

SUMMARY REPORT 2017-2021



CGIAR Platform for Big Data in Agriculture



Platform for
Big Data
in Agriculture

Alliance



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In 2021, **12 CGIAR Research Programs (CRPs)** and four **CGIAR Platforms** came to a close. This summary report presents an overview of the work of the **CGIAR Platform for Big Data in Agriculture (Big Data Platform)** between 2017 and 2021 and highlights its key achievements over this five-year period.



OVERVIEW

CGIAR Platform for Big Data in Agriculture

Led by the Alliance of Bioversity International and the International Center for Tropical Agriculture (CIAT), and the International Food Policy Research Institute (IFPRI)



Platform for Big Data in Agriculture

Alliance



The CGIAR Platform for Big Data in Agriculture was a global leader in applying big data approaches to agriculture to find new ways to reduce hunger and poverty, and to develop robust responses to challenges such as climate change, pest and disease outbreaks, and land degradation. It aimed to reduce some of the daily risks faced by farmers in low- and middle-income countries (LMICs), enabling them to thrive.

The Platform worked to positively disrupt agricultural research, helping to generate impactful big data innovations that revolutionize farming in LMICs. Through global leadership in organizing open data, convening partners to develop innovative ideas, and demonstrating

the power of big data analytics through inspiring projects, the Platform helped ensure that the data revolution is deep, diffuse, and democratic, reaching the most vulnerable farmers. The Platform relied on three modules – **Organize**, **Convene**, and **Inspire** – to deliver on its objectives.

The **CGIAR Centers** and **Research Programs** were Platform partners, alongside external thought partners that included international institutions, universities, and private companies. Big Data worked with partners from a range of sectors, including the public and private sectors, and across LMICs. These partners specialized in different areas of expertise, including analytics and information and communications technology deployment.

Achievements¹

Making data open and FAIR

To monitor and accelerate progress toward making CGIAR data findable, accessible, interoperable, and reusable (FAIR), the Platform developed and launched a prototype data search tool in 2017 – the Global Agricultural Research Data Innovation Acceleration Network (**GARDIAN**). GARDIAN, which was officially launched in 2018, enables users to search for CGIAR publications and datasets.

In 2018, the Platform led a CGIAR-wide assessment of digital strategy and developed an action plan for CGIAR's digital transformation.

In 2019, the Platform contributed to leveraging **semantic standards** for describing agronomic, socioeconomic, and survey data; updating the CGIAR metadata standard; and **enabling digital collection of standards-compliant agronomy data**. A secure analytic environment for researchers to find data and collaborate on analyses was created in the GARDIAN ecosystem, integrating single sign-on technology with **Globus**, a secure data-sharing service.

In 2020, the Platform led the revision of CGIAR's Open Access-Open Data (OA-OD) Policy to elevate FAIR principles for CGIAR and partner data and publications, with the **CGIAR Open and FAIR Data Assets Policy** approved in 2021.

In 2020 and 2021, the Big Data Platform contributed to sector guidance on building data ecosystems

for start-ups; mapped privacy policy to **technology standards to protect agricultural data**; and communicated the risks of using **artificial intelligence in agricultural value chains**.

¹ The content in this section is drawn from the Big Data Annual Reports, which are included in the Resource section of this Summary Report. The complete list of Big Data achievements can be found on the [CGIAR Results Dashboard](#).



Achievements CONT'D

Communities of Practice

In 2017, the Big Data Platform established six **Communities of Practice** (CoPs) for data-enabling food security research: socioeconomic data, geospatial data, data-driven agronomy, crop modeling, livestock data, and data ontologies. In 2018, a seventh CoP was launched on information and data management.

Since their initial launch, the CoPs have expanded dramatically, meeting a growing demand for CGIAR engagement. By 2021, the CoPs boasted more than 6,500 members. The CoPs sparked cross-boundary collaborations in areas such as artificial intelligence and risk in agricultural supply chains, inclusivity in digital technologies, the use of call records to study women's economic empowerment, and the linking of ethical data guidelines to technology standards.

In 2021, the CoPs hosted more than 20 capacity building **webinars** on topics such as **applications of digital innovations** for index-based agricultural insurance products and **impacts of climate change** on crop yields as soon as 2030.

CGIAR Convention on Big Data in Agriculture

The first annual **CGIAR Convention on Big Data in Agriculture** was held in 2017 and attended by approximately 300 global innovators, researchers, and thought leaders from public, private, and non-profit partners.

The convention grew larger each year, and the Big Data Platform worked to attract CGIAR and non-CGIAR participants. In **2018**, the convention reached its target goal of engaging with 60% non-CGIAR participants, and in **2020**, 75% of 1,300 participants were external to CGIAR. In total, the Platform's annual Conventions engaged 5,500 attendees.



Achievements CONT'D



Inspire Challenge

The Big Data Platform initiated the **Inspire Challenge**, an open innovation process to encourage the use of big data approaches to advance agricultural research and development. Recipients of Inspire Challenge funds developed groundbreaking innovations with real potential for developmental impact, mobilized underused or misused data, and demonstrated meaningful partnerships with CGIAR and other sector members. By 2020, 28 grants had been awarded to **21 projects**, with a combined total of US\$3.225 million.

Demonstrating CGIAR's continued commitment to scale projects and ensure their sustainability, the Platform awarded additional scale-up funds to prior winners each year, in addition to awarding new grants. The total amount of scale-up funds granted was US\$1.125 million. The Platform also awarded Rapid Response grants to proposals related to digital responses to the COVID-19 pandemic.

Gender²

The Big Data Platform encouraged women to attend all capacity development events and the Annual Big Data in Agriculture Convention. At the 2020 Convention, 50% of speakers were women. The 2020 Convention also hosted a gender track, which featured sessions on big data topics related to the empowerment of women in agriculture.



² For the complete list of gender achievements, refer to the Big Data Annual Reports included in the Resource section of this Summary Report.

Achievements CONT'D

From 2018 onward, the Platform's Inspire Challenge included a gender dimension that assessed whether and how proposals engaged with gender issues. Further gender mainstreaming components were incorporated into the 2020 round of Inspire Challenge awards and Rapid Response grants. In 2021, reporting from the Inspire Challenge showed progress had been made to ensure women's participation in projects.

In 2020, the Platform developed, adopted, and implemented its first strategy for advancing gender equity in agricultural research and development. With input from the CGIAR Generating Evidence and New Directions for Equitable Results (GENDER) Platform, the Big Data Platform designed a strategy to improve our understanding of relationships among gender, agriculture, and rapidly digitizing economies and to develop FAIR data systems that enable gender data to be used to its full potential.

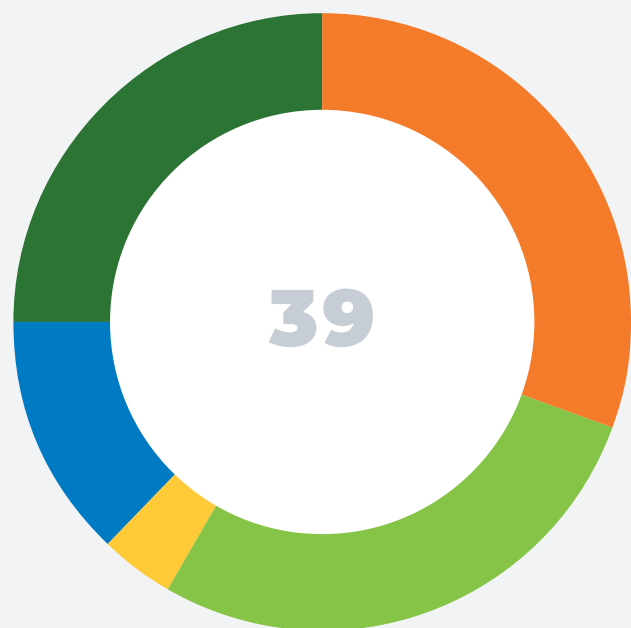
Collaborative research between the Big Data Platform and the GENDER Platform centered on developing a novel and timely large-scale assessment of women's economic empowerment.



A phone-based survey of 10,000 respondents was conducted and used to analyze billions of data points in call detail records (CDRs) – anonymous data generated by the operation of mobile phone networks – to predict gender and decision-making power among female farmers in Uganda. The approach demonstrated the potential for observing changes in female farmers' economic empowerment with greater

speed and scale compared with the sole use of survey-based methods. In 2021, Big Data and GENDER launched a new research collaboration using CDRs to examine gender and labor dynamics in Ghana's food systems.

FIGURE 1: Highlighted Big Data partnerships by main area, 2017–2021



- Research **31%**
- Delivery **28%**
- Capacity Development **25%**
- Other **13%**
- Policy **4%**

From 2017–2021, Big Data’s partnerships primarily focused on research (**31%**), delivery (**28%**), and capacity development (**25%**), with additional partnerships in policy and other areas.

FIGURE 2: Big Data capacity development, 2017–2021

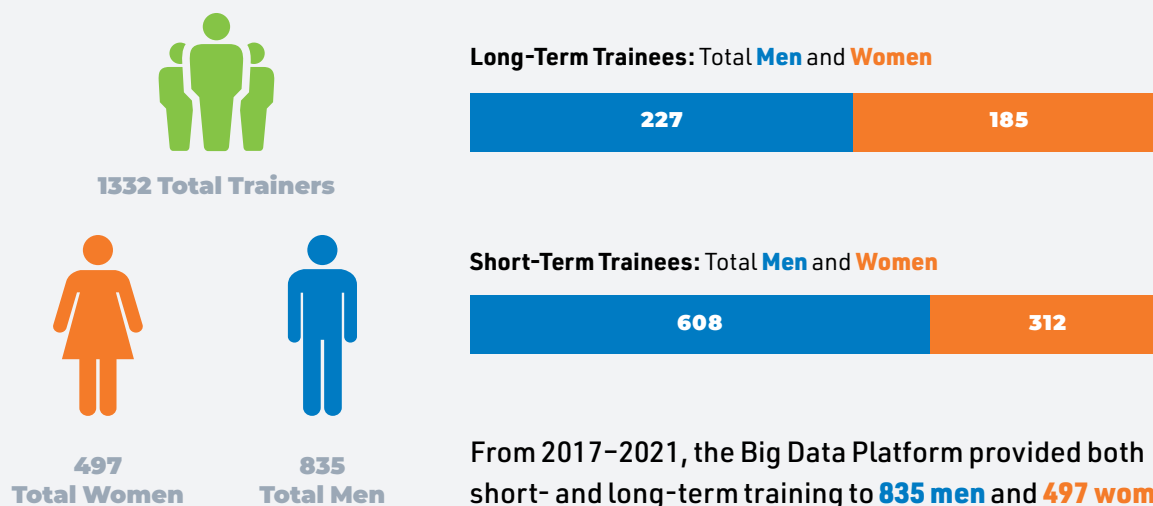
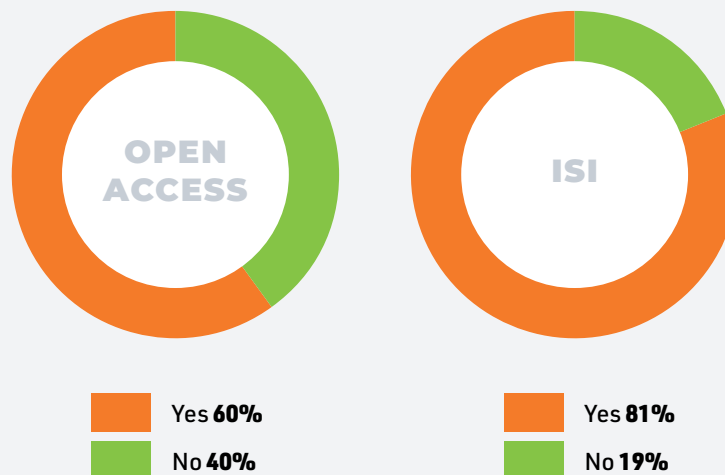
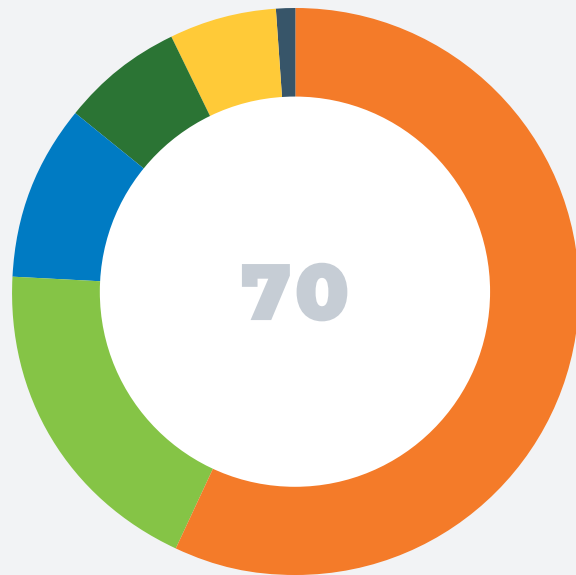


FIGURE 3: Big Data peer-reviewed papers, and percentage of open access and ISI publications, 2017–2021



From 2017–2021, the Big Data Platform published **101** peer-reviewed papers. Of these, **60%** were open access and **81%** were published in ISI-indexed journals.

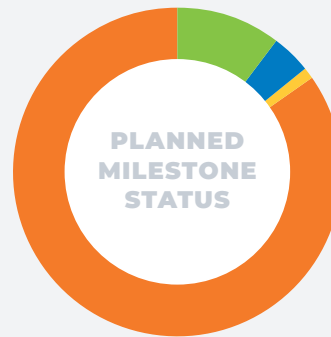
FIGURE 4: Big Data innovations by type, 2017–2021



- Research & Communication Methodologies & Tools Practices **57%**
- Product Systems and Management **19%**
- Biophysical Research **10%**
- Other **7%**
- Genetic (Varieties and Breeds) **6%**
- Social Science **1%**

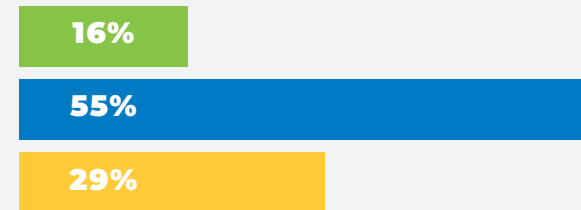
From 2017–2021, the majority of Big Data’s reported innovations centered on research and communication methodologies and tools (**57%**), with significant innovations also made in production systems and management (**19%**).

FIGURE 5: Big Data milestone status and gender relevance of milestones, 2017–2021



- Complete **82%**
- Extended **10%**
- Cancelled **4%**
- Changed **1%**

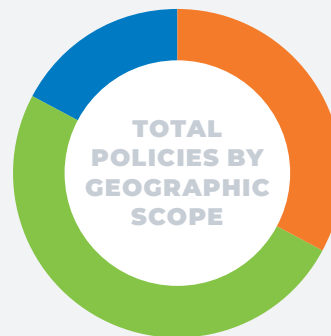
GENDER RELEVANCE



- Principal Objective
- Significant Objective
- N/A

From 2017–2021, Big Data completed **83%** of its 95 milestones. Gender was a principal or significant objective in the majority (**71%**) of the Platform’s milestones.

FIGURE 6: Big Data policy contributions by geography and type, 2017–2021



- Global **33%**
- National **50%**
- Sub-national **17%**

POLICIES BY INVESTMENT TYPE



- Policy or Strategy
- Budget or Investment
- Curriculum

From 2017–2021, half (**50%**) of Big Data’s six policy contributions were national, with significant contributions to global policies (**33%**). The Platform’s contributions focused on policy or strategy.

Explore Big Data Platform results on the [CGIAR Results Dashboard](#).

Figures 1–6 reflect reporting valid as of July 14, 2022.

Key challenges and risks during implementation of Big Data³

VARIANCE FROM PLANNED PROGRAMS AND ACTIVITIES

Between 2017 and 2021, the Big Data Platform reassessed its priorities and focus as a result of changing circumstances, opportunities, and challenges. Notable adjustments and pivots included:

- ▶ Acknowledging the need for market research on the data uses and needs of public, private, and non-profit stakeholders to identify and prioritize particular data users and ways that CGIAR could address their data needs.
- ▶ Investing resources into ensuring compliance with privacy recommendations and regulations in research data across CGIAR.
- ▶ Focusing on the development of Center and CGIAR-wide digital strategies, which led to an expanded role for research examining strategic trends and organizational capabilities to build a more unified CGIAR vision for information.
- ▶ Realigning some internal budgets to issue digital innovation grants for tools and approaches that rapidly respond to the COVID-19 pandemic.

³ The content in this section is drawn from the Big Data Annual Reports, which are included in the Resource section of this Summary Report. These Reports contain a complete list of challenges and risks.



Key challenges and risks during implementation of Big Data CONT'D

MANAGEMENT OF RISKS

► **Timely delivery of open and FAIR data.**

To address the reputational risks posed by late or non-delivery of data, CGIAR Centers received funds to implement their OA-OD strategies, with the distribution of funds subject to having an implementation plan. The Platform held regular meetings of the Data Management Task Force, engaged management to ensure the correct incentives were in place, and maintained communications with Centers.

► **Privacy breaches and data protection.**

In 2018, the General Data Protection Regulation came into effect, posing a legal and reputational risk to both the Platform and CGIAR. The Platform launched an [online course and webinar](#) to help CGIAR understand the implications of the regulation. In 2019, the Platform implemented a software [tool](#) to help CGIAR data managers avert significant regulatory and reputational risks.

► **COVID-19 pandemic.** In 2020, the Platform successfully redesigned its program implementation to be virtual and digital, achieving most programmatic targets for the year. Some access to the field was limited during lockdowns, causing some programmatic delays.

► **One CGIAR Transition.** In response to organizational change, the Platform team actively participated in design groups that spanned different research initiatives and provided input on the new Digital Services design and establishment.



Inspire Challenge Winners⁴

An integrated data pipeline for small-scale fisheries

INSPIRE CHALLENGE WINNER 2018 AND 2019

WorldFish, a CGIAR Research Program on Fish Agri-food Systems (FISH) partner, developed an **integrated data pipeline for small-scale fisheries** in Timor-Leste in response to a need for information on **fisheries and fishing activities**. In 2020, the Government of Timor-Leste adopted the system and agreed to fund its use and maintenance, hiring enumerators nation-wide to gather data.

The initial extrapolated data from the system allowed for the first calculation of national fisheries production, including small-scale fisheries, in the country. With the use of the system, the government was able to provide fisheries statistics to the Food and Agriculture Organization of the United Nations for the first time since 2003, and mention of the system was integrated into relevant articles of the national fisheries decree-law.

The **digital monitoring system** enabled a better understanding of fishing activities in the country and allowed for better management of fisheries, contributing to their potential for food and nutrition

security. This innovation also produced the first useful dataset for benchmarking and monitoring the impacts of climate change on coastal livelihoods. It will be used to evaluate fisheries as an important buffer to climate variability and events that affect pastoral and livestock farming in Timor-Leste. Following the success of the system in Timor-Leste, the project was scaled to additional countries in Africa and Asia.

Herd opportunity

RAPID RESPONSE GRANT 2020

Many of the most important measures to prevent the transmission of COVID-19 are vitally important to maintaining healthy livestock. This project utilized livestock farmers as “nodes” to spread awareness of hygiene and infectious disease within their communities. This project rapidly deployed an **interactive digital course** called “Ensuring Dairy Herd Hygiene” to train livestock farmers on how to prevent the spread of infectious diseases, both on and off the farm. The course was created and deployed by the International Livestock Research Institute (ILRI) in less than two months using the digital training platform [Learn.ink](#).

The course was piloted in Kenya and reached nearly 10,000 livestock farmers within the first four months. Early metrics from the project’s digital training courses indicated that the majority of participants were between the ages of 26 and 35, with 18- to 25-year-old participants being the second largest category.

Approximately 20% of participants were women, and efforts were made to fund a targeted online campaign for women farmers to increase their participation in the digital training courses.

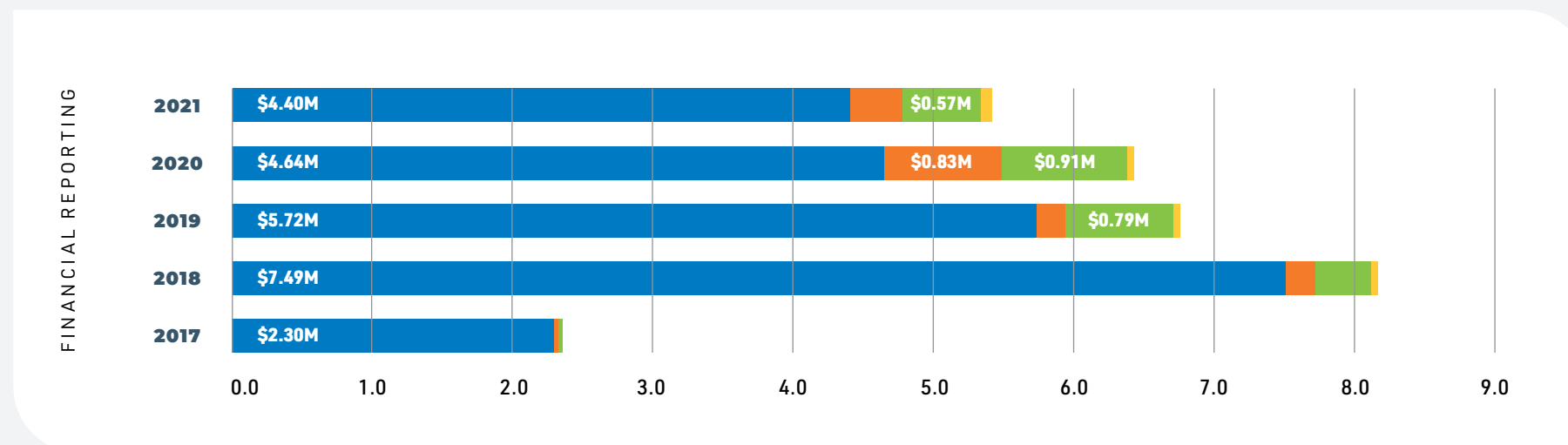
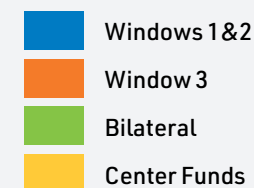


⁴ The content in this section is drawn from the Big Data Annual Reports, which are included in the Resource section of this Summary Report.

Funding and Finance⁵

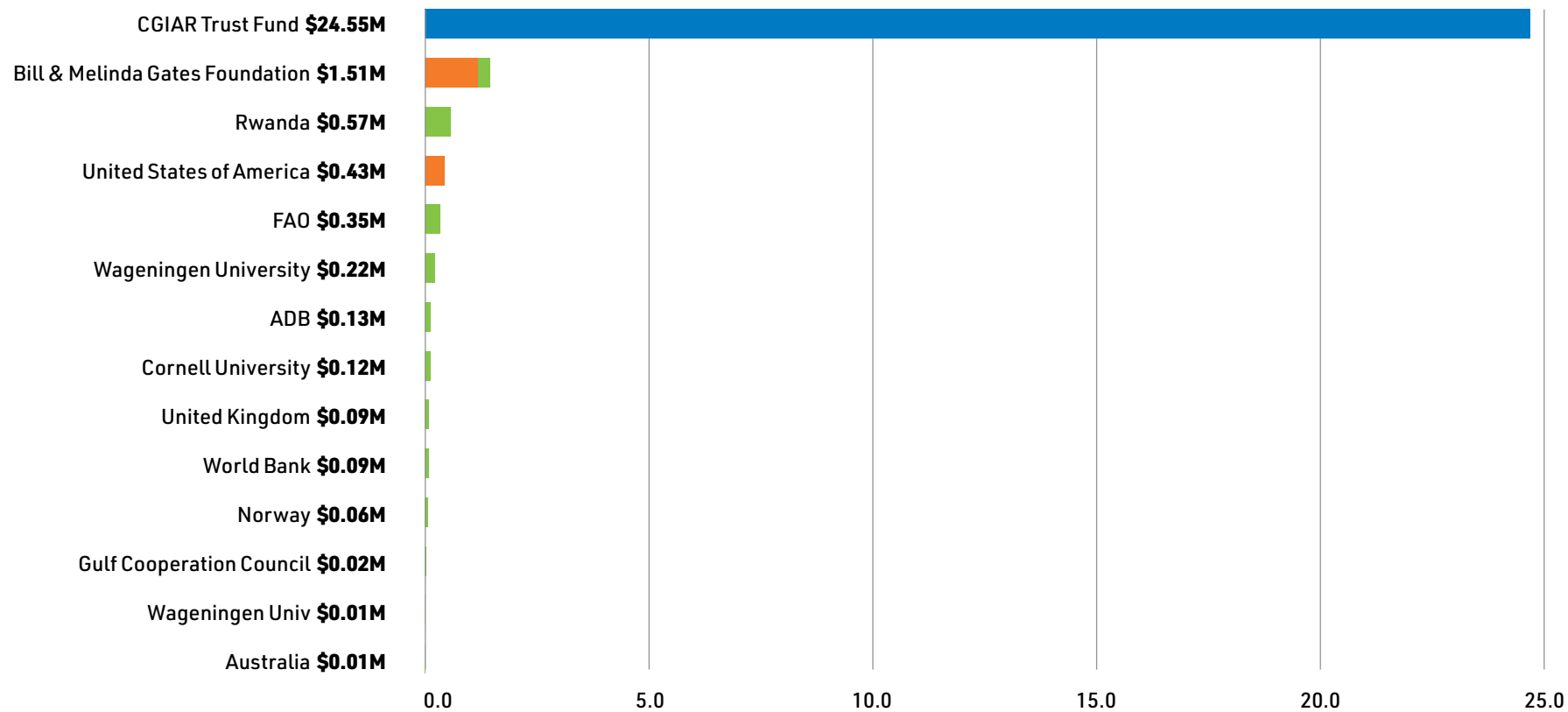
From 2017–2021, Big Data had \$28.96 million in total funding. Over this period, Window 1 & Window 2 represented 85% of funding, Window 3 represented 6%, and Bilateral represented 9% (Figure 7).

FIGURE 7: Funding sources



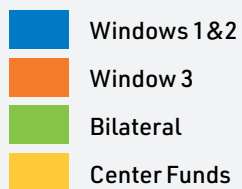
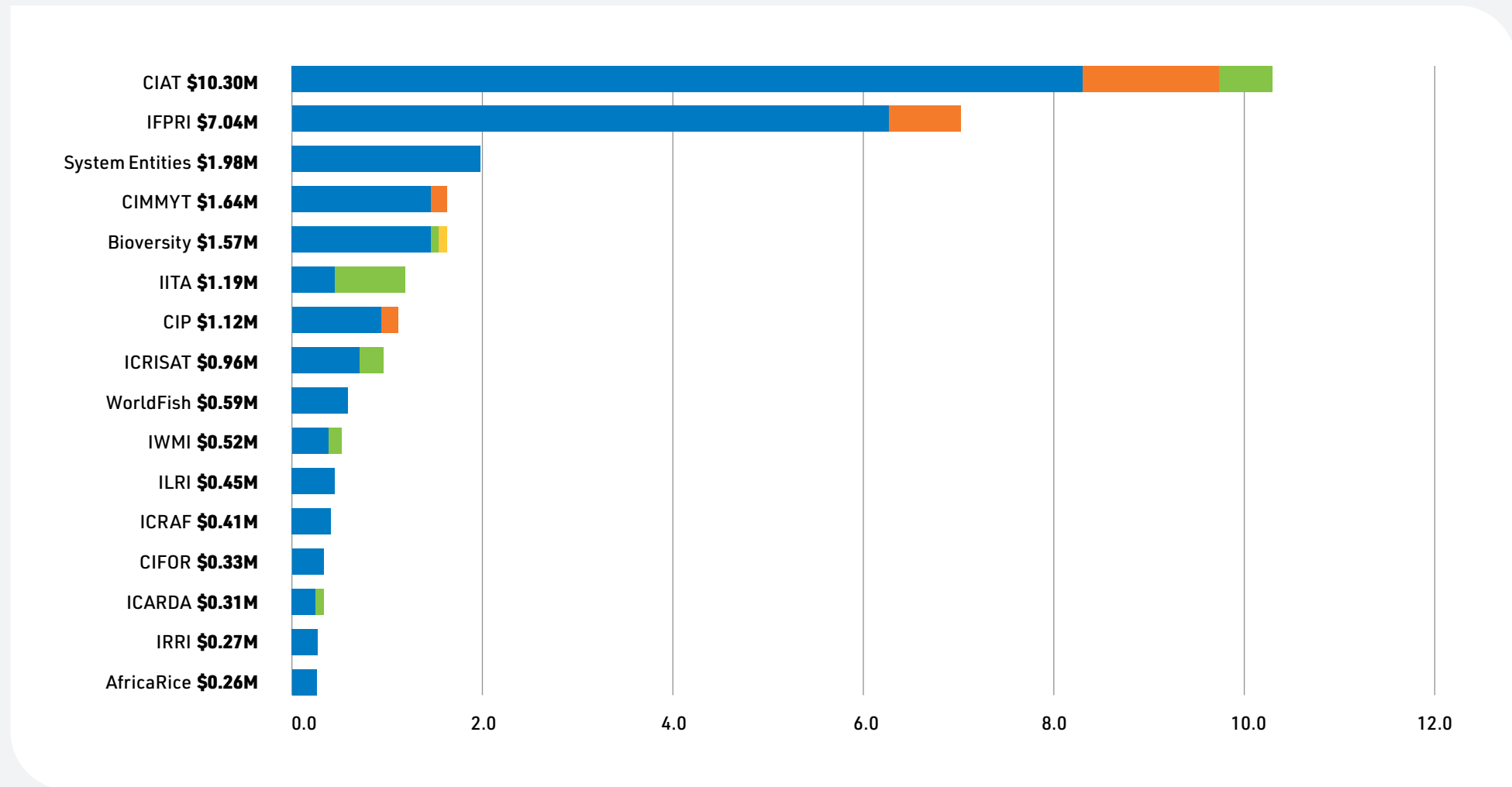
⁵ The content in this section is drawn from CGIAR's annual [Finance Reports](#).

FIGURE 8: Top Funders



The Platform's top funder (Figure 8) was the CGIAR Trust Fund, followed by the Bill & Melinda Gates Foundation, Rwanda, and the United States.

FIGURE 9: Implementing Centers



Big Data was primarily implemented by CIAT, followed by IFPRI and other CGIAR Centers (Figure 9).

Access more financial information on the [CGIAR Financial Dashboards](#).

2021 Independent Evaluative Review⁶

In 2021, the CGIAR Advisory Services (CAS) Secretariat Evaluation Function coordinated an independent evaluative review of the Big Data Platform. Below is a selection of the review's key findings.

Relevance and effectiveness

The Platform developed a range of relevant outputs such as GARDIAN, CoPs, and the Inspire Challenge. The Platform also adapted to evolving environments and constraints with, for example, the GARDIAN syntactic interoperability and the deployment of COVID-19 Rapid Response grants.

The Platform contributed to increased engagement between CGIAR researchers and stakeholders from the digital ecosystem, which resulted in standardization efforts. However, the CAS evaluation found that the Platform did not sufficiently streamline varying data management approaches or leverage the capabilities of the CGIAR Centers. The evaluation also found that consideration of gender issues was not strongly embedded in the Platform's design, and adequate resources were not systematically provided to integrate gender within the Platform.

Mechanisms for achieving sustainability

The work of the Platform added value to CGIAR's efforts to map data, methods, and tools to support the delivery of research, and the Platform was instrumental in updating the 2021 **CGIAR Open and FAIR Data Assets Policy** to replace the 2013 policy. However, the CAS evaluation found that much effort is still needed to advance the agenda of data interoperability and reusability.

⁶ The content in this section is drawn from the [Evaluation of CGIAR Platform for Big Data in Agriculture](#).



The CAS evaluation made the following recommendations to CGIAR:

- ▶ Develop a One CGIAR digital capability model and ensure funding for a long-term digital plan with successive phases and a clear mandate based on the 2021 **Strategic Research on Digital Transformation assessment**.
- ▶ Lead the way in hosting open data and providing analytic tools for CGIAR and its partners, and increase data and funding.
- ▶ Develop data synthesis tools that are amenable for use by decision-makers to support data co-curation.
- ▶ Develop a data curation and transformation dashboard to enable CGIAR and partners to access tools and technical support to undertake data harvesting, data harmonization, and visualization.

Access the [evaluation brief](#) and [full evaluation](#).

Resources

- ▶ Big Data Platform Annual Report 2017
 - ▶ Big Data Platform Annual Report 2018
 - ▶ Big Data Platform Annual Report 2019
 - ▶ Big Data Platform Annual Report 2020
 - ▶ Big Data Platform Annual Report 2021
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- ▶ CGIAR Annual Performance Report 2017
 - ▶ CGIAR Annual Performance Report 2018
 - ▶ CGIAR Annual Performance Report 2019
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 - ▶ CGIAR Annual Performance Report 2021
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- ▶ CGIAR Results Dashboard
 - ▶ CGIAR Financial Report Dashboards



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INTERNATIONAL
FOOD POLICY
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