Female farmer training on push planter usage

CGIAR Research Initiative on
Excellence in Agronomy

Annual Technical Report 2024

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The Artificial Intelligence (AI) software ChatGPT was used to support the editing of parts of this report, specifically to improve clarity, grammar, and style. ChatGPT was not used to generate the content of the report. All edits made with AI assistance were reviewed and validated by the authors to ensure accuracy, coherence, and alignment with the original intent.

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CGIAR Technical Reporting 2024

CGIAR Technical Reporting has been developed in alignment with CGIAR's Technical Reporting Arrangement. This annual report ("Type 1" Report) constitutes part of the broader CGIAR Technical Report. Each CGIAR Research Initiative/Impact Platform/Science Group Project (SGP) submits an annual "Type 1" Report, which provides assurance on progress towards end of Initiative/Impact Platform/SGP outcomes.

As 2024 marks the final year of this CGIAR Portfolio and the 2022-24 business cycle, this Type 1 Report takes a dual approach to its analysis and reporting. Alongside highlighting key achievements for 2024, the report also provides a cumulative overview of the 2022-24 business cycle, where relevant. This perspective captures the evolution of efforts over the three-year period. By presenting both annual and multi-year insights, the report underscores the cumulative impact of CGIAR's work and sets the stage for the transition to the 2025-30 Portfolio.

The 2024 CGIAR Technical Report comprises:

- **Type 1 Initiative, Impact Platform, and SGP Reports:** These annual reports present progress towards end of Initiative/Impact Platform/SGP outcomes and provide quality-assured results accessible via the CGIAR Results Dashboard.
- **Type 3 CGIAR Portfolio Practice Change Report:** This report provides insights into CGIAR's progress in Performance Management and Project Coordination.
- **Portfolio Narrative:** Drawing on the Type 1 and Type 3 reports, as well as data from the CGIAR Results Dashboard, the Portfolio Narrative synthesizes insights to provide an overall view of Portfolio coherence. It highlights synergies, partnerships, country and regional engagement, and collective progress.
- **Type 2 CGIAR Contributions to Impact in Agrifood Systems: evidence and learnings from 2022 to 2024:** This report offers a high-level summary of CGIAR's contributions to its impact targets and Science Group outcomes, aligned with the Sustainable Development Goals (SDGs), for the three-year business cycle.

The Portfolio Narrative informs the 2024 CGIAR Annual Report – a comprehensive summary of the organization's collective achievements, impacts, and strategic outlook.

Elements of the Type 2 report are integrated into the CGIAR Flagship Report, released in April 2025 at CGIAR Science Week. The Flagship Report synthesizes CGIAR research in an accessible format designed specifically to provide policy- and decision-makers at national, regional, and global levels with the evidence they require to formulate, develop, and negotiate evidence-based policies and investments.

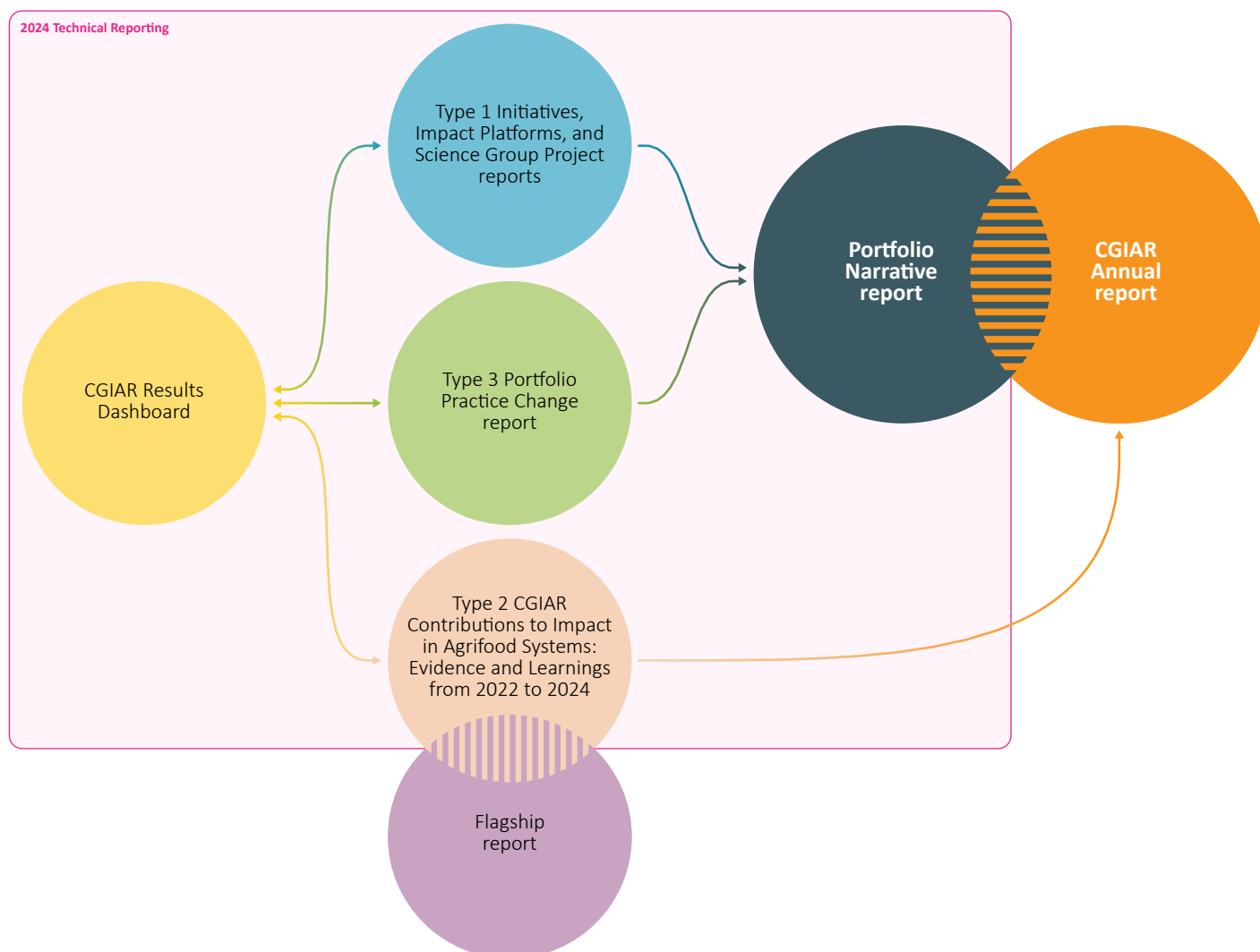The diagram below illustrates these relationships.

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

Section 1: **Fact sheet, executive summary and budget**

Initiative name	Excellence in Agronomy for Sustainable Intensification and Climate Change Adaptation
Initiative short name	Excellence in Agronomy
Initiative Lead	Bernard Vanlauwe (b.vanlauwe@cgiar.org)
Initiative Co-lead	Job Kihara (j.kihara@cgiar.org)
Science Group	Resilient Agrifood Systems
Start – end date	01 January 2022 − 31 December 2024
Geographic scope	**Regions** Central and West Asia and North Africa · East and Southern Africa · Latin America and the Caribbean · South Asia · Southeast Asia and the Pacific · West and Central Africa **Countries** Bangladesh · Cambodia · Cameroon · Colombia · Côte d'Ivoire · Egypt · Ethiopia · Ghana · India · Indonesia · Kenya · Malawi · Mali · Mexico · Morocco · Mozambique · Nepal · Nigeria · Peru · Philippines · Rwanda · Senegal · Tanzania United Republic · The Democratic Republic of the Congo · The Socialist Republic of Viet Nam · The United Arab Emirates · Uganda
OECD DAC Climate marker adaptation score[1]	**Score 2: Principal** The activity is principally about meeting any of the three CGIAR climate-related strategy objectives—namely, climate mitigation, climate adaptation, and climate policy—and would not have been undertaken without this objective.
OECD DAC Climate marker mitigation score[1]	**Score 1: Significant** The activity contributes in a significant way to any of the three CGIAR climate-related strategy objectives—namely, climate mitigation, climate adaptation and climate policy—even though it is not the principal focus of the activity
OECD DAC Gender equity marker score[2]	**Score 1A: Gender accommodative/aware** Gender equality is an objective, but not the main one. The Initiative/project includes at least two explicit gender specific outputs and (adequate) funding and resources are available. Data and indicators are disaggregated by gender and analyzed to explain potential gender variations and inequalities.
Website link	https://www.cgiar.org/initiative/11-excellence-in-agronomy-eia-solutions-for-agricultural-transformation/

[1] The Organisation for Economic Co-operation and Development (OECD) Development Assistance Committee (DAC) markers refer to the OECD DAC Rio Markers for Climate and the gender equality policy marker. For climate adaptation and mitigation, scores are: 0 = Not targeted; 1 = Significant; and 2 = Principal.
[2] The CGIAR Gender Impact Platform has adapted the OECD gender marker, splitting the 1 score into 1A and 1B. For gender equality, scores are: 0 = Not targeted; 1A = Gender accommodative/aware; 1B = Gender responsive; and 2 = Principal.
These scores are derived from Initiative proposals, and refer to the score given to the Initiative overall based on their proposal.

EXECUTIVE SUMMARY

The CGIAR Research Initiative on Excellence in Agronomy (EiA) focused on facilitating the development and delivery of agronomic solutions to farmers through partnerships with public and private sector organizations. The solutions address key challenges faced especially by smallholder farmers. Agronomic solutions related to precision nutrient management such as fertilizer type and amounts, planting time, and mechanization such as for direct seeding of rice were co-developed through 20 demand-driven Use Cases in 13 countries. These solutions, delivered in collaboration with 123 public and private sector partners, reached 450,000 smallholder farmers (33 percent female), and were applied on 272,000 hectares. The observed benefits include up to 40 percent increases in yield and profits, and reduced emissions expected from reduced inputs, for example, for potato in Rwanda.

EiA developed agility support mechanisms to facilitate accelerated development and deployment of agronomy solutions. These included a prioritization process for demand-driven solutions to address production constraints and climate challenges, solutions for agricultural data standardization (Carob), an open access data lake with up to 1 million data points for calibrating recommendation models, a generalized solutions platform, AgWise, allowing fast transfer of solutions to new geographies and for rapid response to new partner demands, a data-driven stage-gating process for go vs. no-go of use cases based on progress. The Initiative also defined agronomic gain and developed a suite of standard operating procedures to support measurement of the gain.

EiA solutions are attracting policy support such as for conservation agriculture mechanization in Morocco, where application in up to 200,000 hectares is achieved, and in Viet Nam where the governments' 1-Million-Hectare High-Quality, Low-Emission Rice Program was initiated in 2023. Also, the Philippine government has adopted the use case approach to develop drone direct seeding technology, which is now undergoing validation trials in five major rice growing regions. In Ethiopia, a harmonized decision support tool (DST) built on progress with two Use Cases is embedded into the national digital agriculture extension system as a national asset, with government-led validations of its recommendations across 2,500 farm fields.

The Initiative, engaging with several advanced research institutes (Eidgenössische Technische Hochschule (ETH-Zurich), Cornell University, Wageningen University and Research (WUR), Pennyslvania State university) and national agricultural research systems (NARS), assessed gaps and conducted research to fill knowledge gaps in relation to key topics, namely, soil health, agronomic biofortification, scale-appropriate mechanization, behavioral change, climate adaptation, yield at scale, and farming systems. Long-term trials by CGIAR and partners have been core to studies on soil health. Through this research, 17 PhD and Masters students have benefitted, while many more have gained knowledge delivered through the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM) webinar series. The EiA framework of innovation challenges, used to identify key research topics for potential R&D, is informing CGIAR's new Sustainable Farming Science Program.

EiA partnered, at different levels, with 27 Initiatives across the CGIAR Portfolio on activities ranging from tool development and application for assessing constraints, to co-designing solutions. Key partnerships included the development and delivery of human-centered design course modules to strengthen the social science needed to achieve EiA's planned outcomes; collaboration with the CGIAR Research Initiative on Digital Innovations; and co-authorship of the 2024 Agriculture Breakthrough Report, coordinated by the CGIAR Research Initiative on Climate Resilience and the Climate Adaptation and Mitigation Impact Platform. In addition, Excellence in Agronomy (EiA) and and Mixed Farming System (MFS) strengthened modeling capacity in Zimbabwe and advanced open data, machine learning, and remote sensing for yield prediction through joint simulation, training and workshops.

Valuable lessons have been learnt. Implementing use cases is not a linear process and requires a phased, flexible approach. Some components may be ready for piloting earlier than others, demanding careful management of timelines, resources, and expectations. Evolution of the use case model to a broadened partnership platform for more efficient solution development and delivery has been developed and is informing the new Science Program. This approach recognized that the same solution could benefit multiple partners, that multiple solutions can be developed in parallel, and that engaging external partners requires flexibility to align expectations and priorities with the value propositions of Initiatives. Given the diverse skill sets needed to implement complex use case components, cross-center staff engagement supported more efficient delivery – although there was no way of ensuring or enforcing accountability.

	2022	2023	2024
PROPOSAL BUDGET ▷	$17.00M	$26.88M	$31.12M
APPROVED BUDGET [1] ▷	$15.45M	$23.33M [2]	$18.76M [2]

[1] The approved budget amounts correspond to the figures available for public access through the Financing Plan dashboard.

[2] These amounts include carry-over and commitments.

Female farmer field trials.

Section 2: **Progress towards End of Initiative outcomes**

Initiative-level theory of change diagram

This is a simple, linear, and static representation of a complex, non-linear, and dynamic reality. Feedback loops and connections between this Initiative and other Initiatives' theories of change are excluded for clarity.

CHALLENGE STATEMENT

- Smallholder farming represents more than 80 percent of the world's farms and produces around 50 percent of its food supply. These farming systems are characterized by degraded soils and/or scarce nutrients and water, low and stagnating crop yields, and reduced product quality and profitability, all of which is exacerbated by climate change, low resource-use efficiencies, declining soil health, and gender inequalities. Smallholder farmers seasonally make critical agronomic decisions regarding crop choice, planting dates, and pest, disease, weed, soil fertility, and water management, often based on subpar practices and information.

- The Excellence in Agronomy (EiA) Initiative addressed these issues by empowering smallholder farmers with climate-adaptive, gender- and youth-responsive solutions. Traditional agronomic research increases knowledge through experiments that enhance understanding of basic processes, but these have limited connection to stakeholder demand and are often based on outdated approaches. The development, deployment, and uptake of solutions also remain hampered by social, economic, and institutional constraints. As such, realization of genetic gains is hindered by suboptimal agronomic practices.

- EiA emphasized demand-driven research and cocreation with partners to scale agronomic interventions through the use case approach. Its objectives were to leverage advances in diagnostics, data science, geospatial analysis, and behavioral sciences to develop scalable, locally relevant solutions and assess the effectiveness of the use case model. There is also a need for systematic research to understand how farmers can better use the tools, backed by targeted field research to improve crop yields, profitability and quality, resource-use efficiency, and soil health—and make agile decisions to minimize climate-related risks. EiA aimed to promote global networking, standardized analytics, and collaboration with advanced research institutes by aligning its research and development priorities (sustainability of soil productivity and ecosystem services, climate change adaptation, precision-cropping system management, and perennial crops for livelihoods and conservation), with scaling partner demands, and national, regional, and funding priorities.

SPHERE OF **CONTROL**

WORK PACKAGES

WORK PACKAGE 1

Facilitating the delivery of agronomy-at-scale solutions.

WORK PACKAGE 2

Enabling the creation of value from big data and advanced analytics.

WORK PACKAGE 3

Driving the next generation of agronomy at scale innovations.

WORK PACKAGE 4

Nurturing internal efficiencies for an agile and demand-driven agronomy R&D community.

Farmers & DAs evaluating the harmonized DST validation trial at Lume district in the Oromiya Region.

SPHERE OF **INFLUENCE**

SPHERE OF **INTEREST**

END-OF-INITIATIVE OUTCOMES

ACTION AREA OUTCOMES

IMPACT AREAS

END-OF-INITIATIVE OUTCOME 1
1 ▶ Gender and youth responsive solutions piloted.

END-OF-INITIATIVE OUTCOME 2
2 ▶ Use and sharing common, open and FAIR data, tools, and analytics.

END-OF-INITIATIVE OUTCOME 3
3 ▶ Cooperate with EiA to fill key knowledge gaps.

END-OF-INITIATIVE OUTCOME 4
4 ▶ Collective decision-making process.

RESILIENT AGRIFOOD SYSTEMS

1 ▶ **1** · Implementation partners (e.g. NARES, NGOs, private companies) actively support dissemination, uptake, and implementation of CGIAR innovations.

1 ▶ **2** · Due to CGIAR involvement, private sector actors invest in business practices or models that have the potential to improve livelihoods, climate resilience, promote sustainable and inclusive food systems, and boost consumption of healthy diets, especially among nutritionally vulnerable population groups.

3 ▶ **3** · Research institutions, government analytical units, and scaling partners in the Global South have improved knowledge, skills, access to data, capacity to develop tools, innovations, and undertake research to support transformation of food, land and water systems contributing to livelihood, inclusion, nutrition, environmental and climate objectives.

2 ▶
3 ▶ **4** · National and sub-national government agencies use
4 ▶ CGIAR research results to design or implement strategies, policies and programs which have the potential to transform food, land and water systems contributing to livelihood, inclusion, nutrition, environmental and climate resilience objectives.

4 ▶ **5** · National and local multi-stakeholder platforms are strengthened to become more effective and sustainable, addressing development trade-offs and generating strategies for effective food, land, and water systems transformation.

NUTRITION, HEALTH & FOOD SECURITY
1 ▶
2 ▶ · End hunger for all and enable affordable
3 ▶ health diets for the 3 billion people who do
4 ▶ not currently have access to safe and
5 ▶ nutritious food.

POVERTY REDUCTION, LIVELIHOODS & JOBS
4 ▶ · Lift at least 500 million people living in rural areas above the extreme poverty line of US $1.90 per day (2011 PPP).

CLIMATE ADAPTATION & MITIGATION
2 ▶ · Equip 500 million small-scale producers to
5 ▶ be more resilient to climate shocks, with climate adaptation solutions available through national innovation systems.

ENVIRONMENTAL HEALTH & BIODIVERSITY
5 ▶ · Stay within planetary and regional environmental boundaries: consumptive water use in food production of less than 2500 km3 per year (with a focus on the most stressed basins), zero net deforestation, nitrogen application of 90 Tg per year (with redistribution towards low-input farming systems) and increased use efficiency, and phosphorus application of 10 Tg per year.

Female farmer demonstrating farm after using push planter

Summary of progress against the theory of change

EiA, in partnership with public and private organizations, developed and deployed agronomic solutions to address challenges related to degraded soils, scarce nutrients and water, stagnating crop yields, reduced product quality, and profitability – all of which are exacerbated by climate change, low resource use efficiency, and gender inequalities. This process leveraged advancements in data science, including FAIR (Findable, Accessible, Interoperable, and Reusable) data principles, research development, policy and capacity strengthening, geospatial analytics, remote sensing, and behavioral sciences.

EiA's results contributed towards 15 Sustainable Development Goals (SDGs), with a primary focus on seven of the SDGs, in line with its theory of change. Additionally, EiA results contribute to CGIAR's five Impact Areas, particularly Climate Adaptation and Mitigation (27 percent); Nutrition, Health, and Food Security (27 percent), with a strong emphasis on food security; Environmental Health and Biodiversity (19 percent); Gender Equality, Youth and Social Inclusion (14 percent); and Poverty Reduction, Livelihoods and Jobs (13 percent).

Through its **DELIVER Work Package**, EiA empowered smallholder farmers (through several training events) with climate-adaptive, gender- and youth-responsive solutions. Through the DELIVER Work Package, EIA engaged 125[1] public and private partners, integrating 14 agronomic solutions into their delivery networks. These partners supported piloting, scaling, and data sharing through an agreed monitoring, evaluation, and learning (MEL) system across

13 countries and 12 crops, reaching over 450,000 farmers – 33% percent of whom were women. These results represent 44 percent of the Initiative target by 2024 (500,000 farmers to be reached).

Up to 85 percent of these farmers confirmed they had received new information or knowledge through various interventions. The delivery process was reinforced by 4,000 partner field extension agents (15 percent women) who were trained through the Initiative to facilitate the piloting and scaling activities. Among the farmers reached, 80 percent (28 percent women) had taken up at least two agronomic practices, such as recommended planting methods, optimal planting dates, improved spacing, and weeding. Forty-one percent applied chemical fertilizers and improved seeds, though many still rely on uncertified seeds.

The uptake of these agronomic practices and technologies led to yield increases of 17-38 percent for rice, soybeans, cassava and wheat. For instance, an increase of potato yields from 21 t/ha with blanket recommendation to 26 t/ha with EiA agronomic solution has been observed. In addition, RiceAdviceLite has increased rice yields and profitability in Nigeria by 20.33 percent and USD 240 respectively. Overall, and given that the average farm size was 0.5 hectares, it is estimated that the recommended practices were applied to nearly 72,000 hectares of land by smallholder farmers. Additionally, the Government of Morocco has formally adopted conservation agriculture and mechanization promoted by this Initiative, implementing these practices across 200,000 hectares of land, giving a total of 272,00 hectares against a target of 250,00

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[1] 14 demand partners who participated in the co-development process and 111 partners (public and private).

hectares. The results of the DELIVER Work Package were assessed using a standardized monitoring, evaluation, learning, and impact assessment (MELIA) framework, as articulated in this MELIA report.

Results of two baseline studies for randomized control trials (RCTs) (Ethiopia, Ghana) and two panel studies (Ethiopia, Cambodia) show that: 1) 3.5 percent of the target population in Cambodia used mechanized direct-seeded rice (mDSR), although 33 percent are aware of it (of which 9.7 percent are applying it), highlighting a significant gap between awareness and adoption; 2) adoption of improved wheat varieties in Ethiopia improve wheat yields by 10 percent, while application of Integrated Soil Fertility Maangement (ISFM) is associated with increases in yields of (50 percent), wheat (45 percent) and sorghum (40 percent).

The **TRANSFORM Work Package** developed tools to support improved data management as well as advanced analytics workflows to facilitate the development and scaling of agronomic solutions. These tools enhanced data accessibility, interoperability, and analytical precision.

The GARDIAN platform is widely utilized, with 28 research papers citing its contributions, while CG Labs, a high-performance computing solution, supports climate risk, mitigation, and adaptation modelling, benefiting 450 users across 21 organizations. Additionally, the Data Lake (v. alpha) enables the search and retrieval of large, standards-compliant datasets, making them directly usable for machine learning and crop modelling. These tools enable researchers and scaling partners to generate timely, actionable insights that drive evidence-based decision-making.

The use of standardized data collection templates (e.g., Validation and APT survey templates) fostered greater consistency and interoperability, with adoption in 12 agronomic solutions. In the last three years, over 2,200 datasets have been standardized using Carob, strengthening the agricultural research community by providing structured data and decision-support tools.

AgWise, has been used to generate recommendations for fertilizer rates, sowing dates, and cultivars across multiple countries, and, as an example, reached over 8,000 farmers in Rwanda. Furthermore, the 2024 Sampling Frames tool, deployed in four use cases, identified biophysically similar geographies for field trials and surveys, ensuring targeted, data-driven agricultural interventions.

EiA promoted data sharing, open access, and innovation, and empowered both research institutions and farmers to integrate data-driven agronomy into their decision-making processes. Over the past three years, capacity development and culture change incentives were instrumental in advancing data-driven agronomy, with training provided to 259 participants from partner organizations across three countries. The maturation of key data management and analytics tools enabled TRANSFORM to achieve its end of Initiative outcomes by facilitating tool adoption and data sharing among stakeholders, thereby supporting the co-creation of locally relevant agronomic solutions.

By the end of 2024, the **INNOVATE Work Package** engaged thirteen advanced research institutions (ARI) including – Cornell, ETH Zurich, Wageningen University, Penn State University, CIRAD, and the Busara Center for Behavioral Economics to contribute complementary expertise to EiA research. In total, scientists from 24 partner institutions (13 ARIs and 11 NARS) across five continents collaborated on ten strategic research and development (R&D) projects to address critical knowledge gaps for scaling agronomic solutions. This is 14 institutions above the original target of 10 set by the Initiative. Twenty-six students and postdoctoral researchers (12 MSc, 8 PhD, and 5 postdocs) were engaged across 11 countries, primarily Ethiopia, Kenya, Morocco, the United States of America, and Zimbabwe, with their research spanning soil health, crop nutrition, climate change adaptation and mitigation, yield gap analysis, and

agroecological practices. From 2022 to 2024, the INNOVATE Work Package produced 101 knowledge products across its 10 strategic R&D projects, e.g. for mechanization. These include R&D outputs aligned with the TRANSFORM and DELIVER Work Packages, student-led publications, and decision-support tools. Seven working groups were active, and six webinars were held in collaboration with RUFORUM on topics such as soil health and regenerative agriculture (https://hdl.handle.net/10568/172514). The Soil Health Framework was developed to guide knowledge exchange and monitor agronomic gain key performance indicators (KPIs).

The **ORGANIZE Work Package** developed solutions that supported its end of Initiative outcome (EOIO) – ensuring that collective decisions were made on key aspects of an expanding agronomy-at-scale research. As reflected in the partnership survey, 54 demand and scaling partners, along with CGIAR scientists, actively participated in joint decision-making processes, including stage-gating of use cases from validation to piloting.

To guide on strategic decisions, various tools were developed, the Agronomic Prioritization Tool (APT) was applied in 12 use cases to prioritize agronomy investments, refine solutions, and shape scaling strategies. In 2024, the LCAS-APT version 0.1 was introduced to enable more efficient and cost-effective collection of high-quality, representative data. Additionally, the Prioritizing Agronomy in Changing Environments (PAiCE) tool was used in 24 assessments to identify and prioritize production constraints and climate adaptation options, directly informing priorities for the Sustainable Farming Science Program. These processes engaged 425 participants from 215 partner organizations. The ex-ante analysis framework was validated in four use cases in Ethiopia, India, Nigeria, and Cambodia, while the agronomic gain KPI framework was applied during stage-gating and in the implementation of baseline studies, e.g. for Cambodia, Ethiopia and Ghana. In 2024, the framework and accompanying guidelines were updated to include perennial crops, five additional crops, and grain nutritional quality.

The MELIA approach was used to assess agronomic solutions. Both scaling partners and CGIAR scientists shared data and insights using a range of tools, analytics, and frameworks. This is evidenced by responses from 50 out of 62 partners in a partnership survey, and by over 100 partners who contributed to piloting and scaling data, as outlined in the MELIA report.

In terms of uptake of the EiA model, the Cambodia model was adopted and scaled by the Vietnamese government under its 1-Million-Hectare High-Quality, Low-Emission Rice Program, deploying mDSR technology. In 2023, the Philippine government adopted the use case approach to develop drone-based direct seeding technology, which is now undergoing validation trials in five major rice-growing regions.

From 2022 to 2024, the EiA Events Platform hosted 38 events in collaboration with 11 partner organizations, convening farmers, researchers, policymakers, and practitioners to discuss sustainable farming and climate change. Stakeholder engagement was further strengthened through digital tools such as the MyEiA Platform, Agronomy Village App and by an expanded social media presence.

These efforts underscore EiA's commitment to advancing scalable agronomic solutions, promoting innovation adoption, and addressing climate-related and production challenges.

This first business cycle revealed overlapping use cases, operational areas, partners, and crops – offering strategic entry points for the Agronomy Science and Scaling Platforms (ASSAPs) as key innovation delivery mechanisms within the Sustainable Farming Program. ASSAPs also help coordinate partners and streamline knowledge sharing. Additionally, PAiCE results identified regional priority areas, laying the groundwork for more targeted and effective prioritization for the Sustainable Farming Program.

Progress against End of Initiative Outcomes

This infographic provides a concise summary of the Initiative's progress toward achieving its Theory of Change End-of-Initiative outcomes for the 2022-2024 period. By drawing on reported results, it offers a comprehensive synthesis of progress made against the established outcome targets, highlighting the Initiative's overall impact and key achievements at the conclusion of this three-year cycle.

EOIO 1

By 2024, at least 20 public and private scaling demand partners pilot gender and youth-responsive agronomic solutions targeting at least 500,000 farmers through extension, social, and/or information technology networks and use one common monitoring, evaluation and learning approach to report on how these solutions perform against the agronomic gain KPIs.

EOIO 2

By 2024, at least 20 partners use and share common, open and FAIR data, tools, and analytics to support the co-creation of locally relevant agronomic solutions, integrating climate-smart, inclusivity, and sustainability dimensions and assessing their performance using standardized protocols.

EOIO 3

By 2024, scientists from at least 5 non-CGIAR advanced research institutions and 10 NARS partners cooperate with EiA in 10 or more R&D projects to fill key knowledge gaps for delivering agronomic solutions at scale.

EOIO 4

By 2024, decisions made on key aspects of an expanding agronomy-at-scale research portfolio of EiA (e.g., stage-gating of use cases) are taken collectively by CGIAR agronomists and scaling partners based on common learning and objectively obtained information, among others, prioritization, and progress with the delivery of agronomic gain.

At the end of 2024, the Initiative had launched 20 use cases in collaboration with a mix of public, private, and civil society partners to address natural resource constraints, productivity, gender and youth issues. Fourteen of the use cases were piloted and scaled across 13 countries and 12 crops, through networks of 125 partners, engaging 450,000 smallholder farmers – 33 percent women. Through a structured MEL framework, the awareness, knowledge, and uptake among the farmers, including performance of agronomic solutions, was assessed across five countries, showing that 360,000 farmers – 28 percent of whom were women – demonstrated uptake of at least two practices which were applied on 272,000 hectares, resulting in yield increases of 17-38 percent.

To broaden further its impact, five scaling platforms have been operational in Ghana, India, Mexico, Nigeria, Tanzania, fostering broad partner engagement and smallholder farmer outreach. The One Stop Shop including MyEiA, Comprehensive Agronomy Solutions Hub, Open Learning and Events Portals further enabled dissemination, stakeholder engagement, and capacity building.

By 2024, there were well over 20 instances of partner uptake and use of EiA-mediated data and analytics tools and products related to agronomic solutions integrating multiple dimensions, including climate, gender, and sustainability. Exact use numbers are not available as EiA emphasis is on fully open tools that do not require login – in alignment with CGIAR's own policy and key funder mandates – with the exception of a few tools like the CG Labs computing solution. Examples of product use include: At least 28 cited examples of GARDIAN powering research and innovation by CGIAR and other partners; at least 150 CGIAR and partner users relying on CG Labs for their computational needs, with more at the Ethiopian Institute of Agricultural Research (EIAR); at least 16 CGIAR partners collaborating to share standardized open and FAIR data via the open-source Carob workflow; and at least 14 use cases/bilaterals involving CGIAR, NARS and other partners using standardized data collection protocols and surveys, resulting in FAIRer data. Additionally, recommendations to optimize fertilizers, planting date, and cultivars developed based on partner demand for at least 10 crop-country combinations are being scaled by public and private partners after field validation and piloting following standardized protocols.
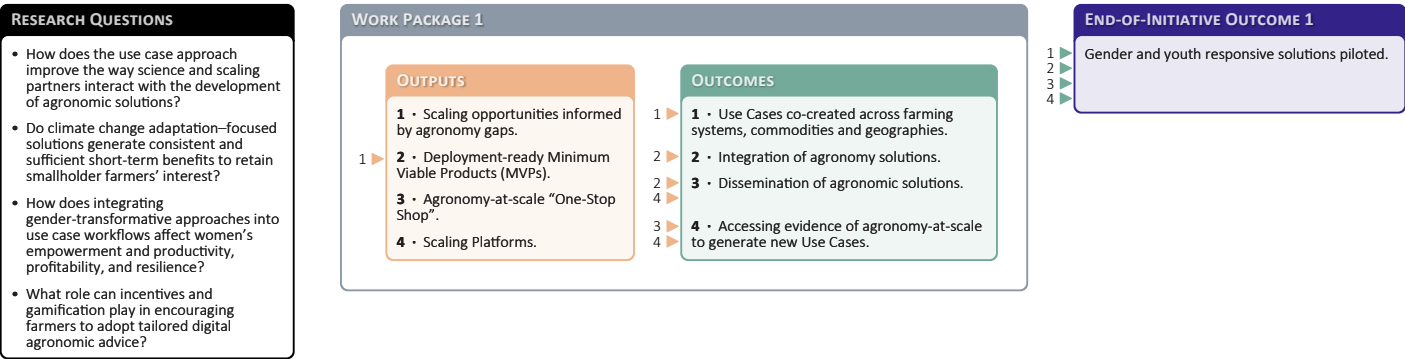
By the end of 2024, the INNOVATE Work Package engaged thirteen non-CGIAR ARI, including Cornell, ETH Zurich, and Wageningen University, to enhance EiA research. In total 24 (13 ARIs and 11 NARS) partner institutions across 5 continents collaborated on 10 R&D projects to bridge knowledge gaps for scaling agronomic solutions. The 10 R&D projects include biofortification, soil health, climate change, yield at scale, behavioral change and scale-appropriate mechanization. These projects are being implemented through different topics by various students. The Initiative supported 26 MSc, PhD, and postdoctoral researchers (50 percent women) across 11 countries, focusing on different topics (soil health, crop nutrition, climate adaptation, and agroecological practices) across the 10 R&D projects.

Since 2022, INNOVATE has produced 101 knowledge products spanning climate change, agronomic practices, and remote sensing. These include R&D outputs integrated into the TRANSFORM and DELIVER Work Packages, student-led publications, and decision-support tools. Gender-inclusive due diligence identified scaling opportunities, while seven working groups advanced key research themes. Six webinars, organized with RUFORUM, covered critical topics like soil health and regenerative agriculture. Additionally, the Soil Health Framework was developed to facilitate knowledge exchange and track agronomic gain KPIs, reinforcing efforts to enhance agricultural productivity and sustainability.

The ORGANIZE Work Package made significant progress toward achieving its end of Initiative outcomes. By the end of 2024, a partnership survey showed that 95 percent of respondents (n=54) had participated in collective decision-making processes, such as stage-gating use cases to advance innovations along their development pathways. Additionally, over 100 partners collectively agreed to pilot validated agronomic solutions by integrating them into their dissemination networks and committing to share related pilot data and experiences. The governments of Viet Nam and the Philippines adopted mDSR and developed drone-based direct seeding technology, respectively – both informed by lessons and experiences shared from Cambodia. Results from the implementation of the Agronomic Prioritization Tool (APT) were used by some use case facilitators and their demand partners to revise and develop scaling strategies.

Section 3: **Work Package progress**

WP1: DELIVER

WORK PACKAGE 1

OUTPUTS

1 · Scaling opportunities informed by agronomy gaps.

2 · Deployment-ready Minimum Viable Products (MVPs).

3 · Agronomy-at-scale "One-Stop Shop".

4 · Scaling Platforms.

OUTCOMES

1 · Use Cases co-created across farming systems, commodities and geographies.

2 · Integration of agronomy solutions.

3 · Dissemination of agronomic solutions.

4 · Accessing evidence of agronomy-at-scale to generate new Use Cases.

END-OF-INITIATIVE OUTCOME 1

Gender and youth responsive solutions piloted.

Work Package 1 progress against the theory of change

DELIVER successfully deployed and facilitated the uptake of agronomic solutions. Collaborating with 125 public and private sector partners across 13 countries, the Initiative contributed to the widespread application of agronomic innovations. These efforts led to 360,000 smallholder farmers using innovations and applying best practices on 272,000 hectares. The application of the solutions contributed to a yield increase of 17-38 percent across selected crops, and the average profitability from using RiceAdviceLite in three Nigerian states is USD 240 per hectare. To achieve these results, 450,000 smallholder farmers were reached, of whom 33 percent were women. Sixty-four percent of beneficiaries were between 25 and 64 years old, ensuring impact among the core agricultural workforce. Co-creation was emphasized across farming systems, commodities, and geographies, developing 20 use cases through a multi-stakeholder innovation process. These use cases followed a seven-step development process; 12 use cases reached scaling readiness levels 8 and 9, meaning they were tested and successfully piloted by partners.

EiA significantly influenced national agricultural policies. In Morocco, conservation agriculture expanded from 50,000 hectares in 2022 to 200,000 hectares in 2024, supported by CGIAR research. EiA also co-organized the Third African Congress on Conservation Agriculture (3ACCA), which emphasized advancing climate-resilient practices across Africa. In Viet Nam, the Hectare High-Quality, Low-Emission Rice Program, backed by EiA, supported mDSR, and improved farmer access to precision agriculture tools. In Ethiopia, a harmonized DST framework, combining NextGen DST and Landscape Segmented DST, was embedded in national digital extension services and validated on 2,500 farm fields in 2024.

To disseminate agronomic solutions, DELIVER developed the One Stop Shop as a central hub linking research to farmers. Key platforms, including MyEiA (an innovation portfolio portal), the Comprehensive Agronomy Solutions Hub, and Open Learning and Events Portals, facilitated broad knowledge-sharing and engagement. Additionally, EiA institutionalized Human-Centered Design (HCD) training and the UXtool4Ag toolkit to strengthen community capacity-building.

A study tested the use case approach's impact on collaboration between science and scaling partners. Results showed it fosters co-learning, iterative validation, and demand alignment, evolving into multi-partner platforms that enhance efficiency and inclusivity. An RCT study in Ethiopia revealed persistent gender-based yield gaps, emphasizing the need for gender transformative approaches (GTA) to improve inclusion and productivity. EiA's GTA integration shifted teams toward gender-responsive practices, boosting adoption and outcomes. A baseline RCT in Ghana showed that digital climate advisory tools can enhance productivity, income, and resilience among maize farmers. Adoption is improving through the use of incentives, private sector promotion, better infrastructure, enhanced digital literacy, gender equity, and engaging features such as online learning and progress tracking to sustain farmer use. Furthermore, a study in Nigeria found that free exposure to a digital decision support system increased willingness to pay for climate and soil fertility advice, supporting trial-based incentives and subscription models.

WP2: TRANSFORM
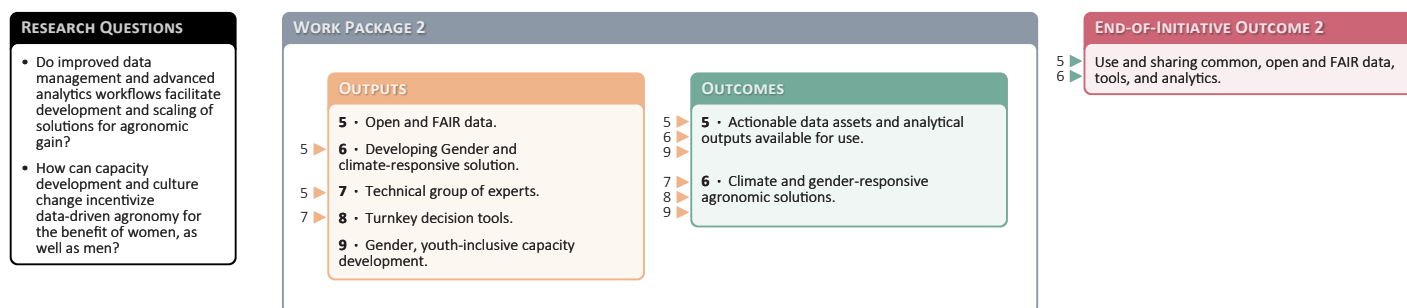
Work Package 2 progress against the theory of change

TRANSFORM helped advance open and FAIR data and predictive analytics for agriculture. As an open, free resource (9/9 for innovation readiness and use), the GARDIAN platform has been pivotal, with at least 28 research papers citing its contributions. Similarly, CG Labs, a high-performance computing solution optimized for low bandwidth that facilitates analytics (9/9 for innovation readiness and use), is used for climate risk, mitigation, and adaptation modeling, particularly in northern Uganda and Ethiopia. A total of 165 users from 21 organizations, including NARS partners, have benefited from CG Labs. A File Manager provides an indelible record of permissions-based data and related files in any format (e.g., protocols). A Data Lake (v. alpha), developed though TRANSFORM, enables search-retrieval of large aggregations of standards-compliant data that can be directly utilized for machine learning and crop modeling.

The use of standard data collection templates like the Validation and the APT survey templates has fostered greater consistency and interoperability across agricultural data, with at least 12 use cases adopting these standard templates. Over the past two years, the Carob project has standardized and compiled agricultural data through strong partner engagement, with nearly 2,200 original datasets standardized—reinforcing its value as a key resource for the research community.

The ability to develop agricultural advisories and recommendations is driven by improved data management and standardization. One key extensible decision support tool is AgWise, which has been used to develop recommendations for fertilizer rates, sowing dates, and cultivars for several crop-country combinations. Deployed by both public and private sector scaling partners in over seven countries, AgWise recommendations have reached thousands of farmers, showcasing its potential for larger-scale impact.

A 2024 Sampling Frames tool has also proven to be useful, with four different use cases employing it to identify biophysically-similar geographies for field trials and surveys, ensuring data-driven choices based on key priorities. A strong collaboration with Microsoft AI for Good resulted in a more powerful geographic Similarity Search tool specifically aimed at data scientists.

Improved data management and advanced analytics workflows therefore do enable timely, actionable insights and scaling of solutions, directly answering TRANSFORM's first research question. The maturation of several key products described above has enabled the TRANSFORM Work Package to achieve its end-of-Initiative outcomes and establish a strong foundation for continued success. This progress is supported by expert groups, capacity-building initiatives, and standardized guidelines – fostering a culture of data sharing, open access, and innovation.

WP3: INNOVATE

WORK PACKAGE 3

OUTPUTS

10 · Due diligence framework.

10 ▶
13 ▶
11 · Portfolio of innovation solutions.

12 · MSc and PhD projects.

12 ▶
13 · Research papers, datasets, R&D products.

14 · Communities of practice.

15 · Global infrastructure for close-to-real time data collection.

OUTCOMES

11 ▶
7 · Generation of products with partners.

13 ▶
8 · A new generation of trained agronomists.

14 ▶
15 ▶
9 · Engaging with cutting-edge research methodologies and approaches.

END-OF-INITIATIVE OUTCOME 3

7 ▶
8 ▶
9 ▶
Cooperate with EiA to fill key knowledge gaps.

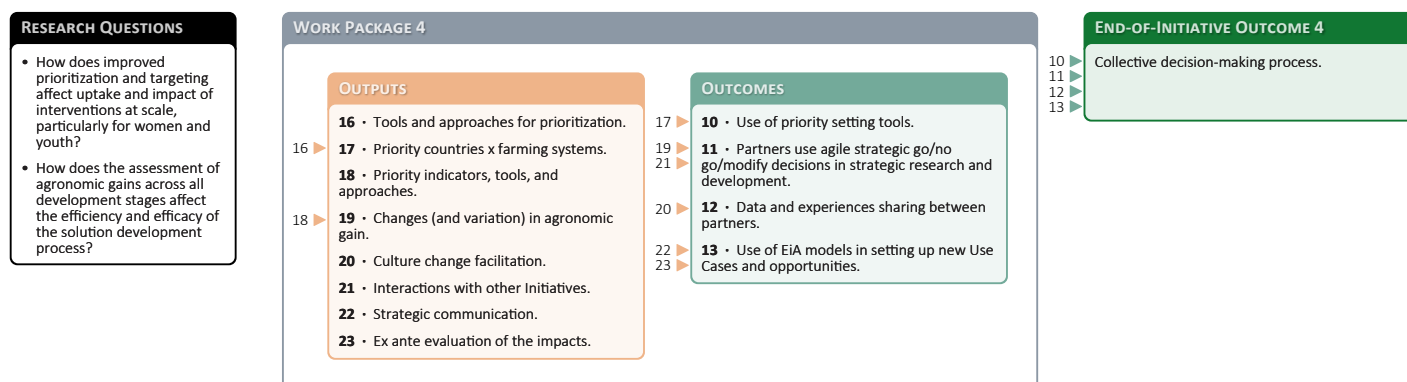## Work Package 3 progress against the theory of change

Thirteen advanced research institutions, including Cornell, ETH Zurich, Wageningen University, Penn State University, CIRAD, and the Busara Center for Behavioral Economics, contributed complementary expertise to EiA. In total, 24 (13 ARIs and 11 NARS) partner institutions across Africa, Asia, Latin America, Europe, and North America collaborated with EiA on ten strategic R&D projects aimed at filling key knowledge gaps for delivering agronomic solutions at scale.

A total of 26 students and postdoctoral researchers (50 percent women) were engaged under the EiA-INNOVATE initiative, including 12 MSc students, 8 PhD candidates, and 5 postdocs, contributing to research across diverse agronomic themes. These individuals were based across 11 countries, with the highest representation from Ethiopia, Kenya, Morocco, the United States of America, and Zimbabwe, reflecting a balance of local and global collaboration. Their research focused primarily on soil health, and crop nutrition, followed by themes related to climate change adaptation and mitigation, yield gap analysis, and other areas such as biofortification, agroecological practices, and scaling readiness. Between 2022 and 2024, the INNOVATE Work Package produced 101 knowledge products spanning seven thematic areas: machinery and technology; climate change and soil health; agronomic practices and yield improvement; farmer behavior and adoption; water and irrigation management; remote sensing and GIS; and food security and socioeconomic studies. These knowledge products include R&D outputs designed to integrate strategic solutions into the TRANSFORM and DELIVER Work Packages, address key global agronomic challenges, and support student research efforts – such as papers, datasets, and theses. Some products contribute to the development of new agronomic solutions, while others support the refinement of existing tools and indicators for measuring agronomic gains at outcome and impact levels. Additionally, structured due diligence efforts were undertaken to identify scaling opportunities based on agronomic performance gaps, with a deliberate focus on gender impact and inclusion.

Seven working groups were operational, each aligned with the core themes of the R&D projects and farming systems research. Over the past years, several webinars were organized, focusing on topics such as yield gap at scale, agronomy and biofortification, and soil health. Of particular note, six webinars were conducted in collaboration with RUFORUM, covering a wide range of topics including soil health where insights were shared from four long-term trials on soil organic matter in Kenya and strategies for restoring soil health through trial redesign – as well as reaching farmers at scale, managing acid soils, promoting climate-smart and scale-appropriate mechanization, using data to improve fertilizer recommendations, and advancing regenerative agriculture for cocoa and coffee systems. Complementing these efforts, the Soil Health Working Group developed a comprehensive Soil Health Framework to support knowledge exchange, harmonize best practices, tools, and data sources, and guide the monitoring of agronomic gain KPIs across the Initiative.

WP4: ORGANIZE

WORK PACKAGE 4

OUTPUTS

- **16** · Tools and approaches for prioritization.
- 16 ▶ **17** · Priority countries x farming systems.
- **18** · Priority indicators, tools, and approaches.
- 18 ▶ **19** · Changes (and variation) in agronomic gain.
- **20** · Culture change facilitation.
- **21** · Interactions with other Initiatives.
- **22** · Strategic communication.
- **23** · Ex ante evaluation of the impacts.

OUTCOMES

- 17 ▶ **10** · Use of priority setting tools.
- 19 ▶ **11** · Partners use agile strategic go/no
- 21 ▶ go/modify decisions in strategic research and development.
- 20 ▶ **12** · Data and experiences sharing between partners.
- 22 ▶ **13** · Use of EiA models in setting up new Use
- 23 ▶ Cases and opportunities.

END-OF-INITIATIVE OUTCOME 4

10 ▶
11 ▶ Collective decision-making process.
12 ▶
13 ▶

Work Package 4 progress against the theory of change

The ORGANIZE Work Package made significant progress toward achieving its end of Initiative outcome: enabling informed decisions on key aspects of expanding agronomy-at-scale research. Fifty-four demand and scaling partners, together with CGIAR scientists, actively engaged in collective decision making in the stage gating of six use cases from validation to piloting and scaling. The prioritization tools developed in 2022-2023 improved tailored agronomy solutions and scaling strategies and helped partners define major production and climate challenges and prioritize adaptation solutions. The Agronomy Prioritization Tool (APT) was adopted by 12 use cases to prioritize agronomy investments, refine solutions and scaling strategies. In 2024, LCAS-APT version 0.1 was introduced for more efficient and cost-effective collection of high-quality, representative data on crop yields, crop management practices, environmental conditions and socio-economic factors using mobile technology and geospatial tools. Through the PAiCE tool, 425 participants from 215 partner organizations conducted 24 assessments to prioritize production constraints and climate adaptation options, informing priorities for the Sustainable Farming Science Program. The ex-ante analysis framework was validated in four use cases in Cambodia, Ethiopia, India, and Nigeria and to determine the return on investments and to support better targeting of scaling strategies of agronomy solutions. Innovation and scaling partners and CGIAR scientists in six use cases applied the agronomic gain KPI framework in stage-gating agronomy solutions integrated with agricultural advisories for rice,

wheat, cassava, maize, sorghum, and teff from validation to piloting stages. In 2024, the framework and guidelines were updated to include perennial crops, five additional crops, and grain nutritional quality. The MELIA approach was adopted to assess agronomy solutions against the agronomic gain KPIs, tracking 450,000 farmers exposed to agronomy innovations through the use cases. From 2022-2024, the EiA Events Platform hosted 38 events with 11 partner organizations, bringing together farmers, researchers, policymakers, and practitioners to exchange ideas and address sustainable farming and climate change challenges. FAIR data, tools and analytics were used and shared by 50 of the 62 partners that participated in the partnership survey. In 2023, approximately 200 CGIAR scientists, along with innovation and scaling partners, engaged in South-South learning – sharing results, scaling strategies, and experiences from use cases across Southeast Asia and Africa. Stakeholder engagement was strengthened via the MyEiA Platform, Agronomy Village App and social media. mDSR was adopted and scaled by the Viet Nam government under its 1-Million-Hectare High-Quality, Low-Emission Rice Program. In 2024, mDSR was successfully demonstrated on 150 hectares in three provinces, with expansion planned in the Mekong River Delta until 2030. In 2023, the Philippine government adopted the use case approach to develop the drone direct seeding technology, now undergoing validation trials in five major rice growing regions.

Interviewing a Degas farmer Ghana.

Work Package progress rating summary

WORK PACKAGE	PROGRESS RATING & RATIONALE
1	🟡 Delayed Significant progress was made, including collaboration with 125 public and private sector partners across 13 countries. A total of 450,000 smallholder farmers were reached with 33 percent women. Furthermore, 360,000 farmers adopted innovations and best practices across 272,000 hectares. The delayed progress rating reflects the initial assumption that more use cases would reach the piloting stage by the end of the Initiative. However, ongoing refinement of MVPs based on user feedback has impacted the overall pace of implementation.
2	🟢 On track The TRANSFORM Work Package has made strong progress in developing and delivering innovative solutions and products across all outputs, with annual progress aligned with the Plan of Results and Budget and Work Package theory of change. Stakeholders and partners within the Initiative and beyond are starting to use these tools and solutions.
3	🟡 Delayed Most Clusters of Activities (CoA) progressed according to the targets in the theory of change, with the activation of a strategic R&D portfolio (CoA 3.1) and facilitation of a community of practice (CoA 3.5) on track. However, delays in the implementation of strategic R&D projects (CoA 3.2), student timelines (CoA 3.3), and no traction on the facilitation of a global network for evaluation and validation (CoA 4.4) brings the overall status to yellow (delayed). Focused efforts are needed to address these gaps and maintain progress as we move into the Sustainable Farming Science Program.
4	🟢 On track ORGANIZE achieved substantial progress. The activities were implemented, and outputs were delivered as outlined in the Plan of Results and Budget, and the Work Package theory of change. The products developed for prioritization, agronomic gain assessment, ex-ante analytics and MELIA underwent thorough validation by the use cases and are now available for use by other CGIAR scientists and stakeholders.

Definitions
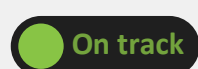
🟢 **On track**

- ✅ Progress largely aligns with Plan of Results and Budget and Work Package theory of change.
- ✅ Can include small deviations/issues/delays/risks that do not jeopardize success of Work Package.

🟡 **Delayed**

- ⚠️ Progress slightly falls behind Plan of Results and Budget and Work Package theory of change in key areas.
- ⚠️ Deviations/issues/delays/risks could jeopardize success of Work Package if not managed appropriately.

🔴 **Off track**

- ❌ Progress clearly falls behind Plan of Results and Budget and Work Package theory of change in most/all areas.
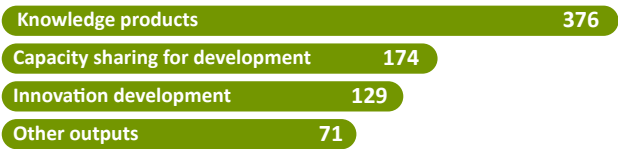- ❌ Deviations/issues/delays/risks do jeopardize success of Work Package.

Section 4: **Quantitative overview of key results**

This section provides an overview of results reported and contributed to, by the CGIAR Initiative on Excellence in Agronomy from 2022 to 2024. These results align with the CGIAR Results Framework and Excellence in Agronomy's theory of change. Further information on these results is available through the CGIAR Results Dashboard.

The data used to create the graphics in this section were sourced from the CGIAR Results Dashboard on 04 April 2025. These results are accurate as of this date and may differ from information in previous Technical Reports. Such differences may be due to data updates throughout the reporting year, revisions to previously reported results, or updates to the theory of change.
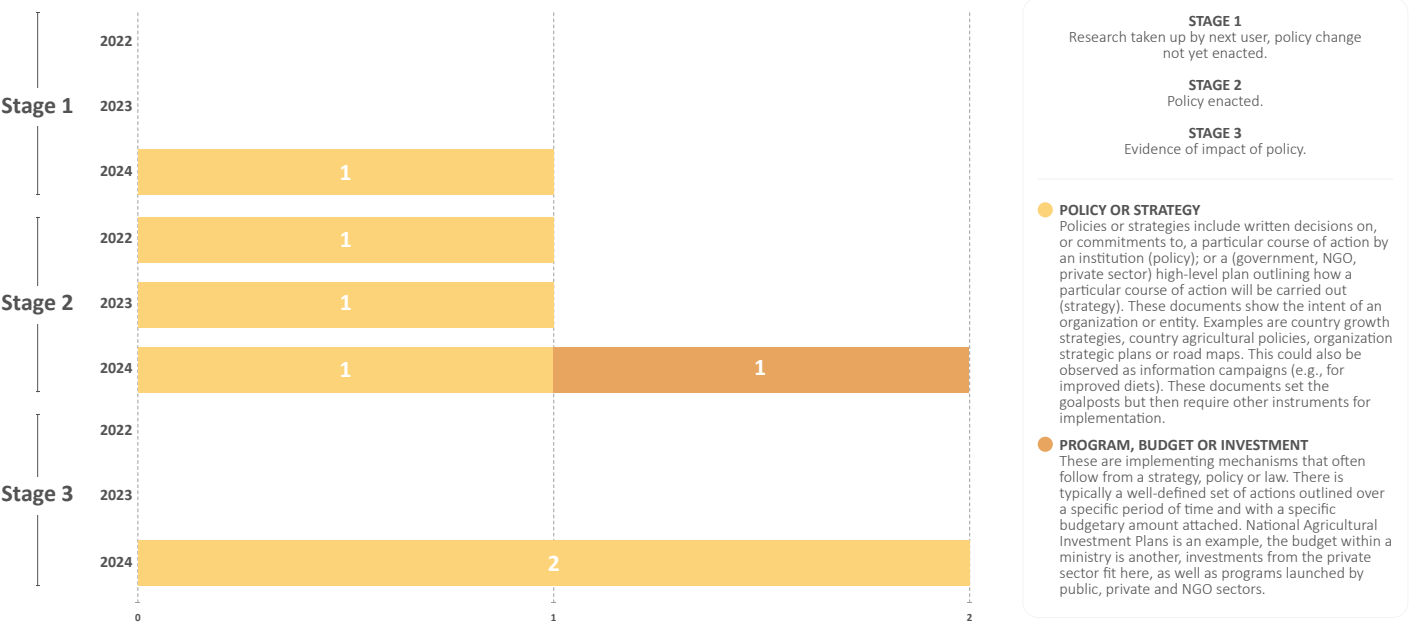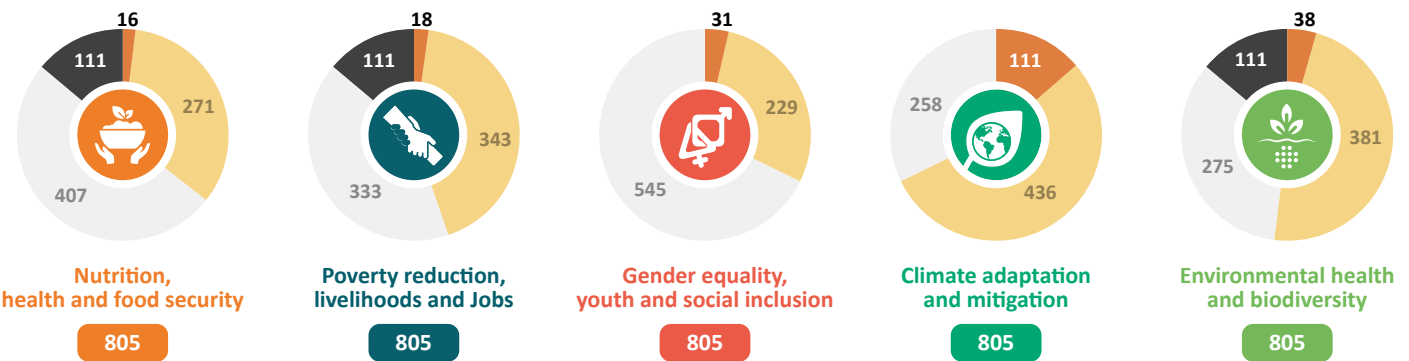
OVERVIEW OF RESULTS BY CATEGORY

Outputs

Knowledge products	376
Capacity sharing for development	174
Innovation development	129
Other outputs	71

Outcomes

Innovation use	41
Policy change	7
Other outcomes	4
Capacity change	3

POLICIES BY STAGE AND BY TYPE

STAGE 1
Research taken up by next user, policy change not yet enacted.

STAGE 2
Policy enacted.

STAGE 3
Evidence of impact of policy.

● **POLICY OR STRATEGY**
Policies or strategies include written decisions on, or commitments to, a particular course of action by an institution (policy); or a (government, NGO, private sector) high-level plan outlining how a particular course of action will be carried out (strategy). These documents show the intent of an organization or entity. Examples are country growth strategies, country agricultural policies, organization strategic plans or road maps. This could also be observed as information campaigns (e.g., for improved diets). These documents set the goalposts but then require other instruments for implementation.

● **PROGRAM, BUDGET OR INVESTMENT**
These are implementing mechanisms that often follow from a strategy, policy or law. There is typically a well-defined set of actions outlined over a specific period of time and with a specific budgetary amount attached. National Agricultural Investment Plans is an example, the budget within a ministry is another, investments from the private sector fit here, as well as programs launched by public, private and NGO sectors.

NUMBER OF RESULTS BY IMPACT AREA CONTRIBUTION

Nutrition, health and food security — 805

Poverty reduction, livelihoods and Jobs — 805

Gender equality, youth and social inclusion — 805

Climate adaptation and mitigation — 805
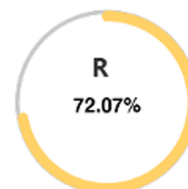
Environmental health and biodiversity — 805

● **2 = Principal:** Contributing to one or more aspects of the Impact Area is the principal objective of the result. The Impact Area is fundamental to the design of the activity leading to the result; the activity would not have been undertaken without this objective.

● **1 = Significant:** The result directly contributes to one or more aspects of the Impact Area. However, contributing to the Impact Area is not the principal objective of the result.

○ **0 = Not targeted:** The result has been screened against the Impact Area, but it has not been found to directly contribute to any aspect of the Impact Area as it is outlined in the CGIAR 2030 Research and Innovation strategy.

● **Not applicable:** Pertains to 2022 reported results when only information on Gender and Climate impact area tagging was available.

Knowledge products by typology

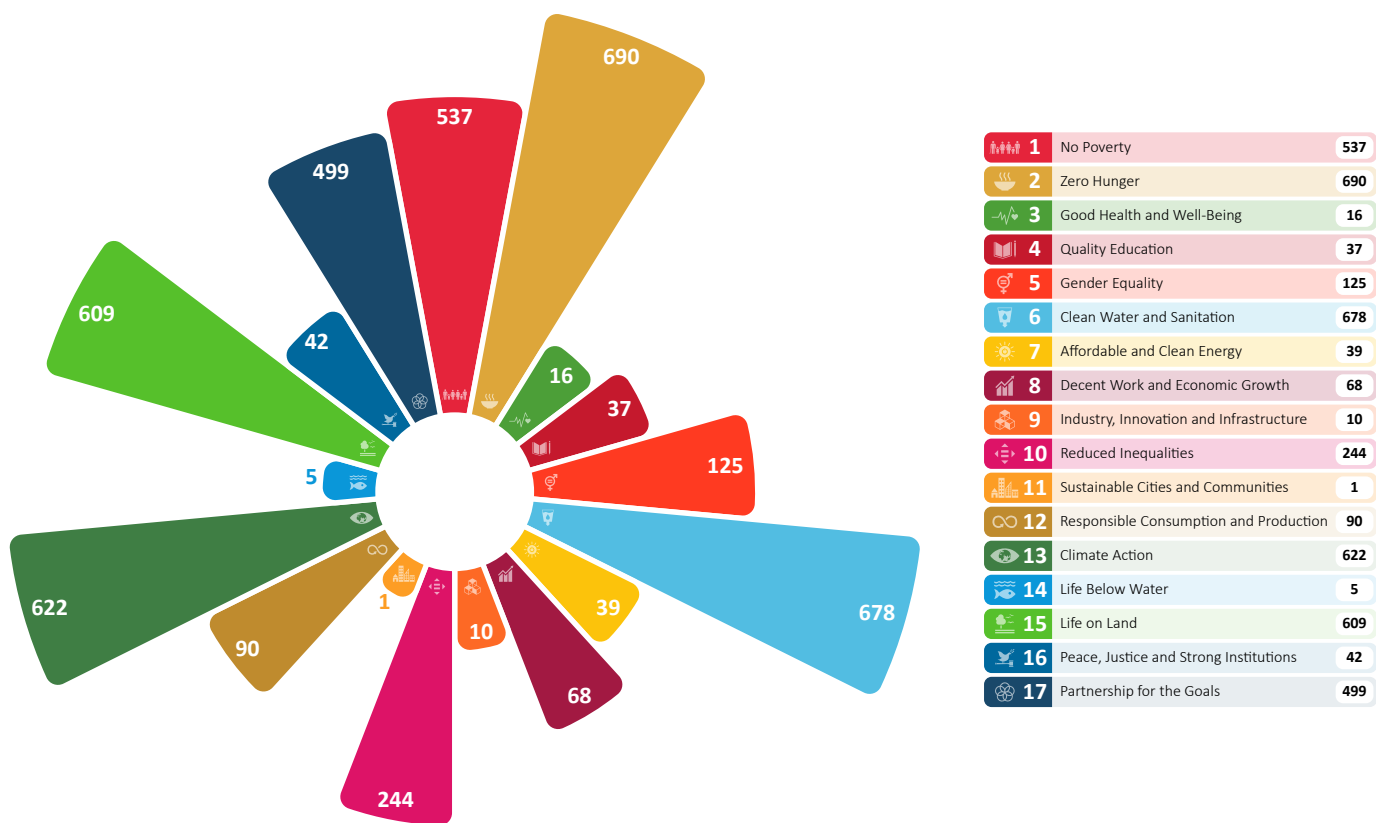| Year	Journal Article	Report	Brief	Brochure	Manual	Presentation	Working Paper	Blog Post	Other	Total
2022	25	7	4	4					10	50
2023	23	52			11	9	6	4	15	120
2024	57	85			11	18	13		22	206

F 81.57%   **A** 100.00%   **I** 59.71%   **R** 72.07%

EiA contributions to the UN Sustainable Development Goals

1	No Poverty	537
2	Zero Hunger	690
3	Good Health and Well-Being	16
4	Quality Education	37
5	Gender Equality	125
6	Clean Water and Sanitation	678
7	Affordable and Clean Energy	39
8	Decent Work and Economic Growth	68
9	Industry, Innovation and Infrastructure	10
10	Reduced Inequalities	244
11	Sustainable Cities and Communities	1
12	Responsible Consumption and Production	90
13	Climate Action	622
14	Life Below Water	5
15	Life on Land	609
16	Peace, Justice and Strong Institutions	42
17	Partnership for the Goals	499

Geographic focus of results

Number of results

108

1

227 partners with a global focus
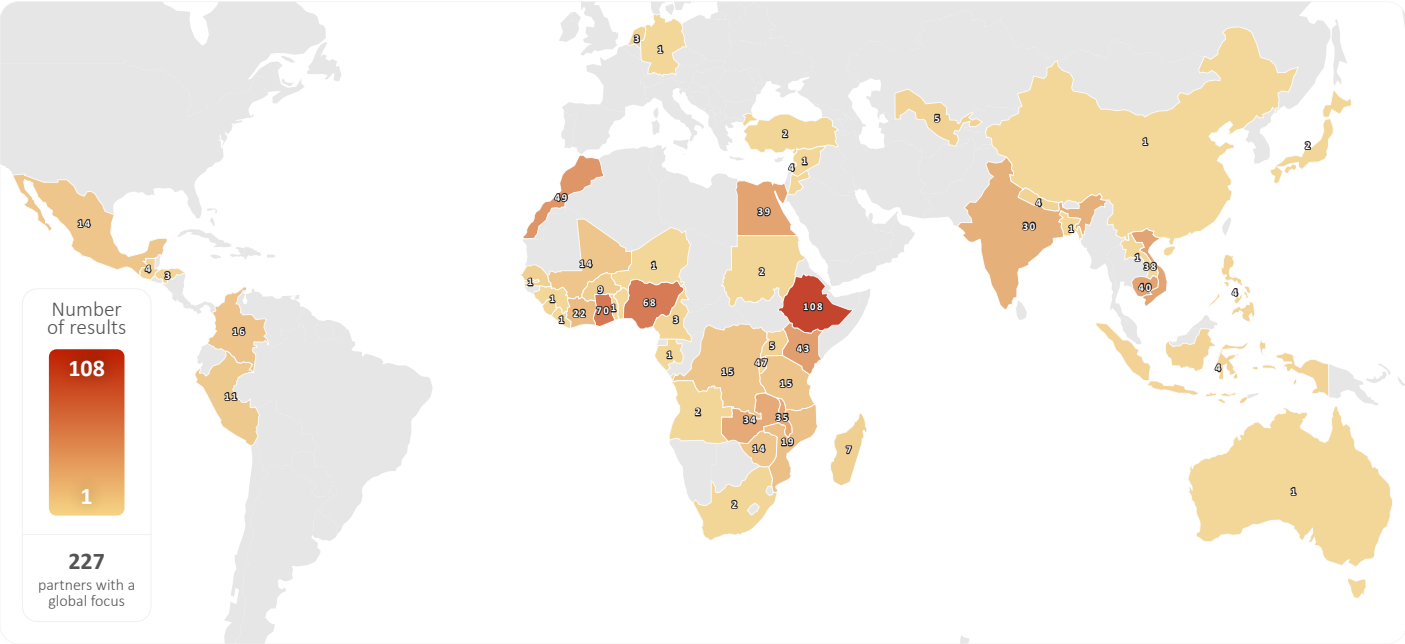
Number of innovations and their readiness levels

| Level		Description	#
9	**Proven Innovation**	The innovation is validated for its ability to achieve a specific impact under uncontrolled conditions	14
8	**Uncontrolled Testing**	The innovation is being tested for its ability to achieve a specific impact under uncontrolled conditions	48
7	**Prototype**	The innovation is validated for its ability to achieve a specific impact under semi-controlled conditions	21
6	**Semi-Controlled Testing**	The innovation is being tested for its ability to achieve a specific impact under semi-controlled conditions	20
5	**Model/Early Prototype**	The innovation is validated for its ability to achieve a specific impact under fully-controlled conditions	4
4	**Controlled Testing**	The innovation is being tested for its ability to achieve a specific impact under fully-controlled conditions	3
3	**Proof of Concept**	The innovation's key concepts have been validated for their ability to achieve a specific impact	13
2	**Formulation**	The innovation's key concepts are being formulated or designed	2
1	**Basic Research**	The innovation's basic principles are being researched for their ability to achieve a specific impact	4
0	**Idea**	The innovation is at idea stage	0

INNOVATIONS READINESS LEVELS PROGRESSION (2022-2024)

9 Proven Innovation · 8 Uncontrolled Testing · 7 Prototype · 6 Semi-Controlled Testing · 5 Model/Early Prototype · 4 Controlled Testing · 3 Proof of Concept · 2 Formulation · 1 Basic Research · 0 Idea · D Discontinued

INNOVATIONS BY TYPOLOGY

Innovation Type

- 5
- 60
- 64
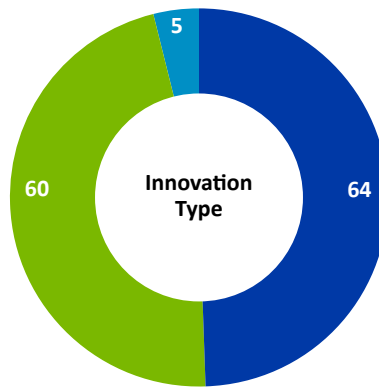
TECHNOLOGICAL INNOVATION
Innovations of technical/material nature, including varieties/breeds, crop and livestock management practices, machines, processing technologies, big data, and information systems.

POLICY/ORGANIZATIONAL/INSTITUTIONAL INNOVATION
Innovations that create enabling conditions, including policy, legal and regulatory frameworks; business models; finance mechanisms; partnership models; public/private delivery strategies.

CAPACITY DEVELOPMENT INNOVATION
Innovations that strengthen capacity, including farmer, extension or investor decision-support services; accelerator/ incubator programs; manuals, training programs and curricula; online courses.

OTHER INNOVATION
Unknown or the type does not work for the innovation.

NUMBER OF INDIVIDUALS TRAINED BY THE INITIATIVE

2022
- Female: 3,257
- Male: 6,622

2023
- Female: 65,781 / 4
- Male: 109,802 / 31
- Unspecified: 532 / 150

2024
- Female: 53,023 / 112
- Male: 68,238 / 496
- Unspecified: 591
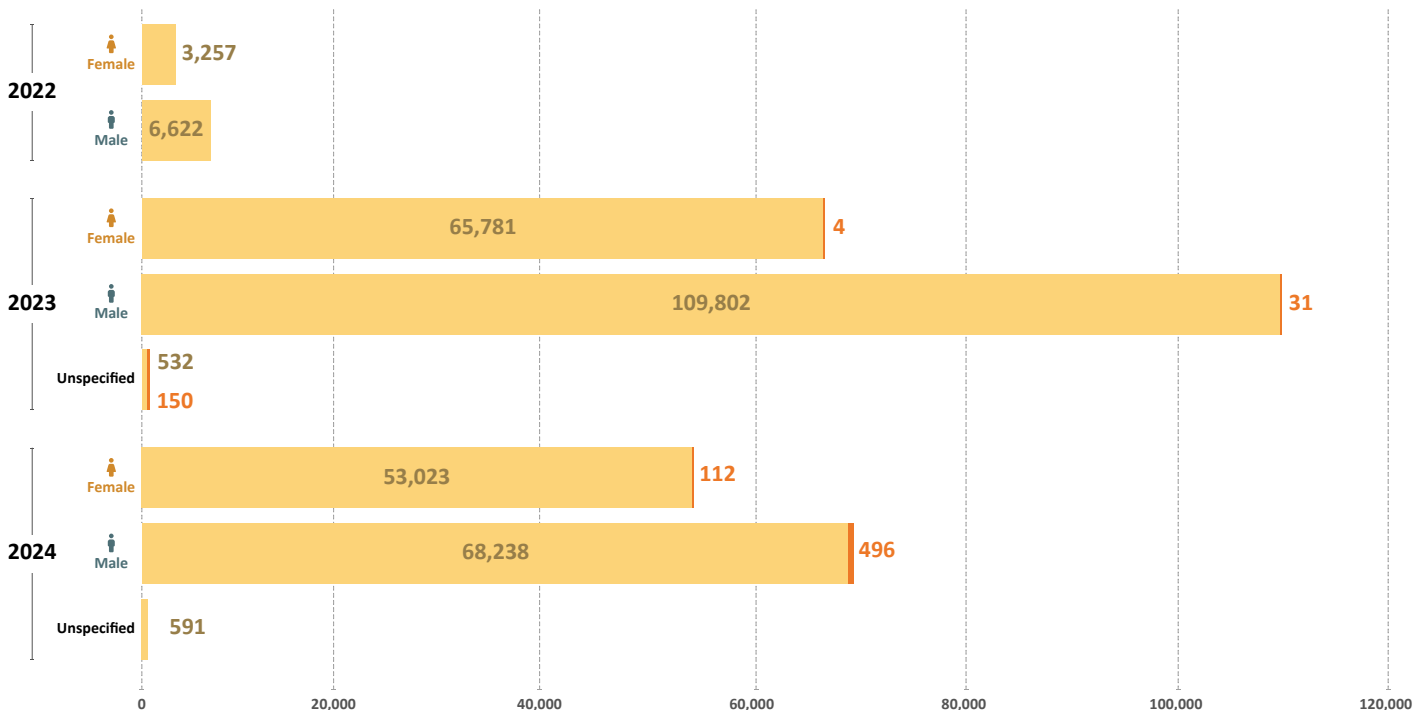
- **Long-term trainees:** Long-term training refers to training that goes for three or more months.
- **Short-term trainees:** Short-term training refers to training that goes for less than three months.

An extension agent with support of a farmer is measuring yield of teff from a farmer field receiving the fertilizer advisory.

Excellence in Agronomy's external partners
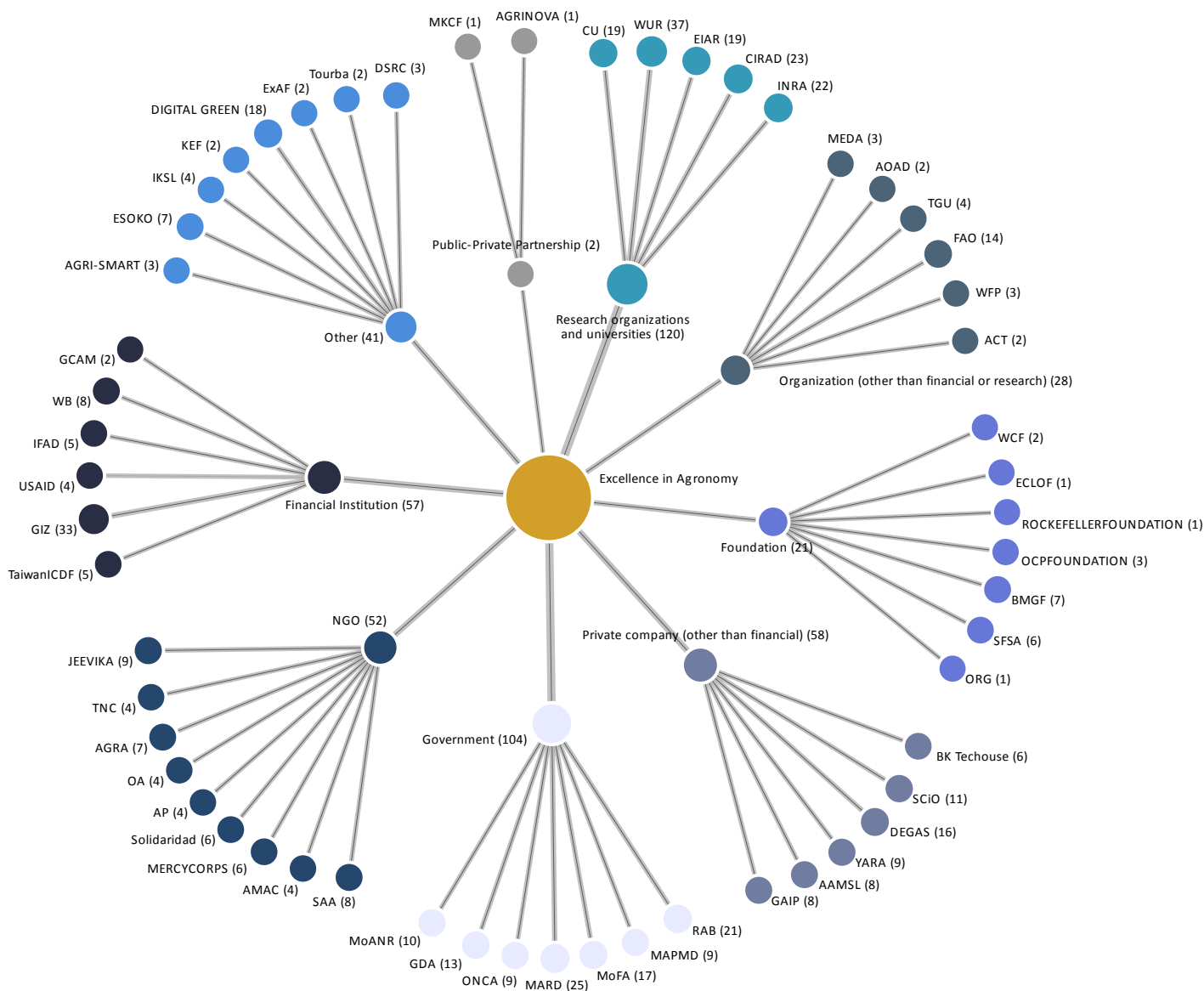
The diagram maps the key external partners of EiA initiative, organized by partner type. The numbers in brackets represent the number of results each partner has contributed to, reflecting the scale and diversity of collaborations. To allow for a clearer view, a maximum threshold of six partners was applied for each typology. The list of partner acronyms is available here.

Partnerships and Excellence in Agronomy's impact pathways

EiA relied on strong, effective partnerships across all four Work Packages to deliver contextualized solutions and measurable impact. Over the last three years, 401 partners collectively contributed to 1,204 results. Among these, research organizations and universities accounted for the largest share of contributions at 49 percent, underscoring their critical role in embedding co-created agronomy solutions within local research and innovation ecosystems.

These academic and research institutions contributed significantly to innovation development, data science, and related R&D projects. National institutions such as Ethiopia's EIAR and Mozambique's Institute of Agricultural Research (IIAM) exemplify the contributions of local research bodies to the development of agronomic solutions. Internationally, advanced research institutes such as Cornell University, Wageningen University, ETH Zurich, and Penn State

University were engaged in cutting-edge research related to soil health, plant production, and social science studies, including GTA.

This partnership support enabled the Initiative to leverage both global and local expertise, ensuring ongoing access to the latest advancements in agronomy research and practice.

Government institutions contributed 18 percent of results, playing a vital role in country-level alignment, piloting, and scaling of agronomic solutions, and providing a platform for policy influence and implementation. Ministries of agriculture in Ethiopia, Ghana, Morocco, Nigeria, Rwanda, and Viet Nam were instrumental through their research and extension departments in validating and scaling innovations.

The private sector, accounting for 14 percent of engaged partners, played diverse roles, including demand creation and technology

dissemination through digital platforms and private extension networks (e.g., Degas, Digital Green, Esoko). Additionally, they provided complementary products and services, such as fertilizers, machinery, output market access, and insurance – essential for the delivery of agronomic solutions. Notable contributors included Notore Chemical Industries, Psaltry International Ltd., Agricsmart, and SCiO, which played a critical technical role in data infrastructure development and standardization.

The top ten individual partner contributors reflect the depth of collaboration across the Initiative. Organizations like Federación Nacional de Cultivadores de Cereales, Leguminosas y Soya (Fenalce)

supported technology development and dissemination. Gender Roles, Equality and Transformation (GREAT) led tailored gender-specific capacity development, while partners like Mercy Corps and Solidaridad served as demand partners and interfaces with farmer-facing organizations.

In summary, the data clearly demonstrate that the Initiative's goal of building an effective agronomic innovation ecosystem – capable of driving demand-driven solution development and delivering farm-level agronomic gains – rests on the engagement and commitment of key partners at the local level.

BREAKDOWN OF PARTNER TYPES

PARTNER TYPE	NO. OF PARTNERS	RESULTS ATTRIBUTED TO PARTNER CONTRIBUTIONS	PERCENTAGE
Research Organizations and Universities	195	589	49
Government Institutions	63	218	16
Private Companies (other than Financial)	55	160	14
NGO	49	110	12
Organization other than Financial	20	42	5
Financial Institutions	11	62	3
Foundation	7	21	2
Total	**401**	**1,204**	**100**

Section 6: **CGIAR Portfolio linkages**

EXCELLENCE IN AGRONOMY'S INTERNAL NETWORK OF COLLABORATIONS
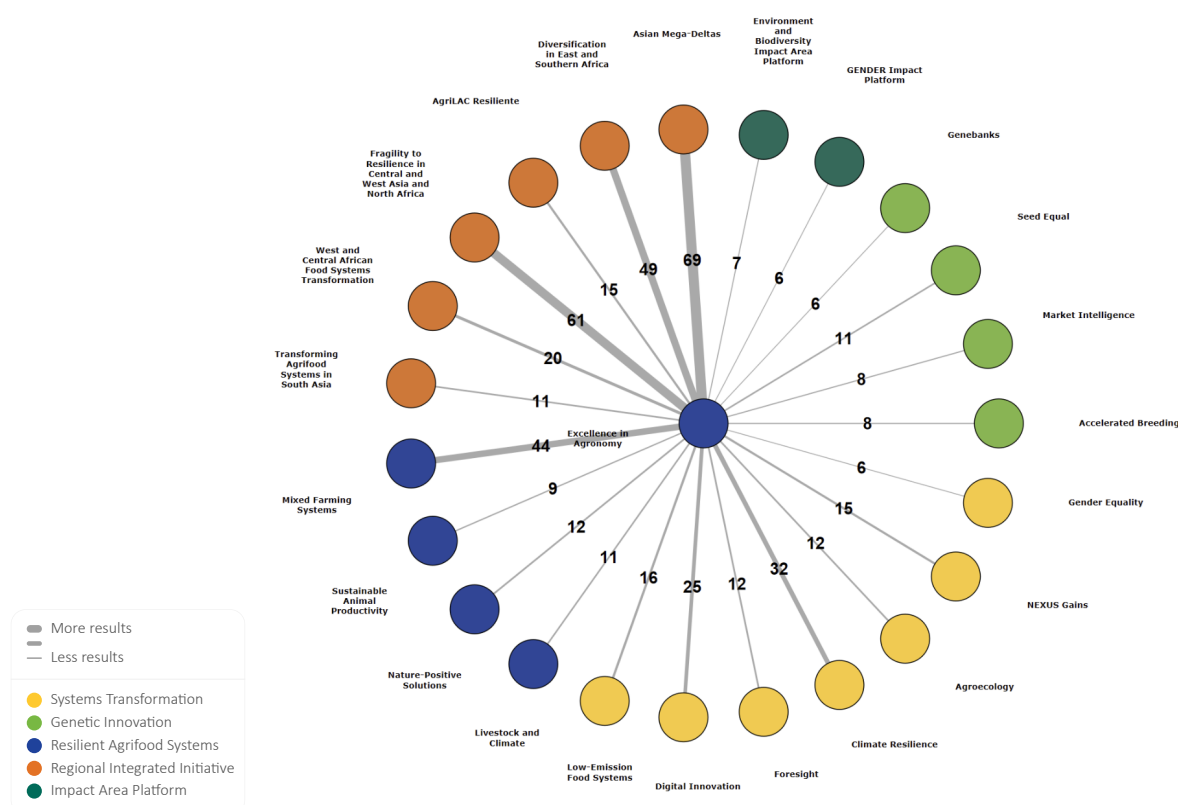
The diagram presents the internal collaborations of EiA with other CGIAR Initiatives, Impact Area Platforms. Connections are sized according to the number of shared reported results, highlighting the depth of collaboration across the CGIAR Portfolio. A results threshold filter is applied (set to a minimum of six results) to focus the view on the most significant collaborations. Thicker lines represent stronger collaborative links based on a higher number of shared results.

Portfolio linkages and Excellence in Agronomy's impact pathways

EiA actively engaged with various Initiatives and Impact Platforms to foster strategic collaboration, synergy, and complementarity in delivering key outputs and outcomes in 2024. Between 2022 and 2024, EiA partnered with six regional Initiatives, 21 global Initiatives, and two Impact Platforms. Through these partnerships, EiA successfully expanded its reach and impact, fostering innovation, knowledge sharing, and capacity sharing to support the scaling of climate adaptive and sustainable agronomy solutions.

EiA's partnership with all six regional initiatives was driven by the goal of responding to agronomy-related demands, fostering capacity sharing, scaling agronomy solutions, and building learning alliances for sustainable knowledge management and dissemination. Through 24 PAiCE workshops involving 215 partner organizations, EiA and the regional Initiatives gained a deeper understanding of production constraints and climate challenges in various regions. These workshops led to the identification of priority adaptation strategies to address challenges in agricultural production.

In Southeast Asia, EiA collaborated with the Asian Mega-Deltas (AMD) Initiative in Viet Nam to enhance rice productivity and efficiency by developing an mDSR technology. This approach integrated management practices designed to reduce the carbon footprint while improving rice productivity and quality. To gain deeper insights into production and climate challenges in the Mekong Delta, EiA and AMD jointly organized two learning workshops, including the PAiCE workshop, with multiple stakeholders. These engagements facilitated an in-depth analysis of

production and climate constraints, allowing for the prioritization of climate adaptation options. Additionally, learning alliances were established with government and private sector partners to design effective scaling strategies for mDSR. In 2023, the Vietnamese government, EiA and AMD hosted the International Rice Festival, enabling South-South knowledge exchange among 200 stakeholders, including CGIAR scientists, government officials, academics, researchers, private sector partners, and farmers. Also, the Vietnamese government adopted mechanized direct seeding technology to drive high-quality, low-emission rice production through its 1-Million-Hectare High-Quality Low-Emission Rice Program. By 2024, mDSR was successfully demonstrated across 150 hectares in three provinces, with plans to scale it up to one million hectares by 2030.

In Cambodia, EiA and AMD collaborated to improve rice-based systems for smallholder farmers, particularly in deltaic areas. EiA focused on developing mechanized direct seeding integrated with tailored agronomy practices, while AMD promoted crop diversification by integrating crops such as watermelon and sweet potato. Additionally, rice-fish and rice-prawn culture systems were introduced to enhance both income and food security for rice-farming households.

In Latin America, EiA's collaboration with the CGIAR Research Initiative on AgriLAC Resiliente centered on driving innovation and mechanization in agriculture. Together, they assessed mechanization in Central America, designed a mechanization service model, and

compiled a fuel consumption database to support climate-smart, low-emission farming. EiA played a crucial role in launching and funding the Latin American Agronomic Research Network, which enhanced agronomic research collaboration and strengthened local research capacity. In 2024, EiA and AgriLAC Resiliente convened 113 stakeholders at the 2nd International Symposium of the Latin American Agronomic Research Network in Mexico, where they discussed the role of regenerative agricultural practices in achieving sustainable agrifood systems. Additionally, the two Initiatives co-developed a machine learning model to assess land use changes and their impact on soil organic carbon in the Peruvian Andean Highlands.

EiA co-developed and implemented a joint project with the Climate Resilience (ClimBeR) Initiative in Kenya (ISPARK), supported by FCDO. Furthermore, EiA partnered with the Livestock and Climate and Climate Resilience Initiatives to co-author the 2024 Breakthrough Agenda Report-Agriculture. This was the first standalone report within the Breakthrough Agenda series dedicated exclusively to agriculture, marking a significant milestone in addressing climate challenges within the sector.

EiA also collaborated with the Digital Innovation (DI) Initiative to advance digital innovation and analytics. DI and EiA co-developed a common analytics infrastructure to enable interoperable data exchange through EiA-mediated tools, contributing to the development of tools for responsible data management and ensuring compliance with privacy and ethical regulations through CG Labs. In 2024, EiA and DI launched a training program integrating human-centered design into the development of demand-driven agronomy solutions. Moreover, in 2023, EiA partnered with the CGIAR Research Initiative on Mixed Farming Systems (MFS) to conduct a crop simulation training and workshop in Zimbabwe, enhancing modeling capacity and fostering African scientific leadership in agricultural problem-solving. This collaboration also led to the creation of an open-source repository for datasets and codes, as well as the application of a machine learning model and remote sensing technologies for spatial and temporal yield prediction.

Additionally, EiA partnered with five global Initiatives to strengthen and promote gender-responsive agronomy. Collaborating with the Foresight Initiative, EiA integrated its micro-level spatial ex-ante approaches with macro-level modeling efforts. Working with the National Policies and Strategies Initiative, EiA developed fertilizer response modeling methods and contributed to a special issue of Food Policy focused on fertilizer policies. EiA also prioritized gender and youth inclusion in use cases, co-implementing GTAs for scaling agronomy in collaboration with the Gender Impact Platform and the Gender Equality Initiative.

Pilot model farms in Vietnam.

Section 7: **Key result story**

Digital fertilizer recommendations boost yields for 8,000 farmers in Rwanda

A digital fertilizer advisory tool boosted yields for 8,000 Rwandan farmers and is scaling to 2 million nationwide.

Farmers on a demonstration site.
Credit: International Potato Center (CIP)

Primary Impact Area

Other relevant Impact Areas targeted

Contributing Initiative

Excellence in Agronomy

Contributing Centers

IITA · CIP

Contributing external partners

Rwanda Agriculture and Animal Resources Development Board (RAB) · BKTechouse · One Acre Fund

Geographic scope

Regions: Sub-Saharan Africa

Countries: Rwanda

Most Rwandan farmers apply uniform fertilizer rates despite diverse local conditions, leading to low yields and high input costs. The CGIAR Research Initiative on Excellence in Agronomy and the Rwanda Agriculture and Animal Resources Development Board (RAB) and its Soil Information System (RwaSIS) co-developed a digital tool that delivers site-specific fertilizer advice, now piloted with 8,000 farmers. The tool improved yields and profitability, laying the groundwork for nationwide scale-up through the Smart Nkunganire System, reaching over 2 million farmers and advancing sustainable, data-driven agriculture in Rwanda.

The challenge

In Rwanda, 85 percent of rural households rely on agriculture, yet most cultivate less than one hectare of land – half on plots smaller than one-third of a hectare. With land scarce and productivity low, improving yields is essential for food security and livelihoods. One of the primary barriers has been the inefficient use of inorganic fertilizers. Since 2007, the Government of Rwanda's Crop Intensification Programme has facilitated farmer access to fertilizer using a uniform, or "blanket," recommendation across the country. However, Rwanda's diverse agroecological landscape – spanning varying soil types, altitudes, and climate conditions – renders such blanket recommendations ineffective. The result: poor crop-nutrient matches, inefficient use of costly inputs, low yield responses, and limited profitability. Farmers often apply too much or too little fertilizer, which strains their finances and contributes to environmental degradation.

The objective

Recognizing these challenges, CGIAR's Excellence in Agronomy (EiA) Initiative set out to co-develop a solution that improves productivity while reducing input waste. The goal was to enable Rwandan farmers to increase crop yields by 10-20 percent while optimizing fertilizer use. For example, average potato yields of 10-15 tons per hectare could increase to 25 tons with the right nutrient inputs. The long-term vision is to build a digitally enabled, sustainable fertilizer advisory system, tailored to the unique conditions of each farming location and accessible to more than 2 million smallholders across Rwanda.

The solution

To bridge the gap between current practices and desired outcomes, EiA partnered with the Rwanda Agriculture and Animal Resources Development Board (RAB) and its Soil Information System (RwaSIS) to develop and pilot a digital fertilizer recommendation system. The tool delivers location-specific fertilizer guidance based on site-specific data – including soil characteristics, altitude, and climate – rather than one-size-fits-all prescriptions. Integrated with Rwanda's

Smart Nkunganire System (SNS), which already connects over 2 million farmers to agricultural inputs and services, the tool currently focuses on six key crops: maize, rice, potatoes, beans, wheat, and cassava.

During the pilot phase, over 8,000 farmers in Rubavu and Nyanza districts received tailored advice through the system, supported by 10 sector agronomists and 100 trained farmer facilitators. Validation results are promising: 74 percent of potato farmers and 84 percent of rice farmers using the site-specific recommendations reported yield increases and improved profitability compared to those using blanket recommendations.

Users and beneficiaries

Smallholder farmers were the primary beneficiaries of this innovation, receiving not only tailored advice but also capacity-building support to understand and apply the recommendations. Women and youth – who play key roles in Rwanda's agricultural sector – were actively included in training sessions and field demonstrations. Early results show a minimum 20 percent increase in yields among participating farmers. Importantly, optimized fertilizer use reduced environmental impact and lowered input costs, strengthening farmer profit margins and sustainability.

Supporting activities

A range of complementary activities ensured the success of the pilot. Farmer training was conducted through community meetings, field demonstrations, and interactive virtual reality modules. User-friendly manuals and video tutorials further supported uptake. Agronomists and farmer facilitators received targeted training to become effective intermediaries between the digital system and end users. Public awareness campaigns via radio and local meetings helped spread the word about the benefits of tailored recommendations. Rigorous, standardized data collection throughout the pilot enabled accurate evaluation and informed scaling strategies.

Looking ahead

The system is now poised for nationwide expansion beginning in the 2025 planting season. Future plans include integrating climate-smart advisories and market information into the platform, and exploring private-sector partnerships to support further innovation and investment. For Rwanda's farmers, this initiative represents more than just better yields – it paves the way for a more resilient, efficient, and sustainable agricultural system.

By combining data-driven innovation, strategic partnerships, and grassroots implementation, CGIAR and its Rwandan partners are transforming fertilizer use – ensuring that Rwanda's farmers grow more, waste less, and secure a better future.

> By providing site-specific fertilizer recommendations, we can optimize fertilizer use, increase yields, and reduce environmental risks. This platform is set to revolutionize how we approach farming in Rwanda.
>
> Dr. Mark Cyubahiro Bagabe, Minister of Agriculture and Animal Resources (MINAGRI), Rwanda
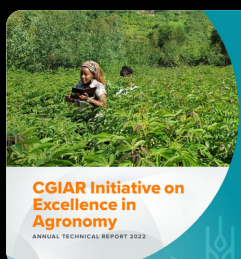
2022 key result story
Smallholder farmers in Ethiopia utilizing NextGen agro-climate advisory increased wheat yield by 25% and earned an additional US$600/ha/season

CGIAR Initiative on Excellence in Agronomy
ANNUAL TECHNICAL REPORT 2022

2023 key result story
Mechanized Direct Seeding Transforms Rice Production, Boosting Yield, Profit, and Reducing Carbon Footprint in Vietnam's Mekong River Delta

CGIAR Research Initiative on Excellence in Agronomy

CA Mechanization implementation in Semoir SD.