CGIAR

INITIATIVE ON
West and Central African
Food Systems Transformation

CGIAR Initiative on West and Central African Food Systems Transformation

ANNUAL TECHNICAL REPORT 2022

CGIAR Technical Reporting 2022

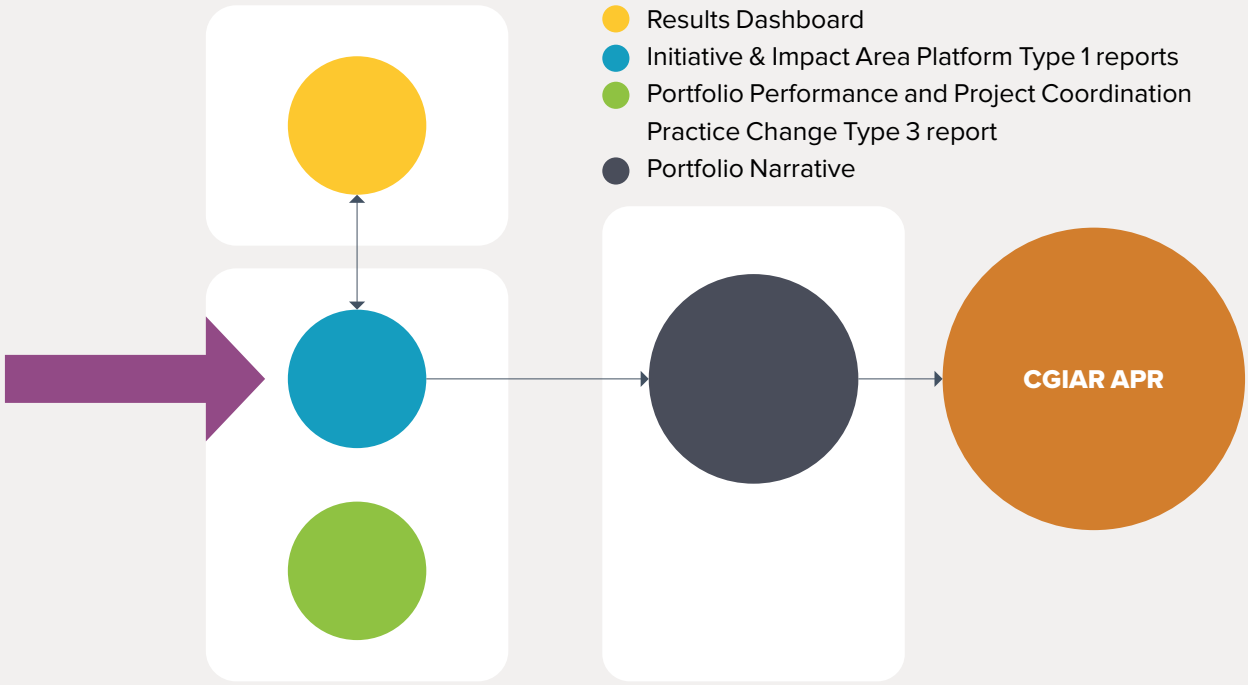
CGIAR Technical Reporting has been developed in alignment with the CGIAR Technical Reporting Arrangement.

This Initiative report is a Type 1 report and constitutes part of the broader CGIAR Technical Report. Each CGIAR Initiative submits an annual Type 1 report, which provides assurance on Initiative-level progress towards End of Initiative outcomes.

The CGIAR Technical Report comprises:

- Type 1 Initiative and Impact Area Platform reports, with quality assured results reported by Initiatives and Platforms available on the CGIAR Results Dashboard.
- The Type 3 Portfolio Performance and Project Coordination Practice Change report, which focuses on internal practice change.
- The Portfolio Narrative, which draws on the Type 1 and Type 3 reports, and the CGIAR Results Dashboard, to provide a broader view on portfolio coherence, including results, partnerships, country and regional engagement, and synergies among the portfolio's constituent parts.

The CGIAR Technical Report constitutes a key component of the CGIAR Annual Performance Report (APR).



US$	2022	2023	2024
Proposal Budget from initial submission	US$6,327,600	US$12,399,397	US$11,273,003
Approved 2022 Budget	US$4,139,557		

2022 Disbursement Target based on Approved FinPlan

Section 1 Fact sheet

Initiative name	Transforming Agrifood Systems in West and Central Africa (TAFS-WCA)
Initiative short name	West and Central African Food Systems Transformation
Action Area	Resilient Agrifood Systems
Geographic scope	**Regions targeted in the proposal:** West and Central Africa **Countries targeted in the proposal:** Burundi, Cote d'Ivoire, Democratic Republic of Congo, Ghana, Nigeria, Rwanda
Start date	April 1, 2022
End date	March 31, 2025
Initiative Lead	Aminou Arouna – a.arouna@cgiar.org
Initiative Deputy	Regina Kapinga – r.kapinga@cgiar.org
Measurable three-year End of Initiative outcomes (EOI-Os)	**EOI-O 1: Nutrient-dense crop varieties** At least 80,000 smallholder households (HH) will have access to climate resilient nutrient-dense crop varieties, with at least 16,000 of them using five climate resilient, nutrient-dense crop varieties and six good agricultural practices.
	EOI-O 2: Household diversity scores An increase of at least 30% in household dietary diversity scores will be attained.
	EOI-O 3: Climate information and early warning systems Three million farmers, 30 value chain actors, and three governments will be using timely climate information and early warning systems for improved decision-making.
	EOI-O 4: Women's Empowerment in Agriculture Index An increase of at least 20% in the Women's Empowerment in Agriculture Index (WEAI) will be attained.
	EOI-O 5: Youth and women engagement At least 20,000 youth and 15,000 women will be engaged in value-added activities related to agriculture, with at least 50% of them having access to credit.

	EOI-O 6: Scaling tools At least 10 key partners in the next phase implementation plans will be consistently using three validated scaling tools.
	EOI-O 7: Landscape management At least four governments will use inclusive approaches towards landscape management, and informed and inclusive land and water management plans will have been developed by 100 rural communities that will diversify income from agriculture and increase production to create jobs and stability.
OECD DAC Gender equity marker score*	**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/22-market-driven-resilient-and-nutritious-agrifood-systems-in-the-humid-zones-of-west-and-central-africa/

*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.
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.

Section 2 Initiative progress on science and towards End of Initiative outcomes

Overall summary of progress against the theory of change

By focusing primarily on food and nutrition security and making agrifood systems more climate-adapted, Transforming Agrifood Systems in West and Central Africa (TAFS-WCA) aims to contribute to the five Impact Areas of One CGIAR through: (i) increasing access to quality, nutrient-dense seed and climate-smart good agricultural practices and reducing post-harvest losses; (ii) developing the matching of digital supply–demand services to increase productivity and adaptation to climate change; (iii) providing opportunities, access to resources (market and finance), and tools for women and youth to engage in agribusiness to reduce existing gender gaps; (iv) improving governance of natural resources using a landscape management approach to improve environmental health and biodiversity; and (v) supporting regulatory and policy environments to create a socially inclusive platform for public and private partnerships and scale the innovations.

The key research questions being tackled include: (i) how can smallholder farming systems be made more productive and adaptive to climate change; (ii) what are the critical factors that incite consumer demand for biofortified and other nutritious foods; (iii) what are the key determinants in seeking and adopting digital-based knowledge information systems; (iv) how can participatory water and land management support systems strengthen landscape resilience planning for enhanced production of nutrient-rich crops and fish; and (v) what are the social constraints that affect gender equality in agribusiness?

The activities of the Initiative depend on competencies from an alliance of seven CGIAR Centers (AfricaRice, International Institute of Tropical Agriculture (IITA), International Water Management Institute (IWMI), International Potato Center (CIP), the Alliance of Bioversity International and the International Center for Tropical Agriculture (CIAT), and WorldFish) and partners in the National Agricultural Research and Extension Systems, universities, and other international research centers (West and Central African Council for Agricultural Research and Development (CORAF), International Centre of Insect Physiology and Ecology (icipe), and World Vegetable Center), and other One CGIAR Initiatives. In addition to operating within existing partnerships and memoranda of understanding, sub-grant agreements were signed with partners such as the Crops Research Institute (CSIR), Ghana; the World Vegetable Center; icipe, CORAF, and the National Cereals Research Institute, Nigeria.

Two stakeholder engagement workshops were held to launch our Initiative in Central Africa (in Rwanda) and West Africa (in Cote d'Ivoire). The purpose of these workshops was to explain the change processes of One CGIAR, create a good understanding of our Initiative, jointly prioritize the areas of intervention, select highly demanded innovation bundles for scaling, agree on priority activities, and provide a plan of action for collaboration with other projects/programs in the region. Follow-up activities included site selection, local partner identification, and diverse stakeholder consultations in the six target countries (Burundi, Democratic Republic of Congo (DRC), Ghana, Nigeria, Cote d'Ivoire, and Rwanda). We selected sites for activities targeting contributions toward the improvement of the following four farming systems: humid lowland tree crop, root and tuber crop, cereal root crop mixed, and highland perennial. Our focus has been on the value chains of the following commodities: cassava, sweet potato, yam, bananas, rice, maize, soybean, beans, vegetables, and inland

fish. To better understand the local conditions of the sites, several surveys were conducted. Baseline surveys and e-registration of potential beneficiaries were completed in all the countries except DRC, where it is ongoing. Using a household-level, multi-crop approach, the baseline survey team collected data on social constraints to gender and generational equality in agribusiness, and awareness and adoption of digital tools by youth and women. For the first time, the e-registration of actors was conducted to set up agribusiness hubs in the target countries and 15,285 value chain actors and future beneficiaries were georeferenced. A systematic review was conducted to assess farmers' needs for climate information services (CIS). A mapping of the climate and agronomic digital advisory services landscape in six target countries was conducted. Priority landscapes within the Initiative's targeted agroecological zones in the six target countries were identified using a participatory approach. Pre-intervention assessments for landscape management were carried out, including mainly social and ecological landscape (SEL) situational analysis in Ghana and barriers and incentive mechanisms for scaling bundled nature-positive and One Health-sensitive technologies in Cote d'Ivoire. These surveys have generated 25 knowledge products including six journal articles.

Using participatory approaches, 18 innovations at various stages of development were tested or validated, including: biopesticides against vegetable pests; decision-support tools for site-specific fertilizer recommendations in Burundi; new biofortified cassava varieties in Ghana; Mucuna pruriens as a cover crop in banana and coffee systems in DRC; and options for diversification in rice-based production systems in Cote d'Ivoire, Ghana, and Nigeria. A new digital advisory tool was developed to deliver early warning and real-time information on production stressors (precipitation, fall armyworm and striga infestations) in Rwanda. For the first time, we validated an isotope technique to select climate resilient varieties in cassava and banana production systems in DRC. Service-based business models for youth were tested for transfer and sustainable scaling of new technologies, mainly RiceAdvice and a rice threshing machine, to increase household resilience. The results showed that higher profitability is observed when both technologies are combined in one business model. Given that scaling requires resources, innovations to be considered ripe for attracting investment for scaling were identified in two countries (Nigeria and Rwanda). Stakeholders' workshops were organized in the two countries with the aim of using multiple state-of-the-art evidence-based management solutions to increase the scaling readiness of the innovations and increase the impact of investments in the Initiative's research and innovation portfolios.

Several capacity-sharing events were organized with stakeholders (women and youth farmers, entrepreneurs, government, and private sector agents). In total, 22 capacity-sharing events were organized which benefited 1,365 actors including 490 women (36%) and were related to input supply, good agricultural practices, post-harvest technologies, and value chain improvement. For instance, 20 experts and 106 master's degree students (29% of whom were women and 36% of whom were over 35 years old) were trained on the use of the Digital AgroClimate Advisory (DACA) platform. To increase the adoption of business models in-country, a training-of-trainer workshop was organized on business model design for youth and women in Cote d'Ivoire. A training manual was also developed as a tool to support women entrepreneurship in the agrifood sector. To reduce post-harvest losses, different technologies, including DryCard, Aflasafe, and Purdue Improved Crop Storage (PICS) bags, and innovations for good post-harvest management practices were introduced in two biofortified crop value chains

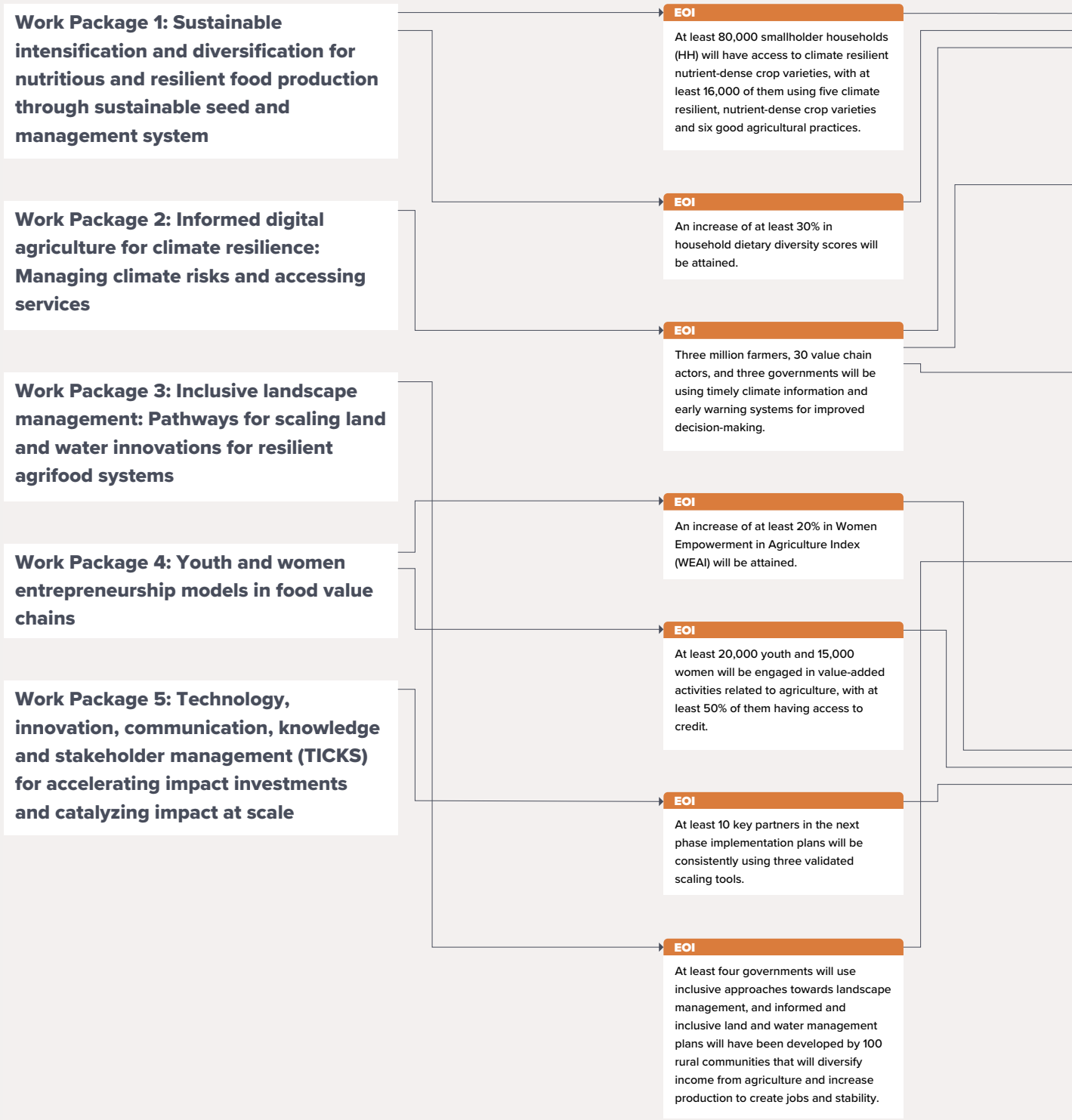
Vitamin A Cassava Seed Lab.
Photo credit: IITA, Mercy Diebiru Ojo

(pro-Vitamin A Maize and pro-Vitamin A Cassava). This was done through physical training of 960 value chain actors by extension agents. NARS partners were also trained on post-harvest loss reduction and mycotoxin control in cereals.

To present the objectives of the Initiative and achievements, we participated in at least 10 conferences and workshops. We organized a side event on September 15, 2022 during the FARA 2022 Biennial Africa Climate-Smart Agriculture (CSA) Stakeholders Conference in Accra. It focused on how linking CIS to CSA can enable sustainable scaling of innovations to strengthen agrifood systems. We participated in a workshop in Niamey on December 15–16, 2022, with Wageningen University and Research (WUR) and other partners, regarding the potential for the development of a Center of Excellence in the Sahelian Zone. This is in line with our Initiative's intent to find the resources (including leveraging ongoing investments by multi-lateral and bilateral organizations) to contribute our competencies beyond the humid and transitional zones in West Africa and the highlands in Central Africa to the Sahel Region in partnership with WUR, other One CGIAR Initiatives, and other agencies.

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.



EOI — End of Initiative outcome

AA — Action Area

IA — Impact Area

SDG — Sustainable Development Goal

- Nutrition, Health, and Food Security
- Poverty Reduction, Livelihoods, and Jobs
- Gender Equality, Youth, and Social Inclusion
- Climate Adaptation and Mitigation
- Environmental Health and Biodiversity

Teams from CGIAR's three Action Areas — System Transformation, Resilient Agrifood Systems and Genetic Innovation — worked to develop an improved set of Action Area outcomes in October 2022. Since this was near the end of the reporting cycle for 2022, it was decided not to update the theories of change based on these new Action Area outcomes.
The exception to this is Genetic Innovation — for this Action Area, as the new outcomes had already been widely discussed among the relevant Initiatives, and with its advisory group of funders and other stakeholders, the decision was made to update their outcomes in time for the 2022 reporting cycle.

Progress by End of Initiative outcome

EOI-O 1: Nutrient-dense crop varieties: At least 80,000 smallholder households (HH) will have access to climate resilient nutrient-dense crop varieties, with at least 16,000 of them using five climate resilient, nutrient-dense crop varieties and six good agricultural practices.	The relevant innovations that were tested or validated include: biopesticides against vegetable pests; decision-support tools for site-specific fertilizer recommendations in Burundi; new biofortified cassava varieties in Ghana; Mucuna pruriens as a cover crop in banana and coffee systems in DRC; and options for diversification in rice-based production systems in Cote d'Ivoire, Ghana, and Nigeria. The capacity sharing with stakeholders and their involvement in the testing and validation of innovations (e.g., farm diversification options, varieties, production practices, and a decision-support tool) will enhance the potential for their adoption of improved climate resilient nutrient-dense varieties and good agricultural practices and the impact on their welfare. A diagnostic study in Burundi provided evidence of the adoption of Vitamin A-rich banana. A total of 15,285 value chain actors (5,041 in Cote d'Ivoire; 5,039 in Ghana, and 5,205 in Nigeria) were georeferenced as future beneficiaries of the Initiative.
EOI-O 2: Household diversity scores: An increase of at least 30% in household dietary diversity scores will be attained.	Efforts in 2022 focused on increasing the availability and affordability of diverse nutrient-dense foods. Stakeholders in vegetable production in Ghana and Nigeria were trained on good production practices, seed production of traditional African vegetables, and container/sack gardening technology. NARS staff in Burundi, Rwanda, and DRC were trained to produce early generation seed of orange-fleshed sweet potato. Extension agents, farmers, and students in DRC were trained on banana macro-propagation. Farmers' cooperatives in Cote d'Ivoire were engaged in participatory evaluation and selection of new rice varieties. Options for diversification in rice-based production systems to increase household dietary diversity were tested in Cote d'Ivoire, Ghana, and Nigeria. The results of the survey show, for the first time, a positive and significant relationship between farm production diversification and dietary diversity in households. With a one-unit increase in farm production diversity, the household dietary diversity score increased by 0.05 in Madagascar, 0.08 in Nigeria, 0.07 in Rwanda, and 0.08 in Senegal.
EOI-O 3: Climate information and early warning systems: Three million farmers, 30 value chain actors, and three governments will be using timely climate information and early warning systems for improved decision-making.	A systematic review of farmers' demand for CIS and the assessment of the impact of weather and CIS on farm productivity and technical efficiency was conducted. Customization of the DACA mobile application in Ghana was undertaken, and a capacity-building exercise provided a total of 20 experts and 106 master trainers (29% of whom were women and 36% of whom were over 35 years old) to help increase its use in Ghana. A development of the early warning system for fall armyworm and striga management in Rwanda was conducted. Digital and personalized advice (RiceAdvice) increases yields by 220 kg/ha and profit of smallholder farmers by US$579/ha in Senegal.

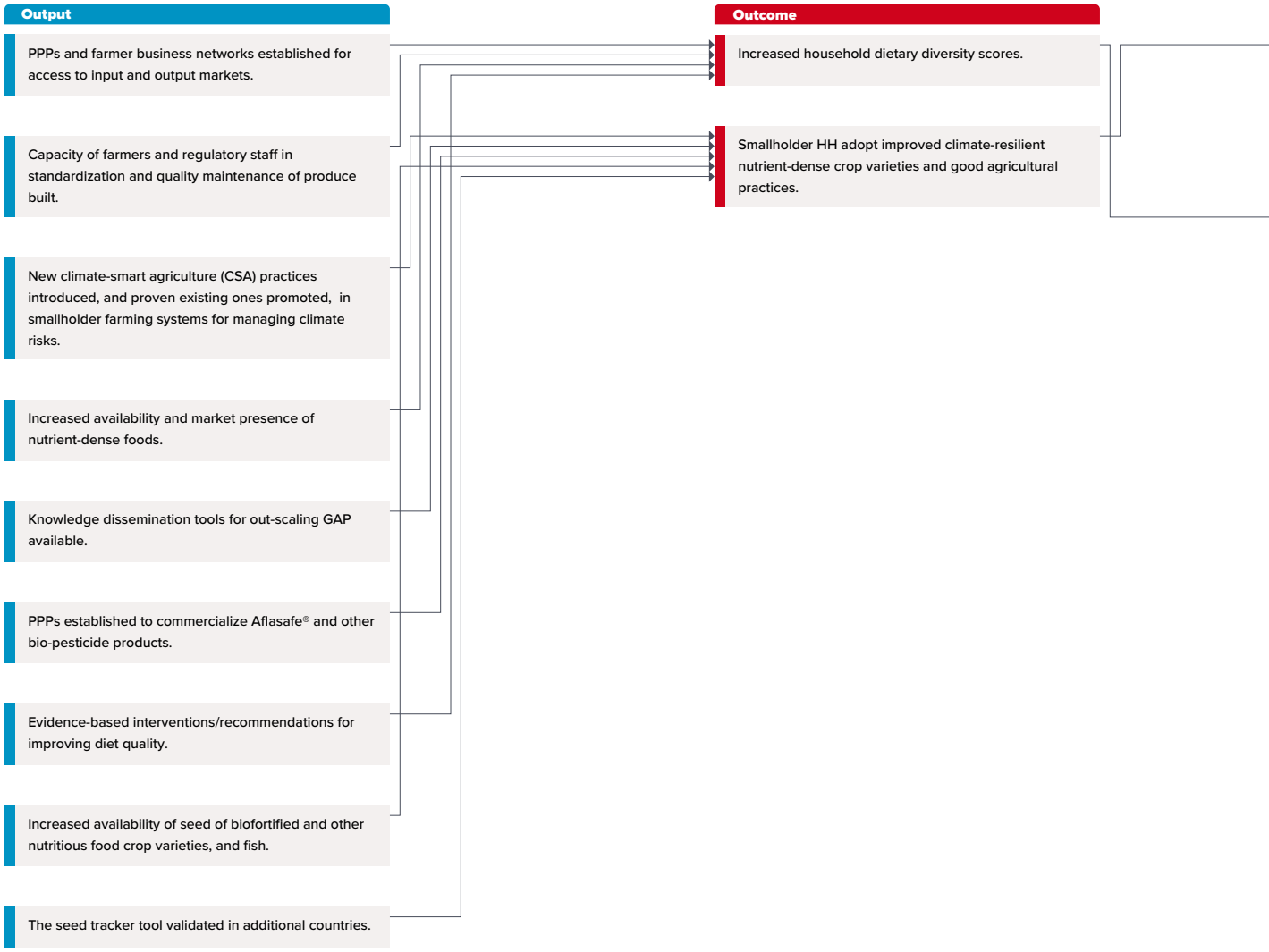
EOI-O 4: Women's Empowerment in Agriculture Index: An increase of at least 20% in Women's Empowerment in Agriculture Index (WEAI) will be attained.	Baseline data was collected on the WEAI. This data will help researchers to know for the first time the reference value of the WEAI in the target countries. This survey will also help build understanding of the need and demand for women to improve their WEAI. In addition, different capacity-strengthening events were organized, targeting women. For instance, an awareness-creation workshop on Youth and Women Entrepreneurship Models in Food Value Chains was organized in Nigeria. A training manual was also developed as a tool to support women entrepreneurship in the agrifood sector.
EOI-O 5: Youth and women engagement: At least 20,000 youth and 15,000 women will be engaged in value-added activities related to agriculture, with at least 50% of them having access to credit.	Data was collected from value chain actors (producers and post-harvest actors) regarding the social constraints to gender and generational equality in agribusiness, and awareness and adoption of digital tools by youth and women. This data will allow the development of a new model to understand the current socioeconomic situation of youth and women in agricultural value chains. E-registration of actors was also conducted to set up agribusiness hubs in the target countries. A total of 15,285 value chain actors (5,041 in Cote d'Ivoire, 5,039 in Ghana, and 5,205 in Nigeria) including youth and women were georeferenced as potential beneficiaries of the Initiative. To increase the adoption of business models in-country, a training-of-trainers workshop was organized on business model design for youth and women. The service-based businesses with the following characteristics are the most preferred profiles and are therefore likely to be adopted by rice farmers: cash payment after harvest at US$9.70/ha for more than two seasons contract and cash payment after harvest at US$14.50/ha for one season contract. Different technologies, including DryCard, Aflasafe, and PICS bags, and innovations for good post-harvest management practices were introduced in two biofortified value chains (Vitamin A Maize and Vitamin A Cassava) and 960 value chain actors benefited. The impact of the GEM system for rice parboiling is estimated at 14.4 kg of milled rice per 100 kg of paddy (21%), equivalent to US$7.30 of additional income (18%) for women. A significantly lower poverty rate of 26% was found among households due to the adoption of the GEM system.
EOI-O 6: Scaling tools: At least 10 key partners in the next phase implementation plans will be consistently using three validated scaling tools.	Two workshops were organized (in Nigeria and Rwanda) for key members of three high-readiness innovation teams (scientists, private sector, and users), with a focus on imparting skills in how to communicate about innovations ("the pitch"), manage the stakeholder community, and identify potential investors.

EOI-O 7: Landscape management: At least four governments will use inclusive approaches towards landscape management, and informed and inclusive land and water management plans will have been developed by 100 rural communities that will diversify income from agriculture and increase production to create jobs and stability.	Country teams (this includes CGIAR staff and relevant government departments as well as research and extension agencies) identified priority landscapes within the Initiative's targeted agroecological zones in the six countries. Pre-intervention assessments were co-implemented. These included: SEL situational analysis in Ghana; development of a geospatial methodology for assessing groundwater potential for climate-smart cocoa production in Ghana; assessment of the sustainability of the financing ecosystem for cocoa irrigation in Ghana; assessment of the priorities, barriers, and incentive mechanisms for scaling bundled nature-positive and One Health-sensitive technologies in Cote d'Ivoire; and the piloting of black soldier fly (BSF) technology in a target landscape in Ghana. The next step is the co-design and implementation of inclusive landscape management plans and decision-support systems in each of the target countries.

The photo was made during the training workshop on Sweetpotato processing in 2022.
Photo credit: Jan Low from CIP

Section 3 Work Package-specific progress

Work Package 1:
Sustainable intensification and diversification for nutritious and resilient food production through sustainable seed and management system



EOI

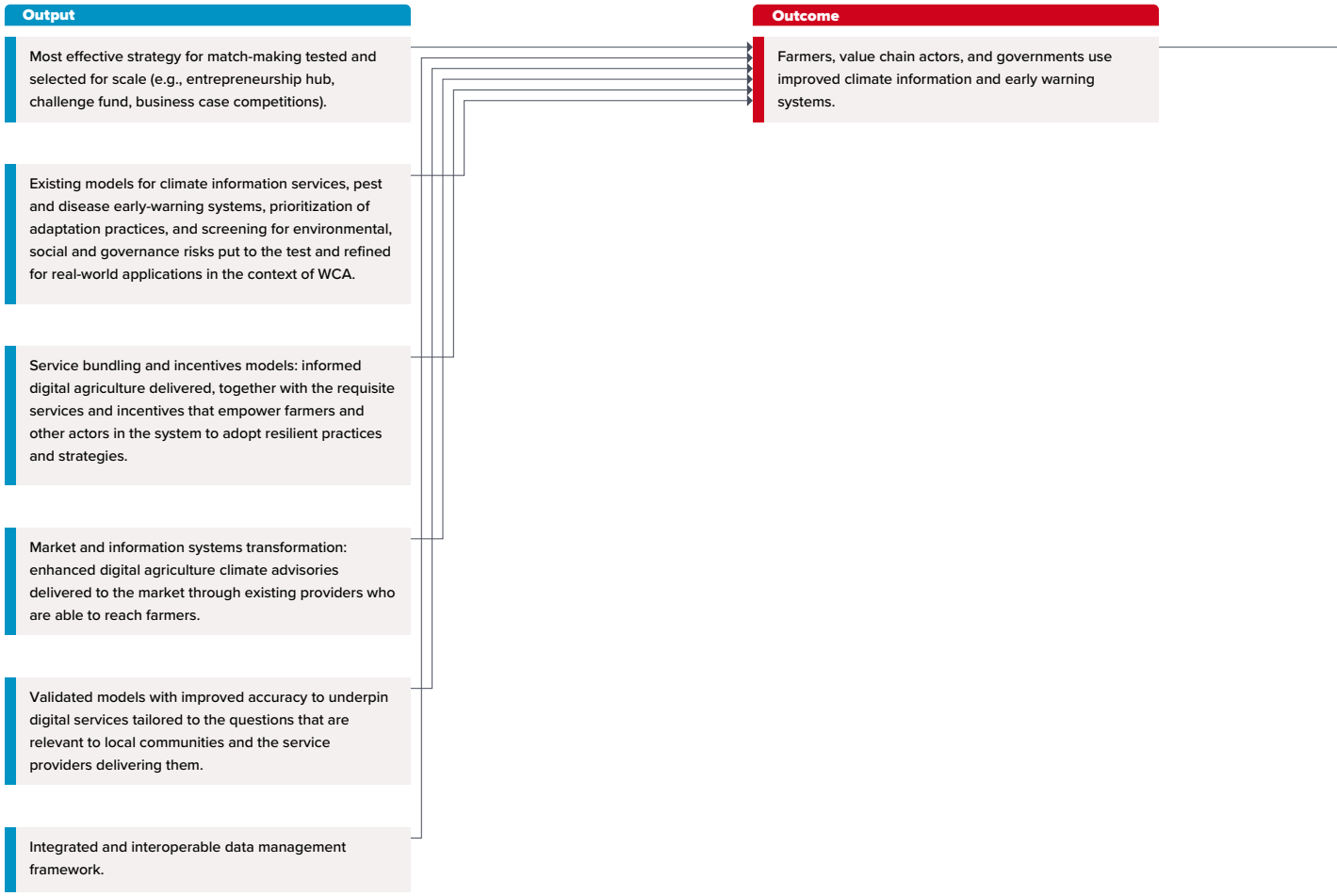
At least 80,000 smallholder households (HH) will have access to climate resilient nutrient-dense crop varieties, with at least 16,000 of them using five climate resilient, nutrient-dense crop varieties and six good agricultural practices.

An increase of at least 30% in household dietary diversity scores will be attained.

Work Package 1 progress against the theory of change

Work Package 1 aims to: use demand creation to promote nutritious foods; co-design diverse and sustainable food production systems; and promote good agricultural practices to address climate change and eroding soil fertility and improve seed systems. Good progress has been made in addressing the key research questions: which factors will spur consumer demand for nutritious foods; how smallholder farming systems can be made more productive and adaptive to climate change; and which institutional and capacity-support mechanisms will enhance smallholder farmers' access to markets. Innovations that were tested or validated toward achievement of the EOI outcomes included: biopesticides against vegetable pests; decision-support tools for site-specific fertilizer recommendations in Burundi; new biofortified cassava varieties in Ghana; Mucuna pruriens as a cover crop in banana and coffee systems in DRC; and options for diversification in rice-based production systems in Cote d'Ivoire, Ghana, and Nigeria. Capacity sharing with stakeholders included training in good production practices, container/sack gardening, and seed production of vegetables; producing early generation seed of orange-fleshed sweet potato; participatory evaluation and selection of new rice varieties; and banana macro-propagation. Overall, 32% of the 536 participants in capacity-sharing activities were female. Women and youth farmer groups in Ghana were specifically targeted in some of the training events. This capacity sharing with stakeholders and their involvement in the testing and validation of innovations will enhance the potential for their adoption of improved climate-resilient nutrient-dense varieties and good agricultural practices. The diagnostic study in Burundi provided evidence of the adoption of Vitamin A-rich banana.

Work Package 2:
Informed digital agriculture for climate resilience: Managing climate risks and accessing services



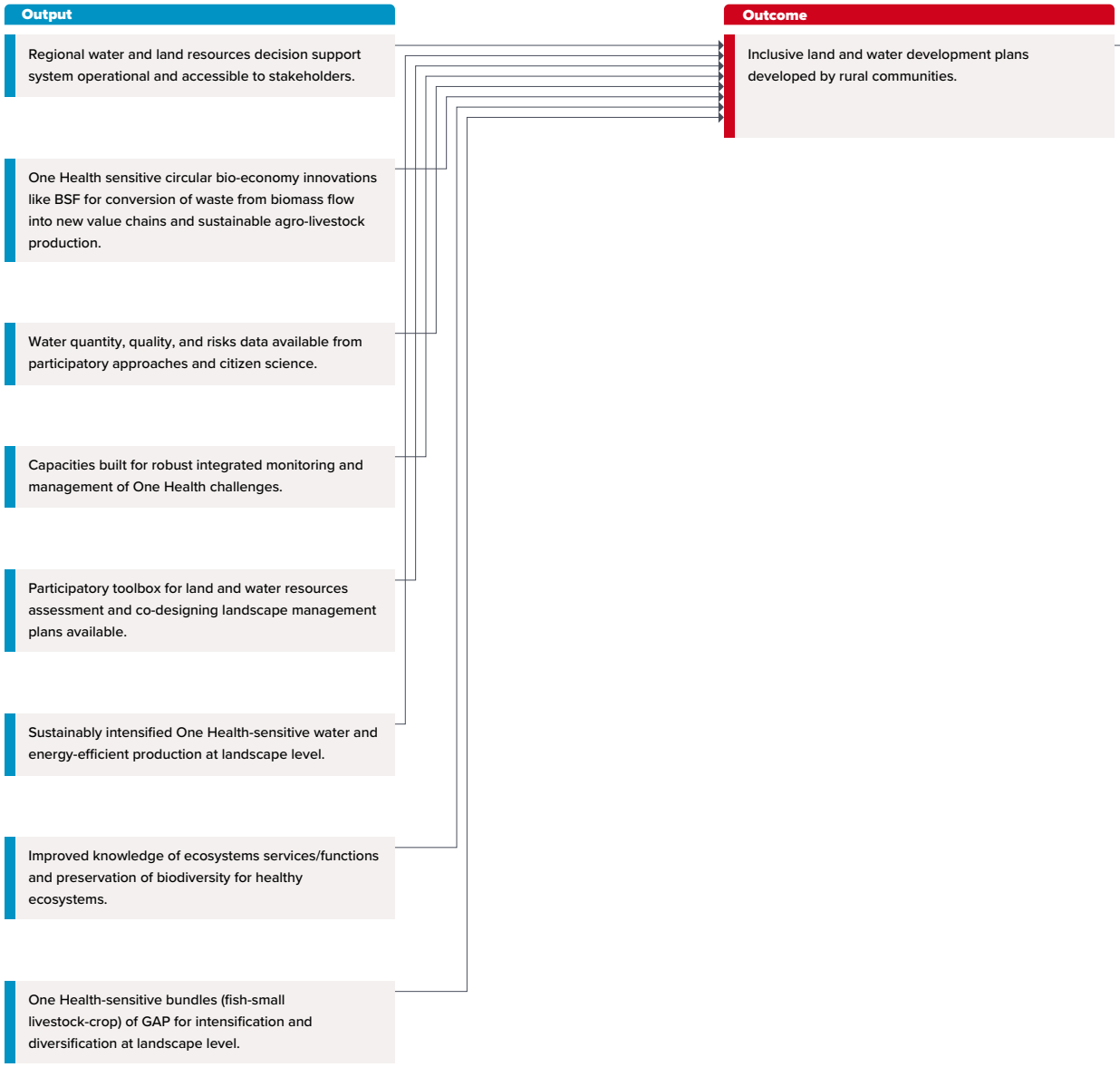
EOI

Three million farmers, 30 value chain actors, and three governments will be using timely climate information and early warning systems for improved decision-making.

Work Package 2 progress against the theory of change

A systematic review was conducted to assess farmers' needs for CIS, the key characteristics of the demanded CIS, and the key drivers of the demand for CIS in Economic Community of West African States (ECOWAS) member states. The results show that 68% of the farmers in ECOWAS demand CIS. The average willingness to pay for CIS is estimated to be US$2.01 for daily forecasts. The main drivers of CIS demand are price, income, vulnerability to climate variability, beliefs and religion, complementary services, gender, type of crops, and farm size. A mapping of climate and agronomic digital advisory services landscape was also conducted in Burundi, Cote d'Ivoire, Rwanda, Nigeria, Ghana, and DRC. Rwanda and Ghana are advanced in digital agriculture solutions, while DRC and Burundi are lagging. Stakeholders' consultation meetings were conducted to understand their needs for digital solutions in Ghana and Rwanda. A new digital advisory tool (an online and SMS service system) was developed that effectively delivers early warning and real-time information on production stressors (including precipitation, fall armyworm and striga infestations) and advises small-scale farmers accordingly in Rwanda. A DACA platform was contextualized for Ghana, and 20 experts and 106 master trainers (29% of them being women and 36% over 35 years old) were trained on its use in Ghana. We have also validated an isotope technique for selecting climate-resilient varieties of cassava and banana in Rwanda, Burundi, and DRC.

Work Package 3:
Inclusive landscape management: Pathways for scaling land and water innovations for resilient agrifood systems



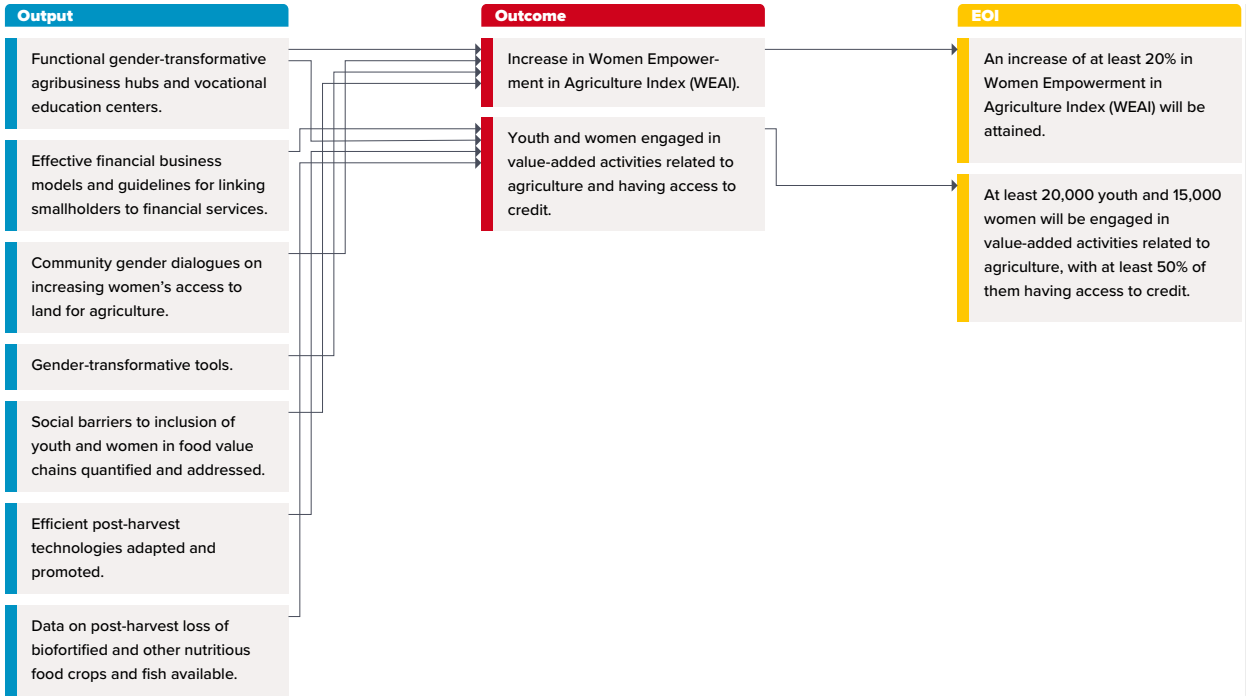
EOI

At least four governments will use inclusive approaches towards landscape management, and informed and inclusive land and water management plans will have been developed by 100 rural communities that will diversify income from agriculture and increase production to create jobs and stability.

Work Package 3 progress against the theory of change

Work Package 3 addresses three research questions: How can participatory water and land management support systems strengthen landscape resilience planning for enhanced production of nutrient-rich crops and fish? How can innovations be One Health-sensitive and scaled to contribute to a productive environment for livelihood improvement? How can ecosystem services and biodiversity be sustained, management of water, soil, and biomass flow improved, and resilient agrifood systems supported, to improve communities' livelihoods? Work Package 3 country teams identified priority landscapes within the Initiative's targeted agroecological zones in the six countries (Ghana, Nigeria, Rwanda, DRC, Cote d'Ivoire, and Burundi). In collaboration with government departments and the research and extension agencies, several activities were implemented. These include: stakeholder engagements and SEL situational analysis in Ghana; development of geospatial methodology for assessing groundwater potential for climate-smart cocoa production in Ghana; the assessment of the sustainability of financing ecosystem for cocoa irrigation in Ghana; assessment of the priorities, barriers, and incentive mechanisms for scaling bundled nature-positive and One Health-sensitive technologies in Cote d'Ivoire; and the piloting of BSF technology in a target landscape in Ghana. There were other sessions of multi-stakeholder engagements (with government agencies and departments, community representatives, and relevant research and extension agencies), which elicited participants' future visions on and pathways for sustainable landscape management for agrifood system resilience in the target countries. These pre-intervention assessments resulted in over 10 knowledge products, some of which are on CGSpace, with others submitted to reputable journals for publication. These pre-intervention engagements and analysis are deemed critical for contextualization and effective execution of the Initiative, since co-development and implementation of informed and inclusive landscape plans and bundled innovations is core to Work Package 3. Per the pre-assessments, the assumption underlying the TOC still holds relevant to the success of the Initiative under Work Package 3. The next step is to co-design, with the government agencies and communities, the landscape management plans and decision-support system which will be integrated in their existing plans for implementation.

Work Package 4:
Youth and women entrepreneurship models in food value chains

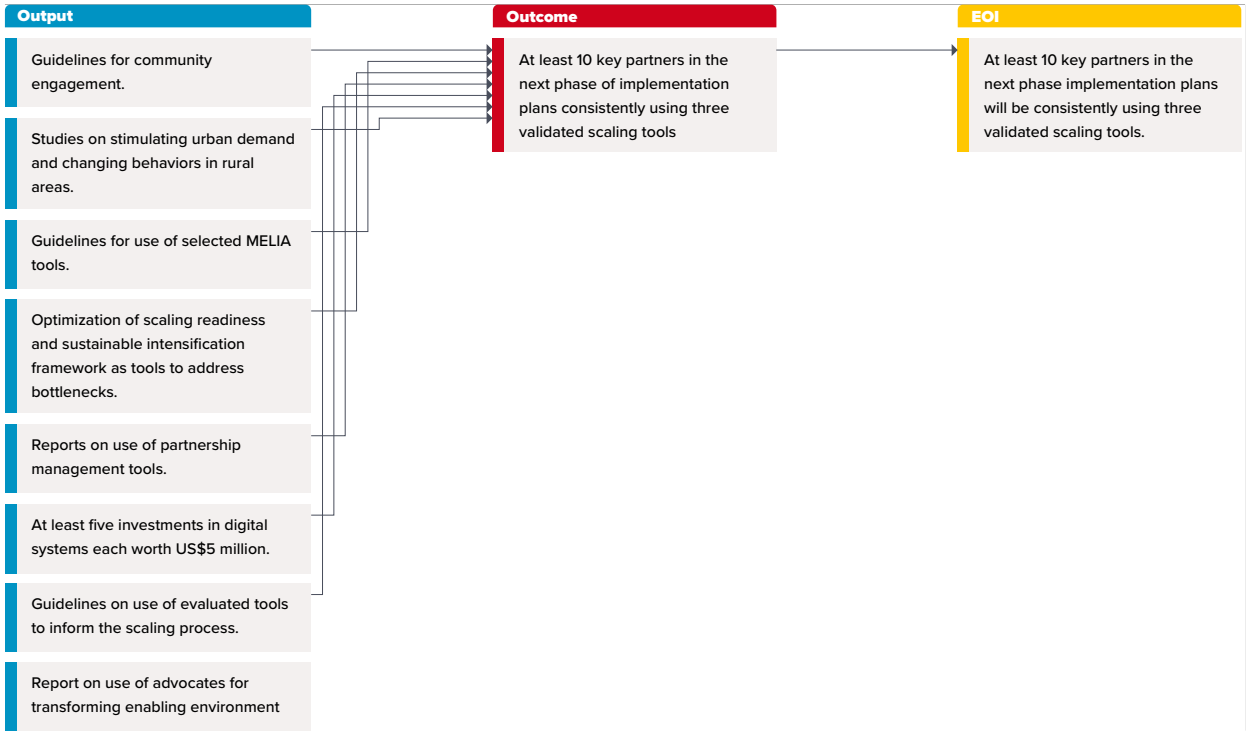


Work Package 4 progress against the theory of change

Work Package 4 aims at promoting and preparing youth and women for agribusiness while addressing social barriers. The research questions relate to mechanisms and policy advocacy tools for access to finance and market linkages; social constraints to gender and generational equality in agribusiness; technologies and digital tools to enhance sustainability of agribusiness hubs; and technologies to reduce post-harvest losses.

Data was collected from value chain actors on social constraints to gender and generational equality in agribusiness, and awareness and adoption of digital tools by youth and women. E-registration of actors was conducted to set up agribusiness hubs in the target countries. Service-based business models for youth were tested for transfer and sustainable scaling of new technologies (RiceAdvice application and a rice threshing machine) to increase household resilience. A higher profitability was observed when both technologies were combined in one business model. To increase the adoption of business models in-country, a training-of-trainer workshop was organized on business model design for youth and women: e.g., an awareness-creation workshop on Youth and Women Entrepreneurship Models in Food Value Chains organized in Nigeria. A training manual was developed as a new tool to support women entrepreneurship in the agrifood sector. To reduce post-harvest losses, technologies (including DryCard, Aflasafe, and PICS bags) and good post-harvest management practices were introduced in the value chains for pro-Vitamin A Maize and pro-Vitamin A Cassava through physical training of 960 value chain actors by extension agents. NARS partners were also trained on post-harvest loss reduction and mycotoxin control in cereals.

Work Package 5:
Technology, innovation, communication, knowledge and stakeholder management (TICKS) for accelerating impact investments and catalyzing impact at scale



Work Package 5 progress against the theory of change

Given that scaling requires resources, Work Package 5, in consultation with other Work Packages, focused on identifying the innovations to be considered ripe for attracting investment for scaling in two countries (Nigeria and Rwanda). The overall objective is to use multiple state-of-the-art, evidence-based management solutions to articulate the demand for research and innovations in West and Central Africa (WCA) and increase impact investments in the Initiative's research and innovation portfolios, integrating them into a coherent and integrated TICKS management process. Underlying this approach is the Scaling Readiness Approach, which is complemented by other tools and methods for assessing and managing progress. Key members of three high-readiness innovation teams (scientists, private sector, and users) were invited to each workshop, and the focus was on imparting skills in how to communicate about the innovation ("the pitch"), manage the stakeholder community, and identify potential investors. In both countries, there was a team emphasizing use of early generation seed technologies for roots and tubers. In Nigeria, the other teams focused on genetically improved farm tilapia and climate-resilient nutritious crop varieties. In Rwanda, the other teams focused on digital climate advisory services and value chains for processed sweet potato. The use of the TICKS tools by the teams to advance their efforts will be examined in 2023. Work Package 5 initiated other studies in partnership management and a consumer assessment of existing sweet potato processed products that were not finalized in 2022.

Work Package progress rating

WORK PACKAGE	TRAFFIC LIGHT / RATIONALE	
1		Progress was made toward achievement of most of the outputs in the Plan of Results within the final approved Budget and in line with the TOC. Good progress was made in testing and validation of 10 incremental innovations (one proven, six under uncontrolled testing, one prototype under testing, and two under semi-controlled testing). Eight short-term capacity-sharing activities were conducted in person, which involved 536 participants (175 female and 361 male). Three knowledge products (a book chapter, a journal article, and a report) were delivered.
2		The activities conducted in 2022 led to the development of two digital solutions for climate and environmental risk management in two countries (Ghana and Rwanda), with a high probability that these tools will be adopted by both governments. We are on a good track toward the outcome of at least three governments using improved timely climate information and early warning systems for improved decision-making.
3		Considering that core to Work Package 3 is the co-development and implementation of informed and inclusive landscape plans and bundled innovations, the pre-intervention engagements and analysis in 2022 are in line with the Plan of Results and the TOC of Work Package 3. Site selection, partner identification, diverse stakeholder consultations, and field assessments have been conducted in the six target countries to address the research questions.
4		Following the TOC, the activities conducted have led to the expected outputs toward achievement of the EOI outcomes. Results in 2022 are related to five outputs (OP4.1.1., OP4.1.2., OP4.2.1., OP4.3.1., and OP4.4.2).
5		Funds for the Initiative were delayed in arriving, as were critical staff hires to support Work Package 5 activities. Greater integration between Work Package 5, the MELIA group, and the globally supported Scaling Readiness team would be useful.

KEY		
On track		• Annual 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 jeopardise success of Work Package
Delayed		• Annual progress slightly falls behind Plan of Results and Budget and Work Package theory of change in key areas • Deviations/issues/delays/risks could jeopardise success of Work Package if not managed appropriately
Off track		• Annual progress clearly falls behind Plan of Results and Budget and Work Package theory of change in most/all areas • Deviations/issues/delays/risks do jeopardise success of Work Package

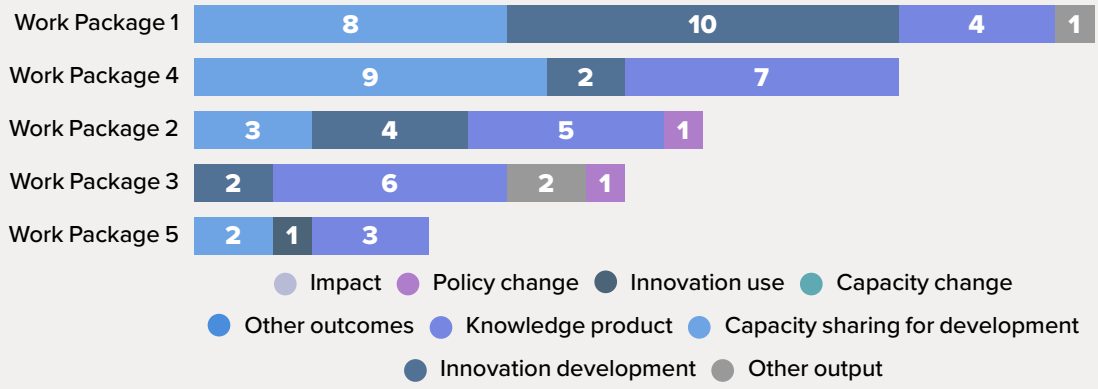
Section 4 Initiative key results

This section provides an overview of 2022 results reported by West and Central African Food Systems Transformation. These results align with the CGIAR Results Framework and West and Central African Food Systems Transformation's theory of change. Further information on these results is available through the CGIAR Results Dashboard.

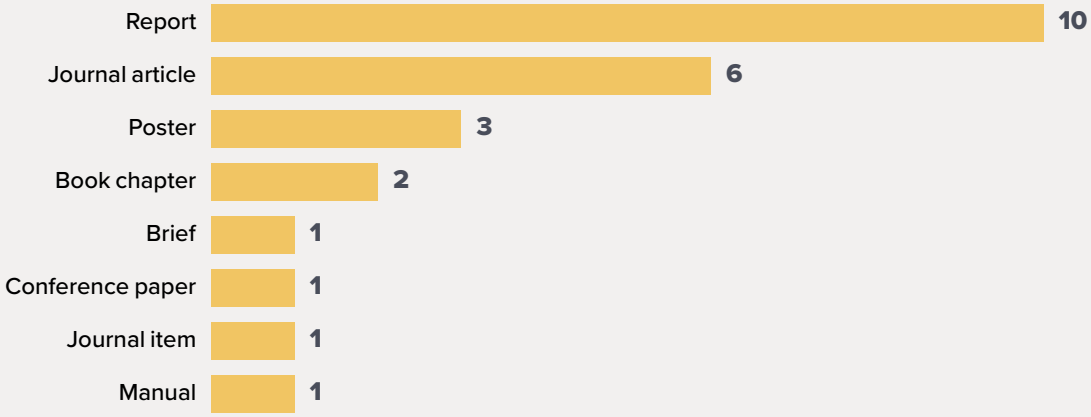
The Initiative contributed to 81 results, of which 64 were directly reported by the Initiative. Due to low capacity of demand, innovation, and scaling partners, capacity-building activities were dominant. In total, 22 capacity-sharing events were organized, which benefited 1,365 actors including 490 women (36%) and were related to input supply, good agricultural practices, post-harvest technologies, and value chain improvement. Key training events included: container/sack gardening for vegetable production for youth and women; sweet potato processing for companies in the private sector; RiceAdvice business model design for youth entrepreneurship; post-harvest loss reduction and mycotoxin reduction in cereals for NARS partners; DACA for private sector companies; seed processing and propagation, simple macro-propagation techniques for banana seed multiplication; and high-quality early generation seed of orange-fleshed sweet potato for farmers. To improve innovators' readiness, two workshops were organized for scaling partners (private sector) in Nigeria and Rwanda on TICKS. The Initiative has also reported 18 innovations. As the Initiative is focusing more on scaling readiness of innovations, most of the innovations reported are at least at level 6 out of 9 in the innovation readiness scales (see diagram below). Nine innovations were under uncontrolled testing and proven, and they can go to scale from 2023/2024. The Initiative contributed to 25 knowledge products, including six journal articles. In terms of outcomes, the Initiative contributed to three policy changes and one innovation in use. These show how the Initiative is working toward contributing to the EOI outcomes and the Impact Areas of CGIAR. The results of the Initiative are targeting both gender and climate change. Climate change and gender are significant in 27 and 25 results, respectively, while they are principal in five and two results, respectively.

Overview

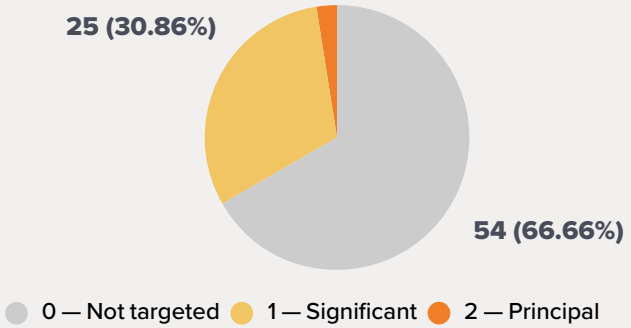
Results by Work Package



Knowledge products by category



Results by gender tag

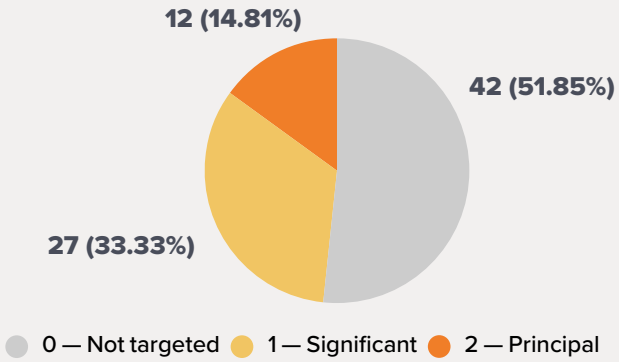


0 = **Not targeted:** The activity/result does not target gender equality.

1 = **Significant:** The activity/result contributes in significant ways to gender equality, even though it is not the principal focus of the activity.

2 = **Principal:** Gender equality is the main objective of the activity/result and is fundamental in its design and expected results.

Results by climate change tag



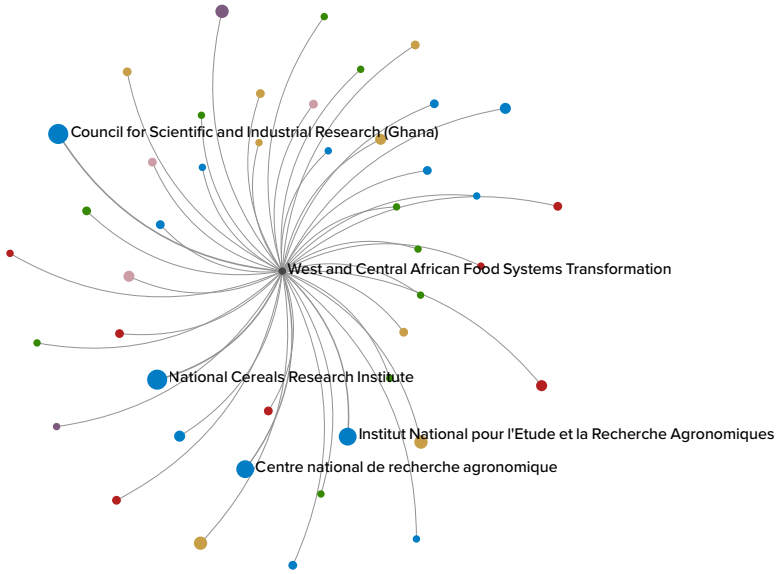
0 = **Not targeted:** The activity does not target climate mitigation, adaptation, and climate policy goals of the CGIAR as put forward in its strategy.

1 = **Significant:** The activity contributes in significant ways to either one 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.

2 = **Principal:** The activity is principally about meeting either one of the three CGIAR climate-related strategy objectives — namely, climate mitigation, climate adaptation, and climate policy, and would not have been undertaken without these objectives.

Innovations by readiness level

Section 5 Impact pathway integration – External partners



Top five institution types

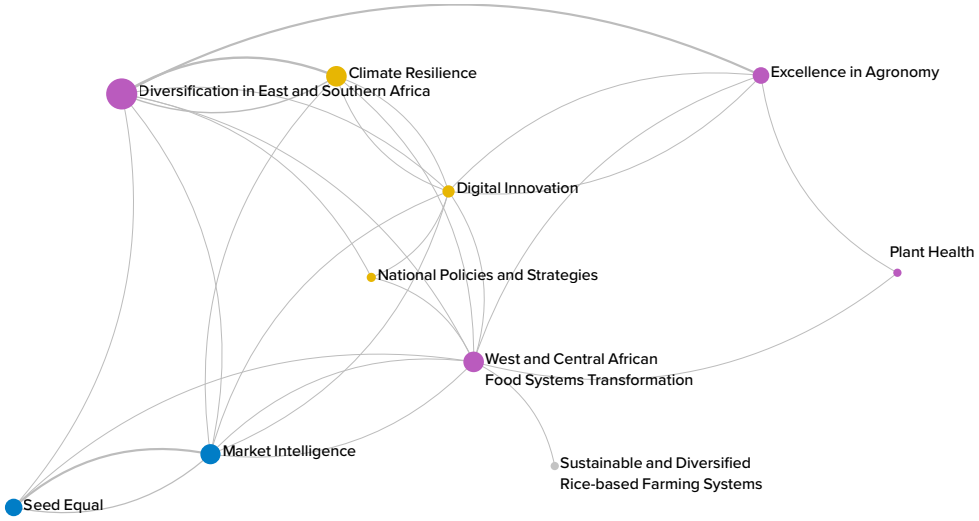
All other categories · Government (National) · Not applicable · Private company (other than financial) · Research organizations and universities (International) (General) · Research O&U (NARS) · Research O&U (National)

Note: CGIAR Centres are excluded from the analysis. Partners and edges are sized by the number of results. Labels are shown for the partners involved in the most results.

Partnerships and West and Central African Food Systems Transformation's impact pathways

Partnerships were key to the progress made during the year 2022, building on the traditional relations of the CGIAR members and creating new ones. In 2022, the Initiative started its launch workshops with stakeholders (in Rwanda for Central Africa and Cote d'Ivoire for West Africa) Followed by site selection with partners and diverse stakeholder consultations in the six target countries. Of the 44 partners with whom there were significant engagements, 14 were national government agencies, 7 were national universities, and 3 were private companies. Consultations with demand partners helped to shape or refine the identification of challenges, opportunities, and objectives and set the stage for the co-creation of solutions with innovation partners. The national research institutes (NARIs), universities, government agencies, and private companies were active in the development, testing, and validation of innovations. Engagements with the key NARIs in Ghana (Council for Scientific and Industrial Research), Cote d'Ivoire (Centre National de Recherche Agronomique de Côte d'Ivoire), Nigeria (National Cereals Research Institute), and DRC (L'Institut Nationale pour l'Etude et la Recherche Agronomiques) and selected universities were particularly strong, e.g., working with Katholieke Universiteit Leuven (Belgium) and NARIs on validating isotope techniques in screening cassava varieties for drought tolerance. They also contributed to capacity-sharing events and to delivering outputs to next users with government extension agencies. To coordinate and develop tools and methods to strengthen the partnerships, a collaboration was initiated with CORAF as a regional organization. Partnerships with non-CGIAR international institutions included: improving vegetable production with the World Vegetable Center; developing decision-support tools for fertilizer recommendations in Burundi with the International Fertilizer Development Center; and developing an early warning system for fall armyworm and striga management in Rwanda with icipe. Engagements with scaling partners via innovators' workshops were useful in terms of assessments of readiness and pathways for scaling innovations.

Section 6 Impact pathway integration – CGIAR portfolio linkages



Note: Initiatives, non-pooled projects, and the connections are sized by the number of results. The table includes the given Initiative's top connections and is sorted by Total Results. The network and summary table include all connections for the given Initiative, as well as the connections between the given Initiative's connections (i.e. the ego network)

Portfolio linkages and West and Central African Food Systems Transformation's impact pathways

In 2022, some results of this Initiative were jointly produced by other CGIAR Initiatives. This Initiative has collaborated with the three Action Areas (AAs) of CGIAR. In the Systems Transformation AA, this Initiative has collaborated with Digital Innovation and Climate Resilience to work on digital tools to deliver climate information to increase the resilience of smallholder farmers to climate change. The collaboration with Resilient Agrifood Systems AA was done mainly with the Excellency in Agronomy, Plant Health, and Diversification in East and Southern Africa Initiatives to test agronomic practices. In the Genetic Innovation AA, the collaboration was with Seed Equal and Market Intelligence to test early seed generation and assess farmers' demand for seed of improved varieties, respectively.

Section 7 Adaptive management

RECOMMENDATION	SUPPORTING RATIONALE
Expand Initiative activities to countries in the Sahel region subject to success in resource mobilization from bilateral and multi-lateral sources.	As the Initiative is concerned with WCA, the focus is currently on the humid and coastal regions. The aim is to expand the Initiative to the Sahel region to contribute to the urgent need to address the major challenges and crises in this region by tapping into and leveraging ongoing and potential investments by multi-lateral and bilateral organizations. The Initiative has started, in collaboration with Wageningen University and Research, to develop a position paper through bilateral funding.
Reduce the number of EOI outcomes.	Currently, the Initiative has seven EOI outcomes. It was suggested to reduce the number of EOI outcomes to four or five. This is in line with budget reductions and to facilitate monitoring and evaluation. We suggest combining EOI outcome 1, "Climate information and early warning systems," and EOI outcome 4, "Nutrient-dense crop varieties." Similarly, EOI outcome 3, "Landscape management," and EOI outcome 5, "Scaling tools," will also be combined.
Consider reducing the EOI outcome targets, especially the proposed increase of the WEAI by 20%.	Considering the significant reduction in the Initiative's Budget for years one and two, the targets of the EOI outcomes need to be revised. For instance, one EOI outcome is to significantly increase female empowerment in the region. However, considering the significant reduction in the Budget of the Initiative for years one and two and the resources needed to improve the WEAI, the Initiative is considering reducing the target of 20%. Indeed, an increase of 5% will be reasonable and significant, considering the limitations in resources. Based on objective analysis, suggestions of an achievable target will be made.
Involve each participating CGIAR Center in more than one Work Package.	The idea of One CGIAR is collaboration and joint work between centers. In the Initiative, there are five Work Packages, but some centers are exclusively involved in only one Work Package. CIAT is involved only in Work Package 2 and IWMI is only in Work Package 3. This was pointed out during the review of the proposal of the Initiative. Centers that are involved in only one Work Package are requested to allocate funding to at least one cross-cutting Work Package, such as Work Package 4 on youth and women entrepreneurship or Work Package 5 on scaling.
Strengthen results-based management of the Initiative to increase the potential of achieving its objectives.	Following the reporting system of the Initiatives, the budgeting of the Initiative needs to be more closely linked to expected outputs/outcomes and not activities. Each dollar in the Initiative needs to contribute to specific target outputs/outcomes. The Initiative needs to plan on the number and types of expected outputs/outcomes.

Section 8 Key result story

These photos are taken by Sanni Lateef (IITA) in 2022 during the workshop in Abuja (Nigeria)

Post-harvest loss reduction technologies (DryCard, Aflasafe, PICS bags) introduced across Vitamin A Cassava and Vitamin A Maize value chains in Nigeria.

There was increased adoption of post-harvest loss reduction practices across the Vitamin A Cassava (VAC) and Vitamin A Maize (VAM) value chains; an increase in the private sector-led aflatoxin-safe foods in markets; healthier foods; improved food safety and livelihoods; less food loss/waste; and enhanced exportable foods. Knowledge and practice of strategies for reducing losses in post-harvest quality and quantity increased in Nigeria, with more gender inclusion resulting in better health, income generation, and stronger multi-stakeholder collaboration.

Food losses do not merely reduce the food available for human consumption but also increase the costs of waste management, greenhouse gas production, and wastage of scarce resources used in agricultural production. The overall objective of the project was to improve the adoption of post-harvest loss reduction practices across the VAC and VAM value chains in Nigeria, with further emphasis on aflatoxin awareness and control strategies for VAM, among key value chain actors (i.e., farmers, input dealers, aggregators, transporters, and food processors) in eight Nigerian states (Anambra, Cross-River, Imo, Kaduna, Kano, Niger, Oyo, and Osun). Sensitization campaigns were conducted on aflatoxin, targeting maize value chain actors across the supply chain. The key outcomes are:

(i) the adoption of aflatoxin control practices and the use of Aflasafe among VAM value chain actors (i.e., input dealers, farmers, aggregators, transporters, and food processors); and (ii) the use of DryCard, Aflasafe, and PICS bags as innovations for good post-harvest management practices with mostly youth and women.

Nigeria's health and trade has been affected by food quality and quantity losses. Aflasafe was promoted as a bioprotectant that reduces quality losses from aflatoxin contamination which commences pre-harvest with elevated concentrations resulting in multiple export rejects and an increased disease burden. PICS bags were promoted as hermetic storage bags that reduce insect populations during storage and resultant bulk and quality losses, including mycotoxins. Furthermore, by reducing the misuse of pesticides in insect management, PICS bags reduce risk of human exposure to pesticide residues. An export ban of Nigerian produce due to high levels of pesticide residues has occurred. The adoption of PICS bags in storage has minimized improper use of pesticides and reduced insect damage. The DryCard technology was promoted as a reusable, low-cost technology that enables moisture to be monitored, especially during storage. High moisture during storage encourages insect infestation, mold damage, and mycotoxin contamination.

A total of 176 extension agents were trained on good pre-harvest and post-harvest strategies

for aflatoxin management, and they conducted stepped-down training for 960 value chain actors. Actors were linked with Harvestfield Industries Limited and Lela Agro Limited, the commercial manufacturers of Aflasafe and PICS bags in Nigeria, respectively. Deliberate efforts were made regarding gender inclusion, ensuring representation of 30% of women. This project also hosted a webinar that disseminated information for improving export potential by avoiding pitfalls in the export market and disseminated radio messages for sensitization to target audiences.

To promote the sustainability of aflatoxin management, the Food Convergence Innovation (FCI)- Nigeria convention on aflatoxin management was convened and attended by 55 participants from 22 organizations. An FCI-Nigeria advocacy platform was established, a multi-stakeholder memorandum of understanding was developed and a communique was disseminated. This platform is focused on converging capabilities among private, public, and development actors in aflatoxin management nationwide, thus contributing to improvements in food safety.

To increase capacity for testing, benefiting domestic consumers and exports, mycotoxin testing hubs were established in two locations for in situ rapid testing. Neogen rapid testing equipment for mycotoxins was purchased and handed over for in situ mycotoxin analysis to one private sector actor — Cooperation Forum for Aflatoxin-Reduced Agricultural Products comprising over 30 enterprises — and one public sector actor, the National Agency for Food and Drug Administration and Control, the national agency responsible for food regulation.

“Failure to take effective measures to limit the harmful effects of exposure to hazardous substances on human health and wellbeing represents a breach of State obligations to respect, protect, and fulfill all human rights.”

– United Nations Human Rights

References

1. https://aflasafe.com/wp-content/uploads/pdf/TrainingManual_WestAfrica.pdf
2. https://www.iita.org/news-item/reducing-postharvest-loss-project-donates-equipment-to-set-up-mycotoxin-testing-hubs-in-nigeria/
3. https://biblio.iita.org/documents/U22ArtChannaOvercomingInthomNodev.pdf-6a21b92d7fa867337f682deb8c919025.pdf
4. https://www.nannews.ng/2022/10/12/stakeholders-to-address-food-safety-aflatoxin-management-in-nigeria-iita/

COVER PHOTO: Women field day for appreciation of rice varieties. Photo credit: Ester, AfricaRice

We would like to thank all funders who supported this research through their contributions to the CGIAR Trust Fund.

LINKS TO IMPACT AREAS

Primary Impact Area: Nutrition, Health, and Food Security

Other relevant Impact Area(s): Poverty Reduction, Livelihoods, and Jobs

Which collective global targets for the relevant Impact Area(s) from the CGIAR 2030 Research and Innovation Strategy does the key result contribute to?

- End hunger for all and enable affordable healthy diets for the 3 billion people who do not currently have access to safe and nutritious food.
- Reduce cases of foodborne illnesses (600 million annually) by one third.

GEOGRAPHIC SCOPE

Region: West and Central Africa
Country: Nigeria

KEY CONTRIBUTORS

Contributing Initiative(s): TAFS-WCA, PHI
Contributing Center(s): IITA
Contributing external partner(s) (full names): Federal Ministry of Agriculture and Rural Development

LINK TO CGIAR RESEARCH PROGRAMS

CGIAR Research Program on Agriculture for Nutrition and Health and CGIAR Research Program on Maize Agri-Food Systems