

A close-up of a smartphone screen displaying a presentation slide. The slide has a dark green background with white and yellow text. The title "Introducing ChatGPT" is prominent. Below it, there is a sub-header "We've trained a model" and a paragraph of text starting with "ChatGPT which...". A "Menu" button is visible in the top right corner of the slide. The phone is held by a hand, with a yellow object (possibly a banana) partially visible on the left edge.

Introducing ChatGPT

Digital Revolution: Learning on CGIAR's Ways of Working

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List of Acronyms

AI	Artificial Intelligence
CGIAR	Consultative Group for International Agricultural Research
CIAT	International Center for Tropical Agriculture
CIMMYT	International Maize and Wheat Improvement Center
DTA	Digital Transformation Accelerator
EF	Evaluation Function
EiB	Excellence in Breeding
FAIR	Findable, Accessible, Interoperable, and Reusable
GARDIAN	Global Agricultural Research Data Innovation Acceleration Network
GLoMIP	Global Market Intelligence Platform
IAES	Independent Advisory and Evaluation Service
IITA	International Institute of Tropical Agriculture
ISDC	Independent Science for Development Council
ISPC	Independent Science and Partnership Council
NARS	National Research Systems
SC	System Council
SPIA	Standing Panel on Impact Assessment
UAE	United Arab Emirates
WoWs	Ways of Working

Overview

This report provides a summary of learning on CGIAR's progress in embedding the digital revolution as a core way of working. Drawing from 48 evaluation reports, reviews, and literature sources, it assesses how digital tools are enabling collaboration, innovation, and inclusion across CGIAR's global partnerships and programming.

There is clear momentum within CGIAR to adopt technologies such as AI, machine learning, and digital platforms to improve coordination and accelerate research outcomes. Tools such as [GARDIAN](#), the [Breeding Portal](#), and Global Market Intelligence Platform ([GloMIP](#)) helped streamline workflows and improve knowledge sharing. Webinars, virtual meetings, and communities of practice further supported cross-center collaboration. However, structural barriers, such as siloed operations and weak inter-module coordination, limit the full potential of these digital systems.

Partnerships with national research systems (NARS), development agencies, and select private sector actors supported the co-development of digital tools. Promising Initiatives include the AI Hub (funded by the United Arab Emirates Government), [NextGenAgroadvisory](#), and the [Scaling Scan](#). However, private sector engagement remains uneven and aspirational in many cases, with challenges linked to coordination, funding, and capacity.

Digital access and use by end-users, particularly smallholder farmers, remain a critical gap. While CGIAR emphasizes co-design and inclusion, barriers such as infrastructure, digital literacy, and gender gaps in device ownership persist. Overall, gender considerations remain under-addressed.

CGIAR made strides in promoting open access and applying Findable, Accessible, Interoperable, and Reusable (FAIR) data principles. Platforms such as [CGSpace](#) offer good practices, however, issues with data quality, metadata, and interoperability remain. More investment is needed to build capacity and governance structures to support FAIR data and enable advanced analytics.

Looking ahead, CGIAR must strengthen internal coordination, invest in capacity building across programs (both internally and with partners), and build inclusive, scalable partnerships to ensure digital tools deliver equitable impact.

1 Background and Introduction

This knowledge product on making digital revolution central to CGIAR's Way of Working (WoW) is part of a series of summaries of learning about CGIAR's WoWs. The Terms of Reference ([ToR](#)) presents the approach to compiling evaluative evidence and learning related to five of CGIAR's seven WoWs. Summaries align with the System Council (SC)-endorsed Multi-Year Evaluation Plan (MYEP) contained in the consolidated [2025-27 Workplan for CGIAR's Independent Advisory and Evaluation Service \(IAES\) \(SC/M21/DP5\)](#). As outlined in the [2030 Research and Innovation Strategy](#), CGIAR seeks to deliver multiple benefits across Impact Areas, leveraging modern digital tools to bring state-of-the-art systems and data analysis to inform and co-design global solutions. King et al. (2021) in a publication about the Platform for Big Data in Agriculture, identified four key digital trends that CGIAR must harness to transform global food security: (1) data; (2) Artificial Intelligence (AI); (3) digital services; and (4) digital trust and collective action. This summary, therefore, seeks to identify learnings, evidence gaps, findings, and identify pathways where CGIAR and its collective partners can achieve a shared goal in the digital revolution.

2 Objectives and Key Questions

The objective of WoWs summaries is to compile evaluative evidence and learning not only from the past [SC](#)-commissioned evaluations conducted by the [IAES Evaluation Function](#) (EF) and associated syntheses, but also from other sources, such as advice and reviews by the [Independent Science for Development Council \(ISDC\)](#); the impact and reach studies of the [Standing Panel on Impact Assessment \(SPIA\)](#); the advisory and audit engagements of CGIAR Internal Audit; as well as [Integrated Partnership Board](#) (IPB) and CGIAR center-led evaluations and studies. A focused literature review enriched the summaries.

Guided by the CGIAR-wide Evaluation [Framework](#) and [Policy](#), this effort aims to provide evidence-based guidance to inform strategic decisions of the [SC](#), its [Strategic Impact Monitoring and Evaluation Committee](#) (SIMEC), and CGIAR boards and leadership more broadly, on the implementation and future planning of WoWs. Summaries will assess challenges and identify areas for improvement in implementing CGIAR's [2030 Research and Innovation Strategy](#), through the lens of WoWs. Findings will help CGIAR establish a baseline portfolio of the WoWs and recommend pathways for progress. This will complement the midline independent evaluations of CGIAR programs (2027).

Summaries, along with knowledge-sharing activities (e.g., dissemination, briefs, and thematic webinars), will support discussions on CGIAR's WoWs in the current context, and they will also aid in monitoring the implementation of recommendations from previous independent evaluations and reviews pertaining to these areas. This effort will strengthen linkages across Monitoring, Evaluation, Learning, Impact Assessment, and Foresight (MELIA-F). Such an approach aligns with CGIAR's institutional efforts to strengthen linkages between functions across centers, programs, and other independent data provider levels—as well as ongoing efforts across CGIAR assurance providers to diminish assurance fatigue.¹

CGIAR's 2030 Research and Innovation Strategy describes the WoW as, "making the digital revolution central to our way of working" from leveraging the rapid global spread of digital technologies to change

¹ Observed through internal discussions with CGIAR stakeholders.

how agri-food innovation is achieved—using the best tools available to enhance research, but also engage digitally empowered end-users to improve access to, and use of, innovations and knowledge. CGIAR will facilitate the co-design of inclusive, transformative digital services across the food system and help to build supporting innovation systems to accelerate their growth.

Drawing from the literature available, this summary will aim to answer the following preliminary questions:

1. How is CGIAR engaging with the private sector and development partners to co-develop digital solutions?
2. To what extent have end-users, small-scale farmers, and other local partners gained improved access to digital tools, data, and information? In terms of CGIAR's digital innovations and efforts, what barriers or enablers exist for end-users?
3. How is CGIAR building and advocating for inclusive and context-appropriate digital services that respond to local needs and capacities?
4. In what ways are digital tools used to accelerate learning, collaboration, and knowledge sharing across CGIAR partnerships?
5. How well are CGIAR data systems applying the Findable, Accessible, Interoperable, and Reusable (FAIR) principles? What are the gaps or good practices?

In responding to these questions, it is intended that they will inform and support CGIAR's forward-looking agenda and planning.

3 Approach and Methodology

Most documents were provided by the IAES EF, and others were identified through targeted online searches. This research was conducted as a desk review, drawing on independent evaluation reports, existing literature, and data sources relevant to CGIAR's work with digital transformation and technology. These materials were reviewed to extract relevant insights, identify systemic challenges, trends, and highlight gaps. The review focused on synthesizing credible available information to inform analysis and support evidence-based conclusions. The review further benefited from a field trip to Uganda which brought tangible examples of digital initiatives in practice. A summary of key examples is presented in Annex 1.

A total of 48 papers were systematically reviewed. [CGspace](#) was used as the main repository for document search, since it is the main digital repository for research outputs and knowledge products from CGIAR and its partners. These papers were categorized and annotated using ReadCube, leveraging its AI-assisted reading functions to deepen engagement with the content. The full set of documents was then exported and uploaded into MAXQDA for qualitative analysis. The review used a predefined set of keywords, including 'partnerships', 'private sector', 'end-user', 'digital', 'data', and 'collaboration', among others. Following this, the papers were coded to identify recurring themes and insights, guided by the key words and a secondary review of the papers. The coded data were then synthesized to address the five guiding research questions.

The review process was subjected to several limitations. First, it was conducted within a limited time which limited the breadth and depth of literature that could be systematically examined across CGIAR's diverse digital initiatives. As a result, while the summary report provides valuable insights, it may not fully capture the scope of existing evidence and perspectives. Secondly, literature covered in this review spanned several years, including those where CGIAR was still in its digital nascency. The rapid evolution and

exponential growth of digital technologies means that data can lose relevance much more quickly and recently launched Initiatives using emerging technologies do not always have results or evaluative data to draw on. Finally, the review design was primarily reliant on secondary sources which may reflect publication biases, variable methodological rigor and gaps in contextual information that primary data might address. To complement this method, the study benefited from one-week field visit to Uganda from the EF team where relevant information on the practice of digital revolution, and all WoWs, was gathered in addition to a webinar organized by the EF with CGIAR stakeholders to discuss results.

Learnings and insights detailed below constitute a substantial desk and literature review focused on the five key questions posed to understand the progress of the Digital Revolution WoW across CGIAR.

4 Key Learnings

4.1 How is CGIAR engaging with private sector and development partners to co-develop digital solutions?

Across CGIAR's portfolio, Initiatives are leveraging digital tools to fast-track learning, coordination, and knowledge exchange across private and development sectors (SPIA, 2024). There is a clear enthusiasm to embrace emerging technologies such as AI, machine learning, and earth observation data. Although still limited in scope (and still largely focused on development partners), several partnerships are taking shape. One such collaboration, between the Alliance of Bioversity International and CIAT, and [NextGenAgroadvisory](#), uses machine learning to deliver location, context, and climate-specific fertilizer recommendations, boosting wheat yields by up to 25% (Urrea-Benítez et al., 2024).

CGIAR is seeking stronger ties with the private sector, inviting representatives to join advisory groups (e.g., the [Genetic Innovation Science Group](#)) and communities of practice, leveraging their experience to co-develop solutions, including digital tools, AI, machine learning, and big data applications, as with the [Inspire Challenge](#) (ISPC, 2016). Some Initiatives, such as [Excellence in Breeding](#) (EiB), engaged the private sector more deeply, engaging with multinational seed companies, including Bayer, Syngenta, Corteva, Limagrain, and SeedCo. However, it is not clear if these engagements resulted in co-developing digital solutions. Overall, these digital co-development efforts were limited both in quantity and scope (IAES, 2024c).

One notable development of the 2025–30 Science and Innovation Portfolio is the [Digital Transformation Accelerator](#) (DTA). This Accelerator involved an extensive partner engagement process, including tech companies (Microsoft, Google, Amazon), government institutions (the [Kenya Agricultural and Livestock Research Organization \[KALRO\]](#)), the [India Meteorological Department \(IMD\)](#), AgTechs ([Kuza Biashara](#)), non-profits ([Mercy Corps AgriFin](#), [Digital Green](#), [Technologies for African Agricultural Transformation \[TAAT\]](#)) alongside the major donor, Government of the United Arab Emirates (UAE) (DT Accelerator, June 2025).

There are also CGIAR endeavors to support co-development with the private sector for specific AI/machine learning activities. CGIAR engaged its legal team to create a Licensing Framework to enable best practices in contracts and royalties (IAES, 2024c). The [CGIAR Genetic Innovations Public-Private Partnership Platform](#) was established to coordinate collaboration with large multinational companies. This is led by the International Institute of Tropical Agriculture (IITA) and supported financially and technically by Bill and Melinda Gates Foundation (BFMG) to reduce dependency on private sector funding (IAES, 2024c).

By leveraging its global expertise and collaborating with industry experts, CGIAR seeks to link digital technologies with agricultural innovation to enhance productivity, resilience and sustainability in developing economies. This is exemplified by Initiatives such as the [Inspire Challenge](#), which bridges CGIAR researchers with external partners and encourages partnerships with industry to leverage public good data (CAS secretariat, 2021).

Several challenges impede effective collaboration and scalability: coordination (institutional, regional, and with external partners), budget (uncertainty with the annual cycles as opposed to guaranteed multi-year), and capacity (within NARS and other country partners). CGIAR is engaging several actors to co-develop and share digital solutions, including NARS, universities, governments, private sector actors, and funders (IAES, 2024c). The nature of diverse partnerships can mean that these engagements are *ad hoc*, as they take advantage of opportunities. In comparison, the approach of Independent Development Research Centre (IDRC) to partnership selection is intentional in that they first identify a strategic list of organizations with strong local expertise and networks that align with its climate-smart and inclusive food systems agenda (IDRC, 2024).

Going forward, CGIAR should continue expanding its partnerships with the private sector and civil society to foster collaboration and drive impact at scale (IAES, 2024a). Initiatives such as training programs, interactive platforms, digital repositories, innovation hubs, and advisory networks are helping enable more inclusive co-development and continuous feedback.

4.2 To what extent have end-users, small-scale farmers and other local partners gained improved access to digital tools, data, and information? In terms of CGIAR's digital innovations and efforts, what barriers or enablers exist for end-users?

Programs and Initiatives consistently stress the importance of, and their efforts in, co-designing digital tools and information products to improve usability for their diverse stakeholders (IAES, 2024; SPIA, 2020). Furthermore, CGIAR has consistently focused on working with local partners, advocating for the inclusion of extension services in national strategies and training, and seeking their validation (CAS Secretariat, 2021). NARS is a crucial partner for CGIAR, and there is a continued need to ensure that digital services are validated by local stakeholders and are suited to local needs and supported by adequate capacity-building and management strategies (IAES, 2021; Alemu et al., 2024; IAES, 2024c). Across CGIAR, efforts encouraging innovation are underway, with an emphasis on ensuring that end-users, small-scale farmers, and other local partners have improved access to digital tools, data and information through a variety of capacity development and open-access Initiatives such as GARDIAN (King et al., 2021).

There are also efforts to embed CGIAR's digital work into national research and development agendas, inviting more meaningful involvement of NARS in designing and implementing the CGIAR Portfolio 2025-30. Developing country-level strategies and results frameworks, aligned with national priorities and strong connections with NARS, would lay the groundwork for more sustainable, impactful, and demand-driven programming of digital innovations in countries where CGIAR operates (IAES, 2024a).

Despite these efforts, inclusion of end-users and small-scale farmers in program design and implementation processes is not yet wholly consistent across different programs (IAES, 2024a). Access does not necessarily translate into usage, and there were mixed findings about end-user's interaction with digital tools, data, and information (CAS Secretariat, 2021). Across reviewed literature, there was no single program that did not face challenges; several barriers and enablers exist for CGIAR's digital innovations and efforts. Challenges to scale remain around rural reach, insufficient digital infrastructure or device ownership, and access to specific digital services, such as video extension services in Ethiopia (IAES,

2024c). While its usage is unclear, the Agronomy Field Information Management System ([AgroFIMS](#)) is a digital tool that standardizes data collection and description for easy aggregation and inter-linking across disparate datasets. Overall, data does not show evidence of large-scale exposure of farmers and communities to digital tools.

Digital literacy and awareness are a significant challenge for (potential) users who cannot use digital technologies. Continued efforts need to be applied to ensure that users have the skills and knowledge required to access and use digital services, as well as basic digital protections, especially for marginalized groups (SPIA, 2024; CGIAR-IEA, 2018). While efforts are being made to ensure that Initiative design resonates with end-users, this appears to be an ongoing issue (IAES, 2024; Ajambo et al., 2023). IDRC also struggled with last mile users adopting and using digital tools, finding that despite qualitative research, the tools did not fit with farmer realities, and training efforts around these tools were lacking (IDRC, 2024).

Despite a 13% gender gap in basic phone ownership and a 25% gender gap in smartphone ownership across Africa (GSMA, 2025), the literature reviewed does not show a coordinated CGIAR effort to reach women with digital services or provide them with any gender-sensitive capacity-building efforts. Given that 66% of women's employment in sub-Saharan Africa is in agri-food systems (FAO, 2023), this gap warrants addressing. CGIAR's reputation for trustworthiness among farmers and its established agreements with local partners may make it easier to introduce and scale digital solutions amongst marginalized groups, such as women (IAES, 2023b). In fact, CGIAR developed a [Multidimensional Digital Inclusiveness Index](#) (MDII) that assesses and promotes inclusiveness in digital innovations within agricultural systems. The index integrates structural and experiential dimensions, and distinguishes between inclusion ensuring access, usability and inclusivity, thereby creating meaningful engagement among under-served groups. It utilizes a capability approach and technical assistance model to evaluate inclusiveness across seven dimensions: (1) accessibility; (2) social consequences; (3) usage effectiveness; (4) ethical and responsible innovation; (5) co-creation and governance; (6) supportive ecosystem; and (7) risk and harms (Martins et al., 2024).

Across programs, there are efforts that would enable farmers to use location- and time-specific climate, agricultural, and earth observation data to improve access to markets and supply chains, decision-making, early warning systems (EWS), and emergency planning through multiple channels (IAES, 2023; Alemu et al., 2024), achieving scale. Tools such as the [Impact Package and Scaling Readiness Report](#) (IPSR) were introduced and help assess whether innovations are ready to scale and their potential impact. However, it is unclear how widely adopted the IPSR currently is (IAES, 2024a).

4.3 How is CGIAR building and advocating for inclusive and context-appropriate digital services that respond to local needs and capacities?

In recent years, CGIAR endeavored to involve end-users, including small-scale farmers, in the co-design of digital tools and has tried to ensure that solutions are tailored to local needs and capacities (ISPC, 2016; SPIA, 2020; IAES 2024c), including using human-centered design and citizen science approaches (IAES, 2024b). For instance, the Alliance for Bioversity and CIAT used such an approach through the [Agroecological TRANSITIONS program's Inclusive Digital Tools \(ATDT\) Project](#) in Brazil. This project combined expert-to-farmer (top-down) with farmer-to-expert (bottom-up) approaches and peer-to-peer (farmer-to-farmer) approaches to agricultural extension (Laurens, Oliveira, Wollenberg & Shelton, 2023). A similar model was used in Vietnam with rice farmers along the Mekong Delta to promote agroecological production and reduce greenhouse gas emissions. However, further efforts are needed to ensure these services are supported by adequate training, workshops, and management strategies for accessing and using digital tools (CAS Secretariat, 2022; CGIAR-IEA, 2018).

From an internal process standpoint, CGIAR has made digital grant management platforms easier for end-users by developing tools such as the Breeding Portal and GLoMIP. These tools are designed to streamline processes and improve user experience, making it simpler for partners and stakeholders to manage grants and related activities (IAES, 2022).

The [Big Data Platform](#) increased awareness and advocated for open access and FAIR data principles. However, there is limited evidence as to whether these efforts resulted in improved access for end-users. More work is needed to advance data interoperability and reusability, which are crucial for practical end-user benefit (CAS Secretariat, 2021). While GARDIAN (CGIAR's metadata platform) offers a strong use case, its initial evaluation showed relatively low usage among end-users. 60% of surveyed users reported using GARDIAN once every six months or less, with only 40% using it at least once a month. This is likely due to the lack of awareness and uptake amongst potential users, and challenges with interoperability and reusability limiting the Platform's use case.

Across the 12 CGIAR Research Programs (CRPs), CGIAR prioritized collaboration between centers, with ongoing engagement to ensure that national research programs and local stakeholders are consistently part of the dialogue, to tailor digital services to local needs and capacities (IAES, 2024a; ISPC, 2016). Reviews assessing the various CRPs carried out in 2020 noted the training and capacity development they provided to national partners (NARS) and local breeding teams to ensure they can effectively access and use digital tools (IAES, 2024c).

As a whole, there is enthusiasm for the advent of AI, which is poised to become a significant focus in the coming years, particularly with the development of the UAE-funded CGIAR AI Hub in Abu Dhabi (CGIAR, 2025), and a Microsoft grant that aims to develop scalable, open-access AI-driven innovations for food, land, and water systems, in partnership with UAE-based institutions (IAES, 2024b, DTA, June 2025). The AI Hub is important since it will be the first of the digital innovation nodes that will enable CGIAR and partners access world class AI talent and infrastructure that centers cannot access independently. It is part of Area of Work (AoW)4 key activities of the DTA (DT Accelerator, June 2025). The recent ISDC review of Programs and Accelerators found a great ambition in the DTA for FAIR and findable data. However, there is no clear strategy to realize that aspiration. Reviewers found the theory of change (ToC), particularly in ethical and inclusive use of AI, to be more transactional as opposed to intentional, and lacks a clear risk mitigation. The Accelerator ought to have adopted a preventative approach as opposed to a curative one (ISDC, 2025). Any emergent AI Initiatives that provide direct support to farmers or end-users may face challenges around connectivity and limited compute power (Satariano et al., 2025), and there are already some concerns about AI energy usage (ISDC, 2024). King et al. (2021) note that whilst some CGIAR researchers routinely use AI, only a few teams possess these capabilities across the organization.

A thoughtful and vigilant approach to AI is warranted, as technology is developing faster than ethical and legal frameworks. Through the DTA, AoW2 is designed to ensure responsible and inclusive use case-driven research, and AoW4 focuses on building the policy, governance, and capacity frameworks needed for ethical and effective adoption of AI across CGIAR and partners (DT Accelerator, June 2025; CGIAR, 2024). Additionally, efforts have been made to integrate major datasets into AI-ready formats through GARDIAN (IAES, 2024b).

"We also hope to create those tools and also provide the necessary trainings, as well as have the incentives and governance mechanisms in place to ensure that the data that is generated is fair and AI ready at the point of collection itself."

Ram Dhulipala, Interim Director of Digital Transformation Accelerator

4.4 In what ways are digital tools used to accelerate learning, collaboration, and knowledge sharing across CGIAR partnerships?

Digital tools are playing a central role in enhancing learning, collaboration, and knowledge sharing across CGIAR partnerships, helping to foster a more holistic and integrated research ecosystem (Alemu et al., 2024; IAES, 2024d). A variety of mechanisms are used to support this transformation. Platforms such as GARDIAN, alongside communities of practice, virtual meetings, and workshops improved coordination across CGIAR centers and with external partners (IAES, 2024b; CAS, 2021). Interactive webinars and online events such as [Venture-Out: Bridging Science and Entrepreneurship](#) focused on further stimulating partnerships and cross-learning between innovators and CGIAR scientists (IAES, 2024a).

Digital tools such as the [Global Market Intelligence Platform](#) (GloMIP) and the Breeding Portal strengthened digital workflows and collaboration across breeding pipelines. These tools support more effective coordination, quality seed delivery, and measurable genetic gains in farmers' fields (IAES, 2024c; IAES, 2022). More broadly, CGIAR's [Open Access and Data Management \(OA/DM\) Policy](#) and the revised 2021 [CGIAR Open and FAIR Data Assets Policy](#) catalyzed a cultural shift toward openness, enabling researchers, data managers, NARS, and Small and Medium Enterprise (SMEs) to access and collaboratively manage breeding data (CGIAR Platform for Big Data in Agriculture, 2021).

[International Maize and Wheat Improvement Center \(CIMMYT\) Scaling Scan](#) is another notable innovation, helping teams assess the scaling potential of technologies, including AI-powered technologies, identify bottlenecks, and develop strategies to enhance impact. It emphasizes systems thinking by guiding users to assess enabling conditions, such as collaboration, capacity, and institutional support, and chart a path toward sustainable scaling, including financial and governance alignment.

AI-based innovations are also beginning to show promise, with the potential to draw on other tools or direct to it validating the accuracy of an AI result with other known tools. Two recent tools assessed *via* the Scaling Scan include:

- An OpenAI-powered chatbot for [Jokolante](#) (applied in India, with possibility in Senegal);
- An AI model for audio processing of farmers' voices, with possible application across Africa.

While these tools show potential, further case study applications are needed to generate the evidence base necessary for broader uptake by agri-food NGOs and partners.

Despite these advancements, the effectiveness of digital tools depends heavily on the quality of underlying organizational structures and processes. For example, the EIB Platform evaluation found a need to strengthen collaboration across modules, that evidenced siloed operations and an absence of structured coordination (CAS Secretariat, 2022). In such contexts, digital tools may only amplify existing inefficiencies. The review of the 2025-30 inception reports found that the overemphasis of AI and machine learning can overshadow the broader agri-food systems innovation. Without strong and intentional integration into CGIAR's interdisciplinary goals, these tools risk deepening siloed practices, rather than breaking them down (ISDC, 2025).

"...in the age AI, we have been making progress of converting all the CGIAR knowledge products to AI ready data set, so that, for example, a large language model can be trained on CGIAR product."

Jawoo Koo, Deputy Director of Digital Transformation Accelerator.

Finally, capacity building remains critical. Without the skills to collaborate effectively or use digital tools appropriately, their potential impact is limited. For digital to truly enable transformation, organizations must invest in both institutional coordination and human capacity.

4.5 How well are CGIAR data systems applying the FAIR principles? What are the gaps or good practices?

FAIR principles were established after the [Open Access and Open Data \(OAOD\) Policy](#), which was launched in 2013, and laid the foundation for adopting FAIR principles across research outputs. This policy was revised and replaced² by the 2021 [CGIAR Open and FAIR Data Assets Policy](#), which outlines the best practices for managing data assets under FAIR principles. CGIAR data should be stored in open repositories with identifiers and standardized metadata. By default, CGIAR adopts an open access policy with permissive licenses except where confidentiality applies with clear access protocols. Data reuse practice is supported through open formats, explicit licensing and metadata that documents lineage and versioning. Through advocacy and some capacity development, it is envisioned that OAOD will be strengthened, including the FAIR principles.

Standardized indicators and central repositories are designed for interoperability and access to data, to help promote data consistency, good practices, and reliability (IAES, 2024; IAES, 2021a). Platforms such as CGSpace and CGIAR Level Agricultural Results Interoperable System Architecture (CLARISA) ensure that research outputs are findable and accessible, assigning globally unique and persistent identifiers to datasets and publications (CGIAR-IEA, 2018). However, it is also important to note existing challenges in data interoperability and reusability, which, left unaddressed, will impact usage (CAS Secretariat, 2021). The Big Data Platform evaluation has seven recommendations addressing data interoperability; specifically, recommendations 2, 2.1, 2.2, 2.3, 2.6, 5, and 9.1 focus on the need for CGIAR to prioritize the interoperability agenda. Additionally, recommendation 8.1 of the Performance and Results Management System (PRMS) evaluation report also focuses on interoperability of organization wide data and handover of [CLARISA](#) (IAES, 2023; IAES, 2024a).

FAIR's standardized, measurable indicators are self-reported and visualized across the system to assess compliance with each FAIR principle for both publications and data and promote transparency and harmonized reporting. Sub-recommendation 2.10 of the Big Data Platform evaluation calls for developing measures that go beyond the FAIR principles to add value across the data continuum (IAES, 2021a). In response, management noted that the One CGIAR structure offers a key opportunity to advance this work. Within the current portfolio, the DTA proposal reflects this commitment: AoW1 reinforces the use of FAIR data principles, while AoW2 and AoW3 address data use cases and showcase the benefits of interoperability (DT Accelerator, June 2025).

Recommendation 2.10 of the evaluation of the Big Data Platform calls for developing measures that go beyond the FAIR principles to add value across the data continuum. In response, management noted that the One CGIAR structure offers a key opportunity to advance this work (IAES, 2021). Within the current

² Approved by the System Management Board with effect from 16 April 2021 (Decision reference SB/M19/EDP3). This Policy supersedes and replaces in its entirety the 2013 OAOD Policy.

portfolio, the DTA proposal reflects this commitment: AoW1 reinforces the use of FAIR data principles, while AoW2 and AoW3 address data use cases and showcase the benefits of interoperability.

However, several areas limit implementation and usage; these include a need for capacity building, concerns about risk mitigation (ISDC, 2024), and monitoring of data inputs to ensure quality (CAS, 2021; IAES, 2021). Further attention to metadata quality and advanced FAIR practices is needed to fully realize the benefits, especially for AI and advanced analytics (IAES, 2021a). Sub-recommendations 2.3, 2.4, 2.8, 2.9 of the evaluation of Big Data Platform and recommendation 7 of the 2021 [Synthesis of Learning Evaluation Report](#) propose allocation of more resources to metadata standardization, adding semantic enrichment of metadata, integration of specific e-infrastructures, including the existing including CGspace (IAES, 2021a; IAES, 2021b). Budget is another area that may have been underestimated—there is a need to continue and increase funding to enable better curation and maintenance of data (ISDC, 2021; ISPC, 2016; Pelletier et al., 2023; CAS Secretariat, 2022). Management recognizes the limitations enumerated, and, in response to recommendation 41 of the Synthesis Report, commits to fully supporting CGIAR to expand the incorporation of big_data and digital technologies in research. Management further notes that in the [2025–30 Research and Innovation Portfolio](#), more than half of initiatives plan to use digital technologies as a key research development tool (IAES, 2021).

Monitoring, Evaluation and Learning (MEL) reporting revealed concerns particularly regarding indicator quality and readiness, unclear baselines, limited data transparency, and the ability to capture long-term development outcomes or partnership effectiveness (IAES, 2024). Furthermore, it was not clear whether evaluations and lessons learned were embedded in a comprehensive knowledge system. There is a consistent need for ongoing capacity-building and behavioral change to fully embed FAIR principles across all partners in the CGIAR system. It is vital to ensure consistent application of FAIR principles across centers to achieve data quality, usability and realize their benefits (CGIAR-IEA, 2018; IAES, 2024b; IAES, 2024d; ISDC, 2024; ISDC, 2021).

5 Conclusions

CGIAR is making genuine efforts to ensure that digital tools and data are inclusive, responsive, and reflective of end-user needs. A strong emphasis on co-design is helping tailor these tools to local contexts, enhancing their relevance and usability, particularly for small-scale farmers and national research partners.

In parallel, multiple mechanisms are in place internally, to strengthen capacity and collaboration across the CGIAR system and with external stakeholders. Communities of practice, virtual meetings, and interactive workshops are effective in promoting knowledge exchange and joint learning.

Partnerships with relation to digital and with NARS are relatively well-developed, with ongoing efforts to deepen collaboration. In contrast, private sector engagement remains limited and largely aspirational. Unlocking the potential of these partnerships will require sustained investment, clear incentives, and structured support, particularly to enable interdisciplinary collaboration across centers and disciplines.

Significant challenges remain around digital access at the last mile.³ These include poor rural infrastructure, low device ownership, and limited digital literacy, all of which constrain the reach and effectiveness of digital innovations, especially among women and marginalized groups.

While FAIR data principles gained traction, their implementation is still emerging. Continued investment in data quality, curation, and system-wide capacity building will be essential to fully realize their potential.

6 Evidence Gaps & Looking Forward to the 2025–30 Portfolio

While CGIAR has made notable progress in embedding digital approaches across its programs and partnerships, several evidence gaps remain that must be addressed to guide and strengthen the 2025–30 Portfolio.

- **Limited evaluative insight into FAIR implementation:** Although FAIR principles are widely endorsed across CGIAR, there is little concrete evaluative data on how effectively they are being applied in practice. Future work should focus on assessing their implementation, impact, and contribution to data quality and use.
- **Lack of detailed information on private sector partnerships:** While private sector engagement is frequently referenced, examples are often general rather than specific. More granular documentation of partnership models, success factors, and challenges is needed to inform scaling and replication.
- **Absence of a quantitative baseline for farmer digital access and impact:** Many digital Initiatives lack a robust baseline to assess smallholder access to, and use of, digital tools. This limits CGIAR's ability to track change or demonstrate impact at the farm level over time. Going forward, CGIAR should consider introducing a standardized digital access and readiness survey, that can be used at the beginning or preparation stages of any Initiative, paying close attention to gender dynamics.
- **Insufficiently addressed gender gaps:** Despite well-documented disparities in women's access to digital tools, the reviewed literature reveals limited attention to gender-responsive design and implementation. More deliberate, gender-intentional approaches are needed to ensure digital services reach and benefit women equitably.

Looking ahead, CGIAR's digital work would benefit from targeted investment in these evidence gaps, especially to strengthen accountability, inform strategy, and ensure inclusive, scalable, and effective digital innovation across the next research and innovation cycle.

³ The final stage of connectivity that links end users; often rural communities, smallholder farmers, or remote institutions, to digital infrastructure and services.

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Annex 1. Evidence from Uganda

This section highlights insights gathered from the field visit in Uganda, where the Ways of Working (WoWs) were observed and are being operationalized. Through these discussions, stakeholders described how digital technologies are being strategically integrated into Uganda's agri-food systems.

The discussions held in Uganda with 43 stakeholders, including CGIAR staff, NARO partners, the private sector, development bank, and development organizations, revealed a digital landscape that is diverse and dynamic. Discussions gave examples of innovative ways through which digital technologies are integrated into agri-food systems. CGIAR centers described ways in which they are working to ensure digital inclusion. The Alliance for Bioversity and CIAT (ABC) team, for instance, includes digital inclusion experts who were able to describe the innovative ways they are using AI for phenotyping. Additionally, the IITA developed the mobile app [StepWize](#), which helps farmers to incrementally adopt farming practices.

Capacity sharing in digital was also found where NARO described having benefited from digitization machines, tablets for data collection, and surveillance drones. This was made possible through a partnership with International Maize and Wheat Improvement Center (CIMMYT). CIMMYT also trained NARO staff to use and operate machines. However, the usage of such machines within NARO remains relatively low, as further capacity building is needed to improve the operators' confidence. Furthermore, ABC partnered with them to test data collection tools for breeding trials, as well as uploaded data through the breeding management system.

According to GSMA, mobile phone penetration is 76% in Uganda, and mobile internet penetration is 66% (2024). It is important to note that most mobile devices in use are basic analog phones that cannot support advanced digital applications (complex apps) designed for agriculture. Moreover, access to mobile technology is uneven, influenced by geographic, demographic, and socio-economic disparities. For example, rural women were found to have significantly lower access to mobile phones. There is a 6% gender gap nationally, but this is assumed to be much higher in rural environments (GSMA, 2025a). In many households, mobile devices are owned by men, who serve as intermediaries for relaying communication, including agricultural information. To address these gaps in mobile phone access, CGIAR centers and their partners developed inclusive mechanisms to extend reach. For example, the International Livestock Research Institute (ILRI) employs a hybrid model that relies on trained community point-persons to disseminate extension messages in areas with limited mobile access.

Private sector engagement in the digital space was evident. Almost all CGIAR centers and partners established working relationships with private sector actors to provide context specific solutions. One example was ABC, which, through the [Rethinking Food Markets and Value Chains for Inclusion](#) initiative, partnered with the [EzyAgric](#) mobile app to provide a wide range of digital solutions for farmers across the value chain. These include access to genuine farm inputs, credit, extension services, alongside market linkages. Elsewhere, ILRI partnered with the [Smart Farming](#) mobile app, a feed calculator that supports feed formulation and nutrient value measurements for farm animals, and [IKnowFarm](#), a mobile app that helps farmers increase their productivity and income.

Despite progress, several challenges remain. Infrastructure development, primarily the responsibility of government and telecommunications companies, continues to limit access to digital solutions and the effective distribution of information, especially in remote areas. For instance, IITA reported difficulties in sharing data on viral disease outbreaks with government bodies, as the institute lacks the mandate to take direct public health action. While they can report data on hotspots and outbreaks, limitations in policy

frameworks hinder swift action. Previously, IITA worked with the now-defunct USAID to mitigate this by raising funds and convening stakeholder meetings aimed at establishing clear parameters for data sharing and management.

Annex 2. Projects and Initiatives Discussed

Excellence in Breeding (EIB)

This program is now referred to as Breeding for Tomorrow, and is one of CGIAR's nine Science Programs, working across CGIAR and its partnerships towards delivering a portfolio of climate-resilient, market-preferred, and nutritious crop varieties.

Global Agricultural Research Data Innovation & Acceleration Network (GARDIAN)

GARDIAN is a digital platform providing a search engine to discover agri-food datasets, documents, and digital assets from CGIAR centers and its partners. GARDIAN also offers a set of tools that apply Findable, Accessible, Interoperable, and Reusable (FAIR) data principles across stages of the data lifecycle, including data collection, sharing, curation, and analysis.

Global Market Intelligence Platform (GloMIP)

This platform was built from two predecessors: Depository Trust and Clearing Corporation (DTCC)'s Global Product Repository and the Priority-setting Dashboard developed by Bert Lenaerts. In 2023, GloMIP was co-developed by multiple CGIAR centers and partners, led by CGIAR's Market Intelligence Initiative. It was later integrated with CGIAR's Breeding Portal, enhancing its capabilities for donors, investors, breeders, researchers, and scientists. This platform continues to advance market intelligence for more impactful and equitable genetic innovation.

NextGen Agroadvisory

This decision support tool was developed to provide farmers, extension workers, and planners with location-specific, tailored, and season-smart agricultural advice. It uses machine learning algorithms to analyze crop responses to fertilizer and other factors, providing recommendations based on data from over 25,000 crop responses.

The Inspire Challenge

This global Initiative encourages research centers and external partners to use data to solve global food challenges. To date, it has awarded 28 grants to 21 projects, a combined total of USD 3.225 million.

Scaling Scan

This digital tool is used to assess the scaling potential of innovations by analyzing their opportunities and bottlenecks. It is based on a systems thinking approach and helps determine the enabling conditions required for innovations to scale sustainably.

SeEdQUAL

CGIAR's Research Initiative Seed Equal focuses on the delivery of seed of improved, climate-resilient, market-preferred, and nutritious varieties of priority crops, providing farmers with a high rate of genetic gain while ensuring equitable access for women and other disadvantaged groups.

Stepwise

This Android-based decision-support app breaks down complex, climate-smart agricultural practices into manageable, phased steps tailored to specific agro-ecological contexts, helping smallholder farmers adopt best practices without overwhelming investment. It covers a range of crops in over 12 countries.

Scaling week

This event brings together scientists, practitioners, and funders to advance the conversation around scaling for impact in global food systems, with a focus on South-South collaboration.

Annex 3. Digital and Big Data Management Response Status

The Evaluation Function (EF) conducts process and performance evaluation to generate evidence on relevance, coherence, effectiveness, efficiency, and sustainability of CGIAR's research innovations. These evaluations are grounded in CGIAR's evaluation policy with a strong emphasis on learning and accountability. These evaluations contain recommendations for management to implement. They are tracked in the CGIAR [Management Response Tracking Dashboard](#). From this dashboard, 70 out of 273 recommendations were identified that align with the Digital Revolution Way of Working (WoW), and were aggregated from seven evaluations conducted by the EF. The table below presents the distribution of the recommendations per evaluation.

Table 1. Distribution of recommendations per evaluation

Evaluation	No. of Rec.	Completed	On Track	Delayed	Canceled	No Status Available
Evaluation of CGIAR Platform for Big Data in Agriculture. Report (2021)	37	27%	22%	24%	3%	24%
Genebank Platform Evaluation	3	-	-	67%	-	33%
2021 Synthesis of learning from a decade of CGIAR Research Programs	3	67%	-	-	-	33%
Excellence in Breeding Platform Evaluation	5	80%	-	-	-	20%
GENDER (Generating Evidence and New Directions for Equitable Results) Platform Evaluation	4	-	-	50%	-	50%
Systems Transformation Science Group: Evaluation Report	1	-	-	-	-	100%
Study of the Performance and Results Management System (PRMS) Project Management Approaches and Fit-for-Purpose Information Products	17	-	-	-	-	100%
Total	70					

From the identified recommendations, the majority, 42, were fully accepted by the management, 20 were partially accepted, and eight had no management acceptance status.

Table 2. Management acceptance of recommendations

Management Acceptance	Number
Fully accepted	42

Partially accepted	20
N/A	8
Total	70

The status of the Management Response implementation was as follows: 22 were completed, 14 were delayed, eight were on track, four were canceled, and 22 had no available status.

Table 3. Status of Management Response implementation

Status	Number
Completed	22
On Track	8
Delayed	14
No status Available	22
Cancelled	4
Total	70

Annex 4. Programs and Accelerators Proposals–Inception Reports (June 2025)

Table 4. Programs and accelerators proposals (June 2025)

S/No	Program	Abbreviation used in this report
1.	Breeding for Tomorrow	B4T
2.	Better Diets and Nutrition	BDN
3.	Capacity Sharing	CapSha
4.	Climate Action	CA
5.	Digital Transformation	DT
6.	Food Frontiers and Security	FFS
7.	Gender, Equality and Inclusion	GEI
8.	Genebanks	GB
9.	Multifunctional Landscapes	MFL
10.	Policy Innovations	PI
11.	Scaling for Impact	S4I
12.	Sustainable Animal and Aquatic Foods	SAAF
13.	Sustainable Farming	SF



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