CGIAR

CGIAR SYSTEM ANNUAL PERFORMANCE REPORT 2017

Full Report

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CGIAR SYSTEM
ANNUAL PERFORMANCE REPORT 2017
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ACRONYMS AND ABBREVIATIONS

A4NH	CGIAR Research Program on Agriculture for Nutrition and Health
ACIAR	Australian Centre for International Agricultural Research
Ag-Incentives	Agricultural Incentives Consortium
Altmetrics	Alternative metrics
AR4D	Agricultural Research for Development
ASTI	Agricultural Science and Technology Indicators
BIG DATA	Platform for Big Data in Agriculture
CacaoNet	Global Network on Cacao Genetic Resources Conservation and Use
CCAFS	CGIAR Research Program on Climate Change, Agriculture and Food Security
CIAT	Centro Internacional de Agricultura Tropical (International Center for Tropical Agriculture)
CIFOR	Center for International Forestry Research
CIMMYT	International Maize and Wheat Improvement Center
CIP	Centro Internacional de la Papa (International Potato Center)
CIRAD	Centre de coopération internationale en recherche agronomique pour le développement (French Agricultural Research Centre for International Development)
CoEx	Cocoa of Excellence Programme
CRP	CGIAR Research Program
CSA	Climate Smart Agriculture
CSIRO	Australian Commonwealth Scientific and Industrial Research Organisation
EiB	Excellence in Breeding Platform
FAIR	Findable, Accessible, Interoperable, and Reusable (open data principles)
FAO	Food and Agriculture Organization of the United Nations
FISH	CGIAR Research Program on Fish Agri-Food Systems
FSC	Forest Stewardship Council
FTA	CGIAR Research Program on Forests, Trees and Agroforestry
GARDIAN	Global Agricultural Research Data Innovation & Acceleration Network
GCF	Green Climate Fund
GENEBANK	Genebank Platform
GIFT	Genetically Improved Farmed Tilapia
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German Corporation for International Cooperation)
GRIPP	Groundwater Solutions Initiative for Policy and Practice
GSARS	Global Strategy to Improve Agricultural and Rural Statistics
HHI	Hidden Hunger Index
IA	Intellectual Assets
IADB	Inter-American Development Bank
ICA	International Cocoa Awards
ICAR	Indian Council of Agricultural Research
ICARDA	International Center for Agricultural Research in the Dry Areas
ICRAF	International Centre for Research in Agroforestry
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IDO(s)	Intermediate Development Outcomes
IEA	Independent Evaluation Arrangement
IFAD	International Fund for Agricultural Development
IFI	International Financial Institutions
IFPRI	International Food Policy Research Institute
IITA	International Institute of Tropical Agriculture
ILRI	International Livestock Research Institute

IRRI	International Rice Research Institute
ISPC	Independent Science and Partnership Council
IWMI	International Water Management Institute
LIVESTOCK	CGIAR Research Program on Livestock
M&E	Monitoring and Evaluation
MAIZE	CGIAR Research Program on Maize
MELCOP	CGIAR Monitoring and Evaluation Community of Practice
MDD-W	Minimum Dietary Diversity for Women
MIS	Management Information System(s)
NERICA	New Rice for Africa
NGO	Non-governmental organization
OECD	Organisation for Economic Co-operation and Development
PGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
PIM	CGIAR Research Program on Policies, Institutions, and Markets
PMCA	Participatory Market Chain Approach
QoR4D	Quality of Research for Development framework
R&D	Research and Development
R4D	Research for development
REDD	Reducing emissions from deforestation and forest degradation
RICE	CGIAR Research Program on Rice
RTB	CGIAR Research Program on Roots, Tubers and Bananas
SDGs	United Nations Sustainable Development Goals
SLO	System Level Outcome(s)
SPIA	Standing Panel on Impact Assessment
SRF	CGIAR Strategy and Results Framework 2016-2030
TNC	The Nature Conservancy
TFP	Total factor productivity
UAV	Unmanned aerial vehicle
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
VAD	Vitamin A deficiency
W1	Window 1 (funding channel in the CGIAR Trust Fund)
W2	Window 2 (funding channel in the CGIAR Trust Fund)
W3	Window 3 (funding channel in the CGIAR Trust Fund)
WEAI	Women's Empowerment in Agriculture Index
WFP	World Food Programme
WHEAT	CGIAR Research Program on Wheat
WLE	CGIAR Research Program on Water, Land and Ecosystems

EXECUTIVE SUMMARY

This is the first in a new series of CGIAR Annual Performance Reports which reflect the introduction of new System-wide results reporting systems. The report presents evidence on progress, offers a reflection on factors that help CGIAR move from research results to achieving practical impacts on the ground, and discusses how CGIAR worked to improve its performance in 2017. The information in this main report is supported by detailed data, available in Annexes and in linked Evidence Tables.

Progress towards Strategy and Results Framework goals: Evidence from 2017

The report presents **progress against an agreed Strategy and Results Framework** (SRF), **including 10 aspirational targets** that feed into the United Nations Sustainable Development Goals (SDGs). Rigorous quantitative evidence is presented on the long-term, at-scale impact of relevant CGIAR innovations against each target. Examples include:

- Large-scale adoption and impact of high-yielding crop varieties (e.g. rice, maize and lentils), biofortified crops, and improved fish varieties;
- Impacts of improved policies and programs: e.g. environmental benefits of fire prevention in Indonesian forests; and
- Impacts of other technologies and innovations, such as uptake of a technology to combat aflatoxins (fungal toxins in foods and feeds), and benefits recorded from adopting tree domestication technologies.

Much of the impact data presented comes from earlier investments in impact studies through the Strengthening Impact Assessment in the CGIAR System special initiative project (SIAC), which finished in 2017.

The report then presents data on the newly introduced Common Results Reporting Indicators with available data from 2017, together with examples and links to full databases with supporting evidence. Numerical highlights include:

616 'innovations' (significant products or findings from research), including 348 in a stage available for uptake, e.g. a variety released, or a technique ready to scale up.

112 international and national policies, legal instruments, investments and curricula to which CGIAR research contributed in 2017.

1,764 peer-reviewed publications, of which 61% were published in Open Access. A new prototype system, 'GARDIAN', gave searchable open access to 50,000 publications and 1,800 datasets from CGIAR by the end of 2017.

348,927 participants (40% women) in CGIAR training courses or events, including 1,700 (30% women) on degree or other long-term courses

1,961 formal partnerships were reported, of which just over half (51%) were for research and a third (33%) were for work on scaling or delivery of mature innovations.

A special mention is made of **CGIAR genebanks**, which represent the largest and most widely used collections of crop diversity in the world, with **768,576** accessions, including 25,301 ***in vitro*** accessions and 28,063 accessions held as plants or trees in the field. In 2017, **109**,339 germplasm samples were provided by CGIAR genebanks to users (including CGIAR breeders). A total of **61,376** samples were distributed outside CGIAR, in 95 countries.

A **case study of CGIAR's work on biofortification**, which has been distinguished by a World Food Prize Award, offers the chance to reflect on the **factors that have led to success** in turning research outputs into practical impacts on the ground. These included:

- Risk-taking and perseverance (CGIAR research on biofortification started 25 years ago with a vision of what 'might' work, and is now scaling up to benefit millions of people);
- Partnership;
- A clear vision of potential pathways to impact, using research to systematically test the assumptions and links in those pathways;
- Substantial investment in monitoring and evaluation; and
- A critical mass of coordinated investment, enabling the above and creating a virtuous circle of increased evidence of effectiveness leading to sustained funding.

This report also highlights some **new directions for some CGIAR research programs** in 2017, in response to expanding international demand. Examples included urban food systems and food safety in the informal sector in Africa; sustainable rice straw management to avoid straw burning in Asia; and linkages between ecosystem health, food production or systems and human well-being in areas such as synthetic proteins and water-related diseases.

Integrating gender and equity into CGIAR research for development

In 2017, CGIAR took several steps forward **toward greater gender equality**. An evaluation of gender in research and in the workplace found that there had been significant progress, but that CGIAR required a clearer overall vision and action plan for. A CGIAR Collaborative Platform for Gender Research was set up in 2017 within the CGIAR Research Program (CRP) on Policies, Institutions, and Markets (PIM), building on the previous System-wide gender network. The platform held a first technical conference and a series of webinars, and launched a successful call for proposals for co-funded gender research. Six gender working groups were launched (or strengthened) on specialist areas of work, including breeding, agriculture and climate change, data and methods, seed systems, water and innovation. Many parts of CGIAR reported activities related to gender integration in research, and this report presents a selection of their results, including tools, measures and frameworks; major reviews; and CGIAR contributions to integrating gender considerations into national and international policy and programming.

Work on **youth** also surged across CGIAR in 2017, with several multi-country studies, meetings and literature reviews on rural youth and employment issues. The main lesson was that a **broader approach to equity** issues would be more effective than a 'youth only' approach, taking in different kinds of social differences as well as age and gender. Understanding differences in the way research products are used and affect different types of people is key to meeting the SDG goal of "leaving no-one behind".

Improving CGIAR performance

This report presents a summary of progress made in 2017 with **System-wide results and performance systems**, taking in recommendations from an evaluation of results-based management. Components of a new System-wide reporting system were approved, and the ground laid for further development in 2018. The year 2017 also saw greatly increased adoption and harmonization of **Management Information Systems** (MIS), and these are expected to be adopted by all parts of CGIAR in 2018, increasing efficiency and checkability in System-wide reporting as well as program management.

The report also discusses the **use of pooled funding (CGIAR Trust Fund Window 1 and 2)** funding to improve performance and provides a link to a compiled list of activities funded. Windows 1 and 2 were used for a wide variety of 'value-added' work. A few examples are: start-up investment on emerging research

topics, supporting integration of gender; capacity development of national partners; and financing international policy engagement to leverage research results.

Three stand-alone **Platforms** which work across CGIAR were also created (or strengthened) in 2017:

- The **Genebank Platform** (GENEBANK) supports the core activities of the CGIAR genebanks to conserve and make available the 35 crop and tree collections under its management, and works towards meeting international standards, improving efficiency, and ensuring more effective use of collections within a supportive policy environment.
- The **Platform for Big Data in Agriculture** (BIG DATA), launched May 2017, aims to: mobilize CGIAR data to accelerate research and spur new data-driven innovations, build data collaboration internally and externally, and leverage CGIAR expertise while claiming a unique leadership voice in digital agriculture. It also supports and promotes Open Data.
- The **CGIAR Excellence in Breeding Platform** (EiB), launched August 2017 aims to modernize breeding programs, drawing from innovations in the public and private sectors to provide access to cutting-edge tools, services and best practices, application-oriented training and practical advice to increase the effectiveness and efficiency of breeding. This has already resulted in some improvements in efficiency.

Collaboration across CGIAR has significantly increased since the inception of CGIAR Research Programs, adding value and improving learning across the System by taking advantage of expertise in areas such as economic modeling or climate change. A total of 192 specific instances of collaboration between CGIAR Research Programs (CRPs) and between CRPs and Platforms were reported for 2017, as detailed in the report.

Partnerships with the private sector are often vital to delivering CGIAR innovations. The effective management of intellectual assets and intellectual property rights are an essential part of these partnerships. In 2017, a review was undertaken of the CGIAR Principles on the Management of Intellectual Assets, which seek to achieve a delicate balance between maintaining the founding value of global accessibility of CGIAR research results and proactively achieving targeted impacts through the use of intellectual property rights and licensing. The review concluded that the Principles were appropriate and useful, and made recommendations to strengthen their application, some of which are currently being implemented. In 2017, CGIAR Centers reported a total of three provisional patent applications and two non-provisional patent applications, as well as 23 Limited Exclusivity Agreements and four Restricted Use Agreements with the private sector. These were all determined to further the CGIAR vision and to be consistent with the Principles.

The report also summarizes reported activities on **monitoring, evaluation, and adoption and impact assessment** carried out across CGIAR. Numbers of reported studies were relatively low in 2017, probably indicating both under-reporting and under-investment in this area. However, there are active cross-CGIAR communities of practice working to improve approaches and methods, and more than half of the programs reported holding learning workshops to feed results of studies back into programming.

A key advance in 2017 was the adoption of a **CGIAR System Risk Management Framework** and associated Guidelines. Building on expertise from the CGIAR IAU, Center management and Internal Audit teams, the System adopted five risk families and indicators to reflect best international practice.

2017 saw CGIAR's **System-wide advisory functions**—the Independent Science and Partnership Council (ISPC) and its Standing Panel on Impact Assessment (SPIA); the Independent Evaluation Arrangement (IEA), and the CGIAR Shared Services Internal Audit Unit (CGIAR IAU)—providing guidance and assurance on the status and performance of CGIAR's research agenda, the quality of the work, its operational effectiveness and its impact.

Other highlights in 2017 included:

- An independent foresight assessment and international workshop on Global Trends affecting Agri-food systems. (ISPC)
- New research insights on agri-food systems innovation. (ISPC)
- A proposed Quality of Research for Development framework. (ISPC)
- A new database of varietal release and adoption estimates for 11 CGIAR mandate crops for 15 countries in Asia. (ISPC-SPIA)
- Important advances in methodology for adoption studies on crop varieties, based on DNA testing. (ISPC-SPIA)
- Publication of a set of influential impact studies. (ISPC-SPIA)
- System-wide evaluations and reviews, including on gender, results-based management, intellectual assets, capacity development and partnerships. (IEA)
- A workshop on Development, Use and Assessment of Theories of Change in CGIAR Research for decision-makers from across CGIAR. (IEA)
- Capacity building to strengthen internal controls across CGIAR Centers, including: publication of Good Practice Notes and self-assessment tools and a review of CGIAR Centers' common financial health indicators, contributing to overall efforts to strengthen Center financial stability. (CGIAR IAU)

Funding and finance

Investments in CGIAR are delivered via a multi-Funder **'CGIAR Trust Fund'**, as well as on a bilateral basis. Harmonized funding is channeled through Windows 1 and 2 of the CGIAR Trust Fund. Window 1 (W1) contributions are pooled and may be used across the CGIAR System, while Window 2 (W2) contributions are designated for specific CGIAR Research Programs (CRPs) and/or Platforms. Funders may also allocate funding to particular CGIAR Research Centers through Window 3 (W3) of the CGIAR Trust Fund, and/or directly to specific projects in CGIAR Research Centers (outside the Fund), which is called 'bilateral' funding. In 2017, CGIAR recognized **revenue** of USD 849 million, of which the clear majority (78%) was Window 3 and bilateral funding, and 19% was Window 1 and 2 funding.

Overall, the top three Funders were the Bill & Melinda Gates Foundation, the USA and UK. The largest providers of Window 1/2 funding were the UK, World Bank, the Netherlands, Switzerland, Sweden, Norway, Australia, and Canada. The largest providers of bilateral funding were Germany, USA and Mexico. Of overall expenditure, 85% was on research led by CGIAR and its partners, and 15% on general, administration and System entity costs. Individual CRPs had annual budgets that varied from about USD 20 million to 90 million, with around 20% of the total (range 7-30%) being pooled Window 1/2 funding.

CGIAR RESEARCH PORTFOLIO

Transforming global agriculture and food systems

In 2017 CGIAR embarked on a new program of innovative research programs and platforms, with a renewed emphasis on nutrition and health, climate change, soils and degraded land, food systems waste, food safety and the global stewardship of genetic resources. The portfolio is designed to contribute significantly to the achievement of the Sustainable Development Goals through CGIAR's 2030 targets: 150 million fewer hungry people, 100 million fewer poor people – at least 50% of whom are women – and 190 million hectares less degraded land by 2030. The new portfolio is structured around three groups of challenge-led research programs:

Agri-Food Systems CGIAR Research Programs

The first of these is the innovation in Agri-Food Systems which involves adopting an integrated, agricultural systems approach to advancing productivity, sustainability, nutrition and resilience outcomes at scale.

CGIAR Research Program on Fish

CGIAR Research Program on Forests, Trees and Agroforestry

CGIAR Research Program on Grain Legumes and Dryland Cereals

CGIAR Research Program on Livestock

CGIAR Research Program on Maize

CGIAR Research Program on Rice

CGIAR Research Program on Roots, Tubers and Bananas

CGIAR Research Program on Wheat

Global Integrating Programs

The second cluster consists of four cross-cutting Global Integrating Programs framed to work closely with the Agri-Food Systems Programs within relevant agro-ecological systems.

CGIAR Research Program on Agriculture for Nutrition and Health

CGIAR Research Program on Climate Change, Agriculture and Food Security

CGIAR Research Program on Policies, Institutions, and Markets

CGIAR Research Program on Water, Land and Ecosystems

Research Support Platforms

Three stand-alone research support Platforms underpin the research of the whole system.

CGIAR Platform for Big Data in Agriculture

CGIAR Excellence in Breeding Platform

CGIAR Genebank Platform

A fourth platform, the CGIAR Collaborative Platform for Gender Research, is housed in the CGIAR Research Program on Policies, Institutions, and Markets (PIM) and serves all CGIAR research programs.

PREFACE

The world's food system is on the wrong trajectory. Most of the world's population eats too little, too much, or the wrong type of food – at an unsustainable cost to the environment, health, and political stability. Achieving the SDGs depends on a food system simultaneously capable of delivering greater volumes of more nutritious food with a lower environmental footprint. Improving the food system to ensure an adequate and nutritious diet, especially for the world's most vulnerable people, is at the core of CGIAR's mission.

"If we can't fix our food system, we will not achieve the SDGs. We want to play a central role in driving a shift in food systems so that they are more sustainable, more productive and benefit populations across the world."
Elwyn Grainger-Jones, Executive Director, CGIAR System Organization

Agricultural research is a smart and critical investment – one that global society neglects at its peril. As world events again demonstrated in 2017, poverty and hunger have ramifications that are far-reaching and potentially explosive, and sustainable food production itself is inextricably linked to a host of factors that include environmental conservation, climate change, market access and equitable conditions for both women and men.

With a strong asset base in terms of skills, science and worldwide reach thanks to its unique research for development partnership network, CGIAR is uniquely positioned to respond to today's pressing global challenges of food insecurity, environmental degradation, unequal prosperity, a changing climate, and the nutrition-related disease burden. Producing more nutritious food with a lower environmental footprint requires collective action and opening up new opportunities for dynamic innovation.

"Agricultural research offers the opportunity for a single investment that provides multiple benefits. Investment in CGIAR expertise and our unique assets will ensure we can provide long-term value to the world."
Juergen Voegele, Senior Director, Agriculture, World Bank; and Chair, CGIAR System Council

Determined to rise to the challenge, CGIAR is working hard to build more effective partnerships, with strengthened funding for sustainable, transformational impact, based on the triad that forms the core of all its research: partnership, transparency and accountability. To ensure accountability, CGIAR is focusing on enhancing performance and strengthening the quality of its reporting.

During this past year, CGIAR's new governance structure has demonstrated results, highlighting the value of working together across the whole System – taking tough decisions and setting clear directions for continued improvement.

"CGIAR is working towards improving system performance. We will take bold steps forward to deliver high quality research through a commitment to partnership, transparency and accountability."
Ann Tutwiler, Director General, Bioversity International, and CGIAR System Management Board member

Impacts have been recorded in important areas of sustainable agriculture – agroforestry, breeding, resilient farming methods, fish and livestock development to name but a few – leading to sizeable increases in farmer incomes, and improved nutrition. On this latter critical issue, a welcome accolade came in 2017 from the MacArthur Foundation, which contributed a grant of USD 15 million to the HarvestPlus Biofortification Program, enabling it to advance its ground-breaking research on developing methods to enrich some basic staples with micronutrients – work that is now being scaled up through novel alliances with the private sector, government, and civil society.

The release of more than 200 new improved crop varieties and other technical innovations (CGIAR Innovations in 2017), the publication of approximately 1,750 peer-reviewed research papers of which more than 60% are openly accessible (CRP Publications in 2017), and the continued massive genomic characterization of crop accessions stored in 11 CGIAR Genebanks are just some of the successes scored by CGIAR Research Programs and Platforms in 2017.

The year ended on a high note with CGIAR receiving a United Nations Framework Convention on Climate Change (UNFCCC) Momentum for Change award for ground-breaking science on climate-informed advisories and big data, the results of which are now being rolled out to hundreds of thousands of farmers in Colombia and Honduras.

CGIAR's achievements in 2017 have been made against a backdrop of pressure on funding, albeit tempered by the generosity of CGIAR's Funders who have continued to support the case for international agricultural research. A stable investment base is essential for long-term planning and impact, so securing reliable and diverse financing remains a key challenge.

"Global funding for agricultural research must be sustained, otherwise more than our food supply could be at risk: employment, peace, gender equality, and efforts to combat climate change would likely also become casualties."
Marco Ferroni, Chair, CGIAR System Management Board

CGIAR is dedicated to reducing poverty, enhancing food and nutrition security, and improving natural resources. The challenge is to attract the funding that is the foundation for all CGIAR research.

Moving forward, CGIAR will continue to sharpen its focus on how to increase relevance and impact in a rapidly changing context, where business-as-usual approaches are no longer an option.

I. INTRODUCTION

This is the first in a new series of CGIAR annual reports which reflect the introduction of new results reporting systems.

This report:

- Presents evidence confirmed during 2017 on CGIAR progress towards high level CGIAR goals and targets.
- Reflects on the factors that help CGIAR research programs achieve practical outcomes and impacts, including through a case study of biofortification.
- Presents CGIAR results from the first year of use of new reporting templates and indicators, including data on CGIAR 'innovations' (significant products and findings), contribution to national and international policies and investments, people trained, partnerships, peer-reviewed publications and more.
- Provides information on how CGIAR is working to improve its performance, including achievement of planned milestones; working across CGIAR, progress on performance systems, intellectual property and more.
- Provides a summary of key financial information, including reporting from CGIAR Research Programs on how funding channeled through Windows 1 and 2 of the CGIAR Trust Fund has been used.

The report is underpinned by a wealth of evidence and references. There are four annex tables, four narrative annexes and nine evidence tables linked to the report which give more details and supporting evidence for common reporting indicators, collaboration across CGIAR, and other numbers presented. From 2019 onwards, much of this detailed information will be available through an interactive CGIAR results dashboard, currently under development, rather than as annexes to reports.

What makes for good performance, and what factors help research programs move beyond producing good research outputs to producing practical outcomes and impacts at scale? The following section addresses these questions through the lens of a case study of a well-known area of the CGIAR program, biofortification, to investigate its secrets of success, as well as the challenges it still faces.

Amina Jomaa collecting Medicago seed in regeneration plots of ICARDA Terbol. Photo: M. Major/Crop Trust

Case study: Getting from research outputs to achieving development goals — a reflection on CGIAR's work on biofortification

Deficiencies in iron, zinc and vitamin A (known as 'hidden hunger') pose serious and widespread threats to health and economic development.[i] The conventional response has been supplementation or food fortification, but these involve substantial recurrent costs,[ii] can be hard to organize in poor rural areas, and cannot always solve the problems.[iii]

CGIAR's biofortification programs were born from the idea that a cost-effective and sustainable way to improve vitamin and mineral intake would be 'biofortification': that is, to breed micronutrients into the staple crops that make up a large part of the diet of the poorest farmers and consumers worldwide. Dr Howarth "Howdy" Bouis initially conceived the idea as a young CGIAR researcher in the 1990s[iv] and in 2016, he was awarded the World Food Prize, along with CGIAR colleagues working on Orange Fleshed Sweet Potato[v] – Drs Maria Andrade, Jan Low and Robert Mwanga – in recognition of their vision, leadership, and effectiveness.[vi]

> *"You have to have a fundamentally sound idea that is scientifically and economically feasible – and then perseverance. When you try things the first time, they often don't work and then you say, 'OK, what did we do wrong? How can we improve this?"*
> Dr Howarth "Howdy" Bouis, Founding Director, interviewed 4 June 2018

HarvestPlus, which leads work on biofortification for the CGIAR Research Program on Agriculture for Nutrition and Health (A4NH), is coming to the end of its third five-year phase, where the focus has been to learn about, and to demonstrate feasibility, dissemination and scaling up. To date, more than 290 new varieties of 12 biofortified crops (Figure 1) have been released or are in testing in 60 countries.[vii][viii] In 2017, 3.2 million farming households used biofortified planting material, bringing the total estimated number of farming households benefiting from biofortified crops globally to 10 million.[ixx] Peer-reviewed published studies demonstrate that biofortified foods improve nutrition and health, contributing to reductions in anemia and prevalence and duration of diarrhea, improved micronutrient status, vision, and cognitive and physical performance.

Now is the time to reflect on the factors that have generated high performance, as well as the continued challenges faced in turning research outputs into development goals, that are common to many agricultural research programs.

> *"The focus on a well-defined goal, of bringing biofortified crops to farming households to improve their nutrition, enabled us to be more cost-effective and targeted in our work."*
> Dr Ekin Birol, head of HarvestPlus impact and strategy

Several key factors have been highlighted in the success of CGIAR's biofortification programs to date,[xi] including:

- **Taking a chance:** Agricultural research is an inherently risky and long-term investment, but has been shown to give large returns.[xii] In the face of initial skepticism, work on biofortification was made possible by early grants from Denmark and the United States Agency for International Development (USAID) that enabled CGIAR breeders and nutritionists to develop evidence supporting the proof of concept which then led to the approval in 2002 of the Biofortification Challenge Program, later renamed HarvestPlus.[xiii] By the end of 2017, HarvestPlus had invested about USD 400 million in breeding, releasing and disseminating biofortified varieties, with the Bill & Melinda Gates Foundation and the UK Department for International Development each contributing about one-third of the total funding.[1] That investment is now paying off.

[1] This does not include the funding invested in Orange Fleshed Sweet Potato (see Box).

- **Perseverance:** Biofortification work has now been going for 15 years, and was a further 10 years in the making. This is a common timeline for agricultural research to move to uptake and impact.
- **Partnership:** Partnership has been fundamental to biofortification success. For example, HarvestPlus works with more than 500 partners around the world. In addition to Funders and national governments, these include: 100 research entities, including CGIAR centers and universities, which conduct crop breeding, nutrition studies, consumer preference surveys, monitoring and evaluation, economic analysis, and other research; more than 240 non-governmental organization (NGO) partners, the majority of whom play an important role in reaching farmers; and more than 120 private sector partners in the seed, food processing, and retail sectors.
- **Building the evidence quickly** for the value of biofortification through ex ante cost-benefit analyses[xiv] and some convincing studies on effectiveness in the field[xvxvi] have been important to keep funders on board. This has required large investments; as Dr Bouis explained[2] in a pilot dissemination study of Orange Fleshed Sweet Potato, *"we spent around 50% to implement and 50% to study and document what the impact had been."*
- **Clear vision of the pathways to impact**, and using program research systematically to check the assumptions in those pathways,[xvii] for example: Will farmers want to grow the new biofortified crops? Will consumers want to eat enough of them? If they do eat them, will this sufficiently improve their micronutrient status? HarvestPlus has set up dedicated nutrition and impact research teams that work closely with the field delivery teams to generate the evidence needed.[xviii]
- **Investing in monitoring and evaluation** (around 10% of annual program costs[xix]), both to document results for accountability purposes, and to feed evidence into decision making.
- **A critical mass of coordinated investment for one main area of work** created a virtuous circle, making it possible for HarvestPlus to invest sufficiently in evidence generation and M&E. The evidence generated has helped to maintain interest and investment.

CGIAR biofortification programs now face some major opportunities and risks, as they move from early counts of 'households reached' with the new biofortified varieties to a focus on long-term, sustained uptake.

Agriculture is a challenging sector to work in.[xx] A new 'biofortified' crop variety is not like a medicine: it needs to be voluntarily grown by millions of scattered farmers, and promoted through many private sector and other channels, in the face of competing crop varieties. As the global climate changes, biofortified varieties must be 'future proofed'[xxi] as well as being attractive to farmers, processors, and consumers.

The world's diets are also changing rapidly. Eating more meat, fish, fruits, and vegetables could overcome many micronutrient deficiencies, and CGIAR is also investing major research resources in those pathways to better nutrition[xxii]. However, the persistence of micronutrient malnutrition in many wealthier countries shows that more money translates into better dietary quality only slowly.[xxiii] As the leader of the CGIAR dietary diversity research group concluded[xxiv]:

"Biofortification should not be seen as a rival or even a complement to dietary diversification, but as an integral component of food-based solutions to improve nutrition and public health by providing people with an array of healthier food choices."

[2] Dr. Howdy Bouis, interviewed 4 June 2018

Orange Fleshed Sweet Potato: a success story led by the International Potato Center as part of the CGIAR Research Program on Roots, Tubers and Bananas

Initiated and led by International Potato Center (CIP) scientist Dr Jan Low, the success of vitamin A rich Orange Fleshed Sweet Potat (OFSP) exemplifies how a CGIAR science-based approach can benefit millions of smallholder farmers and consumers. On the basis of rigorous nutrition, efficacy and effectiveness studies, OFSP was able to attract initial support that it could translate into progress at scale. Through CIP technical support, NARS in Africa has developed and released over 60 locally adapted OFSP varieties, and a pluralistic extension and delivery strategy has brought these varieties to more than 4.5 million households over the past 10 years.

Importantly, an Integrated 'Agriculture-Nutrition-Marketing Approach' has nurtured both demand and supply and has built the capacity of a wide range of partners to reach vulnerable populations with OFSP. Combining methods from biological and social sciences, this approach is at the heart of the continued effort to improve OFSP varieties to meet farmer and consumer preferences, diversify utilization, and deepen impacts on nutrition and livelihoods.

Adapting this approach to different contexts in 20 countries in Africa and Asia will require continued innovation to develop scalable, cost-effective OFSP delivery systems that harness the capacity and interests of a wide range of partners from public and private sectors.

"Just over 100g of Orange Fleshed Sweet Potato can cover the daily vitamin A needs of a 5-year-old '…'. We now also see increased demand in the food industry for biofortified sweet potato as a nutritious ingredient. That can be another huge step forward for farmers and consumers."
Dr Simon Heck, Sweetpotato Program Leader at CIP and leader of RTB flagship on nutrition and postharvest.

Figure 1. Biofortified crops bred by CGIAR Centers and partners

Click on each crop picture to see the breeding program

Main elements of the HarvestPlus Monitoring & Evaluation system

- **Impact pathways:** for each major crop/country combination, setting out the planned route from research to impact, along with the (testable) assumptions.
- **Monitoring:** of more than 30 indicators, from processes to outputs, outcomes and impact. HarvestPlus employs 13 people directly to coordinate monitoring, carry out data quality checks and train partners.
- **Monitoring surveys:** early checks on how biofortified varieties are liked, grown and consumed in practice.
- **Adoption surveys:** to measure long-term outcomes, including adoption, diffusion, sales and consumption.
- **Simulation models:** which help estimate population level outcome and impact from the necessarily limited numbers of households that can be surveyed.

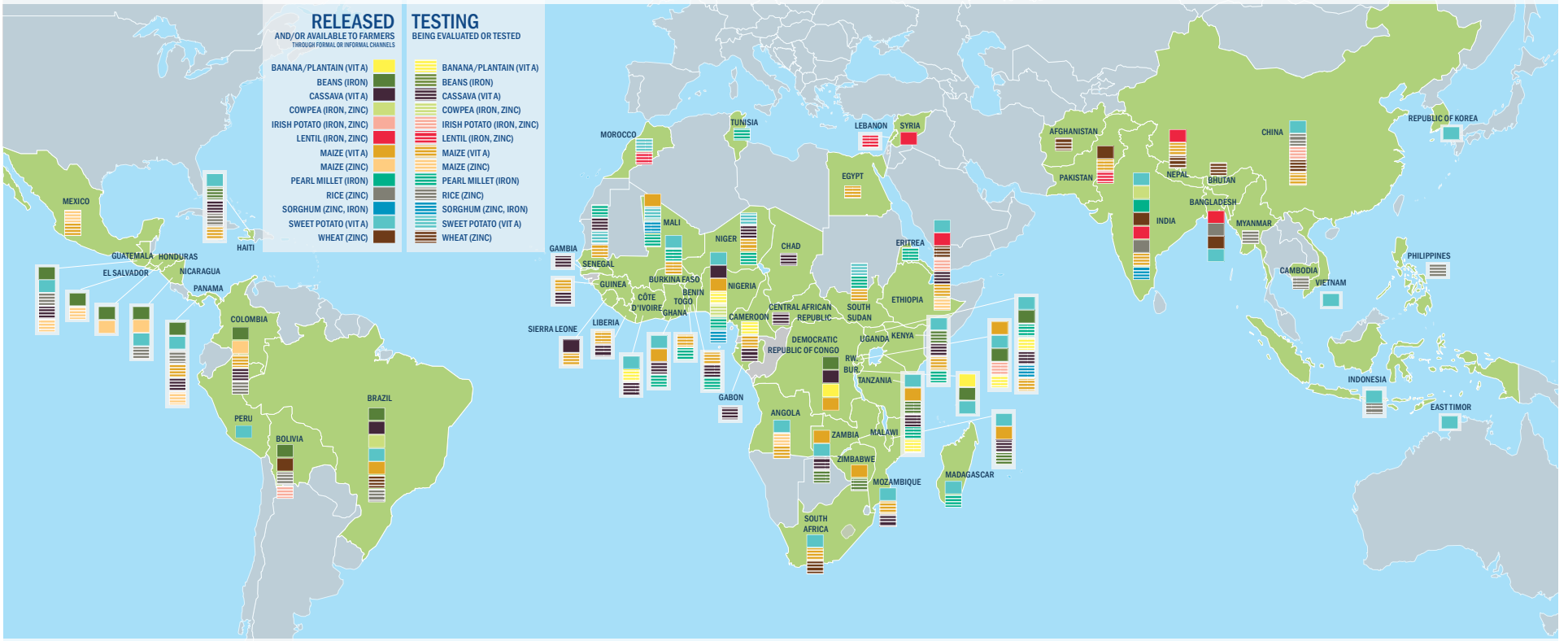
HarvestPlus is still improving all aspects of its M&E, while also working with partner countries and international agencies to integrate key indicators into their own monitoring.

Ensuring that all varieties of key staple crops have high levels of nutrients would be the ideal. CGIAR, which accounts for the majority of breeding programs aimed at small-scale farmers, has committed to integrate breeding for micronutrients across its programs, referred to as 'mainstreaming'.[xxv] Biofortification will 'piggyback' on the best agronomic lines being developed at CGIAR Centers. However, this will take at least another ten years, so reliance on this strategy will leave a gap, which HarvestPlus along with the sweet potato program led by the International Potato Center (CIP) (see Box), is well poised to fill.

The tension between getting quick results and achieving long-term sustainability lies at the heart of much of CGIAR's work. The poorest countries in the world are the main target for many CGIAR innovations, but these countries often also have relatively weak systems for seed production and for providing advice to farmers and consumers, so simply developing improved crop varieties is not enough to achieve impact at scale. Moreover, strengthening these systems has already been the subject of many years of external assistance programs, which have largely failed to overcome the deep-seated structural obstacles[xxvi], so it's not a simple question of integrating 'sustainability' elements into a short-term project. The question, therefore, is to what extent (and depth) should CGIAR and its immediate partners get involved in facilitating or co-organizing agricultural extension, seed production, consumer education and the like in its partner countries?

The experience of CGIAR biofortification programs shows that catalytic steps can be taken and can be initially successful, but long-term institutional sustainability will require expanded commitment by all players across the value chain. This challenge is equally faced by other international programs attempting to tackle a major global problem affecting low-income countries[xxvii]. HarvestPlus and partners have worked hard to encourage changes in policy and practice, both globally and in direct partner countries. For example, 21 countries have integrated biofortification into their national policies to date, and several private seed and food companies have invested in biofortification. However, more remains to be done before they can 'hand over the baton'.

Figure 2. Biofortified crops: What is available where



Source: HarvestPlus, latest data-2018

II. CGIAR PORTFOLIO - PROGRESS REPORTED IN 2017

Overview

Research is a long-term endeavor, and often has to be judged against a multiplicity of goals, measured at different timeframes. This section reports progress under the following headings:

- Progress towards Sustainable Development Goals and CGIAR System Level Outcomes
- Progress towards research outcomes
- External partnerships
- Capacity development
- Open Data

Progress towards Sustainable Development Goals and CGIAR System Level Outcomes

One of the major changes in CGIAR over the past decade has been the full adoption of a 'research for development' (R4D) approach. All research projects must be linked to clearly hypothesized impact pathways to solving specific, long-term development challenges, while maintaining high standards of research quality.

The CGIAR System as a whole reports its progress against an agreed Strategy and Results Framework which has three main System Level Outcomes (SLOs): to reduce poverty, improve food and nutrition security, and improve natural resources and ecosystem services. The SRF also sets out 10 aspirational targets for progress to 2022 and 2030, which feed into the international targets established for the SDGs.

Annex Table A lists each of the SRF aspirational targets, depicts how it links to relevant SDGs, summarizes *global* progress in each area, and then gives evidence based on available adoption and ex-post impact studies published in 2017, on the contribution of CGIAR to each target.[3] Because the timeline between initiating agricultural research and ultimate impact at scale is typically 5-25 years, much of the evidence presented relates to earlier CGIAR research. For example, in the first bullet below, rice varieties released around the year 2000, adoption studies were carried out in 2014-16 and published in 2017. However, the majority of current CGIAR programs build on earlier work and may have a similar order of impact.

Reducing poverty and food insecurity with improved rice varieties

RICE

Improved rice varieties developed by AfricaRice and its partners have lifted 8 million people out of poverty and provided food security to 7.2 million in sub-Saharan African countries, a new study has found. The results from an assessment of 16 countries[lxxiii] showed that the widespread adoption of new varieties using certified seeds has significantly increased yields, providing more food and greater household income. Around 45% of households growing improved rice varieties were lifted out of food insecurity in the scarcity period.

NERICA (New Rice for Africa) research started in the 1990s and intense dissemination began in 2005. Adoption has more than doubled since the previous surveys in 2008, to 1.4 million hectares of cropland in 2016, increasing rice production by nearly 900 kg of grain per household on average. Yields and efficiency gains (total factor productivity) were in most cases reviewed higher for women farmers than for men farmers. This is probably because women farmers have less access to inputs such as fertilizer, and NERICA seeds do better than many others under these conditions.

[3] These figures cannot be summed or accumulated over years, for a variety of reasons including methodology, disadoption or other changes over time, and the possibility of double-counting some people who may have adopted or benefited from more than one CGIAR innovation.

Examples of **high-level impact** of CGIAR varieties, technologies and other innovations reported in 2017 include (for details and evidence sources, see Annex Table A):

- Approximately **9.6 million households** adopted improved rice varieties in Africa. An estimated 8 million persons were lifted above the poverty line. The New Rice for Africa (NERICA) rice varieties often benefited women more than men.
- Nearly **67,000 farmers** across four countries in Africa used Aflasafe®, a biocontrol product, to reduce aflatoxin contamination of maize and groundnuts. Aflatoxins are produced by molds that widely contaminate foods and feeds and are one of many "silent" threats in Africa, affecting health, income, and livelihoods.
- The total estimated number of farming households benefiting from biofortified crops globally now stands at **10 million.**
- In Sulawesi, Indonesia, approximately **637,000 people (52% women)** improved their income as a result of adopting tree domestication technologies.
- Genetically Improved Farmed Tilapia (GIFT) strains of tilapia fish were **disseminated in 16 countries.** One study found that 53% of production in fish hatcheries in Bangladesh and 40% in the Philippines used GIFT or GIFT-derived strains.
- More than **1 million tons a year** of carbon emissions are likely to be saved if new fire regulations in Indonesia's Riau province achieve the predicted 50% annual reduction in fires.
- In Nigeria, about a quarter (24%) of sampled farmers adopted drought-tolerant maize varieties. An estimated **2.1 million individuals** were lifted above the poverty line. Adoption on average reduced by 80% the level of downside risk of crop failure, which is critical for food insecure smallholders. A separate nationwide study found that two-thirds of Nigerian farmers adopted improved cassava varieties, and estimated that this led **1.8 million people to escape poverty** in 2015/16.

Much of the impact data presented comes from earlier investments in impact studies through the Strengthening Impact Assessment in the CGIAR program, which finished in 2017, and it will be important to maintain investment in this area. Moreover, it will be important to ensure that all CGIAR impact studies collect relevant data on indicators for System-level targets.[4]

CGIAR is also making a significant contribution to **tracking global progress** in many of the areas covered by the SRF targets (see Annex Table A, which are often complex to measure. CGIAR researchers are contributing to data collection methods and data on international tracking of nutrition, water use, adoption of crop varieties and innovations, forest cover and climate change.

New cassava varieties reduce poverty in Nigeria

RTB

As many as 1.8 million people in Nigeria have escaped poverty after adopting improved varieties of cassava, a new impact study[lxvii] has estimated. DNA-fingerprinted adoption data from a survey on a large sample of representative cassava-growing areas of Nigeria revealed that the improved varieties have been adopted by about 66% of cassava growers in the country, corresponding to 3.1 million households. Adoption of the new varieties is associated with an 82% increase in yields for growers.

[4] For example, only one study in 2017 collected data on women's dietary diversity (a target indicator).

Progress towards research outcomes

Progress against research outcomes is reported in two main ways. These are: a narrative report (based on a common template) and Common Results Reporting Indicators, introduced for the first time this year. Annex Table B lists CGIAR Common Results Reporting Indicators and available data for 2017.[5] Some numbers in brief:

616 **'innovations'** (significant products or findings), including 348 in a stage available for uptake (for example, a variety released, or a technique ready to scale up). Table 1 summarizes the types and stages of innovations reported, while some examples of innovations are available here. The complete list of innovations available for uptake in 2017 is in Annex Table C and the full database of innovations at all stages can be found in CGIAR Innovations in 2017. Of the innovations available for uptake, 67 % were reported as novel and 33% were reported as adaptive (adaptations of previous innovations for new areas, situations etc.)

112 international and national **policies,** legal instruments, investments and curricular to which CGIAR research contributed in 2017. These are categorized in Table 2, examples are listed in the Box below and a full database is available in Policies/Investments informed by CGIAR Research.

1,764 **peer-reviewed publications** in 2017, of which 61% were published in Open Access. Of these, 152 were co-authored by more than one CRP or Platform.[6] A small selection of significant publications is shown in Table 3 and a complete list is available in CRP Publications in 2017. Highlights of alternative metrics (Altmetric) scores are available in Annex Table D.[7]

348,927 participants (40% women) in **CGIAR training courses** or events, including 1,700 (30% women) on degree or other long-term courses.[8]

1,961 **formal partnerships** reported, as described in the following section[9]. A breakdown by stage of research is given in Table 4, some examples are shown in Table 5 and a list of key partners (not comprehensive) is available in Selected external partnerships in 2017.

Table 1. CGIAR innovations reported for 2017, by stage of research and type of innovation

STAGE OF INNOVATION	METHODS AND TOOLS	PRODUCTION SYSTEMS	GENETIC	SOCIAL SCIENCE	BIOPHYSICAL RESEARCH	TOTAL
1-Research/proof of concept	50	13	57	6	8	134
2-Piloting	45	9	6	3	3	66
3-Available for use	68	32	228	11	9	348
4-Taken up by 'next users'	38	10	11	7	2	68
Total	**201**	**64**	**302**	**27**	**22**	**616**

Source: CRP annual reports and evidence presented to support claims. A list of innovations available for use in 2017 is in Annex Table C, and a full database is available in CGIAR Innovations in 2017.

[5] Since the indicators were only fully introduced in April 2018, after the 2017 year had closed, not all could be reported.
[6] Data was not available for 2017 on the percentage co-authored with external partners.
[7] A full list of available Alternative metrics (Altmetrics) scores for CGIAR publications for 2017 can be found in CRP Publications in 2017.
[8] This indicator was only introduced at the end of the reporting year, so evidence for the numbers reported is fragmentary. In 2018 this number will be underpinned by a database like the other indicators.
[9] This number is likely to be significantly underreported for 2017, since there were cases of multiple partners recorded in one listing. This should improve in 2018.

A 'happy' solution for clean air and Climate Smart Agriculture in India
CCAFS/RICE/WHEAT

A new type of agricultural machinery is promising multiple benefits for farmers – and city-dwellers – in India. Evidence shows[lxix] that use of newly developed Happy Seeder planting machines, coupled with Super SMS mounted combine harvesters, is a cost-effective solution for reducing the problem of crop-residue clearing and its impacts on soil damage, yield limitations and dangerous air pollution.[lxx]

India is home to the 14 cities with the highest air pollution globally, and reports indicate[lxxi] that women and children suffer the worst health effects. Burning of crop residue, or stubble, across millions of hectares of cropland between planting seasons is a major contributor to haze in both rural and urban areas. Use of the new planting machines has the potential to benefit the health of up to 20 million people, while reducing overall carbon emissions.

The new approach is finding success in rice-wheat cropping systems, where traditional machinery required large volumes of crop residue to be cleared between plantings. Unlike the old models, the combined Happy Seeder and Super SMS machines are able to plant wheat seed without becoming jammed by rice residue, by simply lifting the straw, cutting it and replacing it as mulch over the new crops. The approach has also been found to improve soil fertility, conserve water and reduce the use of potentially harmful fertilizers and herbicides.

The Government of India has launched a USD 170 million scheme using the new technology, targeting increased incomes for 2 million farmers and a reduced carbon footprint for 4 million hectares of farmland. The policy decision was supported by evidence from CCAFS, CIMMYT and partners, and an action plan proposal developed by The Nature Conservancy (TNC), CCAFS, WHEAT and other partners.[lxxii] Research is now ongoing into the possibility of scaling the solution across up to 12 countries, contributing to a potential reduction of 57 metric tons of carbon dioxide per year and up to 30% reductions in relevant production systems.

Improved tilapia strains take off in 16 countries
FISH

Improved strains of the freshwater tilapia fish continue to make significant contributions[lxxiv] to food supply and livelihoods around the world. Genetically Improved Farmed Tilapia (GIFT) has now been disseminated by WorldFish to 16 countries and continues to be in high demand.

GIFT and GIFT-derived strains have seen high rates of adoption, accounting for almost 53% of production in sampled fish hatcheries in Bangladesh and 40% of those in the Philippines.

In Egypt, the Abbassa strain, selectively bred from a strain of Nile tilapia, has shown a 12% increase in growth and 48% improvement in profitability when compared to existing strains, according to on-farm performance assessments. The combination of improved strains and better pond management practices also reduces greenhouse gas emissions and the lifecycle environmental impacts of fish farming, outcome studies in Egypt have indicated.[lxxv]

Examples of CGIAR innovations by CRP and Platform for 2017

CRP	INNOVATION
A4NH	Spatial, seasonal and climate predictive models of Rift Valley fever disease across Africa (affects domestic animals and humans)
A4NH	Project-Level Women's Empowerment in Agriculture Index (pro-WEAI), a new survey-based index.
CCAFS	Climate Smart Agriculture Country Profiles
CCAFS	Farm record keeping: A women-targeted practice accounting and farm management tool supporting climate smart agriculture practice
FISH	Business models for smallholder fish farmers
FISH	Life Cycle Assessment tool for analysing future environmental impacts of aquaculture
FTA	LUMENS (Land-use Planning for multiple Environmental Services) to develop green growth scenarios for sustainable land use planning
FTA	Online decision-support tool to help in the selection of tree species and seed sources for restoration of Dry Forests
LIVESTOCK	CLEANED tools: Comprehensive Livestock Environmental Assessment for Improved Nutrition, a Secured Environment and Sustainable Development
LIVESTOCK	New drought resistant tropical forage: Brachiaria hybrid "Camello"
MAIZE	Improved maize germplasm through 'temperate introgressions', with selection for key traits relevant for smallholders in Sub-Saharan Africa
MAIZE	A low-cost Unmanned Aerial Vehicle to speed up the selection of maize varieties
PIM	Improved methodology to aggregate trade distortion measures across commodities within countries
PIM	Rural Investment and Policy Analysis (RIAPA) model: Economy-wide model that evaluates alternative policy and investment options
RICE	High zinc rice: new segregating F4 lines with nutritional values greater than 24 ppm (50% above baseline) and four lines selected by partners for variety release
RICE	Novel tools to assess milling and cooking quality, for screening breeding materials
RTB	Triple S – Storing Sweetpotato Roots in Sand and Sprouting: a system of conserving planting material in time for the rains
RTB	Youth agri-preneurs: a vehicle to make Roots Tubers and Bananas innovations an attractive business for the next generation
WHEAT	Fhb1/Sr2 recombinant to facilitate breeding wheat cultivars with improved resistance to diseases of Fusarium head Blight and stem rust simultaneously.
WHEAT	Raised bed technology- An improved, more efficient surface irrigation technique
WLE	Online water planning tool
WLE	'Contour bunding' shown to preserve soils and boosts farmers' incomes

Source: CRP Annual Reports 2017
Note: this is not a "top thirty" but a selection of 2017 innovations, nearly all in Stage 3, 'Available for use' (with the exception of high zinc rice, in multiple stages), chosen to demonstrate the range.

New technology puts farmers in charge of Climate Smart Agriculture

CIAT/CCFS

Agriculture is highly dependent upon the climate. Changes in the frequency and severity of droughts and floods pose challenges for farmers and threaten food security, and unpredictable, shifting weather patterns and extreme weather events can harm crops and reduce yields.

A partnership between the International Center for Tropical Agriculture (CIAT), the CGIAR Research Program on Climate, Agriculture and Food Security (CCAFS) and more than 10 partners led to the development of a suite of ICT tools and applications. These tools enable technicians from farmer organizations to collect, analyze, and deliver information that allows farmers to understand variations in seasonal climate conditions, and adjust their management practices accordingly. Guided by this information, farmers now know whether to plant, when to plant and which specific crops or crop varieties to plant. In addition, they have site-specific information on how much water and agrochemicals to use.

This increases agricultural productivity, food and income security, and allows for more sustainable farming. In recognition of the impact this tool has had in helping farmers in Colombia and Honduras to make climate smart decisions, this project was awarded a UNFCCC Momentum for Change award in 2017.

Table 2. CGIAR contributions to international and national policies, legislation and significant investments reported in 2017

	GLOBAL	REGIONAL	MULTI-COUNTRY	NATIONAL	SUB-NATIONAL	TOTAL
Policy or strategy	13	8	6	37	8	72
Budget or investment		3	5	18	5	31
Curriculum	1	1	1	2		5
Legal instrument				4		4
Total	**14**	**12**	**12**	**64**	**13**	**112**

Source: CRP annual reports and evidence presented to support claims. Full database available here.

Transforming nutrition from the first 1,000 days of life

A4NH

Since 2012, the Transform Nutrition consortium of five international research and development partners, has strengthened the nutrition evidence base, focusing on the 1,000-day period from conception to a child's second birthday, when interventions to reduce undernutrition are most effective. The consortium has generated over 90 peer-reviewed journal articles; approximately 150 briefs, blogs, and newsletters targeting relevant audiences; and over 1,500 citations, influencing program and policy decisions in its focus countries and helping shape regional and global dialogue. In Ethiopia for example, policymakers, informed by evidence from Transform Nutrition, redesigned the Productive Safety Net Program to include specific nutrition elements to increase the program's potential to improve maternal and child nutrition. Women in the program now receive work credits to attend nutrition education workshops on topics including what is a balanced diet and how to prepare healthy foods.

Selected examples of policies, legal instruments and investments and similar to which CGIAR contributed in 2017

National:

- Livestock researchers and partners used their modeling expertise to provide a guide for public and private investments in Ethiopia. This 'Livestock Master Plan' was adopted by the Ethiopian Government and then used by various actors, including the World Bank, to shape their investments, which will ultimately impact more than 2.3 million of Ethiopia's 11 million livestock-keeping households. The International Livestock Research Institute (ILRI) contribution to livestock development in Ethiopia was recognized by an honorary award from the Government in November 2017. (Reported by LIVESTOCK)
- CGIAR research informed investment of USD 21.5 billion by the Indian Government to provide 2.75 million grid-connected solar irrigation pumps to farmers and farmer cooperatives. (Reported by CCAFS and WLE)
- National agroforestry concession legislation enabled land and tree rights that underpin livelihoods for 120,000 households at the Amazon forest frontier in Peru. (Reported by FTA)
- Private companies in Uganda implemented modified procedures designed to facilitate the registration of outgrower contracts in women's names (Kakira Sugar Limited) and improve access to bank accounts for women (Tropical Bank). (Reported by PIM)
- Conservation Agriculture based sustainable intensification was included in the national extension package in Ethiopia. (Reported by MAIZE)
- Vietnam's food systems are evolving rapidly, making food safety a high priority for the government. CGIAR mobilized, produced, and/or contributed to a range of initiatives supporting a shift in food safety policy to a more efficient and equitable risk-based inspection and monitoring system bolstered by compliance incentives. (Reported by A4NH)

Regional:

- CGIAR research informed investment of USD 2 million for a regional Climate Smart Agriculture strategy for Central America. (Reported by CCAFS)
- Two more countries have joined a nine-country regional seed policy agreement that speeds up the distribution of modern rice varieties across nations in South and Southeast Asia. (Reported by RICE)
- National and regional policy dialogue has led to new policies for one-stop border posts being established in sub-Saharan Africa (so far, in four key border posts involving eight countries), to enable women fish traders and processors to conduct easier and more equitable cross-border trade. (Reported by FISH)

Global/Multi-country:

- CGIAR research and capacity development contributed to the formal decision on the Koronivia Joint Work on Agriculture by the UNFCCC Conference of the Parties. CGIAR provided scientific evidence (inter alia) on the importance of agriculture to the goals and concrete technical and policy options, including the benefits of increasing soil organic matter to mitigate climate change. (Reported by CCAFS and WLE)
- The World Food Programme (WFP) mainstreamed recommendations on practical ways to make their country office programs more nutrition-sensitive, beginning with 'seven key opportunities'. (Reported by A4NH)
- Specific procedures for Intact Forest Landscapes were adopted by the Forest Stewardship Council. (Reported by FTA)
- The European Union designed trade policy relating to agreements with African Regional Economic Communities. (Reported by PIM)

See more examples and details in the policy contribution database at Policies/Investments informed by CGIAR Research.

Source: CRP annual reports 2017 and evidence presented to support claims.

Web portal opens up data on agricultural policies

PIM

Many governments intervene in agricultural markets. The reasons for doing so vary: to keep food prices low for consumers, to support farm incomes, to reduce price volatility, or simply to respond to politically powerful interest groups. Policy interventions can have unforeseen consequences. Measuring the impact of incentives helps governments make necessary policy adjustments and provides information on changes in global markets. Several international organizations have been monitoring agricultural incentives for many countries and commodities on a regular basis. Without coordination, however, these groups have been using incompatible measures. To address these issues, a group of leading international organizations active in this field (Organisation for Economic Co-operation and Development (OECD), FAO, Inter-American Development Bank (IADB) and the World Bank) joined with IFPRI and PIM to form the Agricultural Incentives Consortium (Ag-Incentives); the web portal for this initiative was launched in 2017. The database provides various stakeholders, including journalists, academics, policy makers, and NGOs, access to key indicators on agricultural policies in a user-friendly way.

Septic waste as a resource supported under new sanitation policy in Sri Lanka

WLE

Under a new sanitation policy, septic management has been included as a priority investment area in Sri Lanka. This includes the recycling of septage for reuse as organic fertilizer. Formally approved by the Government of Sri Lanka in late 2017, the new policy follows research and advice from WLE and IWMI on fecal sludge management and the safe recycling of human waste as fertilizer, using 'circular economy' technologies tested over ten years in Ghana and now being introduced in India.

Up to 96% of Sri Lankan households use septic tanks for sanitation waste, which is commonly dumped untreated into rivers, wetlands or the sea. The shift to safe recycling of this waste is hoped to reduce land and water pollution, reduce costs of septage management, contribute to improved nutrient use efficiency in agriculture and forestry, and open up new business opportunities for the production of organic fertilizer.

Research is ongoing into low-cost options for septage treatment, safe crop application rates, and identifying business models for the recycling of other organic waste into fertilizer. The Government of Sri Lanka has formally acknowledged IWMI's support and invited researchers from the Institute to support the implementation of the new policy.

Table 3. Highlighted CGIAR Publications in 2017

REFERENCE	REPORTED BY
Arouna, A., J. C. Lokossou, M. C. S. Wopereis, S. Bruce-Oliver, and H. Roy-Macauley. **"Contribution of Improved Rice Varieties to Poverty Reduction and Food Security in Sub-Saharan Africa."** Global Food Security, Food Security Governance in Latin America, 14 (September 1, 2017): 54–60. https://doi.org/10.1016/j.gfs.2017.03.001.	RICE
Crossa, José, Paulino Pérez-Rodríguez, Jaime Cuevas, Osval Montesinos-López, Diego Jarquín, Gustavo de los Campos, Juan Burgueño, et al. **"Genomic Selection in Plant Breeding: Methods, Models, and Perspectives."** Trends in Plant Science 22, no. 11 (November 1, 2017): 961–75. https://doi.org/10.1016/j.tplants.2017.08.011.	MAIZE/RICE
Ellison, David, Cindy E. Morris, Bruno Locatelli, Douglas Sheil, Jane Cohen, Daniel Murdiyarso, Victoria Gutierrez, et al. **"Trees, Forests and Water: Cool Insights for a Hot World."** Global Environmental Change 43 (March 1, 2017): 51–61. https://doi.org/10.1016/j.gloenvcha.2017.01.002	FTA
Herrero, Mario, Philip K Thornton, Brendan Power, Jessica R Bogard, Roseline Remans, Steffen Fritz, James S Gerber, et al. **"Farming and the Geography of Nutrient Production for Human Use: A Transdisciplinary Analysis."** The Lancet Planetary Health 1, no. 1 (April 1, 2017): e33–42. https://doi.org/10.1016/S2542-5196(17)30007-4.	CCAFS
Iiyama, Miyuki, Abayneh Derero, Kaleb Kelemu, Catherine Muthuri, Ruth Kinuthia, Ermias Ayenkulu, Evelyn Kiptot, Kiros Hadgu, Jeremias Mowo, and Fergus L. Sinclair. **"Understanding Patterns of Tree Adoption on Farms in Semi-Arid and Sub-Humid Ethiopia."** Agroforestry Systems 91, no. 2 (April 1, 2017): 271–93. https://doi.org/10.1007/s10457-016-9926-y.	FTA
Kim, Jaemin, Olivier Hanotte, Okeyo Ally Mwai, Tadelle Dessie, Salim Bashir, Boubacar Diallo, Morris Agaba, et al. **"The Genome Landscape of Indigenous African Cattle."** Genome Biology 18, no. 1 (February 20, 2017): 34. https://doi.org/10.1186/s13059-017-1153-y.	LIVESTOCK
Palazzo, Amanda, Joost M. Vervoort, Daniel Mason-D'Croz, Lucas Rutting, Petr Havlík, Shahnila Islam, Jules Bayala, et al. **"Linking Regional Stakeholder Scenarios and Shared Socioeconomic Pathways: Quantified West African Food and Climate Futures in a Global Context."** Global Environmental Change 45 (July 1, 2017): 227–42. https://doi.org/10.1016/j.gloenvcha.2016.12.002.	PIM/ CCAFS
Reynolds, M. P., H. J. Braun, A. J. Cavalieri, S. Chapotin, W. J. Davies, P. Ellul, C. Feuillet, et al. **"Improving Global Integration of Crop Research."** Science 357, no. 6349 (July 28, 2017): 359–60. https://doi.org/10.1126/science.aam8559.	Wheat/ BIG DATA
Van Boeckel, Thomas P., Emma E. Glennon, Dora Chen, Marius Gilbert, Timothy P. Robinson, Bryan T. Grenfell, Simon A. Levin, Sebastian Bonhoeffer, and Ramanan Laxminarayan. **"Reducing Antimicrobial Use in Food Animals."** Science 357, no. 6358 (2017): 1350-1352	A4NH
Zomer, Robert J., Deborah A. Bossio, Rolf Sommer, and Louis V. Verchot. **"Global Sequestration Potential of Increased Organic Carbon in Cropland Soils."** Scientific Reports 7, no. 1 (November 14, 2017): 15554. https://doi.org/10.1038/s41598-017-15794-8.	WLE

Note: These are not a 'CGIAR top ten', but have been selected to show a range of interesting publications that have generated considerable attention. They were selected after considering the following criteria: featured in CRP Annual Reports; High Altmetric Scores, in particular Mendeley downloads; High Google Scholar Citation Scores; High Journal Impact Factors; Articles with CRP Lead Authorship or multiple co-authors; Open Access status; balance across CRPs.

Source: CRP Annual Reports 2017

Cocoa network breeds success
FTA

The global cocoa economy depends on genetic diversity – to breed improved varieties and adapt to changes in climate, new pests and diseases. In an effort to improve the livelihoods of nearly 6 million cocoa farmers across Africa, Asia and Latin America who produce 90% of cocoa worldwide, the Global Network on Cacao Genetic Resources Conservation and Use (CacaoNet) brings together national and international players from public and private sectors.

The network, coordinated by Bioversity International and integrated within FTA, facilitates access to germplasm and related information for cacao breeders to develop new varieties with greater resistance to current and emerging threats, such as drought and heat impacted by climate change, and supply the cocoa and chocolate industry with cocoas suitable for preparing high-quality products. Members are drawn from the cocoa and chocolate industry, cocoa industry associations, development organizations, research institutes, cocoa producer and producing country organizations, and impact investors.

Results so far include the drawing up of a Global Strategy for the Conservation and Use of Cacao Genetic Diversity;[lxxxii] commitment from the industry to fund two international cocoa ex situ collections, in Costa Rica and in Trinidad and Tobago; guidelines to reduce the risk of pests and diseases spreading between countries and regions; and marketing opportunities through the Cocoa of Excellence Programme (CoEx) platform. Spearheaded by Bioversity International and organizer of the Salon du Chocolat in Paris, Event International, CoEx runs the biennial International Cocoa Awards (ICA), a global competition recognizing the work of cocoa farmers and celebrating the diversity of cocoa. It selects the 50 best cocoa samples, with the ICA winners made into chocolate

External partnerships

Partnerships are at the core of CGIAR's work. In 2017, CGIAR programs reported a total of 1,961 external formal partnerships. These involved a wide range of partners, from policymakers in governments and international agencies, to research collaborators in other research and academic institutions around the world, and public and private sector companies and non-profit institutions involved in development and scaling of innovations.[10] The distribution of formal partnerships reported by phase of research for development (R4D) is shown in Table 4. A small selection of examples of partnerships in 2017 is given in Table 5 and a more extensive list is available in Selected external partnerships in 2017).

Table 4. Number of formal CGIAR partnerships reported in 2017, by phase of research for development (R4D)

PHASE OF R4D	NUMBER OF PARTNERSHIPS	PERCENTAGE
Research	994	51%
Piloting	205	10%
Scaling	647	33%
More than one phase	16	1%
Not defined	99	5%
Total	1961	100%

Source: CRP Annual Reports 2017

[10] Tagging by partner type was inconsistent for 2017, so it is not possible to reliably report numbers by type.

Table 5. Examples of CGIAR external partnerships in 2017

CRP OR PLATFORM	PARTNER NAME	DESCRIPTION OF MAIN ACTIVITIES
A4NH *Vietnam*	World Bank	Supporting situational analysis of food safety in Vietnam; collaborating on two major food safety investment reports.
A4NH *Kenya*	Government of Kenya Zoonotic Disease Unit and County Governments	Surveillance of zoonotic diseases in Kenya, with provision of access to national surveillance data and integration of project data to national recording.
BIG DATA	University of Minnesota International Agroinformatics Alliance	Collaboration on secure data handling and cleaning.
BIG DATA	Agroknow Inc *	Pilot of Semantic Web application to agricultural data exploration and mining, and development and delivery of the CeRes data harvester.
CCAFS *India*	Indian Council of Agricultural Research	Development, validation and scaling up of climate resilient farming systems. Capacity development and policy engagement for scaling investments for Climate Smart Agriculture. Development of post-flood management strategy, including index-based flood insurance.
CCAFS *India*	Agriculture Insurance Company of India Limited*	Development and scaling out of insurance products and engagement with the Ministry of Agriculture, Farmers and Welfare.
CCAFS	Green Climate Fund	Informing the Fund strategy for investing in transformative actions in agriculture.
EIB	Syngenta Foundation & Market Edge Consulting*	Leveraging Syngenta sponsored projects about creating impact in CGIAR breeding programs.
EIB	Roy Cantrell *	Collaboration on process and potential teaching opportunities.
FISH *Egypt*	Central Laboratory for Aquaculture Research, Egypt	Hosting of the Abbassa Aquaculture Research and Training Facility in Egypt.
FISH *Pacific*	Secretariat of the Pacific Community	Scaling partner for small-scale fisheries in the Pacific region.
FTA *Indonesia*	Forestry and Environment Research, Development, and Innovation Agency, Indonesia	Developing and promoting market-based agroforestry options and integrated landscape management for smallholder forestry.
FTA	Laboratory of Geo-Information Science and Remote Sensing, Wageningen University & Research	Part of the Center for International Forestry Research (CIFOR) Global Comparative Study on Reducing emissions from deforestation and forest degradation (REDD+), partners contribute to research on Module 3 that focuses on measuring carbon emissions and determining forest and carbon reference levels, and works on the Monitoring, Measurement, Reporting and Verification of forests and carbon.
GENEBANK	National genebanks	Hosting safety duplicates on behalf of partners or colleagues.
GENEBANK	International Treaty on Plant Genetic Resources for Food and Agriculture and Convention on Biological Diversity Secretariats	International policy development, capacity building for national programs' policy development.
LIVESTOCK *East Africa*	The Global Alliance for Livestock Veterinary Medicines, GALVmed	Making improvements to the live Infection and Treatment Method vaccine for East Coast Fever.

Table 5. Examples of CGIAR external partnerships in 2017

LIVESTOCK *Ethiopia*	Ethiopian Institute of Agricultural Research, Amhara Region Agricultural Research Institute, Southern Agricultural Research Institute, Oromia Agricultural Research Institute, Tigray Agricultural Research Institute	Coordinating sheep and goat research nationally and responsible for aligning objectives of the International Fund for Agricultural Development (IFAD) funded project with the national strategy; the regional centers are responsible for implementation of agreed project activities in the seven value chain sites in Ethiopia and support the project with staff time and facilities of the designated local research centers.
MAIZE *Kenya*	Kenya Agricultural and Livestock Research Organization and Agricultural Research Organization	Elite germplasm for product development.
MAIZE	Purdue University	Diverse yellow/orange maize germplasm for provitamin A enrichment.
PIM *Asia and Pacific Region*	Asia – Pacific Association of Agricultural Research Institutions	Agricultural Science and Technology Indicators (ASTI): Leading capacity strengthening and data collection on agricultural R&D indicators in Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Papua New Guinea, the Philippines, Thailand, Timor Leste, and Vietnam.
PIM	Food and Agriculture Organization of the United Nations (FAO)	FAO's Monitoring and Analysing Food and Agricultural Policies Program is a partner in a series of policy-oriented research studies, and FAO's Special Program on Youth Employment in Africa team is collaborating with PIM on the forthcoming book "Youth and Jobs in Rural Africa".
PIM	International Land Coalition	Scales up the use of Collaborating for Resilience approaches through 22 National Engagement Strategies.
RICE *Kenya*	Cornell University and Makerere University	Capacity building, Design, Analysis and Communicating results (by Gender-responsive Researchers Equipped for Agricultural Transformation, GREAT).
RICE	LEHNER*	Piloting precision application technologies.
RTB	Natural Resources Institute, UK	Development of gender-aware user-preferred product profiles for RTB breeding under the RTBFoods project, taking into account food science and economic considerations. Methods to be shared widely with RTB Breeding teams as appropriate.
RTB	Intertek Lab*	The High Throughput Genotyping platform is a genotyping project. The service is provided by Intertek Lab which became operational in 2017 and offers high-throughput single-plex SNP assay for forward breeding (marker-assisted selection) at competitive rates.
WHEAT *China*	Chinese Academy of Agricultural Sciences (CAAS), China, Beijing	Joint labs, staff, research.
WHEAT *Central Asia*	University of Central Asia Kyrgyzstan, Tajik Agricultural Academy of Sciences, The Scientific Research Institute of Agricultural Economics	Adoption and Impact Study in three countries, Central Asia.
WLE *(5 countries)*	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)	Joint work to share project results with stakeholders, policy makers. Partnerships with the GIZ Soil Protection and Rehabilitation for Food Security Program: Piloting of soil fertility and soil carbon enhancing technologies in Benin, Burkina Faso, Ethiopia, Kenya, and India.
WLE *Ethiopia*	Sustainable Land Management Project, Ethiopia	Piloting and scaling of successful land restoration practices co-developed by WLE in Ethiopia.

*Private sector entities. A longer (but incomplete) list of partnerships in 2017, is available in Selected external partnerships in 2017. A full partnerships database is under construction for the future CGIAR Results Dashboard.

Source: CRP Annual Reports 2017

Tackling an urgent threat from wheat disease

WHEAT

An international effort coordinated by WHEAT resulted in the release in Bangladesh in 2017 of a high-yielding wheat variety with resistance to wheat blast, a deadly fungal disease from South America that appeared in Bangladesh in 2016 and threatens wheat crops on as much as 7 million hectares in South Asia.

Called BARI Gom 33, the variety stems from collaboration by scientists of Bangladesh, Bolivia, the United States and International Maize and Wheat Improvement Center (CIMMYT), and its grain contains the added benefit of high zinc content. Rapid multiplication and promotion of BARI Gom 33 seed is underway to protect wheat crops and slow the spread of wheat blast in South Asia. The variety is also being tested for use in India and Bhutan.

Another blast resistant variety from this research, Borlaug 100, was released in 2016 in Bolivia, where it has shown good yields and blast resistance. Performance of this variety in Bangladesh has also been encouraging and it may be released there soon.

With support from Governments of Bolivia and Bangladesh, as well as Australia Center for International Agricultural Research (ACIAR), Indian Council of Agricultural Research (ICAR), USAID and CRP WHEAT, wheat blast phenotyping platforms were set up in Bolivia and Bangladesh; partners there are screening breeding lines from South Asia, South America, and CIMMYT.

Team efforts to meet global demand for fish

FISH

Fisheries and aquaculture contribute to the livelihoods of 800 million people and provide 3.2 billion people with 20% of their animal protein requirements. But to meet future demand for fish, particularly in developing countries, production will need to double by 2030. A range of multi-stakeholder partnerships forged by FISH is helping to address this challenge.[lxxix] For example, in November 2017, 22 researchers from 16 public and private institutions came together to develop the FISH research program's agenda on tilapia health. Tilapia is one of the world's most important farmed fish species. Partners include global leaders in fish health research (Cefas UK; CSIRO Australia; Norwegian Veterinary Institute; University of Stirling UK; Roslin Institution, UK; Exeter University, UK); experienced private sector companies interested in investing in developing and commercializing aquatic animal health management tools (MSD Singapore, FVG Thailand); national authorities and civil society organizations.

Analysis of the innovations[11] reported in 2017 also shows how vital partnerships are to CGIAR Research Programs (Figure 3). Overall, only 14% of innovations were tagged as being the 'sole' product of CGIAR and of these, nearly two thirds (61%) were at the first stage of innovation (discovery/proof of concept) . At the development/scaling stage, 94% of innovations were the product of joint work: in 73% of cases the CRP was the 'lead organization' in a partnership, while in 21% of cases, the CRP was a 'contributor' to a team led by partners.

The 2017 IEA Evaluation on Partnerships[xxviii] found that more than half of partnerships, in all the categories considered, have been established since the introduction of CRPs, including new engagement in different kinds of partnerships for scaling and a deliberate efforts to involve more non-governmental organizations. "CRPs have been influential in both increasing Centers' collaboration within the programs and positioning of external partnerships along the impact pathway" (page ix). In addition, many programs and platforms have reported increased engagement in global multi-stakeholder platforms (collaborations between governments, private sector and civil society to tackle complex problems). Partnership models are being customized to suit different types of partners and geographical locations, and almost all research outputs and publications are now based on collaborative work.

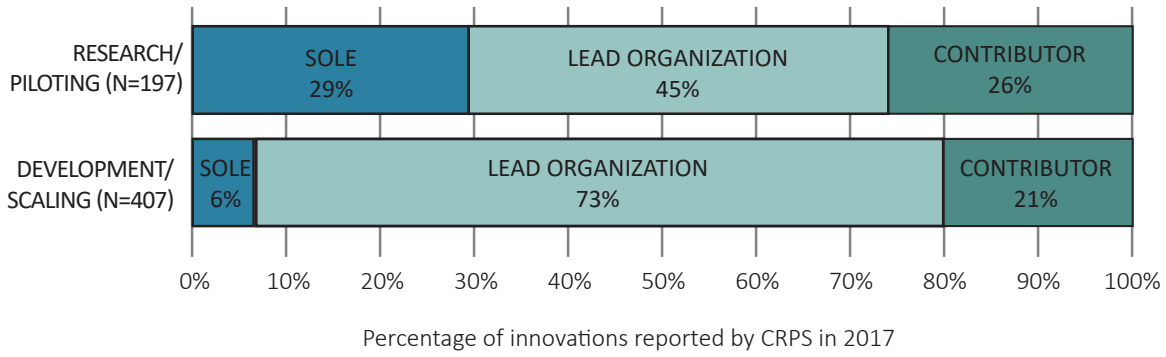
Challenges identified by the evaluation included the need for clear strategy and planning for partnerships, greater clarity on management of public-private partnerships at system level, and further sharing and learning from experience.

The Synthesis of CRP Evaluations, also contained an important message (p.3): "The quality of partnerships with research partners in the 'South' could be improved by engaging them more fully in the entire research process from the design stage and by addressing the power imbalances that may result from their role as subcontractors for much of the CRP research".

"With capacities and interest evolving fast, CGIAR and its partners need to continuously reflect on their respective comparative advantage. Centers must maintain scientific expertise in core areas, and they must collaborate with organizations that have strong capacity for scaling."[xxix]

The evaluation's recommendations, in particular the need for every CRP to have an updated partnership strategy, were broadly agreed on[xxx] by the System Management Board, and are being implemented.

Figure 3. Partnerships are integral to the development of innovations: reported level of contribution of CGIAR programs to innovations in 2017



Source: CRP Annual Reports 2017

[11] Innovations are significant products of Research for Development, such as varieties, technologies, methods or findings. The analysis covers only those innovations which were correctly tagged for 'contribution of CGIAR'.

Scaling up solutions for sustainable groundwater management

WLE

The world's groundwater reserves are increasingly threatened by human pollution, climate change and overpumping to supply irrigation, industry, and urban development. An international partnership is working to advance the sustainable management of this critical resource.

About 96% of all the planet's liquid freshwater is groundwater, which supports global food security, contributes to public health, and is a crucial factor in economic growth. The abstraction of groundwater has increased dramatically since the mid-20th century, jeopardizing supplies for current and future generations – and their food security as a result. The scale of the decline in the Earth's groundwater reserves is so severe that it can be observed by satellites.

The Groundwater Solutions Initiative for Policy and Practice (GRIPP), led by the International Water Management Institute (IWMI), WLE and PIM aims to strengthen, expand and connect current groundwater initiatives to share practical solutions. GRIPP promotes and adapts tested technologies and innovative policy and institutional approaches to connected management of surface water and groundwater resources. The network now comprises 29 academic and non-academic partners, promoting sustainable groundwater use from local to global scales. Key partners include CGIAR and other research organizations, professional associations, leading UN entities, geological surveys, NGOs and private sector enterprises.

Promoting South-South knowledge exchange on agricultural mechanization

PIM

With support from PIM, the International Food Policy Research Institute (IFPRI) and CIMMYT have partnered to help governments in Ethiopia, Ghana, Kenya, and Nigeria to improve strategies, policies and programs for expanding mechanization in the smallholder agricultural sector. In 2015, nine African officials from the four countries participated in a study tour in Bangladesh, and shared what they learned.[lxxxiii]

In 2017, following in-depth research on challenges and opportunities for mechanization in the four countries, IFPRI, CIMMYT, and the Ethiopian Agricultural Mechanization Forum convened an international workshop to share lessons across several African and Asian countries. The event brought together more than one hundred participants, including researchers, policy makers, Funders, and implementing agencies. Among the topics discussed were private sector involvement in mechanization, the role of credit and subsidies, and the linkages between mechanization and employment.

The conference contributed to disseminating policy research results and encouraging dialogue and networking among countries. Some early outcomes on policies and regulations have already occurred, e.g. in the new phase of the Agricultural Mechanization Services Enterprise Centers in Ghana. The formation of Agricultural Mechanization Forums has already enabled longer term South-South learning and support to take place among countries.

Partnering with the private sector for greater impact

Global private spending on agricultural R&D – excluding R&D by food industries – rose from USD 5.1 billion to 15.6 billion between 1990 and 2014.[xxxi] In India alone, the private sector now invests more than four times as much as the public sector in agriculture and agri-food value chains.[xxxii]

Against this backdrop, CGIAR in 2017 renewed its commitment to forging partnerships with private sector players as an important pathway to addressing its key objectives. CGIAR is focusing on building high-level buy-in and awareness for a market-based approach to private sector partnerships. Plans are well under way to drive systemic change across CGIAR to generate social and economic value from collaboration with industry.

A survey conducted under the 2017 IEA Evaluation of Partnerships in CGIAR showed that "the percentage involving private sector partners [has] increased over time, from 15% established before CRPs began, to 19% early in the CRP period and 28% established later."[xxxiii] A small selection of examples of partnerships, including private sector partnerships, in 2017 is given in Table 5 and a more extensive list is available in Selected external partnerships in 2017.

Getting the private sector onboard with direct-seeded rice

RICE

Direct-seeded rice enables rice to be planted more rapidly and easily and with less labor. It consumes less irrigation water, is more conducive to mechanization, and produces fewer methane emissions. Rice seeded this way also matures earlier, which can allow an additional crop to be planted. However, many Asian countries have yet to make the transition to direct-seeded rice, continuing to use transplanting. A new private sector consortium led by the International Rice Research Institute (IRRI) is helping to improve direct-seeded rice technologies and encourage their adoption throughout South and Southeast Asia. The Direct-Seeded Rice Consortium will focus on improving mechanized and precise direct-seeding practices to help farmers draw the maximum benefits from this technology and overcome the challenge of competition from weeds.

Harnessing the sun to cool milk for rural dairy value chains

A solar-powered milk cooling kit is helping small-scale dairy farmers reduce wastage and generate higher incomes, thanks to a public-private partnership between German solar technology company Phaesun GmbH and LIVESTOCK. The kit consists of milk cans wrapped in reusable insulation and a compartment for ice to cool and store milk, keeping milk safe for six hours or overnight. The ice is produced by a solar powered smart ice-maker that works totally off grid with a battery life of up to four days, providing a low-cost and sustainable refrigeration solution for small dairy farms.

Phaesun GmbH joined a Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)-funded partnership and worked together with researchers from the University of Hohenheim, who developed the initial prototype. The cooling kit was tested and modified with dairy farmers in Tunisia in collaboration with the Tunisian research institute INRAT and ICARDA. Phaesun has since developed and is marketing a commercial version of the cooling kit called the BOSS Kit Milky Way, providing the means to scale out the technology.

Capacity development

Capacity development is crucial for CGIAR's work. CGIAR has a long history of capacity development activities which initially focused on the training of individuals at multiple levels[12] but increasingly aim at institutional capacity strengthening and mutual learning between partners.

The 2017 IEA evaluation on capacity development in CGIAR[xxxiv] found that there remains much scope for CGIAR Centers, Research Programs and the CGIAR System as a whole to improve relevance, comparative advantage, effectiveness and sustainability of capacity development activities. The evaluation recommendations were mainly agreed on[xxxv] by the System Management Board, which noted the important role of Centers, and the fact that a number of modalities could be explored to improve lesson learning and increase impact through a more strategic approach.

Open Data

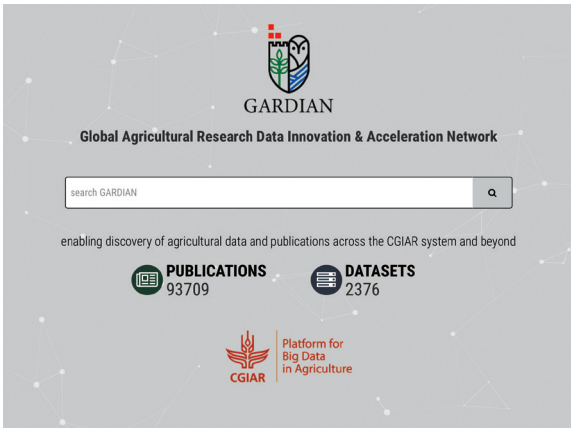
CGIAR is committed through its Open Data Policy to make all research publications and data open, and specifically 'Findable, Accessible, Interoperable, and Reusable' (FAIR). Efforts to promote Open Data accelerated in 2017 via support from the Big Data Platform. A prototype system was developed that enables a "one-stop" search across 30 or so Center data and publications repositories – an exciting first. This tool, Global Agricultural Research Data Innovation & Acceleration Network (GARDIAN), enabled access to about 50,000 publications and 1,800 datasets by the end of 2017, an increase of about 15% for datasets from the previous year. Further GARDIAN features are planned for 2018.

Thousands learn about crop diversity and genetic resources

GENEBANK

In 2017, more than 7,000 participants from 44 countries joined the 500-plus capacity development events hosted by the CGIAR Genebank Platform. The genebanks received a large number of visitors and conducted more than 400 tours to highlight the importance of crop diversity and the CGIAR's work on genetic resources. The high demand for engagement with the genebanks reflects their growing reputation as national, regional and global knowledge hubs for the crops they conserve. Researchers around the world benefit from the unique expertise of genebank staff in the taxonomy and diversity of specific crops and increasingly from the data made available online in Genesys (www.genesys-pgr.org) and other websites.

Figure 4. GARDIAN search tool for agricultural data and publications



Source: GARDIAN Note: Snapshot from 2018

[12] As previously mentioned, in 2017, CGIAR Research Programs reported participation by 348,927 people (40% women) in CGIAR training courses or events, including 1,700 (30% women) on degree or other long-term courses.

III. INTEGRATING GENDER AND EQUITY INTO CGIAR RESEARCH FOR DEVELOPMENT

Gender

In 2017, CGIAR took several steps forward in its integration of gender issues. A CGIAR Collaborative Platform for Gender Research was set up in January 2017[xxxvi], housed in PIM and serving all CGIAR Research Programs and Centers. The aim of the platform is to increase impact and visibility of gender research undertaken across CGIAR. The platform supports priority setting for gender research, strategic partnerships, capacity development, and collaboration between and among CGIAR programs, Centers, and partners, building on work by the previous system-wide gender network. The platform held its first technical conference in December 2017, with 90 participants.

The platform also held a series of technical webinars on topics such as Gender, Technology, and Development and Gender mainstreaming in the Participatory Market Chain Approach (PMCA), and maintains a website with resources on gender research, as well as regular newsletters, blogs and community calls. The platform put out a first call for proposals for co-funded gender research from across CGIAR: in 2017 the focus was gender dynamics in seed systems, and five proposals were selected.

A paper by a CGIAR researcher, Alessandra Galiè (ex-International Center for Agricultural Research in the Dry Areas (ICARDA), now at International Livestock Research Institute (ILRI)) on links between women's empowerment and crop seed improvement and governance in pre-war Syria, won an Elsevier Atlas award in 2017 as "a research paper with outstanding potential for impacting people's lives".

For plant and animal (livestock and fish) breeders to meet users' needs, they need to understand the priorities that women and men assign to genetically determined traits – such as taste, color, size and shape.

The CGIAR Gender and Breeding Initiative, led by RTB/CIP, brings together plant and animal breeders and social scientists to develop a strategy for gender-responsive breeding with supporting methods, tools, and practices.

What is particularly promising about this initiative is its systematic approach to involving breeders and meeting their detailed technical needs. This includes developing gender-responsive varietal product profiles and compiling information on differences between women and men's trait preferences.

Gender working groups were launched (or strengthened) across CGIAR on several specialist areas including:

- Gender and Breeding
- Gender, Agriculture and Climate Change
- Gender and (big) Data, including a blog on data and methods
- Gender Dynamics in Seed Systems
- Water and Gender
- GENNOVATE: a research initiative on gender norms and innovation

A4NH's Gender Nutrition Idea Exchange blog also continued a steady growth of readership since it was launched in 2014. There were 15,078 views in 2017 (a 49% increase from 2016) with the post A Framework for Measuring Women's Empowerment at Multiple Levels viewed more than 2,000 times.

The Evaluation of Gender in CGIAR was completed in 2017, and covered two dimensions; Gender in CGIAR Research, and Gender in the Workplace. The main finding was that CGIAR has made significant progress towards gender equity since 2010. Key institutions have been strengthened, and gender mainstreaming has been incorporated across all research programs. In the workplace, the Evaluation found increased representation of women across all Centers and at all levels of the System, and Centers have developed policies that foster gender equity.

However, there is still much to do. The evaluation recommended that CGIAR develop a clearer overall vision and action plan for gender equity. For Gender in Research, the quality and expertise were found to be variable, and the evaluation recommended stronger systems for monitoring and evaluation of outputs and outcomes and support to gender capacity and expertise. Regarding Gender in the Workplace, the evaluation found that while moderate progress in representation of women has been made since 2008, women remain under-represented in professional, scientific, and leadership roles. It concluded that priority should be given to increasing the representation of women in groups that have the strongest bearing on the delivery of the overall mission, which will require target-setting and proactive recruiting.

The CGIAR System Management Board welcomed the evaluation and fully accepted nearly all its recommendations. It agreed to prioritize supporting collaborative linkages between gender in research communities and integration of gender into results reporting.

Prof. Nguyen Thi Lang, Cuu Long Delta Rice Research Institute, Vietnam. Source: Georgina Smith/CIAT

Individual CGIAR Research Programs also reported many activities related to gender integration. Here is a selection:

Tools, frameworks, and methods for gender analysis

The development and validation of methods and tools for looking systematically at gender issues is a critical step for gender analysis to extend beyond use by a few knowledgeable individuals to full integration into research and development programs.

- An IFPRI discussion paper[xxxvii] makes a simple but potentially useful distinction between **reach** (women are involved in a project, but don't necessarily benefit), **benefit** (women benefit in practical ways related to their current gender role[13]), and **empowerment** as objectives of agricultural development projects. This new framework has been introduced across CGIAR, and externally. (Reported by A4NH)
- A project-level Women's Empowerment in Agriculture Index or pro-WEAI, is being developed. (Reported by A4NH) A Women's Empowerment in Livestock Index[xxxviii] was also trialed and will be further piloted. (Reported by LIVESTOCK)
- The Gender in Irrigation Learning and Improvement Tool[xxxix] was released in 2017 after being tested in Malawi and Uzbekistan. (Reported by WLE)
- A framework on intrahousehold dynamics and the use of irrigation equipment was developed from analysis[xl] in Ethiopia, Ghana, and Tanzania. (Reported by WLE)
- Gender-sensitive protocols for farmers' participatory evaluations were developed to measure end user and consumer preferences of biofortified cassava and gendered preferences of varieties for yam processing. (Reported by RTB)
- CIFOR, Bioversity International, and World Agroforestry Center (ICRAF) developed a framework[xli] that helps ensure that women and men at all levels have equal voice and influence in designing Forest Landscape Restoration initiatives, increasing the likelihood of substantive equality in outcomes. (Reported by FTA)
- CCAFS worked with the International Fund for Agricultural Development and CARE to develop an IFAD 'How To Do Note' on design of gender transformative smallholder agriculture adaptation programs[xlii], as well as a CCAFS 'Info Note'.[xliii] (Reported by CCAFS)
- A new monitoring system to assess the gender dimensions of Climate Smart Agriculture options is being piloted in Climate Smart Villages and includes household and community level analysis, while a Gender Equity Index for Climate Smart Agriculture was piloted in India. (Reported by CCAFS)
- In the FISH CRP, a new Gender Research Strategy launched in 2017, together with 'internal gender analysis methods consolidation', has created the foundation for the development of gender integration guidelines. (Reported by FISH)

[13] An example of meeting practical needs would be the 2017 finding that improved wheat varieties in Afghanistan have eased women's work of cleaning wheat seed by providing more uniform, better quality seed free of bunt, a seed-borne disease. (Reported by WHEAT)

Major reviews with important gender aspects in 2017 included:

- An edited volume, *Earthscan Reader on Gender and Forests*,[xliv] brings together classical theories, analyses, methodologies, and case studies focused on gender in forests. (Reported by FTA)
- A global review on gender in aquaculture value chains[xlv] and in-depth qualitative case studies in Bangladesh and Indonesia. (Reported by FISH)
- A review[xlvi] of the literature on women's land rights and poverty reduction. (Reported by PIM)
- A review of RTB research[xlvii] published between 2013 and 2016 to draw lessons learned and identify gaps in mainstreaming gender crop and seed system interventions. (Reported by RTB)
- A study[xlviii] of the governance of the informal food sector in Africa, a sector in which many women are active, argues for new approaches to regulation and service. (Reported by PIM)
- A synthesis of gender-equitable pathways to achieving sustainable agricultural intensification. (Reported by WLE)

Training: A number of CRPs reported substantial training of staff and partners, for example on gender in agricultural research, gender in breeding and gender in livestock.

CGIAR contributions to national and international gender-related policy and programming in 2017:

- New tools and training materials were developed for the Women's Empowerment in Agriculture Index (WEAI). The index has been integrated into the set of indicators used by the Comprehensive Africa Agricultural Development Programme, bringing to about 50 the number of countries using the index to develop data on changes in empowerment over time and the factors that affect it. (Reported by PIM)
- In 2017 IFPRI's ASTI launched a portal on women in agricultural science in Africa. (Reported by PIM)
- 2017 also saw engagement of the LIVESTOCK gender team in the development of national Livestock Master Plans in Ethiopia, Rwanda, and Tanzania, which had previously been 'gender blind'; new versions will guide investment towards women in the livestock sector. (Reported by LIVESTOCK)
- CIFOR researchers drew from FTA's research to offer recommendations[xlix] to the Board of the Green Climate Fund for updating their Gender Policy and Action Plan. (Reported by FTA)

Youth and other aspects of equity: "Leaving No-One Behind[l]"

Interest in youth issues surged across CGIAR in 2017. A number of CGIAR CRPs and Centers (including CCAFS, FISH, LIVESTOCK, PIM, RICE, and WLE) carried out multi-country studies, meetings and literature reviews on rural youth and employment issues. Two examples:

- A FTA webinar on youth, hosted by the CGIAR Collaborative Platform for Gender Research, convened four prominent researchers and activists to discuss the challenges and prospects facing rural young women and men across the Global South. The webinar was the most-watched among those hosted by the Platform in 2017.
- WLE and FTA co-organized a Social Science public event in Nepal on migration, youth and agricultural transitions.

However, two separate attempts at constructing analytical frameworks for rural youth employment and entrepreneurship both suggested that 'youth' is not a clear and homogeneous target group, whose concerns can be addressed independently of the rest of society. These were: a scoping paper on rural youth employment by MAIZE and WHEAT CRPs, together with the Institute of Development Studies, UK;[li] and a draft framework paper on youth and development developed by LIVESTOCK together with the Royal Tropical Institute, Amsterdam.

An approach taken by some researchers is to treat youth and gender as one of many intersecting social differences that need to be considered together as part of a broad equity agenda (termed 'intersectionality' by sociologists). For example, a CCAFS publication on Uptake of Climate Smart Agriculture through a Gendered Intersectionality Lens[lii] analyzed the influence of gender, age, ethnicity, education, and marital status on adoption of Climate Smart Agriculture. Similarly, FTA has published a manual for 'making sense of intersectionality'[liii] for use in studying sustainable forest management.

A4NH has made significant progress in systematically integrating equity issues into its research. The CRP commissioned a review of equity in A4NH research[liv] in 2017, and plans to implement the recommendations[lv] from 2018 onwards.

CCAFS also works on some aspects of equity, including the equity and social justice impacts of adaptation and mitigation, development of frameworks and guidelines for socially equitable index insurance, and research on priority issues for pastoralist (often marginalized) communities. CCAFS and partners are also examining how a private sector-led approach to scaling up some climate change activities would impact the more vulnerable members of communities.

IV. WORKING TOGETHER TO IMPROVE PERFORMANCE

Progress on performance management

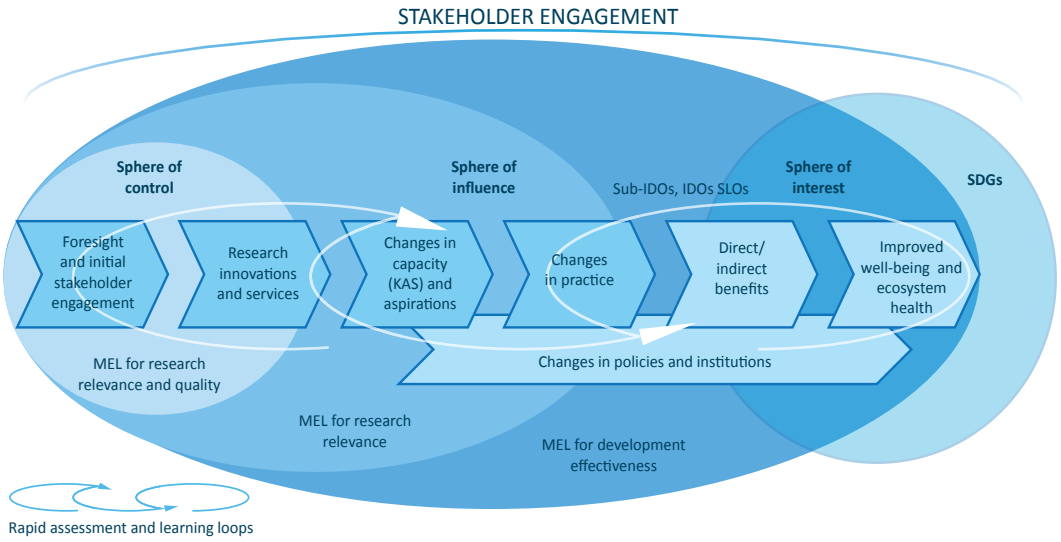
In November 2016, a new framework for performance management was approved by CGIAR's System Council, which recognized the complexity, risk, multiple objectives and long timeframes inherent in agricultural research for development (AR4D). Drawing on a framework originally developed for Canada's International Development Research Centre[lvi], it conceptualized the results of AR4D as falling into three concentric spheres (Figure 5). These are: the Sphere of Control, the direct products of CGIAR research; the Sphere of Influence, where CGIAR may have some input but cannot control the outcome (such as contribution to a policy decision); and the Sphere of Interest, where CGIAR has very little control and which may happen many years after the research, such as adoption by farmers of a technology at large scale and at their own cost.

This decision was followed by the approval at the end of 2017 of a new results reporting system, following consultations with Centers, Programs and Funders.

The principles underlying the new system included:

- Reporting credible, robust data based on checkable evidence.
- Aiming to report through Management Information Systems, not as a separate exercise.
- Not using the results mechanistically to compare research programs or in decision-making on funding.
- A representative range of reporting information and indicators sufficient to demonstrate progress in the spheres of control, influence and interest of CGIAR.
- Choosing indicators that would be relevant to all parts of the CGIAR System, which produces very diverse outputs (for example, 'innovations' rather than 'varieties released')
- Parsimony: minimizing the information required to that needed for accountability and decision-making, as reporting has a high cost.

Figure 5. Integrated performance management framework for CGIAR research[14]



[14] See conceptual framework in SC3-03, 17 Nov 2016 http://www.cgiar.org/wp-content/uploads/2016/11/SC3-03_Towards-PerformanceMgmtSystem_17Nov2016.pdf

Components of the reporting system included the introduction of revised planning and reporting templates collecting new information from Programs (for example on the use of pooled 'Window 1/2' funding) and a significantly revised and streamlined set of common reporting indicators with detailed guidance. An annual system-level performance report (this report) would then draw from these. Plans were also made to scale up existing Management Information Systems, at the time used only in a minority of CGIAR Research Programs, and then link them to a central reporting dashboard.

Implementing such a reporting system takes time, especially in a diverse system like CGIAR. However, there are distinct signs of progress. This report reflects the first year of reporting using the new templates and indicators. There is a mass of rich material to draw on, some of which is in the databases linked to this report. Data or supporting evidence is still incomplete in places, but the templates and guidance are being revised based on the 2017 experience and user feedback, and the improvements should be visible in future reports. In the meantime, adoption of new Management Information Systems has proceeded rapidly, and by 2019 they should cover all CGIAR Research Programs. An interactive results dashboard fed by these 'interoperable' systems is under construction.

Monitoring and reporting form only one part of a performance system. At the moment, work is underway on a series of other important areas, including reform of program appraisal and evaluation processes, and agreeing new program performance standards, expected to be approved in November 2018. These will be covered in more depth in future CGIAR System annual performance reports.

Dietary diversity to improve health and nutrition worldwide
A4NH

Increasing dietary diversity is key to improving the health and nutritional status of billions of people in low- and middle-income countries. Agrobiodiversity and a sustainable food future, a publication that appeared in *Nature Plants,* underscored why eating too much of the same few foods is bad for the global population. However, there is currently no agreed, standard way of measuring agrobiodiversity in diets or food production, nor of assessing how other activities in the food system affect agrobiodiversity. Decision makers need recommendations on actions to make food systems more sustainable.

The Agrobiodiversity Index is a new tool that helps fill both of those gaps and reflects years of CGIAR investment in promoting evidence-based solutions for improving dietary diversity. The next step, to make improvements in specific contexts will be to understand the nuances of individual situations. A4NH is taking a deep dive into food systems in four countries—Bangladesh, Ethiopia, Nigeria, and Vietnam—to do just this.

By the end of 2017, the Ethiopia participatory food system review and research road map were finalized and the research team began to assess food and nutrient gaps, along with household-level dietary diversity, using the most recent household expenditure survey data from all four countries. The research will help lay the foundation for future collaboration with local partners and identify strategies and opportunities for food system-wide improvements.

Monitoring progress in program implementation

Each of the CRPs and Platforms develops an annual Plan of Work and Budget against a standard template, that sets out key Research and Development milestones[15] for the year along each of the impact pathways. Typically, a CRP may have 20-30 annual milestones.

Reported progress in 2017 for each CRP against achievement of each planned milestone is shown in the evidence table available in Achievement of planned milestones in 2017, together with evidence of achievement (if complete) or an explanation (if incomplete, extended for a further year or canceled). Overall progress is shown in Table 6[16].

Table 6 Achievement of planned R4D milestones in 2017

STATUS	PERCENTAGE OF TOTAL (11 CRPS)
Complete	71%
Extended	22%
Partially complete	6%
Canceled	1%
Not stated	<1%
Total	100% (n=285)

Source: CRP Annual Reports 2017

Each Program and Platform also submits a detailed annual report on progress. The reports include a description of major areas of variance from planned program, and any changes to the overall impact pathway. In 2017, programs reported some areas of expansion and some areas which were cut back. *Expansion* mostly resulted from funder and partner demand to support new areas of work which respond to topics of current policy interest.

Examples of these expanding areas of demand include

- urban food systems and food safety in the informal sector in Africa (Reported by A4NH),
- sustainable rice straw management to avoid straw burning (Reported by RICE) and
- linkages between ecosystem health, food production or systems and human well-being in areas such as synthetic proteins and water-related diseases (Reported by WLE).

Most cuts resulted from funding cuts (for example in bilateral projects), or reluctance to invest in the face of budget uncertainty in the case of CGIAR Fund Window 1 and 2 (W1/2), and occasionally from lack of specialist staff, although one program (CCAFS) mentioned cutting back lower-performing research. This is an area CGIAR hopes to be able to better report on in 2018.

[15] A milestone can be, for example, the completion of a significant activity, such as completion of a set of trials, or a major survey; the release of a particular technology onto the market; or the production of significant new evidence about the effects of a policy or variety. Milestones may also mark important decision points in the research, for example 'Results of trial X will inform decision on whether to continue developing technology Y or take a new direction'.

[16] The table does not show comparative achievement data for different CRPs, because there is strong evidence both at the international level and from previous experience in CGIAR that simplistic comparison of percentage achievement, especially when it informs funding allocation, quickly leads to goal displacement and a reluctance to take risks which are essential for high-payoff research. However, the management and independent governance bodies of each Program, which include experts in the relevant field of research and acquainted with the realities of each line of work, are expected to closely scrutinize progress and achievements against each planned milestone, and the level of scrutiny will in its turn be evaluated by system bodies and in independent evaluations.

Use of pooled funding (W1/2)

The CGIAR Trust Fund provides for two types of pooled funding channel for programming carried out by CGIAR Programs and Platforms themselves, through the so-called Funding Windows 1 and 2 (W1/2). Platforms are almost entirely funded through W1/2.

Research Programs used W1/2 in slightly different ways, depending on the nature of their research, relative proportion of project funding ('Window 3/bilateral') they received and whether project funding was able to cover certain key areas of work (e.g. gender integration, M&E) or not. The detailed results are shown in this linked table (Main areas of CGIAR Fund Window 1-2 expenditure for 2017). Nevertheless, there were some common patterns.

> *"In general, Window 1 and 2 (W1/2) funding provided the backbone of RICE and catalyzed impact through strategic investments along the whole impact pathway, from upstream research to downstream development of business models and multi-stakeholder partnerships for innovation and scaling out. ...The long-term nature of W1/2 funding provides the continuity to the program, and guarantees not only short-term impacts (as derived from most bilateral projects) but also long-term impacts on 5- to 10-year time scales. Most W1/2 funds were used to support ...key monitoring, evaluation and learning activities across all projects, gender analyses and mainstreaming, capacity development and partnership building for scaling out and achieving impact at scale, and new initiatives (such as farm diversification, value-chain analyses)."* Introduction to the response from RICE CRP

Putting agriculture on the climate action agenda at COP23

CCAFS

Agriculture will receive a greater focus in climate action plans following the UNFCCC 23rd Conference of the Parties (COP23) decision on the Koronivia Joint Work on Agriculture made in late 2017.[lxxvi] The decision to include negotiations on agriculture, not only in the technical body of the UNFCCC but also in its implementation body, means that discussions will translate into practical steps on climate action.

Research and engagement by CCAFS, WLE and FTA were instrumental in supporting this decision. CCAFS provided scientific evidence on the importance of agriculture to the Paris Agreement goals, analysis of mitigation and adaptation,[lxxvii] options for addressing agriculture issues, produced technical supplements for the National Adaptation Plans process, and convened workshops that negotiators cited as critical to enabling them to formulate their positions.

WLE provided scientific evidence on the climate relevance of improved soil carbon, soil health and soil fertility management, in particular to the program on *Soil Protection and Rehabilitation for Food Security* led by GIZ who used this evidence to support the German Government. While, FTA conducted research on synergies and tradeoffs of Joint Mitigation and Adaptation.

CGIAR also worked to strengthen the capacities of negotiators from Africa, Asia and Latin America, and to incorporate a focus on gender and social inclusion issues. Notably, the African Group of Negotiators' submissions significantly contributed to the decision.

Some examples of W1/2 use in 2017 include:

(a) *Start-up investment on emerging research priorities*, leading to later funding of W3/ bilateral projects, e.g. on fall armyworm (a serious new pest) or precision agriculture (a cutting-edge approach). (Reported by MAIZE)
(b) *Competitive allocation to projects selected under a 'Scaling Fund'* to foster the scaling of the most promising RTB innovations and generate an evidence base on scaling approaches. (Reported by RTB)
(c) *Supporting new collaborative work* on seed policies with several centers and CRPs. (Reported by PIM)
(d) *Developing innovative frameworks* e.g. to evaluate the environmental impacts of productivity enhancing technologies. (Reported by LIVESTOCK)
(e) *Financing a review of equity issues* in research, which is set to inform new equity research across A4NH from 2018. (Reported by A4NH)
(f) *Financing international policy engagement to better leverage research results*, for example work on soil carbon feeding into the UNFCCC Koronivia Decision on Agriculture [lvii] deliberations. (see box) (Reported by WLE)
(g) *Building and maintaining external partnerships*, including start-up costs and maintaining and continuing work between projects. (Reported by several CRPs)
(h) *Developing novel tools and approaches*, for example, new analytical approaches for land restoration planning and rapid soil analysis. (Reported by WLE)
(i) *Financing capacity development*, for example developing curricula and training modules based on research results, supporting participation of national partners in key events, supporting a breeding community of practice. (Reported by several CRPs, including WLE and RTB)
(j) *Supporting integration of gender* across the program. (Reported by most CRPs)
(k) *Funding key research management and communications functions*. (Reported by several CRPs)
(l) *Financing core research*, for example, CCAFS uses W1/2 to fund the core elements of its strategy and only accepts additional project funding to complement this. (Reported by CCAFS)
(m) Adding value to project funding, e.g. extending scaling work to additional countries or to expand a promising area of research. (Reported by several CRPs including RICE, LIVESTOCK)
(n) *Supporting key ex ante and ex post studies to determine research priorities.* (Reported by WHEAT and PIM)
(o) *Supporting other monitoring and learning activities* across the portfolio, including investment in a new Management Information System. (Reported by several CRPs)

CGIAR Platforms

Three stand-alone research support platforms, two of which were launched in 2017, support the work of CGIAR. These are: the Genebank Platform, the Platform for Big Data in Agriculture and the Excellence in Breeding Platform.

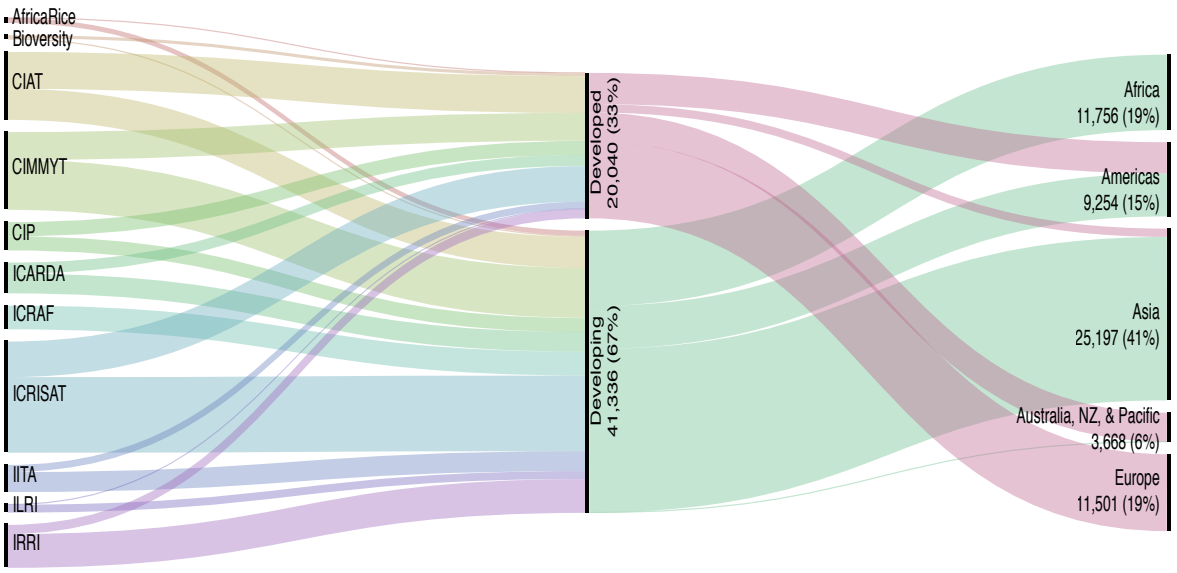
The Genebank Platform

The Genebank Platform supports the core activities of the CGIAR genebanks to conserve collections of plant genetic resources for food and agriculture. Through the Platform, CGIAR fulfills its legal obligation to conserve and make available the 35 crop and tree collections under its management and works towards meeting international standards, improving efficiency, and ensuring more effective use of collections within a supportive policy environment. The work directly contributes to indicator 2.5.1 of SDG Target 2.5: "maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks … and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge".

CGIAR genebanks presently manage 768,576 accessions, including 25,301 *in vitro* accessions and 28,063 accessions held as plants or trees in the field. Taken together, CGIAR genebanks represent the largest and most widely used collections of crop diversity in the world.

In 2017, 79% of total accessions are immediately available for international distribution, a significant improvement from 66% in 2012. Of the seed accessions, 55% are secured in safety duplication at two levels and 73% are duplicated at the Svalbard Global Seed Vault. 79% of clonal crop collections are 'safety duplicated' in the form of cryopreserved samples or *in vitro* cultures. Key statistics on the distribution of germplasm samples are presented below and in Figure 6.

Figure 6. Germplasm samples distributed by Center genebanks to users outside CGIAR in 2017



Source: The Genebank Platform Annual Report 2017

Key statistics on distribution of germplasm samples

109,339 germplasm samples provided by CGIAR genebanks to users (including CGIAR breeders)

61,376 distributed outside CGIAR, in 95 countries, mostly in the developing world. Of these:

- **50%** went directly to National Agricultural Research Organizations
- **32%** to advanced research institutes and universities
- **13%** to farmers and individuals
- **4%** to the private sector

An evaluation of the CGIAR Genebank program was published in 2017. Many of its recommendations have already been implemented by the Genebank Platform. A recommendation for a cost and efficiency analysis study of all CGIAR genebanks is being implemented (started late 2017).

Platform for Big Data in Agriculture

The Platform for Big Data in Agriculture was launched in May 2017, following nearly two years of consultation with private, non-profit, and public stakeholders in digital agriculture worldwide. The Platform is designed to leverage e-research and build new data-driven impact. Specific platform aims include: mobilizing CGIAR data to accelerate research and spur new data-driven innovations, building data collaboration across the organization and with the wider agricultural sector, and leveraging CGIAR expertise while claiming a unique leadership voice in digital agriculture.

Highlights of its first six months of operations included:

- Technical guidance (including data management support packs) and seed funding issued to CGIAR Centers to implement CGIAR's Open Access and Data Management Policy. This contributed to a significant increase – of 10% or more at most Centers – in the number of public datasets and publications made available via their data repositories.
- Launch of a prototype data search tool, 'GARDIAN', enabling any user to search for available CGIAR publications and datasets across more than 30 open databases system-wide.
- Communities of Practice established for six key areas for data-enabling food security research: socioeconomic data, geospatial data, data-driven agronomy, crop modelling, livestock data for decision-making, and data ontologies.
- The first annual CGIAR Convention on Big Data in Agriculture, convened in Colombia and attended by around 300 global innovators, researchers, and thought leaders from public, private, and non-profit partners, who agreed on an action plan.
- Launch of an open innovation process called the Inspire Challenge, which attracted submissions from 120 teams from 37 countries. The aim is to apply data to help solve development problems faster, for less money, and more efficiently. External expert judges chose five teams to receive start-up grants of USD 100,000 each in support of leading-edge applications of data, including in-field disease gene sequencing and identification, social media-enabled animal health, and intermediating a whole market system via mobile phones.

The Platform's activities were funded almost entirely by CGIAR Trust Fund W1/2.

Excellence in Breeding Platform

The CGIAR Excellence in Breeding Platform is the newest Platform arrival, starting up in August 2017 with the recruitment of the director. It aims to modernize breeding programs, targeting the developing world for greater impact on food and nutrition security, climate change adaptation, and development. The Platform draws from innovations in the public and private sectors to provide access to cutting-edge tools, services and best practices, application-oriented training and practical advice, with the aim of increasing the effectiveness and efficiency of breeding.

In its first few months, the Platform:

- Forged partnerships across CGIAR breeding programs, as well as with external bodies such as Monsanto, Diversity Arrays Technology, Cornell University, Corteva Agriscience, the University of Queensland, Hiphen, Institut National de la Recherche Agronomique-Avignon, CSIRO, and Kansas State University.
- Held a successful series of workshops to bring breeders together to address practical problems of product development and breeding program management, including overcoming bottlenecks and identifying lower-cost and more rapid approaches to common breeding processes.
- Conducted two surveys of member programs to assess needs for genotyping and breeding informatics support for CGIAR breeding programs.
- Worked closely with the Breeding Program Assessment Tool team[17] to identify priority improvements for participating breeding programs.

Aerial phenotyping technologies for maize breeding

MAIZE

Maize is a staple food crop in sub-Saharan Africa and Latin America, but drought and poor soil fertility, exacerbated by climate change, are serious production constraints in most maize farming systems. A low-cost unmanned aerial vehicle (UAV) is helping to speed up the selection of maize varieties that are best adapted to adverse environmental conditions and thus improve the efficiency of maize breeding.[lxxx]

The UAV-based phenotyping platform enables high-throughput data collection through image acquisition from visible (RGB), spectral and thermal cameras fitted underneath the UAV and image processing pipeline. The first UAV tested, known as Skywalker, was designed by Airelectronics in partnership with the University of Barcelona, the Teledetection Group of the Institute for Sustainable Agriculture of CSIC, Córdoba, Spain, and the Crop Breeding Institute, Zimbabwe; through a MAIZE grant from CIMMYT. Rapid advances in the UAV technology has led to the adoption of a rotary-wing UAV that has lower speed and can be flown at lower altitude, providing higher spatial resolution required for effective application in breeding.

[17] An initiative led by the University of Queensland with the support of the Bill & Melinda Gates Foundation.

Collaboration across CGIAR

Collaboration across CGIAR has significantly increased since the development of the new portfolio. A total of 192 specific instances of collaboration between CRPs and between CRPs and Platforms were reported for 2017.[18] Certain integrating CRPs – such as CCAFS and PIM – were particularly active in collaboration (Figure 7).

Examples of collaborations reported by CRPs included:

- WLE collaborated with PIM on joint development of diagnostic tools to assess gender issues in water management to support project design.
- CCAFS and LIVESTOCK worked together on the impacts of climate change on feeds and forages in livestock systems.
- A4NH collaborated with MAIZE on the identification of strains for development of Aflasafe® (aflatoxin control) products, as well as to integrate aflatoxin-tolerant maize varieties and hybrids with Aflasafe®.
- PIM and RTB collaborated on seed systems for vegetatively propagated crops: PIM leads studies on policy and regulatory issues, while RTB leads studies on successful models for seed systems.
- FISH and CCAFS together contributed to identifying new approaches to integration of environmental considerations into aquaculture futures modeling and identification of technology and management practices for sustainable intensification of aquaculture in Bangladesh that mitigate greenhouse gas emissions.

Figure 7. Number of reported collaborations among CRPs and CRP Platforms, 2017

		FISH	FTA	LIVESTOCK	MAIZE	RICE	RTB	WHEAT	A4NH	CCAFS	PIM	WLE
Agri-food systems CRPs	FISH											
	FTA	0										
	LIVESTOCK	0	0									
	MAIZE	1	1	1								
	RICE	3	1	1	2							
	RTB	1	1	0	1	2						
	WHEAT	1	1	1	3	1	1					
Integrating CRPs	A4NH	2	0	2	2	3	2	2				
	CCAFS	2	3	8	7	14	1	6	2			
	PIM	2	8	4	8	4	9	4	2	9		
	WLE	1	2	2	1	1	2	1	1	5	2	
Integrated research platform (PIM)	Gender research	1	1	1	1	1	1	1	1	1	1	1
Platforms	GENEBANK	0	1	1	1	1	3	1	0	0	0	0
	Excellence in Breeding	1	1	1	4	2	1	1	0	0	0	0
	BIG DATA	1	0	0	2	1	2	1	1	0	1	1

Source: CRP annual reports for 2017
The full list of reported collaborations can be found in Internal CGIAR collaboration across CRPs and Platforms in 2017.

[18] This is likely to be an under-estimate, due to incomplete reporting.

Improving efficiency

Highlights of efficiency improvements in 2017 included:

- Management Information Systems (MIS) require substantial initial investment, but have the potential to hugely increase efficiency in planning R4D activities and reporting results. The year 2017 saw greatly increased adoption of MIS across Centers, CRPs, and Platforms, and these are expected to be adopted by all parts of CGIAR in 2018. Work also started in 2017 to ensure that all MIS are interoperable, so that they can be drawn on for central reporting and learning.
- The Excellence in Breeding Platform has promoted outsourcing to 'High ThroughPut Genotyping' services, as opposed to carrying out genotyping in-house. User feedback indicates better data quality and faster turnaround time, and overall cost reductions of between 25% and 50% depending on Center and crop.
- Broader efficiencies in breeding are expected to result from a set of Breeding Program Assessments of CGIAR breeding programs, commissioned by the Bill & Melinda Gates Foundation and being led by the University of Queensland. In 2017, these assessments were completed for IITA (yam, cassava, banana and plantain) and CIMMYT (spring bread and durum wheat) programs. Increased collaboration between CRPs and Centers has led to some increased efficiencies, e.g. by sharing genomics and breeding work for livestock forages across ILRI and CIAT.
- Future Annual Performance reports will cover efficiency improvements more systematically, and it is expected that this will lead to an increased focus on measuring efficiency.

Sustainable Landscapes Rating Tool to boost climate action in forests

FTA

The Governors' Climate and Forests (GCF) Task Force is a collaborative partnership among 38 states and provinces from Brazil, Colombia, Côte d'Ivoire, Ecuador, Indonesia, Mexico, Nigeria, Peru, Spain and the United States, whose members hold more than one-third of the world's tropical forests and have committed to reducing deforestation in their jurisdictions.

Sustainable forest and land management can deliver one-third of the solutions to addressing global climate change. In this context, jurisdictional approaches – government-led, comprehensive approaches to forest and land use across legally defined territories – to sustainable development hold significant potential.

FTA and partners are undertaking a comprehensive assessment of jurisdictional sustainability in GCF Task Force member territories – and other places with jurisdictional approach 'experiments' underway – which includes applying the CCBA Sustainable Landscapes Rating Tool. The tool helps GCF Task Force members assess progress towards low-emissions rural development and provides a snapshot of a jurisdiction's capacity to establish and ensure the effective functioning of policies, plans, strategies, regulations, monitoring systems and multi-stakeholder platforms.

Presented to GCF Task Force members at their 2017 Annual Meeting in Balikpapan, Indonesia, the tool will also help subnational jurisdictions and national governments transform forest conservation commitments into practical action, accelerating long-term change. This includes the implementation of REDD+ – the global framework to reduce emissions from deforestation and forest degradation.

Program Monitoring, Evaluation, Learning, and Impact Assessment

CGIAR Programs depend on integrated monitoring, evaluation, learning, and impact assessment to test their assumptions, learn, and improve their work. A list of relevant activities reported in 2017 is available in the Status of evaluations, Impact Assessments and learning exercises in 2017. There was significant under-reporting, and this will be remedied in future. However, based on a preliminary analysis, the main types of activities reported by CRPs included:

- *Studies seeking to understand impact pathways and test assumptions* (Reported by 6 out of 9 CRPs) for example, studying different business models for the Happy Seeder technology in India (Reported by CCAFS), or understanding the role of input subsidies on the adoption of natural resource management technologies. (Reported by MAIZE)
- *Ex post Impact Assessments* (6 CRPs), for example an impact and adoption study on fertilizer tree systems in Malawi. (Reported by FTA)
- *Adoption surveys* (5 CRPs), for example an assessment of GIFT tilapia dissemination in Bangladesh and the Abbassa strain of Nile tilapia in Egypt. (Reported by FISH)
- *Qualitative impact studies* (6 CRPs), for example an assessment of uses of Statistics on Public Expenditure for Economic Development. (Reported by PIM)
- *Ex ante analyses* (4 CRPs), for example an ex-ante analysis of economic benefits and returns on investments in yam seed systems. (Reported by RTB)
- *Learning workshops* to discuss findings and feed these into programming (5 CRPs), for example an annual monitoring, evaluation, impact, and gender learning workshop. (Reported by RICE)
- Other activities, including systems development and training, were also reported by most CRPs.

The cross-CGIAR Monitoring, Evaluation and Learning Community of Practice (MELCOP), and the Evaluation Community of Practice regularly meet to share experience and improve Monitoring, Evaluation and Learning across the system. Their joint October 2017 workshop made an important contribution to the development of common CGIAR reporting indicators and planning and reporting templates and a CGIAR glossary of key terms, as well as holding learning events on approaches and methods. Standing Panel on Impact Assessment (SPIA[19]), also convenes regular meetings of Impact Assessment Focal Points from centers and CRPs to share information, exchange feedback with each other and with SPIA, and identify opportunities for collaboration.

In 2017, SPIA and PIM co-sponsored a technical conference on the impacts of international agricultural research with 180 conference participants, about half from CGIAR and one-third women. The conference discussed evidence from recent rigorous studies on how and how much agricultural research has contributed to development outcomes and considered the implications for how CGIAR and others set research priorities and conduct impact assessments.

> *"CGIAR has both the potential and responsibility to bring in new methods and to think really carefully about how to change the practice of impact assessment … so that we are not ignoring the questions that need to be answered in pursuit of the things we know how to answer."*
> Doug Gollin, Oxford University and Chair of SPIA.

An important lesson from the conference was that: "there is often a contradiction between donor [Funder] demand for rigorous evidence and for evidence of impact at scale, especially in the short term … Strengthening communication between the impact assessment and donor communities should be a priority for CGIAR."[lviii]

19 SPIA is part of CGIAR's Independent Science and Partnership Council, ISPC

Oversight and advice from System Advisory Functions

The year 2017 saw CGIAR's System-wide advisory functions[lix] providing an important source of guidance and objective assurance on the status and performance of CGIAR's research agenda, the quality of that work, and its overall impact.

Highlights of their work included (see Annex E for a more complete picture).

Independent Science and Partnership Council (ISPC):

Part of ISPC's work is carrying out 'big picture' thinking and foresight which among other things aims to keep CGIAR positioned at the cutting edge to address emerging global challenges.

In 2017, this included:

- **Independent Foresight Assessment:** 18 background papers were commissioned on global trends affecting agri-food systems, discussed at an international workshop and will be published in 2018. (see Box)
- In partnership with Australia's CSIRO, ISPC worked to generate new **insights on agri-food system innovation**: including through the analysis of 17 diverse case studies of agricultural research and innovation, and also analyzing key blockages to effective research and innovation.
- ISPC convenes CGIAR's biennial **Science Forum** bringing together world experts to discuss specific challenges. 2017 saw consolidation of the learning from the 2016 Forum, on pathways from agricultural research to rural prosperity, and planning for the 2018 Science Forum, on capturing synergies between SDGs through agricultural research.

ISPC also provides appraisal of CGIAR research programs and setting relevant standards.

In 2017, ISPC carried out:

- **Independent program review of new CGIAR programs**, e.g. the new Grain Legumes and Dryland Cereals proposal.
- ISPC worked to develop a **Quality of Research for Development framework** (QoR4D) for CGIAR, through a workshop and follow-up consultation. The proposed QoR4D framework is presented as a key element to endorse in the inaugural CGIAR System three-year plan (2019-2021).

Main findings of the 2017 **ISPC foresight assessment exercise:** The world is facing a "perfect storm" of global threats and challenges that agri-food R4D can help resolve, including rising urbanization and migration, a changing structure of rural populations; changing diets and food systems; disruptive innovations in technology and not least climate change. CGIAR can play an important role in supporting public good, in the context of the rapidly growing private sector involvement in research worldwide. Using foresight tools to identify interactions across sectors and the leverage points to accelerate sustainable change under varying possible future scenarios is critical to developing strategies to address these challenges.

Another important ISPC workstream is **independent impact assessment of CGIAR-related research**, overseen by SPIA, a subgroup of the ISPC. The year 2017 saw the appointment of a new SPIA chair and also the finalization of a large five-year project on Strengthening Impact Assessment in CGIAR. Highlights of SPIA's work in 2017[20] included:

- Publishing a database of varietal release and adoption estimates for 11 CGIAR mandate crops for 15 countries in Asia.
- Important advances in methodology for adoption studies on crop varieties, based on plant DNA testing. (see Box)
- Studies on adoption of widely promoted Natural Resource Management practices. (see Box)
- Publishing a database of evidenced policy outcomes of CGIAR research.
- Synthesizing a variety of other studies carried out to assess the impact of widely adopted CGIAR innovations.[lxi]

Some of **SPIA's impact studies challenged conventional wisdom** about impacts of agricultural research. Two of the most hard-hitting findings included:

- DNA analysis showed that in many contexts, many farmers cannot reliably identify the crop varieties they are growing, putting into question the published figures from some (but not all) varietal adoption studies, and highlighting the need to develop alternative methods that work at scale.
- Some of the most widely promoted on-farm Natural Resource Management practices have very little uptake among farmers in at-scale studies (e.g. Conservation Agriculture: <10% partial adoption and <5% full adoption in most locations). This has stimulated new work to understand barriers to adoption.
- For more details, see links in text and SPIA webpage.

Farmer Mercy Wambui measuring rain water on her farm Credit: G. Smith /CIAT

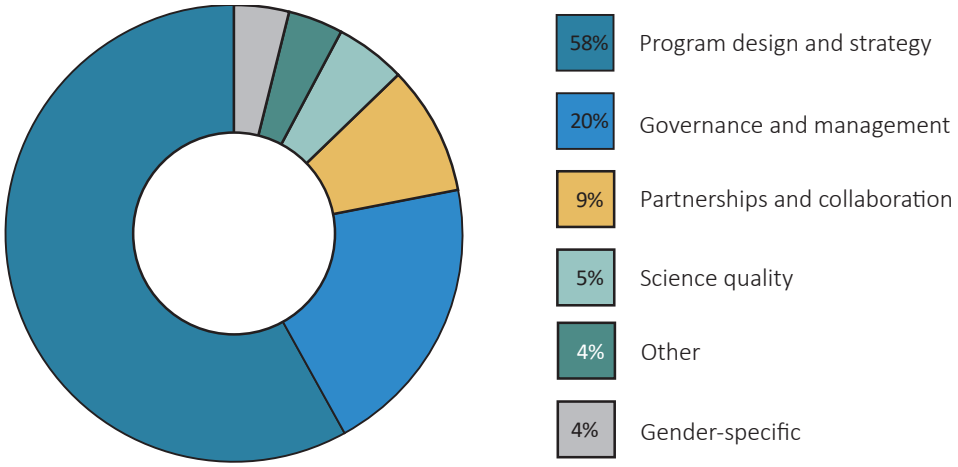
[20] Impact studies typically take several years from start to publication, and may be reported at different stages in more than one year. Studies mentioned here were presented, published or synthesized in 2017. SPIA also convenes CGIAR Impact Assessment Focal Points and held an important conference in 2017 (see previous section).

Independent Evaluation Arrangement (IEA)

Highlights in 2017 included (see Annex G for full list of evaluations conducted):

- Recommendations of an evaluation on gender called for a common CGIAR System-level strategy and action plan for gender equity; greater consistency in gender research; and stronger monitoring and evaluation of outputs and outcomes. To date, this has resulted in agreement[lxii] to increase human and financial resources for integrating gender issues in research, and to incorporate gender more systematically into results reporting and performance management.
- Recommendations of an evaluation on results-based management called for a shared conceptual understanding of RBM, reflecting CGIAR's mandate as a research for development organization. The evaluation informed major changes[lxii] in this area, including investment in CGIAR management information systems and a system-level results dashboard.
- Other evaluations and reviews included CGIAR Intellectual Assets Principles, capacity development, partnerships, the Genebank Platform and ISPC. These are referred to in relevant sections of this report.
- A review of IEA evaluation use found 129 citations of IEA evaluations in Program pre-proposals and proposals for the current CGIAR research programs, including 55 that validated the design choices made and 76 that had informed significant changes in program design (Figure 8).
- An IEA Workshop on Development, Use and Assessment of Theories of Change in CGIAR Research[lxiv] brought together decision-makers from across CGIAR. A key finding was that there had been considerable culture change among researchers in using Theories of Change to think through linkages between CGIAR research and desired impacts, and that they needed to be used much more systematically for monitoring and reporting. This has informed CGIAR Program Management Standards being developed in 2018. The workshop also proposed five key characteristics of a good Theory of Change for agricultural research for development.

Figure 8. Distribution of changes in CGIAR program design that cited IEA evaluations (n=76 citations)



Source: CRP Annual Reports 2017

CGIAR Shared Services Internal Audit Unit

In advance of 2018 agreed changes to the way to achieve overall coordination of internal audit services that are provided across the CGIAR System and the adoption of a 'combined assurance' approach to the management of CGIAR System-wide opportunities and risks, 2017 performance outcomes for CGIAR's Shared Services Internal Audit Unit[21] included:

- Capacity building to strengthen internal controls across CGIAR Centers, including: publication of four Good Practice Notes on project management; control self-assessment; risk management and research data management; self-assessment tools on IT general controls, and IT security and managing fraud risk; and a review of CGIAR Centers' common financial health indicators, contributing to the overall efforts to strengthen Center financial stability.
- Delivery of a substantive advisory engagement throughout 2017, providing the CGIAR System, including its Funders and Centers, with overall analysis and strategic guidance on the most appropriate System-wide objectives and 'Risk Families' to support the CGIAR System's adoption in November 2017 of the inaugural CGIAR System Risk Management Framework, a whole of System binding CGIAR System Risk Appetite Statement, and the CGIAR System Risk Management Guidelines.
- Providing support to Center/Regional internal audit teams through the CGIAR Shared Services Professional Practice Unit and through a variety of assurance and advisory services.

Intellectual Assets

Strategic management of intellectual assets by CGIAR Research Centers and their partners is essential for realizing CGIAR's global access and impact. The CGIAR Principles on the Management of Intellectual Assets[lxv] (IA Principles) provide guidance to Centers on ways intellectual assets can be used to achieve impact for CGIAR target beneficiaries and further the CGIAR strategy. They seek to achieve a delicate balance between maintaining the founding value of global accessibility of CGIAR research results and proactively achieve targeted impacts through the use of intellectual property rights and licensing.

In 2017, a review undertaken by the CGIAR Independent Evaluation Arrangement at the request of the CGIAR System Organization[lxvi] concluded that the IA Principles were "appropriate and have the potential to amplify the impact of the CGIAR System".

The review made recommendations to strengthen thier application and, work is now being undertaken in response, including supporting capacity development within CGIAR Centers.

Also in 2017, CGIAR Research Centers reported a total of three provisional patent applications and two non-provisional patent applications. No plant variety protection applications or registrations were reported. Agreements with the private sector were also reported: 23 Limited Exclusivity Agreements and four Restricted Use Agreements. These were all determined to further CGIAR's vision and to be consistent with the Principles.

Highlights from 2017 are available for review in the CGIAR System Intellectual Assets Management Report 2017 available here.

[21] The November 2017 System Council adoption of a holistic CGIAR System Risk Management Framework resulted in the introduction from January 2018 of a new CGIAR System Internal Audit Function, and the CGIAR System Internal Audit Support Service as a Center-facing capacity building small team. The 2018 changes ensure a more connected approach to opportunity and risk assurance across the CGIAR System, with more effective linkages to Center-own risk management and internal control frameworks.

IV. FINANCIAL HIGHLIGHTS FROM 2017

Funding channels

Investments to CGIAR may be delivered through the multi-Funder CGIAR Trust Fund and/or directly to specific projects in CGIAR Research Centers (outside the Fund), which is called Bilateral funding. Funding to the CGIAR Trust Fund is channeled through three Windows, at increasing levels of Funder collective action:

Window 3 (W3) – Project investments: funding allocated by Funders individually to projects that are defined by the Funders themselves (with partners) and that are aligned with system-wide investments.

Window 2 (W2) – Program investments: funding allocated by Funders individually to any component (CRP, Platform or initiative) of the system-wide portfolio as prioritized, defined and approved by the Funders collectively through the System Council; and

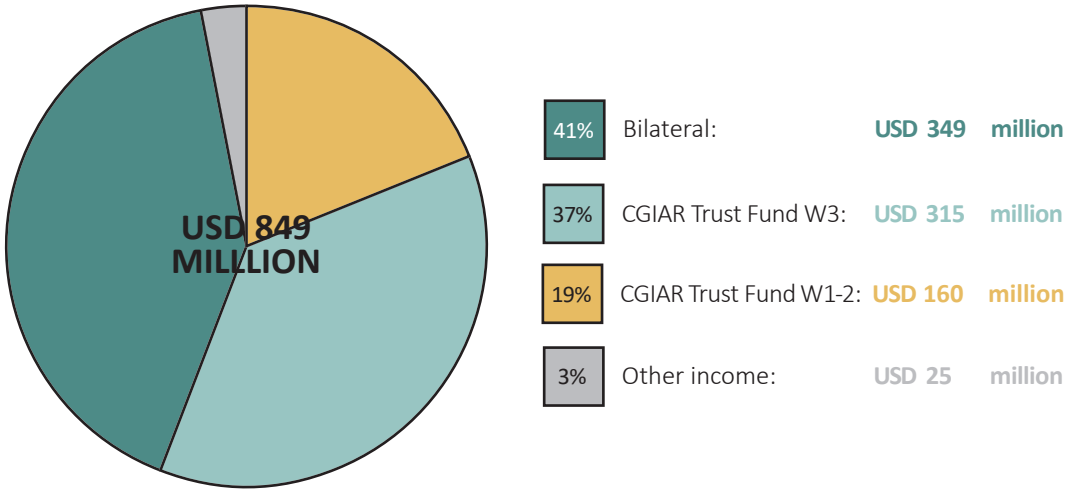
Window 1 (W1) – Portfolio investments: funding allocated to the entire CGIAR portfolio of approved system-wide investments prioritized and allocated by Funders collectively through the System Council – supporting CGIAR as a whole.

In 2017, CGIAR recognized revenue of USD 849 million, of which the vast majority (78%) was Window 3 and bilateral funding, and 19% was Window 1 & 2 funding (Figure 9).

Sources of funding

Figure 10 shows the principal Funders and channels in 2017.[22] The largest overall Funders were the Bill & Melinda Gates Foundation the USA and UK. The largest providers of Window 1 and 2 funding were from the UK, World Bank, the Netherlands, Switzerland, Sweden, Norway, Australia, and Canada. Major bilateral funding came from Germany, USA and Mexico.

Figure 9. Main channels of revenue for CGIAR, 2017 (total USD 849 million)



Source: 2017 CGIAR Financial Report

[22] Principal Funders and channels cannot be put in the same graph because they are calculated differently.

Figure 10. Principal Funders and main funding channels in 2017

Source: 2017 CGIAR Financial Report

Funding trends

Figure 11 shows total CGIAR revenue by funding channel in 2017 – the first year of a new research portfolio – compared to funding for the initial CGIAR CRP Portfolio from 2011 to 2016. Revenues for 2017 were more than 20% below the peak revenues in 2014. The vast majority of funding was allocated to specific projects, and pooled (Window 1/2) funding was at its lowest level over the period shown, in both absolute and percentage terms (USD 160M, 19% of total) since the first introduction of the CRPs.

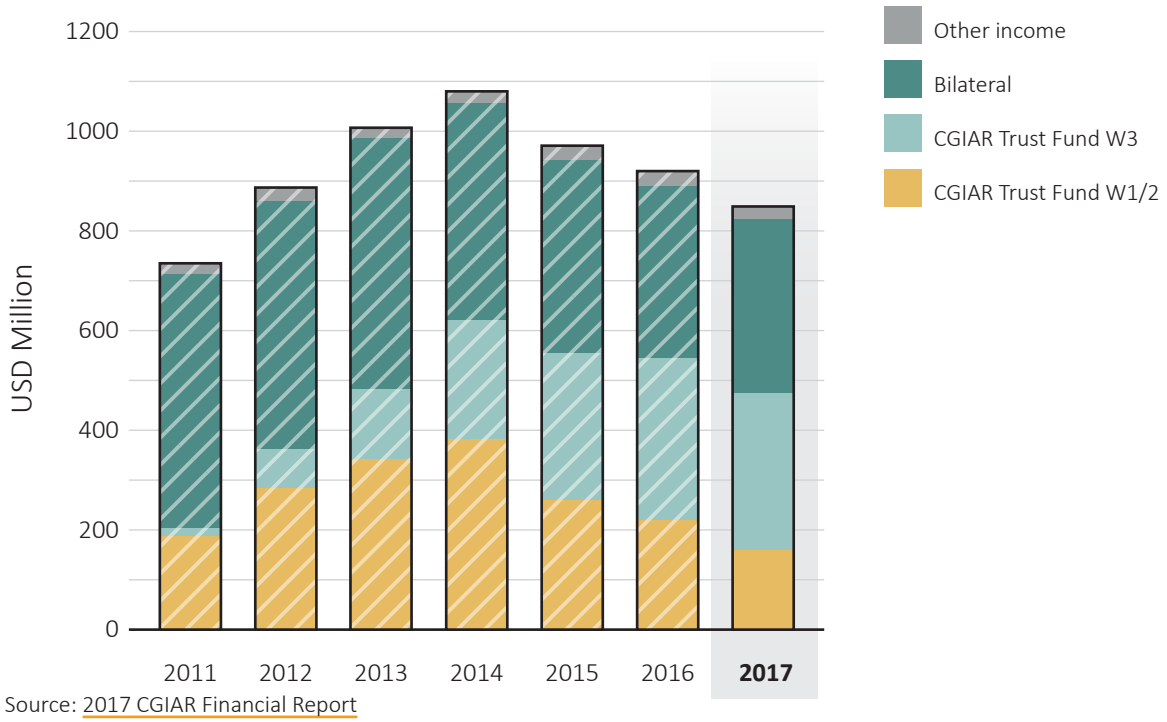
Timing and stability of funding

Recognizing that agricultural research is both long-term and seasonally sensitive, and thus depends on stable funding, the CGIAR Trust Fund aims to provide reliable and predictable multiyear funding and thereby enable research planning over the long term, resource allocation based on agreed priorities, and the timely and predictable disbursement of funds. This was partially successful in 2017 with significant within-year communication to Centers on levels of confidence of funding availability, but the picture looks brighter for future years.

In 2017, 94% of expected (System Council approved indicative) funding was received by the end of the year: a gap of USD 11 million. A key challenge however was the timing of the funding received, as shown in Figure 12. Cumulative receipts by May were only 4% of approved funding, and only 22% of all indicatively-approved external funds were received by the end of August. Over half of all external funds were received in the last quarter of the year. Delays in funding can make it difficult for research programs to carry out trials and studies, maintain partnerships and fulfill contractual obligations. The CGIAR Balancing Fund was vital to provide start-up funds for the first half year (USD 34 million), but insufficient: it only covered 18% of the expected funding.

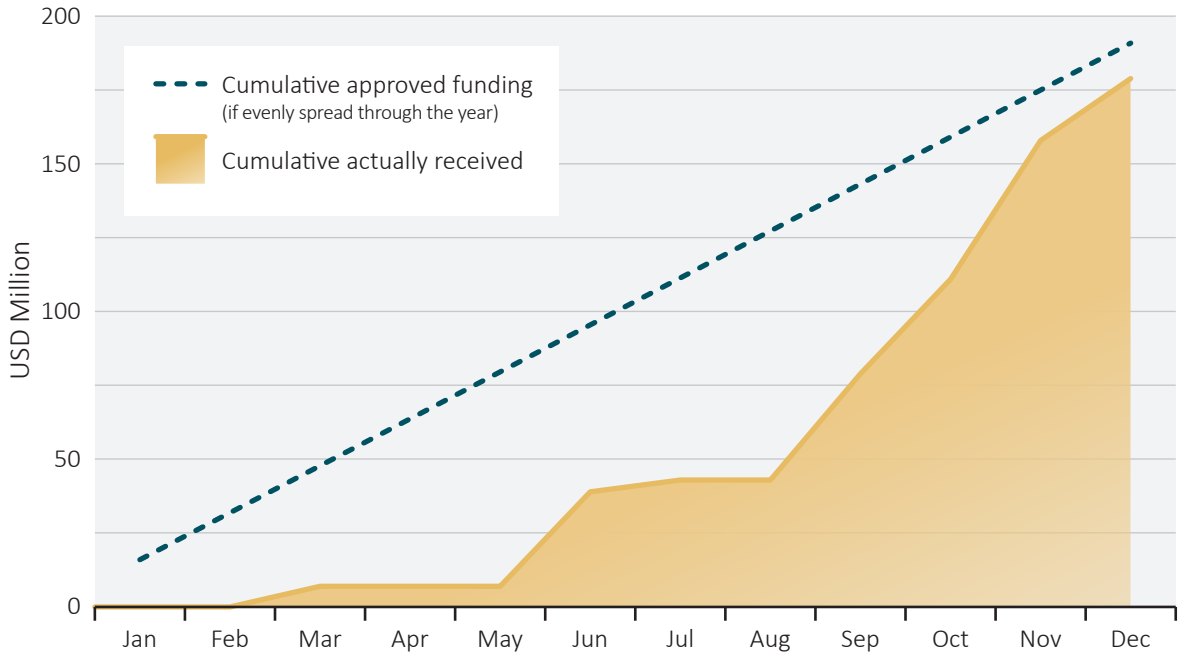
Nevertheless, one important aspect that has improved is the timeliness of information on confirmed funding. Firm funding commitments allow Centers to pre-finance research from their reserves. In the past, firm commitments have only pre-dated actual payments by a matter of one to two months, but this improved in 2017, when more than half of final funding was confirmed by March and over 80% was confirmed by June. Thanks are due to Funders who signed multi-year agreements in 2017.

Figure 11. CGIAR revenue by funding channel in 2017, compared to the CRP Portfolio 2011-16



Source: 2017 CGIAR Financial Report

Figure 12. Timing of funding within year: cumulative Window 1/2 Receipts in 2017, compared to 'expected' (System Council approved indicative) funding



Source: 2017 CGIAR Financial Report

Use of funds

Figure 13 shows the main categories of expenditure. These included 85% of expenditure related to research (led by CGIAR and its partners) and 15% to general, administration and system level costs. General and administrative costs (including system-level costs) declined by about 1% of the total expenditure from 2016 to 2017.

Figure 14 shows expenditure by CRP/platform and funding channel[23]. It can be seen that there is a wide range in overall size of program: overall expenditure in 2017 varied from about US$ 20 to 90 million. There is also wide variation in program access to pooled Window 1/2 funding: generally, this accounted for around 20% of overall expenditure, but in some programs (e.g. Forest, Trees and Agroforestry), the percentage was as low as 7%. This is important, as W1/2 funding adds value not only through its flexibility but also (as discussed earlier) because it helps direct investments to agreed System-level priorities (e.g. gender, monitoring and evaluation) that are not always included in project budgets.

To summarize: CGIAR recognized income of USD 849 million in 2017, of which 56% was channeled through the CGIAR Trust Fund. 19% of the total was pooled funding (Trust Fund Windows 1 and 2), that plays a vital role in programatic activities such as integrating gender across the program and responding to unforeseen challenges such as a new crop disease. Of total funding, 85% was used for research and 15% for general and administrative costs. The main challenge in 2017 was the timing of the pooled funding received: only 4% of funds were received by the end of May and over half were received in the last quarter of the year. Delays in funding make it difficult for research programs to carry out trials and studies, maintain partnerships and fulfill contractual obligations. However, timeliness of information on confirmed funding did improve in 2017, and would further improve with the signature of multi-year agreements by Funders to Windows 1 and 2.

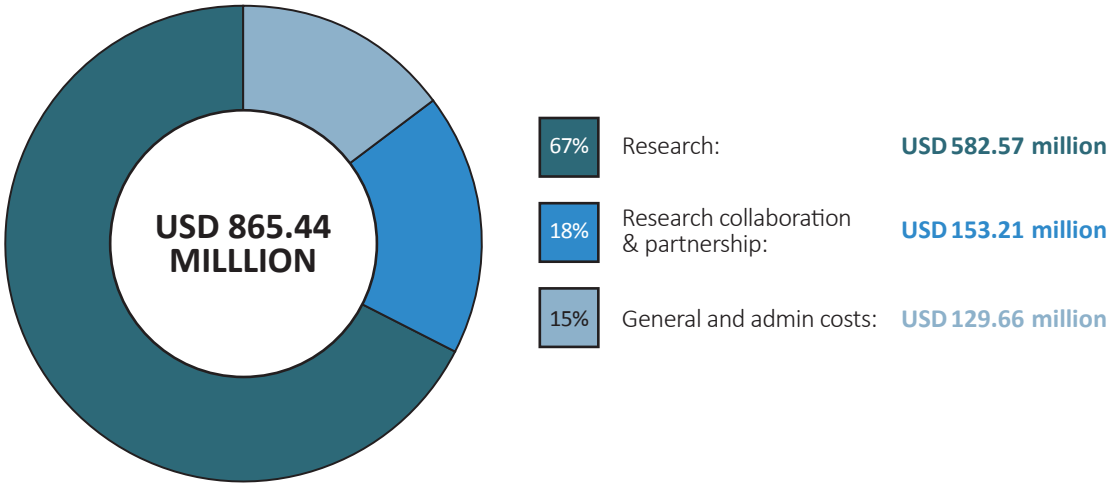
For further information the following reports are available:

CGIAR Financial Report for year 2017

CGIAR System Audited Financial Statement for 2017

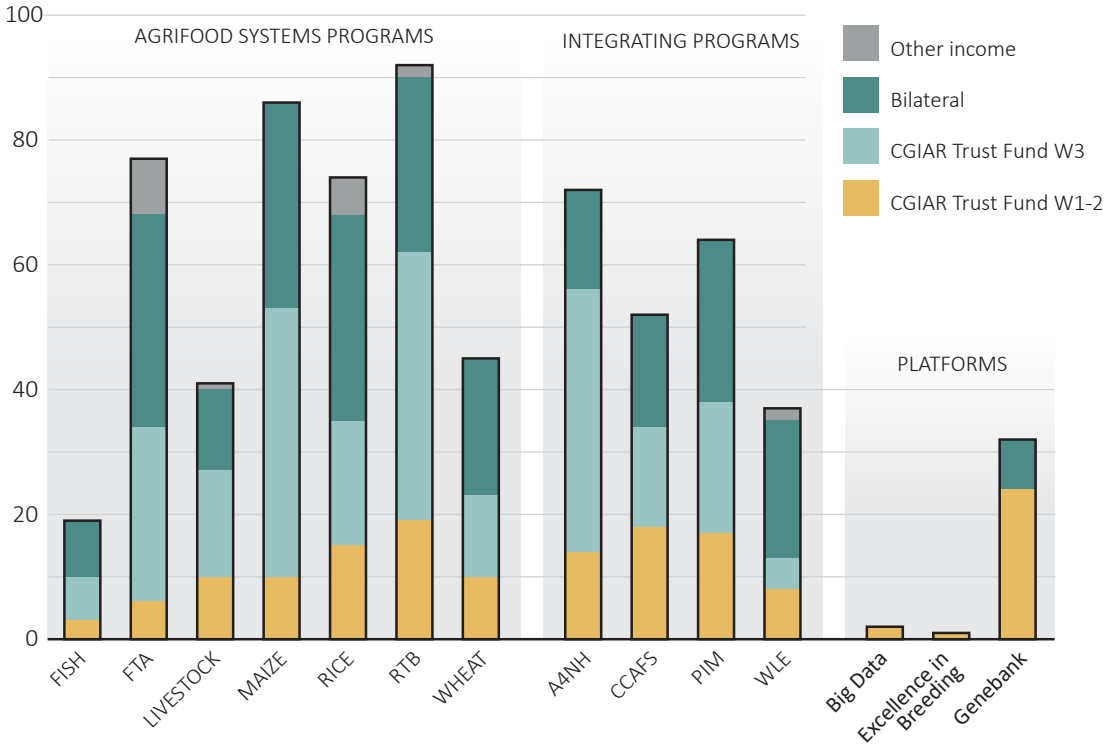
[23] One of these, the CGIAR Research Program on Grain Legumes and Dryland Cereals, was approved for implementation starting in 2018 and thus had no revenue or expenditures in 2017.

Figure 13. Expenditure by main category, 2017



Source: 2017 CGIAR Financial Report

Figure 14. 2017 funding for CGIAR Research Programs and Platforms, by funding channel



Source: 2017 CGIAR Financial Report

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CGIAR Trust Fund* Contributors

Bilateral Contributors

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Belgium
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Brazil
Burkina Faso
Burundi
Canada
Chad
China
Colombia
Congo, Democratic Republic of the
Denmark
Egypt
European Commission
Ethiopia
Food and Agriculture Organization of the United Nations (FAO)
Finland
Ford Foundation
France
Germany
Ghana
Gulf Cooperation Council
Honduras
International Fund for Agricultural Development (IFAD)
India
Indonesia
Iran
Ireland
Islamic Development Bank
Italy
Japan
Kazakhstan
Kellogg Foundation
Kenya
Korea, Repblic of
Lesotho
Liberia
Libya
Malaysia
Mali
Mexico
Mozambique
Nepal
The Netherlands
Nigeria
Norway
The OPEC Fund for International Development (OFID)
Pakistan
Peru
Philippines
Rwanda
South Africa
Sweden
Switzerland
Syngenta Foundation
Tanzania
Thailand
Uganda
United Nations Development Programme(UNDP)
United Nations Environment Pogramme (UNEP)
United Kingdom
United States
World Bank

*Recognizing contributions to the CGIAR Trust Fund established in March 2017.

V. ANNEXES, EVIDENCE TABLES AND ACCOMPANYING CGIAR REPORTS

Annexes:

These are in a seperate volume with links as follows:

Annex Tables:

Annex Table A.	CGIAR Contribution to System Level Outcome targets
Annex Table B.	Common Results Reporting Indicators
Annex Table C.	List of key CGIAR Innovations available for uptake in 2017
Annex Table D.	Examples of Altmetric scores for CGIAR publications

Narrative Annexes:

Annex E	CGIAR Governance, System Entities & Advisory bodies in 2017
Annex F	Independent Science and Partnership Council summary annual report 2017
Annex G	Independent Evaluation Arrangement summary annual report 2017
Annex H	CGIAR Internal Audit Unit summary annual report 2017
Annex I	Methods and data sources

Evidence Tables:

Throughout the main text, there are also links to longer tables of evidence and databases that cannot be accommodated in the annexes. These include:

- Achievement of planned milestones in 2017
- Selected external partnerships in 2017
- CRP Publications in 2017
- Policies/Investments informed by CGIAR Research
- CGIAR Innovations in 2017
- Altmetric reported for CGIAR Publications in 2017
- Internal CGIAR collaboration across CRPs and Platforms in 2017
- Status of evaluations, impact assessments and learning exercises in 2017
- Main areas of CGIAR Fund Window 1-2 expenditure for 2017

Accompanying CGIAR Reports:

- CGIAR Financial Report for year 2017
- CGIAR System Audited Financial Statement year 2017
- CGIAR Intellectual Assets Management Report 2017
- CGIAR Research Program and Platform Annual Reports 2017

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lxxi P. Kumar, S. Kumar, and L. Joshi, eds., *Socioeconomic and Environmental Implications of Agricultural Residue Burning*, SpringerBriefs in Environmental Science (New Delhi: Springer India, 2015), https://link.springer.com/book/10.1007/978-81-322-2014-5.

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lxxv P.J.G. Henriksson et al., "Benchmarking the Environmental Performance of Best Management Practice and Genetic Improvements in Egyptian Aquaculture Using Life Cycle Assessment," *Aquaculture* 468 (February 1, 2017): 53–59, https://doi.org/10.1016/j.aquaculture.2016.09.051.

lxxvi UNFCCC secretariat, "Decision-/CP.23; Koronivia Joint Work on Agriculture: Advance Unedited Version," 2017.

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CGIAR RESEARCH CENTERS

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CGIAR SYSTEM
ANNUAL PERFORMANCE REPORT ON 2017

ANNEXES

CONTENTS

ANNEX TABLE A – CGIAR CONTRIBUTION TO SYSTEM LEVEL OUTCOME TARGETS

Notes:

- The left-hand column records the 'aspirational targets' for 2022 from CGIAR's SRF.[1]
- The second column shows links to relevant SDG targets.[2]
- The third column records available information on global progress against each target. This helps identify areas which are most off track globally and may need additional investment (in actions/research to tackle each area and/or in gathering more evidence on impact of existing actions). Global data is incomplete in many areas, and CGIAR is one of the main contributors to improved data.
- The right-hand column lists recent evidence on the CGIAR contribution to global progress against each target.[3] Mostly this relates to new evidence published in 2017 of adoption and ex-post impact of earlier CGIAR work.[4] There are also some cases of monitoring of current (2017) scaling-up programs. Ex ante projections are not reported. A database of collected adoption and impact evidence is under construction.

[1] CGIAR, "CGIAR Strategy and Results Framework 2016-2030: Redefining How CGIAR Does Business until 2030" (Montpellier, France: CGIAR, 2015), http://hdl.handle.net/10947/3865.

[2] CGIAR has recently mapped all its 'sub-IDOs' (sub-Intermediate Development Outcomes, part of the SRF) to SDG targets, and is incorporating this mapping into Management Information Systems. This will facilitate reporting more closely against specific SDG targets in future years.

[3] These figures cannot be summed or accumulated over years, for a variety of reasons including methodology, disadoption or other changes over time, and the possibility of double-counting some people who may have adopted or benefited from more than one CGIAR innovation.

[4] Because the timeline between initiating agricultural research and ultimate impact at scale is typically 5-25 years, much of the evidence presented relates to earlier CGIAR research. However, the majority of current CGIAR programs build on earlier work and are expected to have the same order of impact.

SRF ASPIRATIONAL TARGET	LINKS TO SDGS	LATEST DATA AVAILABLE ON GLOBAL PROGRESS	RECENT EVIDENCE ON CGIAR CONTRIBUTION TO GLOBAL PROGRESS
1.1 100 million more farm households to have adopted improved varieties, breeds or trees, and/ or improved management practices		**Insufficient global data**  Efforts to track adoption of improved varieties and management practices on a global scale vary widely by methodology, definition, and region. Data quality is better for varietal adoption than for adoption of management practices. Data from smallholder households are expensive and cumbersome to collect, and data based on expert opinion can be unreliable. Current adoption estimates rely on a wide variety of regional case studies and do not necessarily reflect global trends. Estimates of crop variety adoption rates in sub-Saharan Africa specifically show that cropped area of improved varieties increased by 10-15% between 1998 and 2010. Genetic improvements to food crops, including major cereal grains as well as legumes, roots, and tubers, were estimated to have raised aggregate food crop output in sub-Saharan Africa by 15%.[5] SDG data on agriculture has many gaps. Entities such as the Global Strategy to Improve Agricultural and Rural Statistics (GSARS), hosted by the statistics division of the FAO, have been developed in response to this need for robust agricultural data. At CGIAR, approaches using DNA fingerprinting, remote sensing, adjustments to large-scale household surveys, and openly accessible global data will in future enable more rigorous tracking of agricultural technology adoption rates globally.[6]	New evidence on adoption: An estimated 3.1 million farm households in Nigeria (66%, varying across regions) have adopted improved cassava varieties.[7] (Reported by RTB/IITA). Monitoring data for 2017: 271,000 rural households (1.6 million individuals) in Ethiopia were provided with emergency seed of improved varieties, which they grew on 100,000 ha.[8] (Reported by WHEAT) Monitoring data for 2017: In Bangladesh and Nepal, 81,100 farmers (11% women) adopted improved rice varieties and/or management practices on 26,800 ha in 2017.[9] (Reported by RICE) New evidence on adoption: At least 69,540 households in Kenya had adopted CGIAR-informed agroforestry innovations.[10] (Reported by FTA) New evidence on adoption: The GIFT strain of improved tilapia (farmed fish), which continues to be genetically improved over time, has now been disseminated in 16 countries and there are high rates of adoption, with 53% of production in fish hatcheries in Bangladesh and 40% in the Philippines found to use GIFT or GIFT-derived tilapia strains.[11] (Reported by FISH) New evidence on adoption: 60% of the potato area in Peru (approximately 192,000 ha) is planted with improved varieties, and half of this

[5] T.S. Walker and J. Alwang, Crop Improvement, Adoption and Impact of Improved Varieties in Food Crops in Sub-Saharan Africa (CABI, 2015).
[6] J.R. Stevenson, K. Macours, and D. Gollin, "The Rigor Revolution in Impact Assessment: Implications for the CGIAR," (Rome: CGIAR Independent Science and Partnership Council (ISPC), 2018).
[7] T. Wossen et al., "The Cassava Monitoring Survey in Nigeria Final Report" (Ibadan, Nigeria: International Institute of Tropical Agriculture (IITA), 2017); Standing Panel on Impact Assessment (SPIA), "What Is the True Impact of Improved Cassava Varieties in Nigeria?" Brief (Rome, Italy: Independent Science and Partnership Council, 2018).
[8] CIMMYT, "Emergency Seed Support for Drought Affected Maize and Wheat Growing Areas of Ethiopia: 01 January 2016 - 30 June 2017: End of Project Report" (Addis Ababa, Ethiopia: International Maize and Wheat Improvement Center (CIMMYT), 2018).
[9] CSISA, "Cereal Systems Initiative for South Asia Phase III Annual Report 2017," 2017, http://csisa.org/annual-reports/.
[10] K. Hughes et al., "Assessing the Downstream Socioeconomic and Land Health Impacts of Agroforestry in Kenya: Impact Assessment Report" (Independent Science and Partnership Council, 2017).
[11] R.W. Herdt, "Documenting the Impact of Widely-Adopted CGIAR Research Innovations," SPIA Technical Note (Rome, Italy: CGIAR Independent Science & Partnership Council (ISPC) Secretariat, 2018).; Kumar, Ganesh, and Carole R. Engle. "Technological Advances That Led to Growth of Shrimp, Salmon, and Tilapia Farming." Reviews in Fisheries Science & Aquaculture 24, no. 2 (April 2, 2016): 136–52. https://doi.org/10.1080/23308249.2015.1112357.

SRF ASPIRATIONAL TARGET	LINKS TO SDGS	LATEST DATA AVAILABLE ON GLOBAL PROGRESS	RECENT EVIDENCE ON CGIAR CONTRIBUTION TO GLOBAL PROGRESS
			(approximately 30% of the total potato area) is planted with varieties that were released by CGIAR with national partners. The new varieties showed an increase in yields in farmers' fields of about 1 ton/ha, equivalent to an additional average annual profit of US$ 585 per farmer.[12] (Reported by RTB) Updated adoption data: 79 CGIAR-derived winter wheat varieties, including those released between 2000 and 2017 by the Kazakhstan-Siberian Network on Wheat Improvement were grown on 130,000 ha.[13] (Reported by WHEAT.) Updated adoption data: The total area sown with CGIAR Brachiaria hybrids (forage grasses) increased by 103,000 ha in 23 countries in 2017 (monitoring data).[14] Global acreage has nearly doubled since 2013 and is now estimated to be 829,000 ha in 30 countries. In a separate study of five Latin American countries,[15] the total area planted with improved CGIAR Brachiaria varieties (including hybrids) was estimated to be about 3.9 million ha. (Reported by LIVESTOCK) New evidence on increased species conservation: On-farm crop diversity and fruit consumption and/or marketing increased for 160,000 households across Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan.[16] (Reported by FTA) (Note: adoption studies which also contain evidence of impacts such as poverty reduction and nutrition are reported under those targets, below)

[12] W. Pradel et al., "Adopcion e impacto de variedades mejoradas de papa en el Peru: Resultado de una encuesta a nivel nacional (2013)." (Lima, Peru: International Potato Center, 2017), https://doi.org/10.4160/9789290602118.
[13] Annual Reports of the Kazakhstan-Siberia Network on Spring Wheat Improvement (KASIB), 2001-2017, based on unpublished Ministry of Agriculture statistics and Craig T. Beil et al., "Population Structure and Genetic Diversity Analysis of Germplasm from the Winter Wheat Eastern European Regional Yield Trial (WWEERYT)," Crop Science 57, no. 2 (04/01 2017): 812–20, https://doi.org/10.2135/cropsci2016.08.0639.
[14] Estimate based on seed sales data and a conservative sowing rate of 7kg/ha.
[15] R. Labarta et al., "Assessing the Adoption and Economic and Environmental Impacts of Brachiaria Grass Forage Cultivars in Latin America Focusing on the Experience of Colombia," SPIA Technical Report (Rome: Standing Panel for Impact Assessment (SPIA), 2017).
[16] E. Gotor et al., "Livelihood Implications of in Situ-on Farm Conservation Strategies of Fruit Species in Uzbekistan," Agroforestry Systems, January 31, 2017, https://doi.org/10.1007/s10457-017-0069-6.

SRF ASPIRATIONAL TARGET	LINKS TO SDGS	LATEST DATA AVAILABLE ON GLOBAL PROGRESS	RECENT EVIDENCE ON CGIAR CONTRIBUTION TO GLOBAL PROGRESS
1.2 30 million people, of which 50% are women, assisted to exit poverty		**Globally on track**  World Bank data show that the poverty headcount (including those living on less than US$ 1.90 a day) has dropped significantly from 1.73 billion people in 1999 to 783 million in 2013. The average international poverty gap has also dropped from 9.6% in 1999 to 3.3% in 2013.[17] Although gender-disaggregated data are not yet available via the SDGs, are reported to represent about half (50.3%) of the world's extreme poor.[18] Recent statistics show that 80% of the extreme poor live in rural settings.[19]	New evidence on adoption and impact: Around 9.6 million households adopted improved rice varieties (including NERICA) in Africa between 2000 and 2014. The rate of adoption of these varieties increased over these years and was more significant after the 2008 food crisis. Average income from rice more than doubled for NERICA adopters, from US$ 25 per capita to US$ 58 per capita. An estimated 8 million people were lifted out of poverty.[20] (Reported by RICE) New evidence on adoption and impact: In Nigeria, about a quarter (24%) of sampled farmers had adopted drought tolerant maize varieties. Adoption on average reduced the level of downside risk of crop failure by 80% (this is critical for food insecure smallholders) and maize yields were also 13% higher compared to non-adoption. An estimated 2.1 million individuals were lifted out of poverty. A smaller study in southeast Zimbabwe estimated that 30% of farmers had adopted drought tolerant maize and that this provided extra income of US$ 240/ha or more than nine months of food at no additional seed cost.[21] (Reported by MAIZE) New evidence on impact: Gains in cassava productivity in Nigeria are associated with reduced poverty. At a poverty line of US$ 1.25 per person per day and using national adoption estimates from DNA fingerprinting, cassava productivity gains were associated with a reduction in poverty by an estimated 4.7 percentage points, implying that 8.4% of Nigeria's rural poor cassava producers (1.8 million people) escaped poverty in 2015/16.[22] (Reported by RTB/IITA)

[17] World Bank, "PovcalNet," accessed August 31, 2018, http://iresearch.worldbank.org/PovcalNet/povDuplicateWB.aspx.
[18] UN Women Headquarters, "Spotlight on Goal 1: Gender Differences in Poverty and Household Composition through the Life Cycle. World Bank" (World Bank, Washington, DC, 2018), http://www.unwomen.org/en/digital-library/publications/2018/4/gender-differences-in-poverty-and-household-composition-through-the-life-cycle.
[19] UN Women Headquarters, "Turning Promises into Action: Gender Equality in the 2030 Agenda for Sustainable Development" (United Nations Women, 2018), http://www.unwomen.org/en/digital-library/sdg-report.
[20] A. Arouna et al., "Contribution of Improved Rice Varieties to Poverty Reduction and Food Security in Sub-Saharan Africa," Global Food Security, Food Security Governance in Latin America, 14 (September 1, 2017): 54–60, https://doi.org/10.1016/j.gfs.2017.03.001.
[21] T. Wossen et al., "Measuring the Impacts of Adaptation Strategies to Drought Stress: The Case of Drought Tolerant Maize Varieties," Journal of Environmental Management 203 (December 1, 2017): 106–13, https://doi.org/10.1016/j.jenvman.2017.06.058; R.W. Lunduka et al., "Impact of Adoption of Drought-Tolerant Maize Varieties on Total Maize Production in South Eastern Zimbabwe," Climate and Development (September 7, 2017): 1–12, https://doi.org/10.1080/17565529.2017.1372269.
[22] Wossen et al., "The Cassava Monitoring Survey in Nigeria Final Report"; Standing Panel on Impact Assessment (SPIA), "What Is the True Impact of Improved Cassava Varieties in Nigeria?"

SRF ASPIRATIONAL TARGET	LINKS TO SDGS	LATEST DATA AVAILABLE ON GLOBAL PROGRESS	RECENT EVIDENCE ON CGIAR CONTRIBUTION TO GLOBAL PROGRESS
			New evidence on adoption and impact: In Sulawesi, Indonesia, an independent review concluded that approximately 637,000 people (52% women) had improved their income as a result of adopting tree domestication technologies under the Ag-For project.[23] (Reported by FTA) New evidence on adoption and impact: In Yunnan province, China, the estimated present value of economic benefits from planting the Cooperation-88 (C88) potato variety, developed cooperatively by CIP and Chinese researchers and released in 1996, ranged from a low of US$ 2.84 billion to a high of US$ 3.73 billion over a 19-year period.[24] (Reported by SPIA for CIP/RTB)
2.1 Improve the rate of yield increase for major food staples from current <1% to 1.2-1.5%/year (This target range refers to maize, rice and wheat global annual average yield gains, which are based		**Global trends are unclear at this time**  Global data on rice, maize, and wheat show that yield increases will be smaller than hoped. Yields are expected to grow between 2017 and 2026, but not to 1.2-1.5% per year targets. Figures show global yields will rise 0.88% for wheat, 1.01% for maize, and 1.11% for rice.[25] Wheat yield gains in developing countries specifically are more encouraging. Statistics from FAO and USDA indicate that wheat production is increasing in line with 1.5% goals.[26] No data is available on whether gains are achieved through "sustainable intensification".	*Studies of yield increases at scale that also contain evidence of impacts such as poverty reduction and nutrition are reported instead under those targets – see other rows in this table.* New evidence on yields: A major review of the adoption of NERICA and other improved rice varieties in Africa[27] (see above) reported positive and significant impacts of improved rice varieties on on-farm yields, with estimated impact ranging from 0.16 to 0.71 tons/ha. In many cases, yields and total factor productivity (TFP) gains were significantly higher for women rice farmers than for men (e.g. average TFP of rice farming increased by 38% for women and 25% for men in a study in Benin. However, there appeared to be a decreasing trend in the impact on yield observed over the years, estimated at 0.03 tons per ha per year. This is probably due to farmers saving their own poor-quality seed and not buying new certified seed. (Reported by RICE)

[23] N. Khususiyah et al., "Dampak Pendampingan Terhadap Penghidupan Petani Agroforestri Di Sulawesi Tenggara," Brief (Bogor, Indonesia: World Agroforestry Centre (ICRAF) Southeast Asia Regional Program), accessed September 8, 2018, http://www.worldagroforestry.org/region/sea/publications/detail?pubID=4043;
J.M. Roshetko et al., "Agroforestry and Forestry in Sulawesi: Linking Knowledge with Action (AgFor) Project. End of Project Report" (Bogor, Indonesia: World Agroforestry Centre (ICRAF) Southeast Asia Regional Program; Center for International Forestry Research; Bau Bau, Indonesia: Operation Wallacea Trust; Makassar, Indonesia: Faculty of Forestry, Hasanuddin University, 2017), http://www.worldagroforestry.org/region/sea/publications/detail?pubID=4042.

[24] Robert W. Herdt, "Documenting the Impact of Widely-Adopted CGIAR Research Innovations," SPIA Technical Note (Rome, Italy: CGIAR Independent Science & Partnership Council (ISPC) Secretariat, 2018); ISPC, "Adoption and Impact of Cooperation-88 Potato in China," Brief (Rome: CGIAR Independent Science & Partnership Council (ISPC), 2018), https://ispc.cgiar.org/publications/adoption-and-impact-cooperation-88-potato-china.

[25] OECD and Food and Agriculture Organization of the United Nations, "OECD-FAO Agricultural Outlook (Edition 2018)," https://doi.org/10.1787/d4bae583-en, 2018, https://www.oecd-ilibrary.org/content/data/d4bae583-en.

[26] FAO, "FAOStat," Crop Production, accessed August 31, 2018, http://www.fao.org/faostat/en/#data.

[27] Arouna et al., "Contribution of Improved Rice Varieties to Poverty Reduction and Food Security in Sub-Saharan Africa."

SRF ASPIRATIONAL TARGET	LINKS TO SDGS	LATEST DATA AVAILABLE ON GLOBAL PROGRESS	RECENT EVIDENCE ON CGIAR CONTRIBUTION TO GLOBAL PROGRESS
on national averages of actual on-farm yield gains, achieved through germplasm improvement and sustainable intensification			New evidence on adoption and yields: A survey in western Bangladesh, checked with DNA fingerprinting, indicates that improved lentil varieties, developed by CGIAR and the Bangladesh Agricultural Research Institute, may have increased lentil production in Bangladesh by an estimated 52,600 tons per year (about 27%).[28] Improved lentil varieties have almost completely replaced landraces: approximately 99% of the 150,000 ha of lentil area in the rice-lentil system are planted with varieties released after 1995, and 69% of the area with varieties released after 2005. Modeling showed that adoption of newer (post-2005) varieties was associated with average on-farm yield increases of 382 kg/ha (29%). (Reported by SPIA, for GLDC) New evidence on yields: Using DNA-fingerprinted adoption data suggests that improved varieties are associated with an 82% increase in cassava yields in Nigerian farmers' fields.[29] (Reported by RTB/IITA.)
2.2 30 million more people, of which 50% are women, meeting minimum dietary energy requirements		**Global trends are unclear at this time**  The number of undernourished people dropped by 211 million people between the 2000-2002 three-year average and the 2014-2016 three-year average.[30] However, the most recent statistics from 2016 show an increase in the total number of undernourished people by 38 million, reversing years of progress.[31] Global data on undernourishment by sex is not yet available, however data from the 2014–2015 FAO Food Insecurity Experience Scale (FIES) survey indicates that from a national representative sample of adults, women were more likely to report food insecurity in almost two-thirds of the 141 surveyed countries.[32]	New evidence on food security: According to a major review published in 2017[33], adoption of improved rice varieties substantially enhanced food consumption in the households of rice producers in Africa. The impact varied seasonally. During the abundance period, (first 3–4 months after harvest), 33% of households that adopted NERICA varieties and 25% of those that adopted other improved rice varieties shifted from 'poor food consumption' to 'acceptable food consumption'. During the scarcity period (3–4 months before harvest, the proportion of households lifted out of food insecurity, due to the adoption of any improved rice variety, increased to 45%. These numbers correspond to about 300,000 households in sub-Saharan Africa lifted out of food insecurity in the abundance period and 900,000 households in the scarcity period. (Reported by RICE)

[28] ISPC, "Adoption and Impact of Improved Lentil Varieties in Bangladesh, 1996-2015," Brief (Rome: CGIAR Independent Science & Partnership Council (ISPC), 2018), https://ispc.cgiar.org/publications/adoption-and-impact-improved-lentil-varieties-bangladesh-1996-2015; Herdt, "Documenting the Impact of Widely-Adopted CGIAR Research Innovations."
[29] Wossen et al., "The Cassava Monitoring Survey in Nigeria Final Report"; Standing Panel on Impact Assessment (SPIA), "What Is the True Impact of Improved Cassava Varieties in Nigeria?"
[30] FAO, "FAOStat."
[31] FAO, "News Article: World Hunger on the Rise Again, Reversing Years of Progress," accessed August 31, 2018, http://www.fao.org/news/story/en/item/902489/icode/.
[32] J.C. Ruel-Bergeron et al., "Global Update and Trends of Hidden Hunger, 1995-2011: The Hidden Hunger Index," PLOS ONE 10, no. 12 (December 16, 2015): e0143497, https://doi.org/10.1371/journal.pone.0143497.
[33] Arouna et al., "Contribution of Improved Rice Varieties to Poverty Reduction and Food Security in Sub-Saharan Africa."

SRF ASPIRATIONAL TARGET	LINKS TO SDGS	LATEST DATA AVAILABLE ON GLOBAL PROGRESS	RECENT EVIDENCE ON CGIAR CONTRIBUTION TO GLOBAL PROGRESS
			New evidence on child nutrition: Modeling based on a household survey in Ethiopia[34] found significantly positive effects of adoption of improved varieties on the height for age and weight for age of children under 5 (of the order of 0.5 Z-score), with increased consumption of homegrown maize being the major contributor to this result. Previous work has shown that maize is the most common crop on Ethiopian farms and 76% percent of maize produced is consumed at home; a survey in 2011 estimated[35] that 27% of households had adopted improved varieties. (Reported by MAIZE)

[34] Di Zeng et al., "Agricultural Technology Adoption and Child Nutrition Enhancement: Improved Maize Varieties in Rural Ethiopia," Agricultural Economics 48, no. 5 (September 1, 2017): 573–86, https://doi.org/10.1111/agec.12358.

[35] M. Jaleta, M. Kassie, and P. Marenya, "Impact of Improved Maize Variety Adoption on Household Food Security in Ethiopia: An Endogenous Switching Regression Approach" (2015 Conference, August 9-14, 2015, Milan, Italy: International Association of Agricultural Economists, 2015), https://ideas.repec.org/p/ags/iaae15/211566.html.

SRF ASPIRATIONAL TARGET	LINKS TO SDGS	LATEST DATA AVAILABLE ON GLOBAL PROGRESS	RECENT EVIDENCE ON CGIAR CONTRIBUTION TO GLOBAL PROGRESS
2.3 150 million more people, of which 50% are women, without deficiencies of one or more of the following essential micronutrients: iron, zinc, iodine, vitamin A, folate, and vitamin B12		**Globally off track** **Overall**  In low- and middle-income countries, where diets tend to be poor quality, people frequently have overlapping micronutrient deficiencies. The Hidden Hunger Index (HHI) documents the distribution and prevalence of three common micronutrient deficiencies (zinc, iron-deficiency anemia, and vitamin A) using a composite indicator. A comparison of changes in HHI scores from 1995 to 2011 showed a 6.7 net decrease in hidden hunger globally.[36] Countries that were most successful in improving their score were concentrated in Southeast Asia (e.g. Cambodia, Indonesia, Myanmar, and Vietnam), whereas the five worst performing countries in terms of the HHI were in sub-Saharan Africa. Those countries had also experienced times of significant conflict and/or food insecurity due to climate-related shocks (e.g. drought and floods) during that same period (1995 to 2011). The authors concluded that improvements observed were mostly due to reductions in zinc and vitamin A deficiencies, while anemia due to iron deficiency persisted and even increased. As with other targets, there are significant data gaps for population-level estimates of micronutrient status. For example, the majority of vitamin A deficiency prevalence data comes from surveys conducted in the 1990s.[37] Expert opinion insists that to determine how to meet the SDGs or other targets, nationally representative data needs to be collected frequently from more countries and on more micronutrients than has been the pattern in the past.	Monitoring systems data from 2017:[42] 3.2 million farming households were 'reached' with biofortified planting material, bringing the total estimated number of farming households benefiting from biofortified crops globally to 6.7 million. For vitamin A crops this included 3.7 million households in 10 countries, for iron crops 1.7 million households in 8 countries, and for zinc crops 1.6 million households in 6 countries (note total > 6.7 million as some received multiple crops). (Reported by HarvestPlus/A4NH) Monitoring systems data from 2017: There is emerging evidence that aflatoxin exposure is associated with micronutrient deficiency[43] in children. In sub-Saharan Africa, more than 100,000 ha were treated with Aflasafe© by 66,787 farmers during 2017, allowing production of maize and groundnut with safe aflatoxin levels. Large-scale use of Aflasafe© contributed to improved food safety (e.g. in Nigeria 91% of samples had less than 20 ppb) and increased the income of smallholder maize farmers (average 11.5% more than regular maize).[44] (Reported by A4NH)

[36] Ruel-Bergeron et al., "Global Update and Trends of Hidden Hunger, 1995-2011."
[37] G.A. Stevens et al., "Trends and Mortality Effects of Vitamin A Deficiency in Children in 138 Low-Income and Middle-Income Countries between 1991 and 2013: A Pooled Analysis of Population-Based Surveys," The Lancet Global Health 3, no. 9 (September 1, 2015): e528–36, https://doi.org/10.1016/S2214-109X(15)00039-X.
[42] HarvestPlus, "Biofortification: The Evidence: A Summary of Research That Supports Scaling up of Biofortification to Improve Nutrition and Health Globally" (HarvestPlus, 2018).
[43] S. Watson et al., "Dietary Exposure to Aflatoxin and Micronutrient Status among Young Children from Guinea," Molecular Nutrition & Food Research 60, no. 3 (March 2016): 511–18, https://doi.org/10.1002/mnfr.201500382.
[44] AgResults Secretariat, "Nigeria Aflasafe Pilot" (AgResults), http://agresults.org/.

SRF ASPIRATIONAL TARGET	LINKS TO SDGS	LATEST DATA AVAILABLE ON GLOBAL PROGRESS	RECENT EVIDENCE ON CGIAR CONTRIBUTION TO GLOBAL PROGRESS
		Vitamin A: Regional trends in vitamin A deficiency (VAD) in children under 5 years of age suggest there have been significant declines in the prevalence of VAD between 1991 and 2013 in East Asia, Southeast Asia, and Oceania (42% to 6%) and in Latin America and the Caribbean (21% to 11%). Prevalence rates in Africa south of the Sahara and in South Asia remain persistently high (48% and 44% respectively).[38] Zinc: Global data on zinc levels are difficult to find. Data from Wessells et al.[39] show little progress between 1990 and 2005, where similar numbers of countries are tagged as "high risk" (greater than 25% of the population with inadequate zinc intake). Iron: In a comparison of changes in Hidden Hunger Index (HHI) scores from 1995 to 2011, in most countries, anemia due to iron deficiency persisted and even increased.[40] Among the 186 countries with sufficient data, 137 showed no or worsening progress since 2012 in reducing the percentage of women of reproductive age with anemia.[41]	

[38] Stevens et al., "Trends and Mortality Effects of Vitamin A Deficiency in Children in 138 Low-Income and Middle-Income Countries between 1991 and 2013: A Pooled Analysis of Population-Based Surveys."
[39] K.R. Wessells and K.H. Brown, "Estimating the Global Prevalence of Zinc Deficiency: Results Based on Zinc Availability in National Food Supplies and the Prevalence of Stunting," PLOS ONE 7, no. 11 (November 29, 2012): e50568, https://doi.org/10.1371/journal.pone.0050568.
[40] Ruel-Bergeron et al., "Global Update and Trends of Hidden Hunger, 1995-2011."
[41] Development Initiatives, "Global Nutrition Report 2017: Nourishing the SDGs." (Bristol, UK: Development Initiatives Poverty Research Ltd.), accessed August 31, 2018, http://globalnutritionreport.org/the-report/.

SRF ASPIRATIONAL TARGET	LINKS TO SDGS	LATEST DATA AVAILABLE ON GLOBAL PROGRESS	RECENT EVIDENCE ON CGIAR CONTRIBUTION TO GLOBAL PROGRESS
2.4 10% reduction in women of reproductive age who are consuming less than the adequate number of food groups		**Globally off track**  With the introduction of the Minimum Dietary Diversity for Women (MDD-W) indicator, there are a number of new and ongoing initiatives, many of them linked to CGIAR researchers, to collect and catalog food consumption data so that the minimum dietary diversity data for women of reproductive age could be calculated.[45] This data may show improvements in the consumption of adequate food groups; however, current statistics on rising undernourishment[46], and growing rates of anemia among women of reproductive age[47] are not encouraging. Statistics show increasing per capita vegetable availability between 2000 and 2013 (from 29.98 kg per person per year to 41.52 kg per person per year among Least Developed Countries).[48] Unfortunately, these figures represent national averages of availability and do not account for access to or utilization of food groups among women in particular.	No new evidence in 2017. This is due mainly to the fact that very few impact studies measure this indicator.
3.1 5% increase in water and nutrient (inorganic, biological) use efficiency in agro-ecosystems, including through recycling and reuse		**Globally off track**  There is no measurement of either water or nutrient efficiency at a significant scale. There are reported statistics of water use in agriculture and mineral fertilizer use which are reported which provide partial information on these indicators. Global initiatives to promote water use efficiency are encouraging. For example, 50% of countries have implemented water resource management plans in conjunction with the SDGs.[49] However, no improvements in water and nutrient use efficiency have been made	No new evidence in 2017. Further impact work required.

[45] "Data4Diets - INDDEX Project," accessed August 31, 2018, https://inddex.nutrition.tufts.edu/data4diets.
[46] FAO, "News Article: World Hunger on the Rise Again, Reversing Years of Progress."
[47] FAO, "FAOStat."
[48] FAO, "FAOStat," Food Balance Sheets, accessed August 31, 2018, http://www.fao.org/faostat/en/#data/FBS.
[49] United Nations Economic and Social Council, "Progress towards the Sustainable Development Goals: Report of the Secretary-General" (United Nations Economic and Social Council, 2017), https://unstats.un.org/sdgs/files/report/2017/secretary-general-sdg-report-2017--EN.pdf.

SRF ASPIRATIONAL TARGET	LINKS TO SDGS	LATEST DATA AVAILABLE ON GLOBAL PROGRESS	RECENT EVIDENCE ON CGIAR CONTRIBUTION TO GLOBAL PROGRESS
		globally, as limited advances in some countries are outstripped by lack of advances in most countries in development.[50] Recent CGIAR data show that water reuse is more prominent than previously thought, given that about 30 million ha are indirectly receiving wastewater, while flagging the need for risk reduction, as this water is commonly untreated.[51] Fertilizer use efficiency is not currently monitored globally but modelled similarly to yield improvements. Inorganic/chemical fertilizer use in kilograms per hectare of arable land is increasing globally. The estimates generally do not include organic fertilizer, such as animal and plant/green manures (CGIAR programs usually encourage the combined use of organic and inorganic fertilizers, which improve farm-level and plant-level use-efficiencies). The significance of increased use in terms of efficiency depends upon baseline levels of use in different parts of the world. For example, baseline use in Africa is different from baseline use in North America, thus progress toward 'efficient' use differs among regions. In addition, low baseline levels can cause as much environmental damage as too high fertilizer rates, e.g. from accelerated soil erosion due to poor soil cover, and leaching of mineralized nitrogem to insufficient uptake demand. Globally, fertilizer use has increased from 106.4 kg per hectare of arable land in 2002 to 137.6 kg in 2015.[52] A summary from FAO World Fertilizer Trends and Outlook to 2020[53] projects the demand for nitrogen, phosphate and potassium to grow annually on average by 1.5%, 2.2%, and 2.4% respectively, from 2015 to 2020. Though global data on fertilizer use efficiency is not available, increases in use per hectare of arable land do not imply progress with regard to efficiency.	

[50] F. Jaramillo and G. Destouni, "Local Flow Regulation and Irrigation Raise Global Human Water Consumption and Footprint," Science 350, no. 6265 (December 4, 2015): 1248–51, https://doi.org/10.1126/science.aad1010; M. Rodell et al., "Emerging Trends in Global Freshwater Availability," Nature 557, no. 7707 (May 2018): 651–59, https://doi.org/10.1038/s41586-018-0123-1.

[51] A.L. Thebo et al., "A Global, Spatially-Explicit Assessment of Irrigated Croplands Influenced by Urban Wastewater Flows," Environmental Research Letters 12, no. 7 (2017): 074008, https://doi.org/10.1088/1748-9326/aa75d1.

[52] World Bank, "World Bank Data," Fertilizer consumption (kilograms per hectare of arable land), accessed August 31, 2018, https://data.worldbank.org/indicator/AG.CON.FERT.ZS.

[53] FAO, "World Fertilizer Trends and Outlook to 2020: A Summary" (Rome: Food and Agriculture Organization of the United Nations (FAO), 2017), http://www.fao.org/3/a-i6895e.pdf.

SRF ASPIRATIONAL TARGET	LINKS TO SDGS	LATEST DATA AVAILABLE ON GLOBAL PROGRESS	RECENT EVIDENCE ON CGIAR CONTRIBUTION TO GLOBAL PROGRESS
3.2 Reduction in agricultural-related greenhouse gas emissions by 0.2 Gigatonnes (Gt) CO_2e per year (5%) compared with business-as-usual scenario in 2022		**Globally off track**  Global greenhouse gas emissions by the agricultural sector are rising globally (i.e. not including carbon sinks like trees). Gross agriculture-based greenhouse gas emissions, measured in carbon-dioxide equivalents (CO_2e) have risen from 4.66 Gt in 2000, to 4.88 Gt in 2006, to 5.04 Gt in 2010.[54] Under a business-as-usual scenario, emissions are projected to rise to 5.76 Gt in 2030 and 6.31 Gt in 2050.[55] Data from Climate Action Tracker shows different projections in greenhouse gas emissions based on a number of scenarios. These projections offer hope that evidence-informed policies can lead to reduced emissions. For example, emissions with no climate policies in place, under current climate policies, and with more aggressive national pledges beyond those reached within the Paris Agreement.[56] Recent research on agriculture specifically suggests that more technical and scaling work is needed, as using current technology will only achieve 21-40% of the mitigation required to meet targets.[57]	New evidence and modeling: An expected return-on-investment study of the FTA contribution to fire prevention regulations in Indonesia's Riau province estimates that if the new regulation achieves a 50% reduction in fires in the province annually, given FTA's contribution to the policy development process, there is an attributable contribution to avoided emissions through this reform process of up to 1.26 million tons annually. This is a 3% reduction based on World Bank estimates for 40.8 million tons emitted in 2015. (Reported by FTA) New evidence and modeling: An ex-post impact study of a co-management forestry project by CGIAR and partners in Guinea LAMIL, undertaken eight years after the end of the project, found that net rates of forest decline were 4% lower in areas which had been involved with the project.[58] This resulted in moderate amounts of retained natural forest and sequestered carbon—the area of natural forest retained due to LAMIL was about 11 square kilometers (km^2) in 2010, 24 km^2 in 2014, and about 14 km^2 in 2016. The associated social value of carbon ranges from US$ 6.9 million to US$ 13.8 million (at US$ 20 and US$ 40 per ton of carbon, respectively). (Reported by FTA)

[54] FAO, "FAOStat," Agriculture Total, accessed August 31, 2018, http://www.fao.org/faostat/en/#data/GT/visualize.
[55] FAO, "FAOStat."
[56] Global Partnership on Forest Landscape Restoration (GPFLR), "Atlas of Forest Landscape Restoration Opportunities," 2016, http://www.wri.org/applications/maps/flr-atlas/#&init=y.
[57] E. Wollenberg et al., "Reducing Emissions from Agriculture to Meet the 2 °C Target," Global Change Biology 22, no. 12 (December 1, 2016): 3859–64, https://doi.org/10.1111/gcb.13340.
[58] Mills, Nelson, and Achdiawan, "Into the Forest with or Without a Trace? A Multi-Level Impact Analysis of Forest Co-Management in Guinea. Unpublished Report Submitted to the Standing Panel on Impact Assessment (SPIA) of the ISPC."; Standing Panel on Impact Assessment (SPIA), "Impacts of Co-Management Activities on Forests and Households in Guinea."

SRF ASPIRATIONAL TARGET	LINKS TO SDGS	LATEST DATA AVAILABLE ON GLOBAL PROGRESS	RECENT EVIDENCE ON CGIAR CONTRIBUTION TO GLOBAL PROGRESS
3.3 55 million hectares (ha) of ecosystem restored, including degraded land area and aquatic ecosystems		**Insufficient global data**  Over the years, a number of approaches have been taken with regard to assessing land degradation. For this reason, it is difficult to find a harmonized global dataset. Even in FAO's soil database, only three years have been tracked globally, with each year monitoring a different variable. Approaches introduced in the guidelines for reporting on SDG 15.3.1, as well as digital soil mapping techniques, will hopefully allow for more harmonized land degradation data across regions and time periods. While increases in land use in and out of agriculture are tracked (FAOStat), these do not cover changes in land quality within agriculture. Thus, it will be important to track land degradation in future. The Atlas of Forest Landscape Restoration Opportunities highlights that 2 billion hectares of the world's deforested and degraded forest lands contain opportunities for restoration—including mosaic restoration, where trees can be integrated into mixed-use landscapes such as smallholder agricultural lands and settlements.[59] In September 2011, a number of countries and institutions set a global target to restore 150 million hectares of degraded and deforested lands by 2020. To date, the Bonn Challenge has received 47 national and institutional commitments targeting the restoration of 160.2 million hectares. Political commitment to restore degraded lands is thus encouraging, as well as efforts to produce harmonized data and tracking as part of SDG 15.3.1.	New survey evidence: From impact studies in Kenya and Malawi, it was estimated that improved agroforestry innovations are being practiced on at least 66,167 ha of partially degraded land.[60] (Reported by FTA) New evidence of contribution to this outcome: 186,050 ha of water area is under improved management in Bangladesh, through co-management in Bangladesh and (as yet unquantified) progress made in Solomon Islands, Cambodia, and Myanmar.[61] (Reported by FISH)

[59] Global Partnership on Forest Landscape Restoration (GPFLR), "Atlas of Forest Landscape Restoration Opportunities."
[60] Hughes et al., "Assessing the Downstream Socioeconomic and Land Health Impacts of Agroforestry in Kenya: Impact Assessment Report"
[61] I.M. Dutton, M.S. Hossain, and H. Kabir, "Midterm Performance Evaluation Report of USAID/Bangladesh Enhanced Coastal Fisheries (ECOFISH) Project," Accelerating Capacity for Monitoring and Evaluation (ACME) (United States Agency for International Development (USAID), 2018).

SRF ASPIRATIONAL TARGET	LINKS TO SDGS	LATEST DATA AVAILABLE ON GLOBAL PROGRESS	RECENT EVIDENCE ON CGIAR CONTRIBUTION TO GLOBAL PROGRESS
3.4 2.5 million ha of forest saved from deforestation		**Global trends are unclear at this time**  The global rate of forest loss has decreased by 25% since the 2000-2005 period. FAO has also indicated "positive change" for three of the five SDG 15.2.1 sub-indicators.[62] Despite these positive trends, deforestation and forest degradation are still a concern, particularly in the tropics. According to the World Bank, the world lost 564,686 square kilometers of forest between 2000 and 2015.[63] Data on SDG 15.1.1 reveals that forest area (as a percentage of total land area) decreased from 31.15% in 2000 to 30.71% in 2015. Most of the losses occurred in sub-Saharan Africa, Southeast Asia, and Latin America, and are largely attributed to the expansion of agriculture.[64] Hansen et al.[65] used Earth observation satellite data to map global forest loss (2.3 million square kilometers) and gain (0.8 million square kilometers) from 2000 to 2012. Tropical areas showed both the greatest losses and the greatest gains (due to regrowth and/or planting). Brazil notably reduced deforestation, but forest loss increased in Indonesia, Malaysia, Paraguay, Bolivia, Zambia, and Angola.	No examples provided for 2017, apart from the LAMIL example reported under Target 3.2.

[62] FAO, "15.2.1 Sustainable Forest Management, Sustainable Development Goals, Food and Agriculture Organization of the United Nations," accessed August 31, 2018, http://www.fao.org/sustainable-development-goals/indicators/1521/en/.
[63] World Bank, "World Bank Data," Forest area (sq. km), accessed August 31, 2018, https://data.worldbank.org/indicator/AG.LND.FRST.K2.
[64] FAO, "15.1.1 Forest Area, Sustainable Development Goals, Food and Agriculture Organization of the United Nations," accessed August 31, 2018, http://www.fao.org/sustainable-development-goals/indicators/1511/en/.
[65] M.C. Hansen et al., "High-Resolution Global Maps of 21st-Century Forest Cover Change," Science 342, no. 6160 (November 15, 2013): 850–53, https://doi.org/10.1126/science.1244693.

ANNEX TABLE B – COMMON RESULTS REPORTING INDICATORS

Note: This was the first year of reporting against this indicator set, and the definitions and guidance are still being improved following the pilot. There is only partial reporting against some indicators. Some numbers may change slightly following finalization of data checks.

COMMON REPORTING INDICATORS [66]	TOTALS FOR 2017	HIGHLIGHTS AND LINKS TO MORE DETAILS
Number of policies, legal instruments, investments and similar modified in their design or implementation in 2017, informed by CGIAR research	72 policies/strategies 4 legal instruments 31 investments 5 curricula Total 112	Among those reported for 2017 were contributions to the design or redesign of: 13 global policies/legal instruments 42 national policies/legal instruments in more than 30 countries 28 national or international-level investments See main text for examples. Details can be explored further in Policies/Investments informed by CGIAR Research
Altmetric (mentions on media and social media of CGIAR publications, both peer-reviewed papers and others)	Seven of 14 CRPs are currently tracking their publications via Altmetric. For 2017, CRPs provided statistics on 1,208 publications, including peer-reviewed publications, briefs, manuals, reports, and others. A total of 799 (66%) of these publications received: **45 total policy document citations** from institutions such as FAO, the World Health Organization, the World Economic Forum and the World Bank **540 total news mentions** in sources such as Newsweek, National Geographic, The Japan Times, The Times of India, Al Jazeera, Business Insider, El País, The Guardian, The Zimbabwe Star, AllAfrica, and BBC News. **12,906 Tweets** **16,473 saves on Mendeley**	*Notes: All these numbers reflect scores taken from early July 2018. Scores are expected to rise as 2017 publications continue to be shared.* Keep in mind that tracking via this method is very new. These scores provide a rough overview of how CGIAR publications are shared, but do not cover all CGIAR publications nor do they reflect sharing activity on all forms of social and news media. Information about what constitutes a 'good' score can be found here. Both CGIAR and Altmetric are working to improve tracking capacity for 2018. Highlighted examples of Altmetric scores are in Table D. Full Altmetric scores for 2017 can be explored further in Altmetric reported for CGIAR Publications in 2017.

[66] Note: these are strictly 'reporting metrics', not 'indicators'. They should not be used mechanistically for performance assessment, direct comparison of programs or examination of trends over time. The reasons for this are explained fully elsewhere in the context of the CGIAR performance assessment system. For one thing, most of the indicators are potentially gameable and this creates perverse incentives for researchers (e.g. a focus on 'number of publications' as a performance metric, has been recorded from many research organizations worldwide to result in splitting up publications to get higher numbers in less prestigious journals). Their main value is not as numbers, but as pointers to the underlying databases.

COMMON REPORTING INDICATORS	TOTALS FOR 2017	HIGHLIGHTS AND LINKS TO MORE DETAILS
People trained by CGIAR in 2017	348,927 (40% women)	Long term (degree or other long courses): 1,700 (30% women) Short term: 149,408 (19% women) Not specified: 197, 819 (55% women) Numbers were not consistently reported due to late introduction of this indicator – this will improve for 2018
CGIAR Partnerships	1,961 reported	994 (51% of total) in research phase, up to proof of concept 205 (11%) in piloting phase 647 (33%) in scaling/delivery phase 16 (1%) reported partnering across more than one phase 88 (5%) not defined Types of partners were not fully recorded in 2017. From a subset of partnerships that CRPs recorded as among their most important (n=268): ■ 50% were Academic and Research institutions, both national and international ■ 22% were development organizations (NGOs, networks, regional organizations and International Financial Institutions (IFIs) such as development banks) ■ 12% were private sector ■ 9% were national government institutions (for example, the Ministry of Health) ■ 5% were community-based organizations and farmers' groups ■ 2% were funding agencies, including foundations and donors (excluding IFIs) A list of the top partners reported by CRPs in 2017 is in Selected external partnerships in 2017.
Number of CGIAR innovations	616 innovations were reported, of which: 134 were at Stage 1: end of research phase 66 were at Stage 2: end of piloting phase 348 were available for uptake: see table C (list of innovations/ findings available for use) 68 were available for uptake by next users	Of innovations newly available for uptake (stage 3) in 2017 (n=348): 68 (20%) represented Research and Communication Methodologies and Tools (the CGIAR is well-known for its methods and tools, used by many other researchers and practitioners) 228 (66%) were genetic innovations (varieties/ breeds) 32 (9%) were production systems and management practices 11 (3%) were significant social science findings and evidence 9 (3%) related to biophysical research (e.g. computational biology, decision support tools, geospatial analysis). Of these, 67% were reported as novel and 33% were reported as adaptive (adaptations of previous innovations for new areas, situations etc.) (n=348). The full list is available in CGIAR Innovations in 2017.

COMMON REPORTING INDICATORS	TOTALS FOR 2017	HIGHLIGHTS AND LINKS TO MORE DETAILS
Number of peer-reviewed publications authored/co-authored by CGIAR researchers	1,764 reported	61% are open access 86% have been published in ISI publications[67] CGIAR open data and publications can be explored further in CRP Publications in 2017.

Note: This is the first year of reporting these indicators and they were introduced late in the reporting year, so numbers are incomplete. Altmetrics was reported only by CRPs where this was already in use, so excludes 4 CRPs and 3 platforms. Geographic breakdown was not possible for all CRPs this year, but there will be more information on geographic area in future.

[67] Average of 5 CRPs and 1 Platform who reported this: CCAFS, FTA, Livestock, Wheat, RTB, and Big Data publications

ANNEX TABLE C – LIST OF KEY CGIAR INNOVATIONS AVAILABLE FOR UPTAKE IN 2017

Note: 'Available for use' could mean for example that a variety has been released, a technique is ready to promote through extension recommendations or a significant finding (for example, about gender or social science) is robust and ready for use in policy or programming.

CRP	TITLE OF INNOVATION	INNOVATION TYPE	STAGE OF INNOVATION	LOCATION
A4NH	Multi-sectoral policy platform to promote best practices and pilot programs around biodiversity in Kenya	Methods and Tools	3-AV	Kenya
A4NH	New evidence on positive effects of consumption of iron biofortified beans in Rwanda	Social Science	3-AV	Rwanda
A4NH	Iron Beans: INTA BIODOR (SMR 88)	Genetic	3-AV	Nicaragua
A4NH	Vitamin A Orange Maize: variety MH44A	Genetic	3-AV	Malawi
A4NH	Zinc Rice: DRR Dhan 49	Genetic	3-AV	India
A4NH	Zinc Rice: Binadhan 20	Genetic	3-AV	Bangladesh
A4NH	Zinc Rice: BRRI Dhan84	Genetic	3-AV	Bangladesh
A4NH	Vitamin A Orange Maize: LY1001-14	Genetic	3-AV	DRC
A4NH	Iron Beans: NCC 34	Genetic	3-AV	.
A4NH	Vitamin A Orange Sweet Potato: IDIAP C9017	Genetic	3-AV	Panama
A4NH	Vitamin A Orange Sweet Potato: IDIAP C0317	Genetic	3-AV	Panama
A4NH	Vitamin A Orange Maize: RAHA02 (HP942-15)	Genetic	3-AV	Rwanda
A4NH	Vitamin A Orange Maize: RAHA04 (HP942-12)	Genetic	3-AV	Rwanda
A4NH	Vitamin A Orange Maize: RAHA01 (GV665A)	Genetic	3-AV	Rwanda
A4NH	Vitamin A Orange Maize: RAHA03 (ST50-13)	Genetic	3-AV	Rwanda
A4NH	Iron Beans: ICTA Chorti-ACM (SMN 39)	Genetic	3-AV	Guatemala
A4NH	Zinc Wheat: HPBW-01 (Ankur Shiva)	Genetic	3-AV	India
A4NH	Zinc Wheat: variety WB-02	Genetic	3-AV	India
A4NH	Zinc Wheat: BARI-Gom33	Genetic	3-AV	Bangladesh
A4NH	Zinc Maize: DICTA B03	Genetic	3-AV	Honduras
A4NH	Zinc Maize: DICTA B02	Genetic	3-AV	Honduras
A4NH	Zinc Wheat: BHU-31	Genetic	3-AV	India
A4NH	Zinc Wheat: BHU-25	Genetic	3-AV	India
A4NH	Iron Beans: INTA BIOF100 (SMR 100)	Genetic	3-AV	Nicaragua
A4NH	Iron Millet: DHBH 1211	Genetic	3-AV	India
A4NH	Iron Millet: AHB 1200 (MH 2072)	Genetic	3-AV	India
A4NH	Iron Millet: HHB 299 (MH 2076)	Genetic	3-AV	India
A4NH	Vitamin A Orange Maize: Sammaz 52 (PVA SYN 13)	Genetic	3-AV	Nigeria
A4NH	Vitamin A Orange Cassava: YBI2011/323	Genetic	3-AV	.
A4NH	Vitamin A Orange Cassava: GKA 2011/274	Genetic	3-AV	DRC
A4NH	Vitamin A Orange Cassava: MVZ 2011B/360	Genetic	3-AV	DRC
A4NH	Aflatoxin control: Aflasafe BF01 product for Burkina Faso and potentially 10 other countries in the Sahel	Production systems	3-AV	Burkina Faso

CRP	TITLE OF INNOVATION	INNOVATION TYPE	STAGE OF INNOVATION	LOCATION
A4NH	Aflatoxin control: Aflasafe product GH01 and GH02 for Ghana	Production systems	3-AV	Ghana
A4NH	Aflatoxin control: Aflasafe product for Nigeria	Production systems	3-AV	Nigeria
A4NH	Development intervention: Pig diets for human nutrition and gender equity	Production systems	3-AV	Uganda
A4NH	Surveillance tool for improving disease control: Predictive mapping for climate-sensitive diseases in Vietnam	Biophysical Research	3-AV	Vietnam
A4NH	Research and policy tool: Risk assessment for food transmitted disease	Social Science	3-AV	Uganda
A4NH	Research tool: spatial, seasonal and climatic predictive models of Rift Valley fever disease across Africa (affects domestic animals and humans)	Methods and Tools	3-AV	Regional: Sub-Saharan Africa
A4NH	Research and policy tools: Research tool conceptual framework	Social Science	3-AV	Global
A4NH	Development intervention: guidance for program planning	Social Science	3-AV	Regional: Western Africa
A4NH	eSurveillance' tool for Food Borne Diseases (FBD): SMS reporting of disease by village animal health workers in Kenya	Biophysical Research	3-AV	Kenya
A4NH	Development intervention: training and certification intervention for traders/ slaughterhouse workers to improve food safety (dairy in Kenya, dairy in Assam, butchers in Nigeria)	Methods and Tools	3-AV	Kenya, India, Nigeria
A4NH	Stories of Change, a structured case study approach which systematically assesses and analyses drivers of nutritional change in specific country contexts. These resulting 'stories' aim to improve our understanding of what drives impact in reducing undernutrition, and how enabling environments and pro-nutrition policy and implementation processes can be cultivated and sustained.	Methods and Tools	3-AV	Global
A4NH	District nutrition profiles for India	Biophysical Research	3-AV	India
A4NH	Project-Level Women's Empowerment in Agriculture Index (pro-WEAI), a new survey-based index for measuring empowerment, agency, and inclusion of women in the agriculture sector.	Social Science	3-AV	Global
CCAFS	'Climate Wizard': online tool providing access to downscaled climate change information for a wide range of uses from more technical to less technical (Academia and research; National Agricultural and Extension organizations; Agricultural development agencies; governmental agencies etc)	Methods and Tools	3-AV	Global

CRP	TITLE OF INNOVATION	INNOVATION TYPE	STAGE OF INNOVATION	LOCATION
CCAFS	'ClimMob'digital platform and software for crowdsourcing climate smart-agriculture solutions. It allows to involve and collect data from a large number of small farmers carrying out reasonably simple experiments that taken together can offer even more information that the one generated by a few researchers.	Methods and Tools	3-AV	Global
CCAFS	Science-informed large-scale routine public investment (business model) to promote the "Happy seeder "technology for in-situ management of crop residues aiming to curb air pollution and build resilience.	Social Science	3-AV	National- India
CCAFS	Farm record keeping: A must-have women-targeted practice accounting, farm management (and empowerment tool) tool, that also aims to support gender-enabled climate smart agriculture practice scaling strategy for development. Piloted at sub-national level but can be adopted at much wider scale.	Biophysical Research	3-AV	Sub-national - state of Haryana, India
CCAFS	Gender equitable knowledge Index on climate smart agriculture practices (CSAPs) adoption to support food and nutrition security under climatic risks. The methodology to measure difference and generate awareness for adoption is ready for uptake by government and researchers	Social Science	3-AV	Sub- national- state of Bihar, India
CCAFS	Development of robust and highly skilled forecasts capabilities of dynamical models used to simulate crop performance in the Colombian agricultural context	Biophysical Research	3-AV	National- Colombia
FISH	Improved tilapia strains	Genetic	3-AV	Myanmar
FISH	Life Cycle Assessment tool for analysing future environmental impacts of aquaculture	Biophysical Research	3-AV	Indonesia
FISH	Business models for small-holder fish farmers	Social Science	3-AV	AV: Zambia and Malawi
FISH	Management and technical innovations for enhanced fisheries	Production systems	3-AV	Bangladesh, Solomon Islands, Timor Leste
FTA	'Shade motion', a model for the shading patterns of trees which helps advise on appropriate planting patterns	Methods and Tools	3-AV	Central America
FTA	Map-based decision-support tools for global conservation and restoration planning	Methods and Tools	3-AV	Global
FTA	Online decision-support tool to help in the selection of tree species and seed sources for restoration of Dry Forests of Colombia	Methods and Tools	3-AV	Colombia
FTA	Remote sensing bamboo land cover classification system	Methods and Tools	3-AV	Kenya, Uganda and Ethiopia
FTA	Seed supply systems for the implementation of landscape restoration under Initiative 20x20: An analysis of national seed supply systems in Mexico, Guatemala, Costa Rica, Colombia, Peru, Chile and Argentina	Methods and Tools	3-AV	Latin America

CRP	TITLE OF INNOVATION	INNOVATION TYPE	STAGE OF INNOVATION	LOCATION
FTA	Bringing agroforestry into the Nationally Determined Contributions (NDC) discourse in the United Nations Framework Convention on Climate Change (UNFCCC)	Methods and Tools	3-AV	Global
FTA	Contributing to ecosystem services discourses and policies at global level	Methods and Tools	3-AV	Asia, Africa
LIVESTOCK	CLEANED tool: Comprehensive Livestock Environmental Assessment for Improved Nutrition, a Secured Environment and Sustainable Development along Livestock and Fish Value Chains	Methods and Tools	3-AV	Multi-country (Kenya, Nicaragua, Tanzania)
LIVESTOCK	Index based livestock insurance	Methods and Tools	3-AV	Ethiopia
LIVESTOCK	New Brachiaria hybrid "Camello"	Genetic	3-AV	Global
LIVESTOCK	Napier grass core population	Genetic	3-AV	Global
LIVESTOCK	The Producers Organisation Sustainability Assessment (POSA)	Methods and Tools	3-AV	Multi-country (Kenya, Rwanda, Uganda)
MAIZE	Genotyping of exotic germplasm for breeding	Genetic	3-AV	Global
MAIZE	A low-cost unmanned aerial vehicle (UAV) is helping to speed up the selection of maize varieties that are best adapted to adverse environmental conditions and thus improve the efficiency of maize breeding. The device UAV-based phenotyping platform enables high-throughput data collection through image acquisition from visible (RGB), spectral and thermal cameras fitted underneath the UAV and image processing pipeline.,	Methods and Tools	3-AV	Multi-county
MAIZE	Develop improved maize germplasm through temperate introgressions, with selection for key traits relevant for smallholders in Sub-Saharan Africa (SSA)	Genetic	3-AV	Global
MAIZE	Improved Maize Germplasm with good general combining ability (GCA) and producibility as well as with resistances to major foliar diseases and tolerance to multiple abiotic stress	Methods and Tools	3-AV	Region
MAIZE	Use of remote sensing techniques with drones to evaluate impact of Tar Spot Complex Disease on maize.	Biophysical Research	3-AV	Global
MAIZE	Mobile phone application for Maize variety selection	Biophysical Research	3-AV	Multi-county
MAIZE	Zimplow direct seeder	Methods and Tools	3-AV	Region
MAIZE	Grownet direct seeder	Methods and Tools	3-AV	One country
MAIZE	Two-wheel tractor based service provision of Sustainable Intensification technologies	Production systems	3-AV	One country
MAIZE	An Aspergillus flavus population associated with maize in Zimbabwe composed of 2,150 isolates was obtained. Identification of non-toxin producing strains for use as aflatoxin biocontrol agents is ongoing	Production systems	3-AV	One country

CRP	TITLE OF INNOVATION	INNOVATION TYPE	STAGE OF INNOVATION	LOCATION
MAIZE	The Agricultural Production Systems simulator (APSIM) model validated for simulating maize response to Nitrogen and climate change	Methods and Tools	3-AV	Region
MAIZE	CERES-Model in DSSAT (decision support system for agro-technology transfer) calibrated and validated to simulate and predict performance of under changing crop management practices and environment	Methods and Tools	3-AV	Region
MAIZE	Environmental Genome-wide Association (GWAS) to identify useful sources of genetic diversity	Genetic	3-AV	Global
MAIZE	Field Phenotyping with Image Analyses and Open Source Software- image processing tools for maize foliar disease assessments	Methods and Tools	3-AV	Region
MAIZE	CKHRM1212	Genetic	3-AV	Uganda
MAIZE	CKHRM1219	Genetic	3-AV	Uganda
MAIZE	CKHRM13580	Genetic	3-AV	Uganda
MAIZE	ADV2309W (CKDHH15008)	Genetic	3-AV	Kenya
MAIZE	ADV2310W (CKDHH15064)	Genetic	3-AV	Kenya
MAIZE	WE6108 (CKLMLN146350)	Genetic	3-AV	Kenya
MAIZE	WE6109 (CKLMLN146285)	Genetic	3-AV	Kenya
MAIZE	WE6110 (CKLMLN146012)	Genetic	3-AV	Kenya
MAIZE	KATEH16-01 (CKMLN150079)	Genetic	3-AV	Kenya
MAIZE	KATEH16-02 (CKMLN150077)	Genetic	3-AV	Kenya
MAIZE	KATEH16-03 (CKMLN150078)	Genetic	3-AV	Kenya
MAIZE	WE6106 (CKDHH15110)	Genetic	3-AV	Kenya
MAIZE	WE6103 (CKDHH15014)	Genetic	3-AV	Kenya
MAIZE	WE6105 (CKDHH15001	Genetic	3-AV	Kenya
MAIZE	TH501	Genetic	3-AV	Tanzania
MAIZE	Kitoko	Genetic	3-AV	DRC
MAIZE	Tokachini	Genetic	3-AV	DRC
MAIZE	Amani	Genetic	3-AV	DRC
MAIZE	GV511	Genetic	3-AV	Zambia
MAIZE	GV642	Genetic	3-AV	Zambia
MAIZE	GV693	Genetic	3-AV	Zambia
MAIZE	ETGM401 (CZH132194)	Genetic	3-AV	Zambia
MAIZE	ETGM601 (CZH132047)	Genetic	3-AV	Zambia
MAIZE	ZMS 520 (CZH142019)	Genetic	3-AV	Zambia
MAIZE	MH45A	Genetic	3-AV	Malawi
MAIZE	MH46A	Genetic	3-AV	Malawi
MAIZE	MH47A	Genetic	3-AV	Malawi
MAIZE	MH48A	Genetic	3-AV	Malawi
MAIZE	MH49A	Genetic	3-AV	Malawi
MAIZE	ZS244A	Genetic	3-AV	Zimbabwe
MAIZE	ZS246A	Genetic	3-AV	Zimbabwe
MAIZE	ZS248A	Genetic	3-AV	Zimbabwe
MAIZE	ZS225	Genetic	3-AV	Zimbabwe
MAIZE	ZS229	Genetic	3-AV	Zimbabwe
MAIZE	ZAP31 (CZH1257)	Genetic	3-AV	Zimbabwe

CRP	TITLE OF INNOVATION	INNOVATION TYPE	STAGE OF INNOVATION	LOCATION
MAIZE	PGS33 (CZH1262)	Genetic	3-AV	Zimbabwe
MAIZE	CSIR-Denbea	Genetic	3-AV	Ghana
MAIZE	CSIR-Similenu	Genetic	3-AV	Ghana
MAIZE	CSIR-Kom-naaya	Genetic	3-AV	Ghana
MAIZE	CSIR-Wang-Basig	Genetic	3-AV	Ghana
MAIZE	Sammaz 53	Genetic	3-AV	Nigeria
MAIZE	Sammaz 54	Genetic	3-AV	Nigeria
MAIZE	SC612 in 2017	Genetic	3-AV	Nigeria
MAIZE	SAMMAZ 52	Genetic	3-AV	Nigeria
MAIZE	CHLHW02517	Genetic	3-AV	Mexico
MAIZE	CHLHW09035	Genetic	3-AV	Mexico
MAIZE	CHLHY09002	Genetic	3-AV	Mexico
MAIZE	CHLHY09004	Genetic	3-AV	Mexico
MAIZE	CHLHY12004	Genetic	3-AV	Mexico
MAIZE	CHLHY12006	Genetic	3-AV	Mexico
MAIZE	S07HEY-N	Genetic	3-AV	Mexico
MAIZE	CLTHW14001	Genetic	3-AV	Mexico
MAIZE	CLTHW14003	Genetic	3-AV	Mexico
MAIZE	CLTHY11002	Genetic	3-AV	Mexico
MAIZE	CLTHY13002	Genetic	3-AV	Mexico
MAIZE	CLTHY15013	Genetic	3-AV	Mexico
MAIZE	RETINTO	Genetic	3-AV	Mexico
MAIZE	24 Kilates	Genetic	3-AV	Mexico
MAIZE	DOGO	Genetic	3-AV	Mexico
MAIZE	GOLDEN	Genetic	3-AV	Mexico
MAIZE	MIXTIADO	Genetic	3-AV	Mexico
MAIZE	HOJERO	Genetic	3-AV	Mexico
MAIZE	CSTHW10001	Genetic	3-AV	Mexico
MAIZE	CSTHW14001	Genetic	3-AV	Mexico
MAIZE	CENTA H-CAS	Genetic	3-AV	El Salvador
MAIZE	CENTA ASG	Genetic	3-AV	El Salvador
MAIZE	CENTA CS	Genetic	3-AV	El Salvador
MAIZE	DICTAB02	Genetic	3-AV	Honduras
MAIZE	DICTAB03	Genetic	3-AV	Honduras
MAIZE	ICTA B-9 ACP	Genetic	3-AV	Guatemala
MAIZE	BHM-14	Genetic	3-AV	Bangladesh
MAIZE	BHM-15	Genetic	3-AV	Bangladesh
MAIZE	RCRMH2	Genetic	3-AV	India
MAIZE	SMH11-7	Genetic	3-AV	India
MAIZE	Rampur Hybrid-8	Genetic	3-AV	Nepal
MAIZE	Rampur Hybrid-10	Genetic	3-AV	Nepal
MAIZE	MI Maize Hybrid 02	Genetic	3-AV	Sri Lanka
PIM	QPHM 200	Methods and Tools	3-AV	Pakistan
PIM	QPHM 300	Methods and Tools	3-AV	Pakistan
PIM	Public spending quantification template	Methods and Tools	3-AV	National: Malawi

CRP	TITLE OF INNOVATION	INNOVATION TYPE	STAGE OF INNOVATION	LOCATION
PIM	Index to measure aspirations of the rural poor	Methods and Tools	3-AV	Global
PIM	The Kaleidoscope Model (KM) of Food Security Policy Change: Applied framework to analyze the drivers of change in the food security arena and to identify barriers to policy reform and implementation	Methods and Tools	3-AV	Global
PIM	Rural Investment and Policy Analysis (RIAPA) model: Economywide model that evaluates alternative policy and investment options based on their impacts on economic growth, job creation, poverty reduction, and dietary change	Methods and Tools	3-AV	Multi-National: Egypt, Ethiopia, Ghana, Kenya, Malawi, Myanmar, Tanzania
PIM	Method for assessing the effectiveness of public extension systems	Methods and Tools	3-AV	Malawi
PIM	Methodological toolbox for evaluation of the level of trade integration within Africa	Methods and Tools	3-AV	Africa
PIM	Improved methodology to aggregate trade distortion measures across commodities within countries	Methods and Tools	3-AV	Global
PIM	Agricultural Incentives Database for Measuring the Policy Environment for Agriculture	Methods and Tools	3-AV	Global
PIM	Methodology for assessing physical and economic loss in the value chain	Methods and Tools	3-AV	Global
PIM	Woreda (district) participatory land use planning approach to secure pastoralists' rights to rangelands	Methods and Tools	3-AV	National (Ethiopia)
PIM	Realist synthesis methodology, applied to 31 case studies on governance of community fisheries	Social Science	3-AV	Global
PIM	Methodology to analyze the extent of agreement or disagreement between spouses about who make decisions	Methods and Tools	3-AV	Global
PIM	Conceptual framework to analyze the relationships between women's land rights and poverty reduction	Methods and Tools	3-AV	Global
PIM	Dispelling of gender myths on land ownership, agricultural production, farm labor, and environmental stewardship	Social Science	3-AV	Global
PIM	Best practices for collecting individual-level data on the ownership and control of assets in household and farm survey	Methods and Tools	3-AV	Global
PIM	Methodology for measuring time use in development settings	Methods and Tools	3-AV	Global
PIM	Vignettes for measuring typologies in household decision making	Methods and Tools	3-AV	Global
RICE	Framework for "gastronomic systems research" to understand culture-specific consumer food choice, validated on rice varieties in the Philippines.	Methods and Tools	3-AV	Global
RICE	Maps of biotic (pests, diseases) and abiotic (drought, salinity, etc.) stresses to rice growing in Africa	Methods and Tools	3-AV	Region

CRP	TITLE OF INNOVATION	INNOVATION TYPE	STAGE OF INNOVATION	LOCATION
RICE	Identification of new Funders accessions for Quantitative Trait Locus (QTLs) and genes involved in biotic and abiotic stresses	Genetic	3-AV	Global
RICE	At IRRI- 1k Amplicon panel now available as Genotyping Services Laboratory (GSL) service. This new platform presents faster and more cost-effective solution for interrogating genetic variation in rice varieties	Methods and Tools	3-AV	Global
RICE	At CIAT-The second major version of MapDisto, a program for mapping genetic markers in experimental segregating populations, was released, with several new major features	Methods and Tools	3-AV	
RICE	Novel markers for BB (xa4, xa5, xa13, Xa21), blast (Pi9, Pita2), low chalkiness, submergence (sub1), drought (qDTY12.1, qDTY2.2, qDTY4.1) developed in rice.	Methods and Tools	3-AV	
RICE	3 sets of 10 Single Nucleotide Polymorphism (SNP) trait marker sets now available globally through Intertek at a price of $1.5 per sample including DNA extraction. At JIRCAS- KASP marker system established in-house.	Methods and Tools	3-AV	Global
RICE	Novel tools to assess milling and cooking quality has been established and applied to screen the breeding material.	Methods and Tools	3-AV	Regional
RICE	Development of markers for amylose and amyopectin established.	Methods and Tools	3-AV	Regional
RICE	Novel glycemic index assessment techniques established.	Methods and Tools	3-AV	Regional
RICE	Germplasm identification to develop pre-breeding material in high yielding background	Genetic	3-AV	Global
RICE	Generation of new segregating lines (F4:6 generation) involving high zinc parental lines in progress	Genetic	3-AV	Global
RICE	At CIRAD, new segregating lines (110 F4) with nutritional values greater than 24 ppm (50% above the base line) and four candidate lines selected by partner for variety release process in Bolivia, Nicaragua, Guatemala and Colombia	Genetic	3-AV	Global
RICE	At least one Quantitative Trait Locus (QTL) for high Zinc content and associated markers	Genetic	3-AV	Global
RICE	Micro-dosing fertilizer application for direct seeding	Production systems	3-AV	Dibbled seeding in non-flooded conditions in poor soils in sub-Saharan Africa
RICE	Mechanical weeder (ring hoe) to establish uniform sowing conditions in sub-Saharan Africa	Production systems	3-AV	Sub-Sahara Africa
RICE	Nursery bed nutrient management system	Production systems	3-AV	India
RICE	Crop management recommendations for stress-tolerant varieties adapted to climate change	Production systems	3-AV	India, Bangladesh, Tanzania, Burundi
RICE	Climate change adaptation: Salinity monitoring system (in collaboration with CCAFS)	Production systems	2-PIL	Vietnam

CRP	TITLE OF INNOVATION	INNOVATION TYPE	STAGE OF INNOVATION	LOCATION
RICE	Twelve quantitative performance indicators proposed by the Sustainable Rice Platform (SRP) that enable users to monitor impacts of adoption of climate-smart best practices- as well as other field interventions	Methods and Tools	3-AV	South and Southeast Asia
RTB	Seed Tracker: online application for real-time tracking of cassava seed production that supports communication and networking of cassava producers	Methods and Tools	3-AV	Nigeria
RTB	High-yielding and black Sigatoka resistant banana hybrids (NABIO) for East Africa	Genetic	3-AV	Uganda
RTB	Dual Cassava Brown Streak Disease (CBSD) and Cassava Mosaic Disease (CMD) resistant varieties for the mid-altitude agro-ecologies of East and Central Africa	Genetic	3-AV	Malawi, Mozambique, Kenya, Tanzania, Uganda
RTB	Integrated management strategy of banana fields affected by bunchy top disease (BBTD)	Production systems	3-AV	Malawi, Nigeria, DR Congo
RTB	Insect Life Cycle Modelling software (ILCYM)	Biophysical Research	3-AV	Global
RTB	Virtual network for rapid preliminary diagnosis of banana diseases by visual inspection of symptomatic plants facilitated through mobile app	Methods and Tools	3-AV	Nigeria
RTB	Banana bunchy top virus (BBTV) tolerant Musa varieties and hybrids	Genetic	3-AV	Cameroon
RTB	Smart-dart: diagnostic kit, for field detection of bacteria and phytoplasma pathogens in cassava	Methods and Tools	3-AV	Global
RTB	Protocol for absolute quantification of cassava brown streak viruses using standard curves	Methods and Tools	3-AV	Global
RTB	Waxing: A technology for extending the shelf-life of fresh cassava roots in Africa	Production systems	3-AV	Uganda, Nigeria
RTB	High quality cassava peel for animal feed	Production systems	3-AV	Nigeria and Tanzania
RTB	Sweet potato silage-based diet for pig feeding	Production systems	3-AV	Uganda
RTB	Orange-fleshed Sweet potato Purée for Bakery Applications in Kenya	Production systems	3-AV	Sub-Saharan Africa
RTB	Flash dryer for cassava	Production systems	3-AV	Colombia, Nigeria, Uganda, Tanzania
RTB	Consumer preferred and nutritious cassava-based food products	Production systems	3-AV	DR Congo, Nigeria, Zambia
RTB	Pro-Vitamin A rich cassava bread and other baked products	Production systems	3-AV	Nigeria
RTB	Youth agri-preneurs: a vehicle to make RTB innovations an attractive business for the next generation	Social Science	3-AV	DR Congo
RTB	Gender sensitive M&E tool for the Participatory Market Chain Approach	Methods and Tools	3-AV	Ecuador, Uganda
RTB	Social Network Approach for Guiding and Leveraging Results for Development (R4D) Investments	Social Science	3-AV	Rwanda, Burundi, DRC

CRP	TITLE OF INNOVATION	INNOVATION TYPE	STAGE OF INNOVATION	LOCATION
WHEAT	Use of electronic data capture and bar-coding devices (hardware) for selection, crosses, nursery, seed production.	Methods and Tools	3-AV	Mexico and India
WHEAT	Drought field phenotyping for winter wheat to improve precision for selection	Methods and Tools	3-AV	Dryland of Central Asia.
WHEAT	Novel wheat blast resistant germplasm	Genetic	3-AV	South Asia
WHEAT	Utilization of Fhb1/Sr2 recombinant in breeding to facilitate the development of wheat cultivars with improved resistance to Fusarium Head Blight (FHB) and stem rust simultaneously.	Methods and Tools	3-AV	Global
WHEAT	Fungicide for Yellow Rust and Septoria tritici blotch (STB) of wheat: Azoles mixture and application frequency	India/South Asia	Production systems	Contributor
WHEAT	Wheat strip tillage using a 2WT and a 2BFG (Mechanical row planting of wheat and fertilizing in a single pass, without prior land preparation)	Production systems	3-AV	Wheat and teff growing areas of Ethiopia
WHEAT	Wheat strip tillage using a 2WT and a 2BFG (Mechanical row planting of wheat and fertilizing in a single pass, without prior land preparation)	Production systems	3-AV	Smallholder wheat growing areas of sub-Saharan Africa
WHEAT	Portfolio of practices (Conservation Agriculture, precision water & nutrient management, mechanization) to address food-water-energy nexus. Tailor combination of practices to specific context	Production systems	3-AV	India/South Asia
WHEAT	Raised bed technology for improved water-use efficiency in irrigated systems	Production systems	3-AV	USE mostly in one country (Egypt) and at adoption stage in others in MENA region.
WHEAT	Irrigation scheduling based on Short Messaging Systems (SMS) technology	Production systems	3-AV	Multiple countries, MENA region
WHEAT	New Spring Bread Wheat variety: Daima-17	Genetics	3-AV	Afghanistan
WHEAT	New Spring Bread Wheat variety: Lalmi-17	Genetics	3-AV	Afghanistan
WHEAT	New Spring Bread Wheat variety: Shamal-17	Genetics	3-AV	Afghanistan
WHEAT	New Spring Bread Wheat variety: Borlaug100	Genetics	3-AV	Australia
WHEAT	New Spring Bread Wheat variety: SEA Condamine	Genetics	3-AV	Australia
WHEAT	New Spring Bread Wheat variety: BARI Gom 31	Genetics	3-AV	Bangladesh
WHEAT	New Spring Bread Wheat variety: BARI Gom 33	Genetics	3-AV	Bangladesh
WHEAT	New Spring Bread Wheat variety: Amibara 2	Genetics	3-AV	Ethiopia
WHEAT	New Spring Bread Wheat variety: WB2	Genetics	3-AV	India
WHEAT	New Spring Bread Wheat variety: PBW1Zn	Genetics	3-AV	India
WHEAT	New Spring Bread Wheat variety: Ankur Shiva	Genetics	3-AV	India
WHEAT	New Spring Bread Wheat variety: Ankur Shiva	Genetics	3-AV	India
WHEAT	New Spring Bread Wheat variety: Super 252	Genetics	3-AV	India
WHEAT	New Spring Bread Wheat variety: Super 272	Genetics	3-AV	India
WHEAT	New Spring Bread Wheat variety: Ehsan	Genetics	3-AV	Iran
WHEAT	New Spring Bread Wheat variety: Chyakhura	Genetics	3-AV	Nepal
WHEAT	New Spring Bread Wheat variety: Munal	Genetics	3-AV	Nepal
WHEAT	New Spring Bread Wheat variety: Zincol 2017	Genetics	3-AV	Pakistan
WHEAT	New Spring Bread Wheat variety: Anaaj-17	Genetics	3-AV	Pakistan

CRP	TITLE OF INNOVATION	INNOVATION TYPE	STAGE OF INNOVATION	LOCATION
WHEAT	New Spring Bread Wheat variety: Barani-17	Genetics	3-AV	Pakistan
WHEAT	New Spring Bread Wheat variety: Khaista-17	Genetics	3-AV	Pakistan
WHEAT	New Spring Bread Wheat variety: Kohat-17	Genetics	3-AV	Pakistan
WHEAT	New Spring Bread Wheat variety: Israr-shaheed-2017	Genetics	3-AV	Pakistan
WHEAT	New Spring Bread Wheat variety: NIFA-Aman	Genetics	3-AV	Pakistan
WHEAT	New Spring Bread Wheat variety: Pasina-2017	Genetics	3-AV	Pakistan
WHEAT	New Spring Bread Wheat variety: Shahid-2017	Genetics	3-AV	Pakistan
WHEAT	New Spring Bread Wheat variety: Wadaan-2017	Genetics	3-AV	Pakistan
WHEAT	New Spring Bread Wheat variety: Cyumba	Genetics	3-AV	Rwanda
WHEAT	New Spring Bread Wheat variety: Gihundo	Genetics	3-AV	Rwanda
WHEAT	New Spring Bread Wheat variety: Keza	Genetics	3-AV	Rwanda
WHEAT	New Spring Bread Wheat variety: Kibatsi	Genetics	3-AV	Rwanda
WHEAT	New Spring Bread Wheat variety: Majyambere	Genetics	3-AV	Rwanda
WHEAT	New Spring Bread Wheat variety: Mizero	Genetics	3-AV	Rwanda
WHEAT	New Spring Bread Wheat variety: Nyangufi	Genetics	3-AV	Rwanda
WHEAT	New Spring Bread Wheat variety: Nyaruka	Genetics	3-AV	Rwanda
WHEAT	New Spring Bread Wheat variety: Reberaho	Genetics	3-AV	Rwanda
WHEAT	New Spring Bread Wheat variety: Rengerabana	Genetics	3-AV	Rwanda
WHEAT	New Spring Bread Wheat variety: Haydari	Genetics	3-AV	Tajikistan
WHEAT	New Spring Bread Wheat variety: Roghun	Genetics	3-AV	Tajikistan
WHEAT	New Spring Bread Wheat variety: Ekinoks	Genetics	3-AV	Turkey
WHEAT	New Spring Durum Wheat variety: Durum#3	Genetics	3-AV	Afghanistan
WHEAT	New Spring Durum Wheat variety: DL101 TC	Genetics	3-AV	Argentina
WHEAT	New Spring Durum Wheat variety: DL102 TC	Genetics	3-AV	Argentina
WHEAT	New Spring Durum Wheat variety: DL103 TC	Genetics	3-AV	Argentina
WHEAT	New Spring Durum Wheat variety: Tesfaye	Genetics	3-AV	Ethiopia
WHEAT	New Spring Durum Wheat variety: CENEB C2017	Genetics	3-AV	Mexico
WHEAT	New Spring Durum Wheat variety: Khajura Durum 1	Genetics	3-AV	Nepal
WHEAT	New Spring Durum Wheat variety: Khajura Durum 2	Genetics	3-AV	Nepal
WHEAT	New Spring Durum Wheat variety: Kahrabo	Genetics	3-AV	Tajikistan
WHEAT	New Spring Bread Wheat variety: Malika	Genetics	3-AV	Morocco
WHEAT	New Spring Bread Wheat variety: LACRIWHIT 9 (PASTOR)	Genetics	3-AV	Nigeria
WHEAT	New Spring Bread Wheat variety: LACRIWHIT 10 (Kauz)	Genetics	3-AV	Nigeria
WHEAT	New Spring Durum Wheat variety: Alemtena (Zagharin 2)	Genetics	3-AV	Ethiopia
WHEAT	New Spring Durum Wheat variety: Pooneh	Genetics	3-AV	Iran
WHEAT	New Spring Durum Wheat variety: Miloudi (Trouve')	Genetics	3-AV	Morocco
WHEAT	New Spring Durum Wheat variety: Yaren	Genetics	3-AV	Turkey
WHEAT	New Winter Bread Wheat variety: Layagatli	Genetics	3-AV	Azerbaijan
WHEAT	New Winter Bread Wheat variety: Manas	Genetics	3-AV	Kyrghyzstan
WHEAT	New Winter Bread Wheat variety: Kantskaya	Genetics	3-AV	Kyrghyzstan
WHEAT	New Winter Bread Wheat variety: Alturna	Genetics	3-AV	Turkey
WHEAT	New Winter Bread Wheat variety: ÜÇOK	Genetics	3-AV	Turkey

CRP	TITLE OF INNOVATION	INNOVATION TYPE	STAGE OF INNOVATION	LOCATION
WHEAT	New Winter Bread Wheat variety: Havabaci	Genetics	3-AV	Turkey
WHEAT	New Winter Bread Wheat variety: Pasa	Genetics	3-AV	Turkey
WHEAT	New Winter Bread Wheat variety: Berkarar	Genetics	3-AV	Turkmenistan
WHEAT	New Winter Bread Wheat variety: Garashsyzlyk	Genetics	3-AV	Turkmenistan
WHEAT	New Winter Bread Wheat variety: Kiska	Genetics	3-AV	Uzbekistan
WLE	Online water planning tool for Honduras	Methods and Tools	3-AV	National (Honduras)
WLE	Mobile data entry app for manual field data, allowing for rapid transfer of data from field to researchers, for analysis	Methods and Tools	3-AV	Sub-national (Nepal)
WLE	'Contour bunding' preserves soils and boosts farmers' incomes by 20% in Mali	Methods and Tools	3-AV	National (Mali)

ANNEX TABLE D – EXAMPLES OF ALTMETRICS SCORES FOR CGIAR PUBLICATIONS

Alternative metrics ("altmetrics") at CGIAR are recorded via an online service called Altmetric. Altmetric scores are automatically recorded for all publications, including journal articles, manuals, briefs, reports, and working papers, which either have a DOI or are recorded in a subscribed repository (there are currently three subscribed repositories in CGIAR: CGSpace, IFPRI, and CIFOR). The advantage of altmetrics is that they provide a means to show the reach and influence of the many non-peer reviewed publications of CGIAR, that can balance reporting on peer-reviewed papers.[68]

Note that Altmetric scores were only recorded for seven CRPs in 2018. Moreover, there is likely to be significant under-reporting for three main reasons: a) many publications record only the author affiliation of the Center, not the CGIAR Research Program; b) many publications are not yet archived in repositories (it is hoped that the reporting of altmetrics data will improve this; c) some publications are shared using the wrong links (Altmetric tracks DOIs and repository handle links only). The following list therefore should be seen only as an example, and not representative of CGIAR as a whole.

The colorful Altmetric 'donut' image conveys the different sources of 'attention' received by a publication (for example in the news media, social media, and policy sources) as explained here.

Finally, all Altmetric scores and images recorded here date from July 2018 (which means that publications which came out late in 2017 are at a comparative disadvantage, since they had less time to accumulate attention). However, the current Altmetric score can be found via the links provided under Attention Score. Please note: occasionally, scores will drop as links are broken and Altmetric data is refreshed.

CGIAR EXAMPLES FROM 2017

Imbach, Pablo, Emily Fung, Lee Hannah, Carlos E. Navarro-Racines, David W. Roubik, Taylor H. Ricketts, Celia A. Harvey, Camila I. Donatti, Peter Läderach, Bruno Locatelli, and Patrick R. Roehrdanz. **Coupling of Pollination Services and Coffee Suitability under Climate Change**. *Proceedings of the National Academy of Sciences* 114, no. 39 (September 26, 2017): 10438–42. https://doi.org/10.1073/pnas.1617940114.

This publication obtained the highest Altmetric score of reporting CRPs for 2017, including the highest number of news mentions. It was cited in 132 news stories from 103 news outlets, including Business Insider, Newsweek, Huffington Post, Wired UK, National Public Radio (NPR), and many other sources globally. It received 213 tweets from 178 users, with an upper bound of 787,041 followers; was cited in 13 posts from 12 blogs; and was mentioned in 17 public wall posts from 15 Facebook users. It received an overall Altmetric Attention Score of 1022. This article finds that climate change will reduce coffee-suitable areas by 73–88% by 2050. It is a collaborative work between CCAFS and FTA, CIAT, CIFOR and the French Agricultural Research Centre for International Development (CIRAD).

[68] One caveat is that the Altmetric scores are still fed mainly by media and social media from the Global North, but this is constantly improving.

Gill, David A., Michael B. Mascia, Gabby N. Ahmadia, Louise Glew, Sarah E. Lester, Megan Barnes, Ian Craigie, Emily S. Darling, Christopher M. Free, Jonas Geldmann, Susie Holst, Olaf P. Jensen, Alan T. White, Xavier Basurto, Lauren Coad, Ruth D. Gates, Greg Guannel, Peter J. Mumby, Hannah Thomas, Sarah Whitmee, Stephen Woodley and Helen E. Fox. **Capacity Shortfalls Hinder the Performance of Marine Protected Areas Globally**. *Nature* 543, no. 7647 (March 2017): 665–69. https://doi.org/10.1038/nature21708.

With a total Altmetric Attention Score of 660, this article received the highest number of Tweets for 2017: 1028 tweets from 776 users, with an upper bound of 4,147,605 followers. This paper exposes how shortages in staffing and funding prevents marine protected areas from realizing their full potential. Notable news source mentions include National Geographic and Popular Science. CIFOR research consultant Lauren Coad participated in the data compilation and analysis for this paper, with the support of FTA.

Herricks, Jennifer R., Peter J. Hotez, Valentine Wanga, Luc E. Coffeng, Juanita A. Haagsma, María-Gloria Basáñez, Geoffrey Buckle, Christine M. Budke, Hélène Carabin, Eric M. Fèvre, Thomas Fürst, Yara A. Halasa, Charles H. King, Michele E. Murdoch, Kapa D. Ramaiah, Donald S. Shepard, Wilma A. Stolk, Eduardo A. Undurraga, Jeffrey D. Stanaway, Mohsen Naghavi , Christopher J. L. Murray. **The Global Burden of Disease Study 2013: What Does It Mean for the NTDs?** *PLOS Neglected Tropical Diseases* 11, no. 8 (August 3, 2017): e0005424. https://doi.org/10.1371/journal.pntd.0005424.

This paper by Herricks, J. R. et al reflects the importance of A4NH work on health and disease. Altmetric reported an overall Attention Score of 224. It was cited in two World Health Organization policy documents, and received notable interest on social media, including 377 tweets from 335 users, with an upper bound of 840,811 followers. This article was co-authored by Eric Fèvre, a professor of veterinary infectious diseases based at ILRI, with support from A4NH.

Griscom, Bronson W., Justin Adams, Peter W. Ellis, Richard A. Houghton, Guy Lomax, Daniela A. Miteva, William H. Schlesinger, David Shoch, Juha V. Siikamäki, Pete Smith, Peter Woodbury, Chris Zganjar, Allen Blackman, João Campari, Richard T. Conant, Christopher Delgado, Patricia Elias, Trisha Gopalakrishna, Marisa R. Hamsik, Mario Herrero, Joseph Kiesecker, Emily Landis, Lars Laestadius, Sara M. Leavitt, Susan Minnemeyer, Stephen Polasky, Peter Potapov, Francis E. Putz, Jonathan Sanderman, Marcel Silvius, Eva Wollenberg, and Joseph Fargione. **Natural Climate Solutions**. *Proceedings of the National Academy of Sciences* 114, no. 44 (October 31, 2017): 11645–50. https://doi.org/10.1073/pnas.1710465114.

This paper received the greatest number of Mendeley saves (458 readers) and the greatest number of blog citations (23 blog posts). It received an Altmetric Attention Score of 875. This paper shows how natural climate solutions can offer a powerful set of options for nations to deliver on the Paris Climate Agreement. It received 924 tweets from 787 users, with an upper bound of 3,100,580 followers. Attention is well spread geographically and across social media forms. Notable news sources (40 news stories from 23 different news outlets) include Newsweek, BBC News, The Guardian, Japan Times, and El Pais. Eva Wollenberg, Flagship Leader for Low Emissions Agricultural Development with CCAFS, participated as a co-author.

Kosec, Katrina, and Cecilia Hyunjung Mo. **Aspirations and the Role of Social Protection: Evidence from a Natural Disaster in Rural Pakistan**. *World Development* 97 (September 1, 2017): 49–66. https://doi.org/10.1016/j.worlddev.2017.03.039.

This article received an overall Altmetric Attention Score of 366. It was picked up by 40 news outlets, largely in the US, including The Washington Post and multiple stations of National Public Radio (NPR). Attention to the study was triggered by Harvey, the first major hurricane of the extremely active 2017 Atlantic hurricane season. Using evidence from Pakistan, this article shows that government social protection programs (such as cash transfers) can significantly blunt negative impacts of natural disasters on people's aspirations. This article was co-authored by Katria Kosec, a Senior Research Fellow at IFPRI, with support from PIM.

Murcia, C., M. R. Guariguata, E. Quintero-Vallejo, and W. Ramirez. **La restauración ecológica en el marco de las compensaciones por pérdida de biodiversidad en Colombia: Un análisis crítico**. CIFOR Occasional Paper. Center for International Forestry Research (CIFOR), Bogor, Indonesia, 2017. https://doi.org/10.17528/cifor/006611.

This publication received the most attention for an Occasional Paper. It received an Altmetric Attention Score of 78. This paper received 108 Tweets from 78 users with an upper bound of 252,330 followers. It was also mentioned in 7 Facebook posts and was cited in four posts by two blogs. It provides recommendations to strengthen legal and institutional frameworks to safeguard against biodiversity loss and promote ecological restoration. With support from FTA.

Dinesh, Dhanush, Bruce M. Campbell, Osana Bonilla-Findji, and Meryl Richards. **10 Best Bet Innovations for Adaptation in Agriculture: A Supplement to the UNFCCC NAP Technical Guidelines**. Working Paper. Wageningen, The Netherlands: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), November 2, 2017. http://hdl.handle.net/10568/89192.

This publication received the highest attention score for a Working Paper. It received an Altmetric Attention Score of 48. This paper aims to support countries in the elaboration of their National Adaptation Plans by tapping into agricultural research for development conducted by CGIAR Centers and research programs. It was Tweeted 58 times by 49 users, with an upper bound of 174,225 followers. Tweets cames from users in the United Kingdom, Nigeria, Ghana, Canada, Indonesia, the Netherlands, Mexico, Australia, and Sweden. Published by CCAFS.

Dione, Michel M., Noelina Nantima, L. Mayega, Winfred C. Amia, Barbara Wieland, and E. A. Ouma. **Enhancing Biosecurity along Uganda's Pig Value Chains to Control and Prevent African Swine Fever**. Livestock Brief. Nairobi, Kenya: International Livestock Research Institute (ILRI), July 2017. http://hdl.handle.net/10568/82665.

This publication scored impressively for a policy brief. It received an Altmetric Attention Score of 18. It was Tweeted 32 times by 17 users, was mentioned in two Facebook posts, and was cited in one blog post. Published by Livestock.

CRP Altmetric scores can be explored further in Altmetric reported for CGIAR Publications in 2017.

ANNEX E - CGIAR GOVERNANCE, SYSTEM ENTITIES AND ADVISORY BODIES IN 2017

As agreed between CGIAR's Funders and Centers, the CGIAR System Framework provides for a CGIAR System Council and a CGIAR System Organization.

CGIAR System Council

Chair: Juergen Voegele

The System Council meets at least twice per year to keep under review the strategy, mission, impact and continued relevance of the CGIAR System in a rapidly changing landscape of agricultural research for development. Details of the make-up of the Council, along with information on meetings, committees and decisions, can be found here.

CGIAR System Organization

Chair, System Management Board: Marco Ferroni
Executive Director: Elwyn Grainger-Jones

The System Management Board provides a mechanism for CGIAR's 15 Research Centers to participate in decisions that impact the operations of the CGIAR System Organization and the CGIAR System as a whole. Details of its members, meetings, committees and decisions taken can be found here.

The System Organization's Executive Director (a non-voting ex-officio member of the Board), heads the System Management Office. The Office carries responsibility for the day-to-day operations of the System Organization and provides support to the System Council, System Management Board and the General Assembly of the Centers.

General Assembly of the Centers

2017 Co-conveners
Nicole Birrell representing Center Boards of Trustees
Matthew Morell representing Center Directors-General

Meeting at least once each calendar year, the General Assembly of Centers is a forum for CGIAR Research Centers to discuss issues related to the CGIAR System and CGIAR System Organization. Among their important functions are nomination for and appointment of voting membership of the System Management Board.

Learn more here.

In 2017, the CGIAR System operated with the following advisory bodies and functions.

Independent Science and Partnership Council (ISPC)

A standing panel of experts appointed by the System Council to serve as an independent advisor on science and research matters, including strategies for effective partnerships along the research for development continuum. More information is provided at Annex F.

Independent Evaluation Arrangement (IEA)

Manages and supports evaluations that aim to improve the quality and effectiveness of the processes involved in agricultural research for development outcomes. More information is provided at Annex G.

System Council Intellectual Property Group (SC IP Group)

Facilitates coordination between the System Council and the System Organization in regard to the implementation of the CGIAR Principles on the Management of Intellectual Assets, and provides independent advice to the System Council regarding the Council's oversight of intellectual assessment management in CGIAR. The SC IP Group's independent report for 2017 is accessible in the 2017 CGIAR Intellectual Assets Management report.

CGIAR Shared Services Internal Audit Unit (CGIAR IAU)

In its final year of operations in advance of revised and more risk-based internal audit arrangemants that were adopted with effect from January 2018, CGIAR IAU provided expertise and resources to support CGIAR Center Internal Auditors in the delivery of their audit plans. More information is provided at Annex H.

ANNEX F - INDEPENDENT SCIENCE AND PARTNERSHIP COUNCIL: SUMMARY ANNUAL REPORT 2017

This is a short summary. The full ISPC annual activity and financial report can be found here.

In 2017, ISPC's membership comprised a Chair and eight members who are experts renowned in various fields related to agricultural research and development with academic or institutional affiliations outside of CGIAR. The council members provide up to 50 days per year to the ISPC. The council is supported by a Secretariat of full-time professionals hosted by FAO.

Overall, ISPC was successful in delivering its planned outputs for 2017. The expectation is that these outputs will lead to an improvement in the System Council's capacity to make evidence-based decisions in support of effective agricultural programs for development, as articulated in the ISPC Theory of Change. The mechanisms for achieving this are still under discussion as part of the overall discussion of the advisory services to the System Council. The ISPC was evaluated in 2017. The evaluation found that the ISPC and Secretariat deliver significant output professionally, with good functional performance, and very good operational performance. How the ISPC can better translate outputs to outcomes was raised in the evaluation and in continuing discussions on the advisory services.

The ISPC activities are organized into five work streams, with a lead council member and Secretariat staff assigned to each. The main highlights of 2017 activities for each of these follows below.

1. Strategic foresight

As part of its remit to advise the System Council on strategy, in 2017 the ISPC initiated a two-year process of building strategic foresight capacity at system level. The process was launched with the development of an independent (non-CGIAR) assessment of major trends and drivers affecting global agri-food systems. The ISPC organized a foresight workshop on "Global Agri-Food Systems to 2050: Threats and Opportunities" in collaboration with the University of Naples (April 2017). It commissioned 18 background papers for the workshop, summarized in the workshop report. The papers are being edited for inclusion in a book to be published in 2018. This initial step in the foresight work stream will be followed up in 2018 by a workshop on the state of foresight in the CGIAR (Aberdeen, UK, April 2018) , and a second event on scenarios on the future of agricultural research for development in the CGIAR context (Seattle, USA, November 2018).

2. Independent program review

The objective of the ISPC independent program review work stream is to conduct a review process that will ensure excellence in CGIAR research meeting the standards laid out in the QoR4D concept and framing (see point 4.b below). The ISPC review process includes the use of external experts whose reviews are used to support discussion and debate among the ISPC council members in developing the recommendations provided in the commentary.

The ISPC delivered the following reviews in 2017:

- Assessment of the new GLDC proposal and the five Flagships resubmitted (September 2017).
- In addition to its own review of CRPs and FPs, the System Council's Strategy, Impact, Monitoring and Evaluation Committee (SIMEC) requested the ISPC to organize a simultaneous review process in 2017 by reviewers nominated by Funder agencies.
- Summary of the Cross-CRP Analysis from the ISPC Review Process of the 2017-2022 CGIAR Portfolio (October 2017).

3. Agri-food system innovation and partnership

The objective of this work stream is to identify key processes, factors and leverage points for augmenting the innovation potential and development outcomes of CGIAR research. In 2017 ISPC partnered with CSIRO to generate new insights on the role of agricultural research in agri-food system transformation through the analysis of 17 in-depth case studies of systems and sub-sectors in diverse agricultural, political, geographical, and temporal settings. ISPC and CSIRO convened a workshop at ICRISAT in 2017, providing an opportunity for a system-wide conversation about major barriers to innovation (e.g. lock-ins) and developing potential ways to overcome them. The ISPC tested the proof of concept of a partnership and innovation model, working with the Tanzanian Ministry of Agriculture, GFAR and FAO. The outcome of this exercise was useful and practical information for refining the concept, but also a reframing of the partnership strategy deployed by Tanzania in its recently launched ASDP II.

4. Science Dialogue

4.a Science Forum

One of the ways the ISPC provides assurance to the System Council on science quality and relevance is by convening and brokering science discussions with experts and scientists from within and outside the CGIAR System. In 2017, the main activity was follow-up from the 2016 Science Forum (SF16) on "Agricultural research for rural prosperity: rethinking the pathways", by developing a special issue in the peer-reviewed journal Agricultural Systems. SF16 raised some fundamental questions about our assumptions of how agricultural research contributes to poverty reduction. To elaborate on these, ISPC led the development of a special issue of a high impact peer-reviewed journal (Agricultural Systems) on the themes explored in SF16, including a workshop with lead authors. Further information here. The year 2017 also saw the initiation of planning for Science Forum 2018 (SF18) on "Win more, lose less: Capturing synergies between SDGs through agricultural research". A Steering Committee was set up and a first virtual meeting held in December 2017.

4b. Quality of Research

Ensuring excellence in the quality of CGIAR research is clearly of top strategic priority for the system. In 2017, the ISPC facilitated a process of discussion and system-wide agreement on how CGIAR would define and ensure Quality of Research for Development (QoR4D). The ISPC held a workshop at FAO HQ, Rome, Italy, on 6-7 February 2017 with 22 invited participants. A consultation document was then sent out for feedback from entities across the System which led to an emerging consensus that QoR4D in the CGIAR context should be viewed as an integrated whole of four key elements that could be the basis for a common frame of reference.

5. Impact assessment

The impact assessment work stream is overseen by the Standing Panel on Impact Assessment (SPIA), a sub-group of ISPC. In 2017, a new SPIA chair was appointed, Professor Karen Macours of the Paris School of Economics. SPIA completed a five-year project on Strengthening Impact Assessment in CGIAR (SIAC) and work in 2017 focused on finalizing outputs, communicating findings, conducting synthesis, and preparing future activities, as follows:

5.a Collection of data at scale on CGIAR innovations

a) The database of varietal release and adoption estimates for 11 CGIAR mandated crops for 15 countries was published on the ASTI website; b) Results on testing alternative methods for collecting data on crop varietal improvement began to become available in 2017; c) Nine case studies on adoption of on-farm natural resource management practices to document diffusion of other types of research outputs at scale were carried out, the results of which were synthesized; d) A database of 94 plausible policy outcomes of CGIAR research covering the period 2006-2014 was compiled; and e) SPIA worked with the World Bank, FAO, national statistical

agencies and CGIAR Centers to refine household survey questions and protocols.

5.b Evidence of impact of CGIAR research on System-level Outcomes (SLOs)

Under SIAC, a total of 27 impact assessments were commissioned, all of which are in various stages of peer review. Several early synthesis pieces have been published and the full synthesis paper is in process.

5.c Support the development of communities of practice for ex-post impact assessment

The SPIA conference in Nairobi in July 2017 was the culmination of several years' work across the SIAC program and was attended by 180 participants. Furthermore, to build capacity and strengthen linkages with external impact assessment specialists, SPIA supported CGIAR-university partnerships.

ANNEX G - INDEPENDENT EVALUATION ARRANGEMENT: SUMMARY ANNUAL REPORT 2017

This is a short summary. The full IEA annual activity and financial report can be found here.

Evaluating cross-cutting topics

In 2017, IEA evaluations focused on issues beyond program and research specific topics to provide analysis and recommendations on System-wide issues. Topics and issues that cut across the research portfolio and CGIAR as whole were evaluated to assess progress and identify challenges and opportunities following the reform process.

Evaluations in 2017 included thematic evaluations (gender in research, gender in workplace; partnerships, capacity development, and results-based management; evaluations of institutions (ISPC); research support programs (genebanks), and the review of CGIAR policies (intellectual assets policy).

The evaluation of gender in research and the evaluation of results-based management conducted by IEA during this period are two examples of cross-cutting topics with high relevance to and impact on program delivery. For gender in research, the evaluation found that there has been significant progress towards gender equity in CGIAR since 2010, with key institutions strengthened and gender mainstreaming incorporated across all research programs, resulting in a growing body of gender research. Though much has been achieved, there is still more that CGIAR must do in order to achieve its objectives. The Evaluation offered 11 recommendations for future action relating to clearer vision and action plan for gender equity; greater consistency in gender research; stronger systems for monitoring and evaluation of outputs and outcomes, and support for gender capacity and expertise.

For results-based management, the evaluation found that CGIAR lacked a shared conceptual understanding of RBM. At System-level, CGIAR saw RBM mainly in relation to the SRF and results-based reporting to Funders; while Centers and CRPs sought to develop performance management systems for their own purposes, resulting in confusion about the purpose of RBM for CGIAR. Insufficient consideration was also given to the fact that CGIAR is a research for development organization with a mandate to deliver research results. The five recommendations offered by the evaluation focused on the need for System-level conceptualization and guidance for RBM, and investment needed for a management information system that prioritizes CRP needs.

How useful are IEA evaluations? A desk review

A desk review of CRP pre-proposals, proposals and review documents conducted in 2017 illustrated a significant number of changes across CRPs as a result of the IEA evaluations. Across the 10 IEA-commissioned CRP evaluations, 129 references to the evaluations were made in the research proposals, the majority of which (76) were made to support changes and adjustments to the program in critical areas such as program strategy, priorities, governance, and management. The remaining references were made to validate program's strengths or direction by citing support from the evaluation. The independent external review documents also frequently cited evaluations.

A full list of evaluation reports and other IEA outputs in 2017 can be found in the table on the following page. More information on all evaluations can be found online here.

IEA Reports and Outputs - 2017

EVALUATIONS	
Evaluation of Gender in CGIAR Research	Report, Annexes, and Response: http://iea.cgiar.org/evaluating/cgiar-gender/ Video summary: https://vimeo.com/223789947
Evaluation of Gender at CGIAR workplace	Report, Annexes, and Response: http://iea.cgiar.org/evaluating/cgiar-gender/
Evaluation of Partnerships in CGIAR	Report, Annexes, and Response: http://iea.cgiar.org/evaluating/evaluation-of-cgiar-partnerships/ Video Summary: https://vimeo.com/239100181
Evaluation of Capacity Development Activities of CGIAR	Report, Annexes, and Response: http://iea.cgiar.org/evaluating/evaluation-of-capacity-development-activities-of-cgiar/ Video Summary: https://vimeo.com/240988067
Evaluation of CGIAR Genebanks (a CGIAR research support program)	Report, Annexes, and Response: http://iea.cgiar.org/evaluating/crp-evaluation-of-genebanks/
Evaluation of the Independent Science and Partnership Council (ISPC)	Report, Annexes, and Response: http://iea.cgiar.org/evaluating/evaluation-of-the-independent-science-and-partnership-council-ispc/
Evaluation of Results-Based Management (published with management response in early 2018)	Report, Annexes, and Response: http://iea.cgiar.org/evaluating/results-based-management/
Review of CGIAR Intellectual Assets Principles	Report, Annexes, and Response: http://iea.cgiar.org/evaluating/review-of-intellectual-assets-principles-of-cgiar/
Technical workshop – Using and Assessing Theories of Change in CRPs	Report: http://iea.cgiar.org/wp-content/uploads/2017/10/IEA_Report_ToCWorkshop2017.pdf Infographic on results: http://iea.cgiar.org/wp-content/uploads/2017/10/Lessons-learnt-from-CGIAR-infographic.pdf

ANNEX H – CGIAR SHARED SERVICE INTERNAL AUDIT UNIT: SUMMARY ANNUAL REPORT 2017

Overview

2017 was a transition year for the CGIAR Shared Service Internal Audit Unit (CGIAR IAU). As changes in CGIAR governance structures and their roles and responsibilities took effect, the overall internal audit function arrangements were re-defined to align with the CGIAR reform, Center and System needs and new approaches to risk management and assurance. While deliberations on the future internal audit function arrangements continued, CGIAR IAU re balanced its work to identify activities benefiting the CGIAR Centers and the System as a whole, offering advice and insight. Hence, in 2017 CGIAR IAU allocated more resources to advisory type of work.

CGIAR IAU activities approved by CGIAR System Management Board in 2017 included:

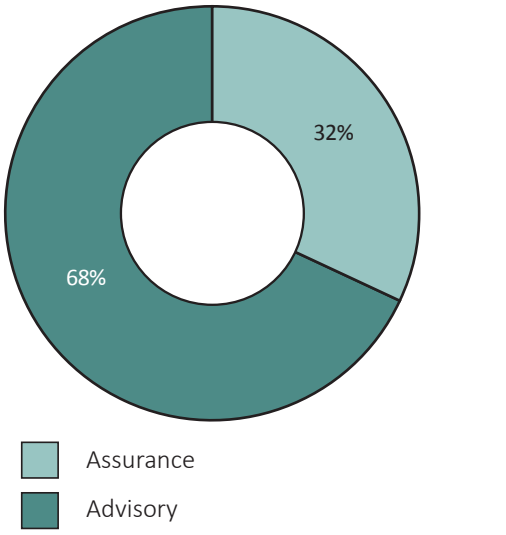
i. Offering advice, expertise and resources to facilitate CGIAR re-organization efforts post-reform

As the organization was re-defining core components of its assurance framework such as risk management, CGIAR IAU was actively contributing its expertise and time in the discussions and formulation of the future frameworks. At the same time, CGIAR IAU allocated considerable efforts into strengthening of internal controls systems in CGIAR. In 2017, CGIAR IAU published four Good Practice Notes[69] on project management, control self-assessment, risk management and research data management accessible here.

ii. Professional Practice Unit

- The Professional Practice Unit of the CGIAR IAU played an important role supporting the Center/Regional internal audit teams in their efforts to improve quality of internal audit activities. This was done through regular and ad hoc activities agreed with the Center/Regional Heads of the Internal Audit, including:
  - Knowledge and learning sharing by maintaining a database of quality audit programs, approaches, methodologies; sharing information on best practices and providing access to tools, templates and other practical materials
  - Supporting quality assurance activities through routine updates and support on matters related to Center-specific Quality Assurance and Improvements Programs
  - Maintaining the audit software shared across the majority of Centers
  - Facilitating regular meetings between Heads of Internal Audit
  - Capacity building and training.

IAU distribution of service types



[69] Good Practice Notes are developed in collaboration with subject matter experts in CGIAR; they build on experience accumulated by the Centers and leverage knowledge, tools and approaches developed externally. Their purpose is to provide reference tools to support Center and System Organization management in their efforts to establish efficient and effective business processes.

IAU engagements

ENGAGEMENTS BY CGIAR IAU FOR:	ASSURANCE	ADVISORY	TOTAL
CGIAR Centers	11	4	15
CGIAR System Organization	4	2	6
CGIAR System	0	4	4
Total	**15**	**10**	**25**

iii. Assurance and advisory activities in relation to CGIAR System, System Organization and CGIAR Centers

In 2017, CGIAR IAU continued providing expertise and resources to support CGIAR Center Internal Auditors in the delivery of their audit plans. This took form of fully outsourced arrangements or as an addition to a Center in-house resources. The engagements included a broad spectrum of subjects across wide range of business areas including but not limited to strategy, risk management, IT and partnerships.

In addition, CGIAR IAU served as the internal auditor to the CGIAR System Organization providing assurance on its risk and control. As part of this activity total of 15 recommendations were raised and agreed to be implemented by management.

Broader and more strategic advisory projects were also delivered to benefit the CGIAR System. The advisory engagements included the development of control self-assessment tools on IT general controls; on IT security and; on fraud risk and a review of CGIAR Centers' common financial health indicators contributing to the overall efforts to strengthen Center financial stability.

Governance transitions adopted by the System for internal audit from January 2018

CGIAR IAU ceased to exist as a unit at the end of 2017. From 2018, a CGIAR System Internal Audit Function was established with a mandate to provide assurance to CGIAR System Management Board and the System Council on System-wide risks. The primary purpose of the CGIAR System Internal Audit Function is to identify strategic recommendations that add value and improve CGIAR System-wide operations, achievable only by reason that the Internal Audit Function arrangements take a cross-System view this link.

In 2018, the former CGIAR IAU Professional Practice Unit will evolve into the CGIAR System Internal Audit Support Service (IASS) and will work in close cooperation with the Centers' Internal Audit Community of Practices (IACoP). The CGIAR Internal Audit Support Service ToR is available here. The IACoP is established by the Centers to facilitate, through regular and ad hoc activities, the exchange of knowledge, learning, and best practices; and supporting quality and consistency of audit approaches and methodologies.

ANNEX I: METHODS AND DATA SOURCES

Data sources

The source of data is indicated for each table, figure and annex. Data was mainly sourced from annual reports by CGIAR Research Programs (CRPs) using standard reporting templates and indicators. Some data had different sources: for example data on progress against SRF targets, which is based mainly on peer-reviewed publications, or Altmetrics data, which is drawn from online sources.

Process

This was the first year of reporting against new CGIAR-wide templates and common results reporting indicators. All reporting templates and guidance documents for 2017 can be seen on the CGIAR reporting website.

Guidance was initially developed by working groups of volunteers from the CGIAR Monitoring, Evaluation and Learning Community of Practice (MELCOP), together with the System Organization. Comments were then incorporated from across the System, including from CRP leaders, Program Management Units and Management Information System (MIS) developers. The System Oranization carried out some outreach sessions on the new reporting system to CRPs on request, and also responded to emailed questions, building up a bank of Frequently Answered Questions (FAQs). Presentations and FAQs are available on the reporting website.

Challenges in 2017

Templates and indicators were introduced after the end of the reporting year, and data for many indicators had to be retrieved retrospectively for 2017. As a result, data involving ex-post reflection by research teams (for example innovations, policies and outcome-impact case studies) was generally better quality and better evidenced than data on activities, which needs to be collected at the time (e.g. trainees).

The guidance needed some improvement, and there were also some inconsistencies between indicators and annual templates. As CRPs used the new reporting system, they fed back criticisms and suggestions to the team. An additional short questionnaire was circulated just before the end of the reporting period.

Comments are compiled on the reporting website at this link and they are being taken into account in modifying templates and guidance for 2018 reporting and 2019 planning.

Key dates in reporting on 2017

October 2017	MELCOP meeting reviews proposals for first set of reporting indicators
November 2017	Reporting approach and indicators approved by System Council
November 2017	Working groups formed to develop guidance
December 2017	Annual reporting templates issued
January 2018	First version of guidance circulated for comments
February-March 2018	Further meetings with MIS developers and others to improve guidance
April 2018	Final version guidance circulated along with Outcome-Impact Case Study Template. Guidance website created.
May-July 2018	Outreach sessions and online Q&A. Presentation to Science Leaders meeting.
July 15 2018	Deadline for CRP annual report submission to System Organization
Late July-August 2018	Construction of databases, checking data back with CRPs, compiling overall report
September 10 2018	Annual performance report and underlying data submitted to SMB

Data quality

The agreed principles behind reporting include checkability and evidence for all claims.

Checks on data for 2017 were carried out at several levels: by Flagship leaders, by CRP Program Management Units, by MIS system managers (when relevant) and lastly by the System Organization Program team. Most attention was paid to the common results reporting indicators: e.g. innovations, policies, publications and altmetrics. Nevertheless, time frames were tight, teams were stretched, and it is improbable that the compiled databases are 100% error-free.

Virtually all the errors spotted in checks by System Organization related to misunderstandings of guidance or poor communication of results, not to over-claiming. In fact, the most common problem was finding that an interesting policy result or innovation was concealed in an incomprehensible description. CRP leaders and researchers were aware that all claims would be visible in the public domain and potentially scrutinized by their immediate colleagues and partners as well as Funders, and this is likely to have provided an additional incentive for honesty.

Checking evidence will be much easier in future years, when reporting is done through MIS. From 2018 onwards, all CRPs and platforms should be reporting through MIS, which will vastly improve efficiency as well as easing verification.

The majority of claims received were accompanied by evidence, but not all were. An example of a systematic problem is the indicator for trainees. Detailed data on this is available in many Center systems, but this year, most numbers were summed by CRPs and manually re-entered, and it is not easy data to trace back to the original record and evidence. Further work is needed to make Center systems 'interoperable' with CRP and Platform MIS ('MARLO' and 'MEL') so the data can be picked up by the main MIS systems.

A full systematic quality assurance system will be put in place for 2018 reporting.