consideration of heterogeneity in treatment effects and the presentation of power calculations (Figure 32).

u Two studies were classified as both because they evaluated multiple interventions, some of which reached the criteria for impact evaluations and some of which did not.

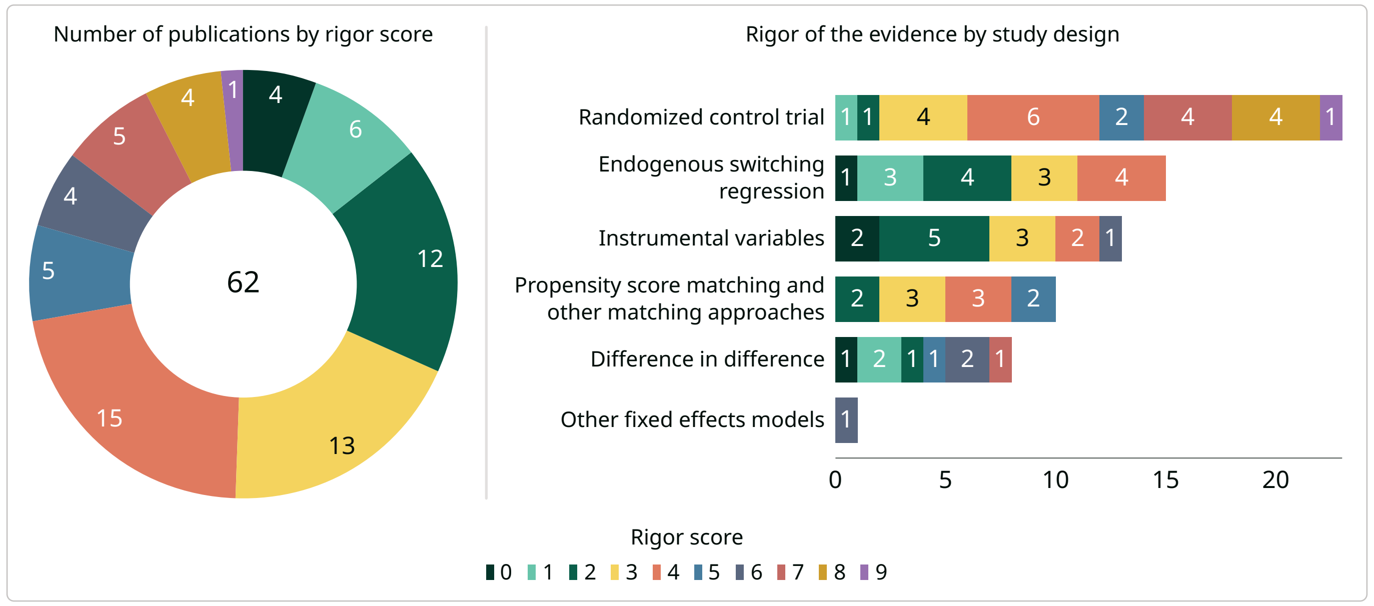

Figure 31: Methods and rigor of the impact evaluations included in this report.

Note: Some studies used multiple methods or received multiple rigor scores for different reported impact estimates. Therefore, the sum of the number of studies reflected in the graph is more than the total number of 62.

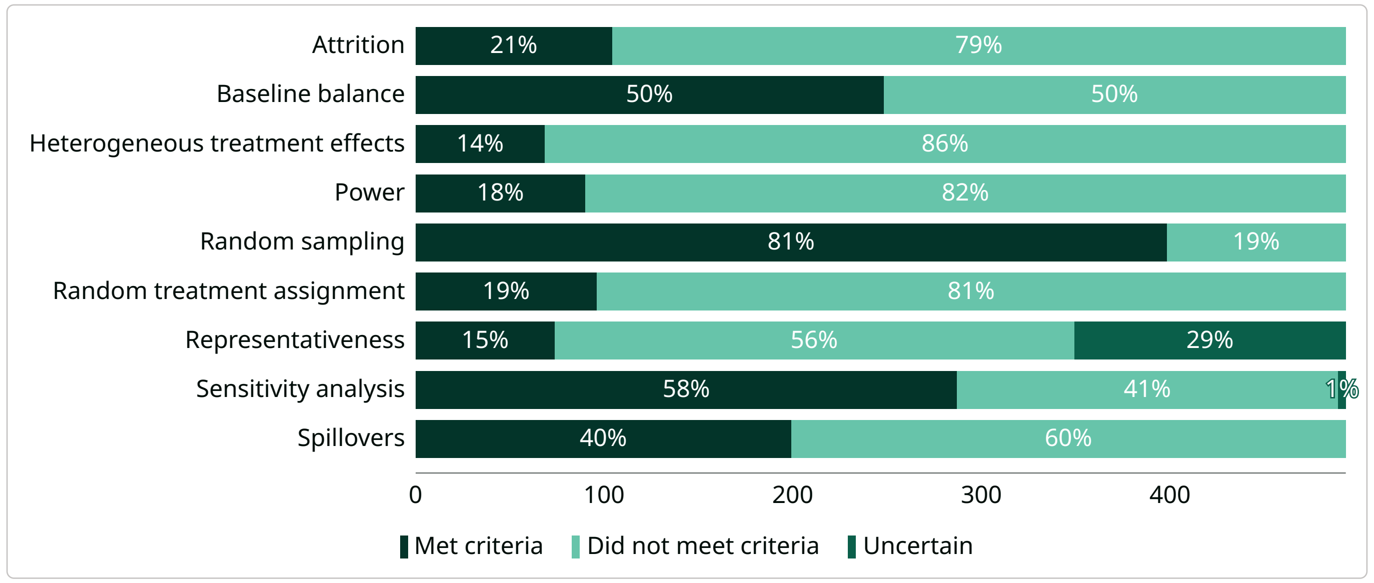

Figure 32: Proportion of impact evaluation analyses which met each of the best-practice rigor score criteria. Included are 125 studies, which contained 488 indicator analyses.

B. Impact indicators

CGIAR's Results Framework contains 19 Impact Area indicators it committed to tracking in the 2022 to 2024 period. These indicators are well aligned with the SDG targets and supporting indicators. CGIAR poverty-related indicators are closely linked with SDG targets 1.1 and 1.2 (on reducing poverty) and target 2.3 (on increasing agricultural productivity on small farms). CGIAR nutrition-related indicators are well aligned with SDG targets 2.1 and 2.2 (on reducing hunger and malnutrition). CGIAR gender-related indicators match closely to SDG targets 5.5 (on full participation of women), 5.a (on enhancing rights to economic resources), and 5.b (on use of enabling technology). CGIAR climate-related indicators align with SDG targets 13.1 (on strengthening resilience) and 13.2 (on integration of climate change measures into strategies and policies). Finally, CGIAR environment-related indicators are linked closely to SDG targets 12.2, 15.2 and 15.3 (on sustainable management of natural resources), 6.4 and 6.5 (on improving water use efficiency and management), and 2.5 (on enhancing genetic diversity of crops and animals).

In terms of how well the impact assessment studies aligned with the CGIAR Results Framework, in only 9 percent (n=11) of the identified studies were these exact indicators reported (Figure 33). Two indicators were never reported on: the amount of climate adaptation investments and the number of youth benefiting from CGIAR innovations. In the case of the former, climate

adaptation investments is, by definition, an outcome, and some reported outcomes were aligned with helping to raise investment funds relevant to climate change. For inclusion as an impact assessment study, investigating the impacts of these investments would have been required, and none were identified. All indicators reporting on the number of people benefiting from innovations, including youth, may be slightly undercounted for a similar reason: studies reporting on the number of people interacting with a CGIAR innovation that did not investigate the impact of that innovation were reported as innovation use outcomes. The higher threshold of estimating the number of people benefiting from innovation use was not observed in the case of youth.

Studies often reported on indicators that have longstanding academic interests, such as household dietary diversity, income, and yield, over CGIAR-specific indicators. In addition, studies often report percent change as opposed to absolute numbers (such as percent increase in income, not absolute increase in income). Many of these differences are likely driven by measurement challenges and statistical limitations in model specification. It can be easier to collect data on changes in diet and income than to collect data that determine whether participants move over specific thresholds related to dietary quality and poverty. In addition, these thresholds require analysis on a binary outcome (such as being poor), which will inherently have less power than analysis on the corresponding continuous indicator (such as income).

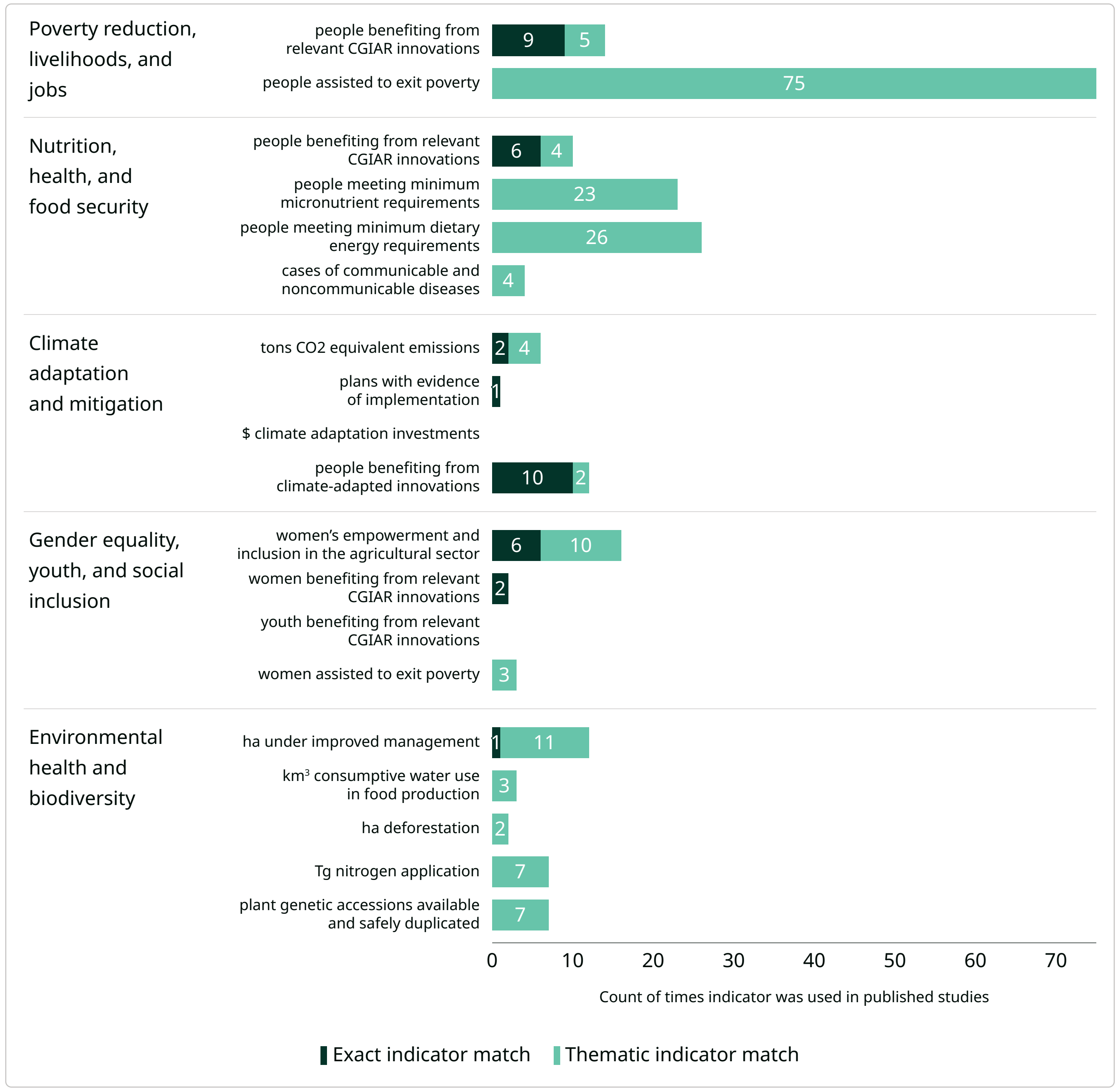

Figure 33: Comparison of the indicators measured in impact assessment studies against the indicators mandated in the CGIAR Results Framework to track progress in each Impact Area.

Intha fishermen in Inle Lake catching fish traditional way, Myanmar. Photo credit: MehmetO/Shutterstock

CGIAR Impacts in Agrifood Systems:

Evidence and Learnings from 2022–2024

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