CGIAR

INITIATIVE ON
One Health

CGIAR Initiative on One Health

ANNUAL TECHNICAL REPORT 2022

CGIAR Technical Reporting 2022

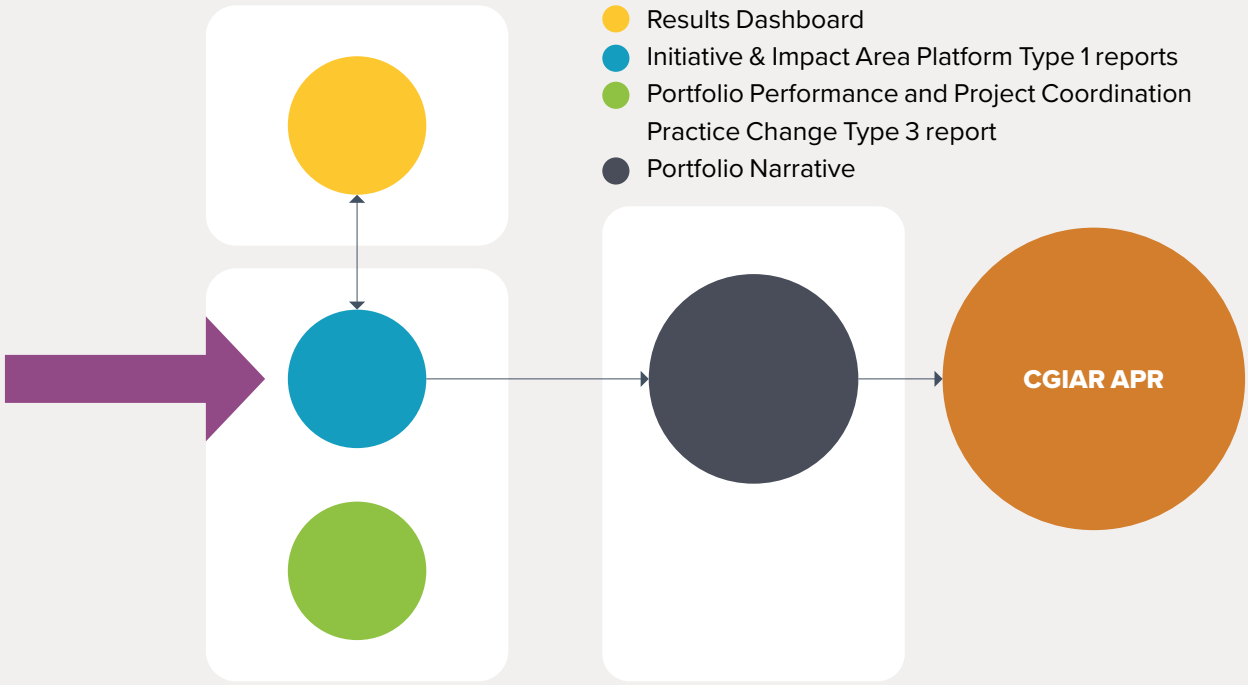
CGIAR Technical Reporting has been developed in alignment with the CGIAR Technical Reporting Arrangement.

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	$11,498,778	$11,742,566	$11,758,654
Approved 2022 Budget	$5,915,852		

2022 Disbursement Target based on Approved FinPlan

Section 1 Fact sheet

Initiative name	Protecting Human Health Through a One Health Approach
Initiative short name	One Health
Action Area	Resilient Agrifood Systems
Geographic scope	**Regions targeted in the proposal:** East and Southern Africa; South Asia; Southeast Asia and the Pacific; West and Central Africa **Countries targeted in the proposal:** Bangladesh; Côte d'Ivoire; Ethiopia; India; Kenya; The Socialist Republic of Viet Nam; Uganda
Start date	Jan. 1, 2022
End date	Dec. 31, 2024
Initiative Lead	Hung Nguyen-Viet – h.nguyen@cgiar.org
Initiative Deputy	Vivian Hoffmann – v.hoffmann@cgiar.org
Measurable three-year End of Initiative outcomes (EOI-Os)	**EOI-O 1:** Policymakers at the national level allocate more resources (finances, personnel, facilities, etc.) for zoonoses sensitization, surveillance, and response.
	EOI-O 2: Government and private sector partners support the integration of an ECM approach for informal food business operators into the regulatory system.
	EOI-O 3: Stakeholders and policymakers are informed of CGIAR evidence on the extent of AMU, and the economic and production impacts of lower and better targeted AMU in key production systems (poultry and aquaculture).
	EOI-O 4: Role of water in the transmission of pathogens and AMR, and proposed solutions for waste and water management, are recognized in national One Health planning processes of at least two out of seven project countries (e.g., Ethiopia, India).
	EOI-O 5: One Health policy planning processes in at least three out of seven project countries (e.g., Bangladesh, India, Viet Nam) take into account CGIAR evidence on gendered constraints and incentives of small- and medium-scale food system actors, tradeoffs across policy goals, and the magnitude and distribution of impacts.

OECD DAC Climate marker adaptation score*	**Score 0: Not targeted:** The activity does not target the climate mitigation, climate adaptation, and climate policy objectives of CGIAR, as put forward in its strategy.
OECD DAC Climate marker mitigation score*	**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*	**Score 1B: Gender-responsive:** On the top of the minimum requirements for 1A, the Initiative/project includes at least one explicit gender equality outcome, and the Initiative/project team has resident gender expertise or capacity. The Initiative/project includes gender equality indicators and monitors the participation of and differential benefits for diverse men and women.
Website link	https://www.cgiar.org/initiative/07-protecting-human-health-through-a-one-health-approach/

*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.

Fruit and vegetables on sale alongside other food items in a local market in Addis Ababa, Ethiopia.
Photo credit: Geraldine Klarenberg/ILRI

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

A Maasai pastoralist taking livestock to drink from the Olkitikiti dam in Olkitikiti village, Kiteto, Tanzania
Photo credit: ILRI/Fiona Flintan

Overall summary of progress against the theory of change

During the first year of the CGIAR Research Initiative on One Health, we conducted research to validate assumptions underlying our theory of change and laid the groundwork for several large-scale studies that will begin in 2023:

- We established a strong working relationship with government authorities in a semi-pastoral region in Kajiado, Kenya, who have officially committed funding from government budgets for personnel to work with us on a mosquito vector surveillance program (a sign of strong support).
- A census of rural slaughter facilities in six Kenyan counties was conducted, which will serve as the sampling frame for a randomized controlled trial (RCT) testing the impact of providing training, water infrastructure, and incentives on meat handlers' hygiene behavior.
- Protocols for RCTs testing the impact of food safety training and grading systems on business outcomes and food safety among small-scale meat vendors in Viet Nam and Ethiopia were designed, and piloted in Viet Nam.
- Results of a study testing the impact of food safety information on product choice validated the assumption underlying the food safety grading approach that informed consumers will demand safer food.
- Observational studies on the use of antimicrobials in poultry (Kenya) and fish (Bangladesh) production were conducted to inform strategies to tackle antimicrobial resistance (AMR); farm-level use was catalogued and quantified, and farmer practices and perceptions were documented.
- Watersheds in Ethiopia and India were selected for the characterization and modeling of zoonotic pathogens, and pollution monitoring plans for these were developed. Stakeholder analyses were conducted to inform our strategy for the uptake of evidence on the role of water in the transmission of pathogens and AMR and associated solutions.

A woman with fish caught using gill net in Bangladesh.
Photo credit: Md. Masudur Rahaman/WorldFish

- Through a global survey, we collected 70 examples of resource, recovery, and reuse (RRR) of livestock waste to inform the development of business models to be tested in India and Ethiopia.

All of the above activities were based on continuous engagement with national and subnational partners. Several more formal consultations were conducted, including:

- A workshop with public health and veterinary officials in five Kenyan counties, to understand constraints to hygienic practices in slaughterhouses, and the feasibility of engaging meat inspection officers in disease surveillance.
- A stakeholder meeting with Viet Nam government officials in animal health and forestry management, and local and international researchers to identify wildlife meat value chains for zoonoses risk assessments.
- Capacity development of water authority staff in water quality monitoring in Ethopia

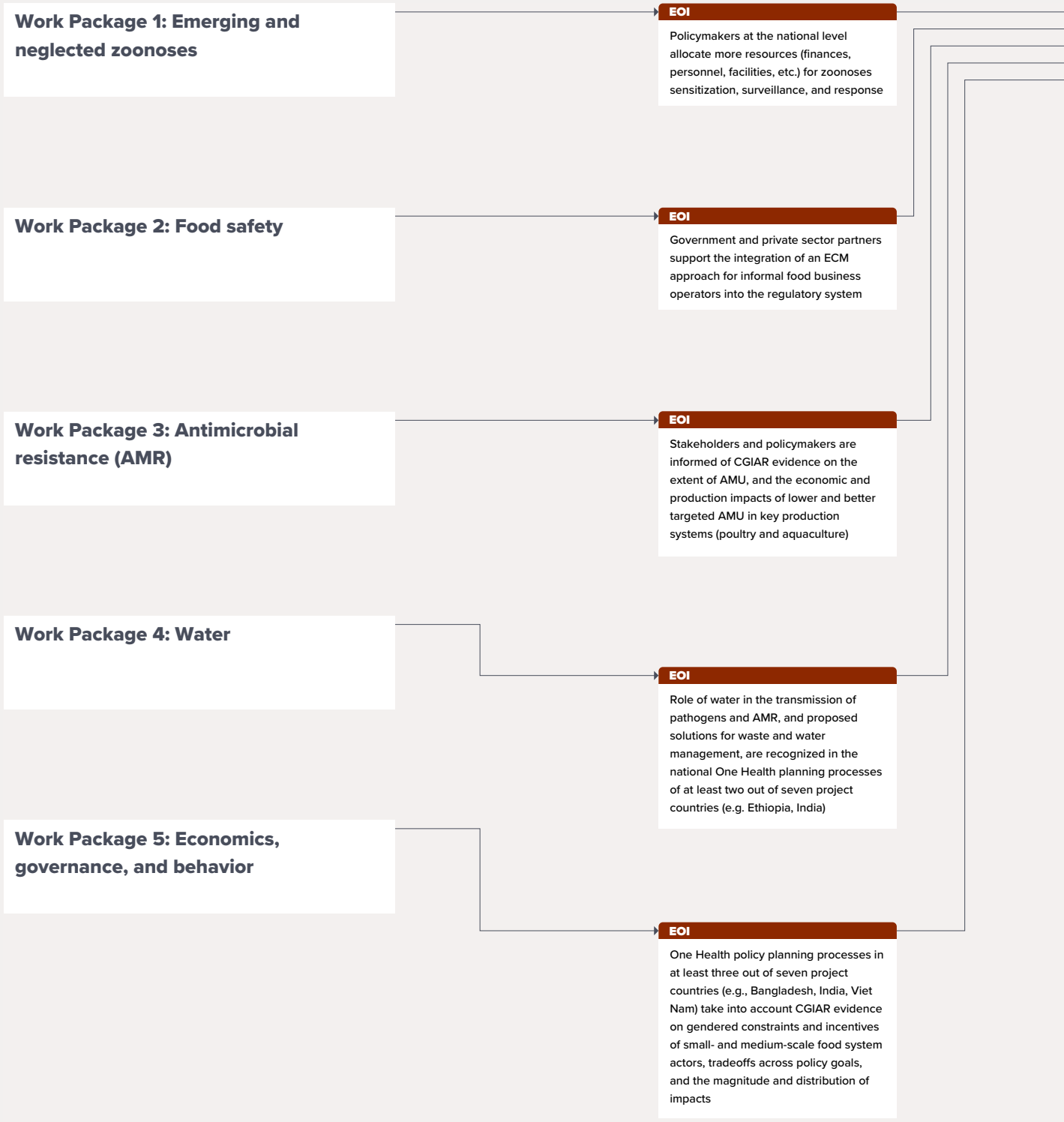
In addition, we built the capacity of partners through training and curriculum development:

- Veterinary officers from Rwanda and Burundi were trained on serologic and molecular screening procedures for Rift Valley fever virus to strengthen laboratory screening of zoonoses.
- Curriculum benchmarks for a Bachelor of Science degree in food safety were jointly developed with the Inter-University Council of East Arica (IUCEA).

Building on work initiated under CCGIAR Research Program on Agriculture for Nutrition and Health (A4NH), 14 peer-reviewed articles were published through the One Health Initiative in 2022, for example on food safety knowledge of pork vendors in Viet Nam, urban wastewater pollution impacts in Ethiopia, AMR in food crops globally, strategies for the elimination of anthrax in Kenya based on hotspot mapping, and the motivators behind farmers' adoption of food safety technologies.

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

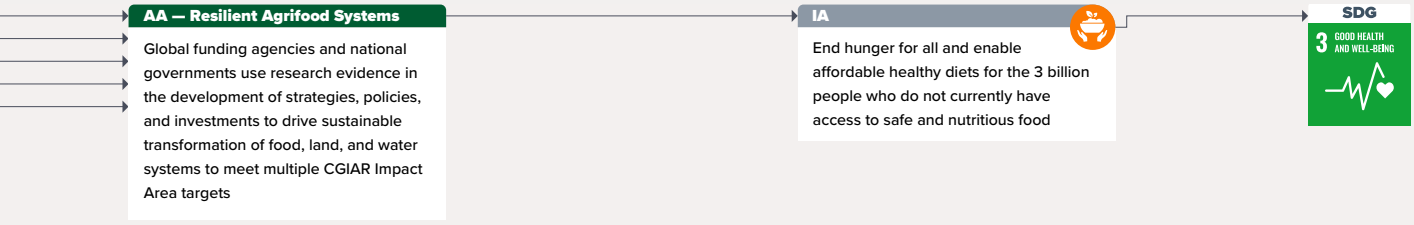
AA — Action Area

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.



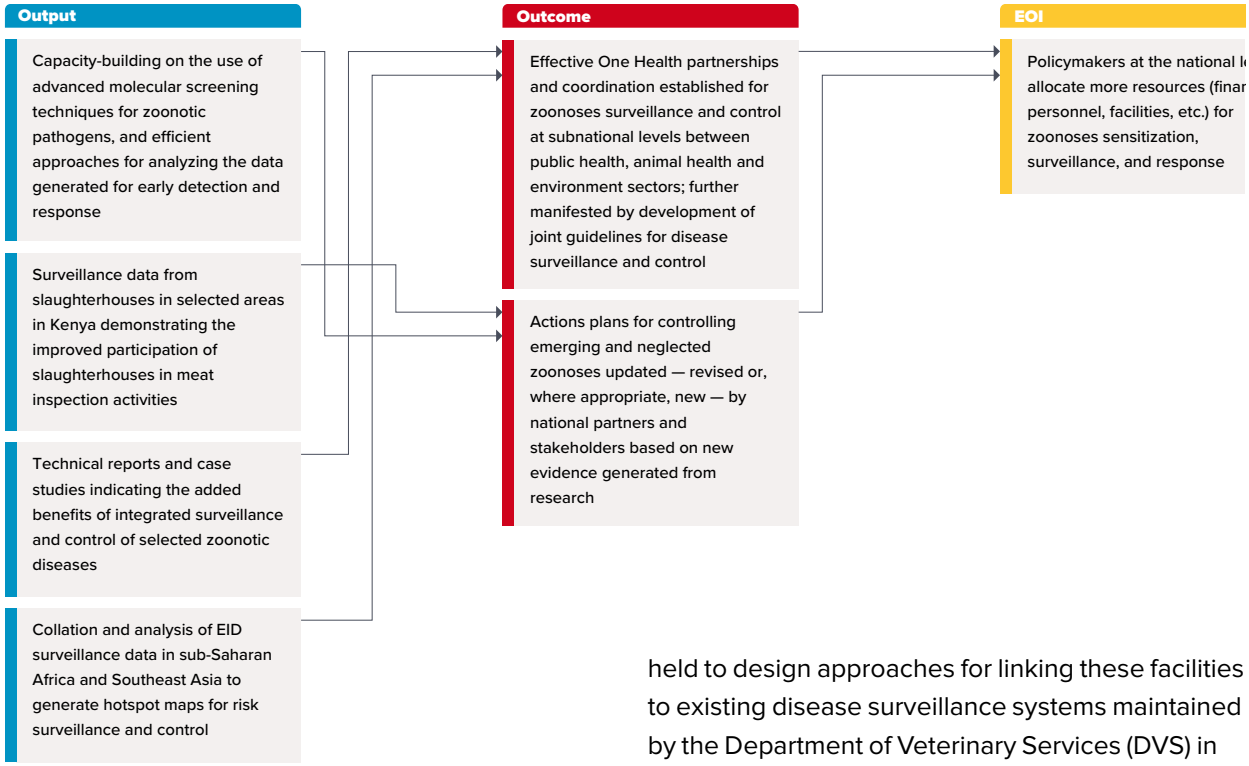
Progress by End of Initiative outcome

EOI-O 1: Policymakers at the national level allocate more resources (finances, personnel, facilities, etc.) for zoonoses sensitization, surveillance, and response.	By involving local government partners in the analysis of hotspot maps of zoonotic disease, we are building capacity among key partners for the effective targeting of resources. By training veterinary officers on advanced laboratory screening techniques, we are ensuring that the capacity to absorb additional resources will be present. Through stakeholder consultations on the national disease surveillance systems, we are co-developing a roadmap toward greater investment.
EOI-O 2: Government and private sector partners support the integration of an ECM approach for informal food business operators into the regulatory system.	The development of detailed protocols and submission of these for ethical and administrative approval sets the stage for two RCTs, which will provide rigorous evidence on the impact of providing training and access to a voluntary food safety rating program to meat vendors in traditional market settings. By piloting this approach in partnership with local government authorities in Viet Nam, we are building public sector support and capacity for scaling. Curriculum benchmarks adopted by the IUCEA will contribute to the quality of training received by the next generation of food safety scientists, technicians, and regulators in East Africa, and inculcate a risk-based orientation to food safety that supports the ECM approach to informal food business operators.
EOI-O 3: Stakeholders and policymakers are informed of CGIAR evidence on the extent of AMU, and the economic and production impacts of lower and better targeted AMU in key production systems (poultry and aquaculture).	Results from studies on the use of antimicrobials in poultry (Kenya) and fish (Bangladesh) production will be communicated to stakeholders (e.g., AMR scientific community, including donors and United Nations (UN) agencies with AMR agendas, ministries of agriculture, and national AMR committees in the intervention countries), and will inform the design of an RCT to assess the economic impacts of lower and better targeted AMU in these production systems.

EOI-O 4: Role of water in the transmission of pathogens and AMR, and proposed solutions for waste and water management, are recognized in the national One Health planning processes of at least two out of seven project countries (e.g., Ethiopia, India).	Studies in Ethiopia and India characterizing the load of zoonotic pathogens and modeling their transmission through water will provide critical missing evidence on the role of water in the transmission of pathogens and AMR. Stakeholder engagements are ongoing to inform communication strategies and the integration of findings into national One Health policy processes. The water quality modelling framework we have developed serves as a foundation for analyzing AMR in aquaculture contexts.
EOI-O 5: One Health policy planning processes in at least three out of seven project countries (e.g., Bangladesh, India, Viet Nam) take into account CGIAR evidence on gendered constraints and incentives of small- and medium-scale food system actors, tradeoffs across policy goals, and the magnitude and distribution of impacts.	Experimental results showing that low-income consumers choose safer food when informed of relative food safety risks demonstrates that lack of information is an important constraint to developing markets that reward food safety. This supports the assumption required for this outcome, that providing visible food safety ratings will motivate vendors to adopt better practices. Questions on the gender and roles of food business operators and employees have been incorporated into surveys to be fielded in 2023.

Section 3 Work Package-specific progress

Work Package 1:
Emerging and neglected zoonoses



Work Package 1 progress against the theory of change

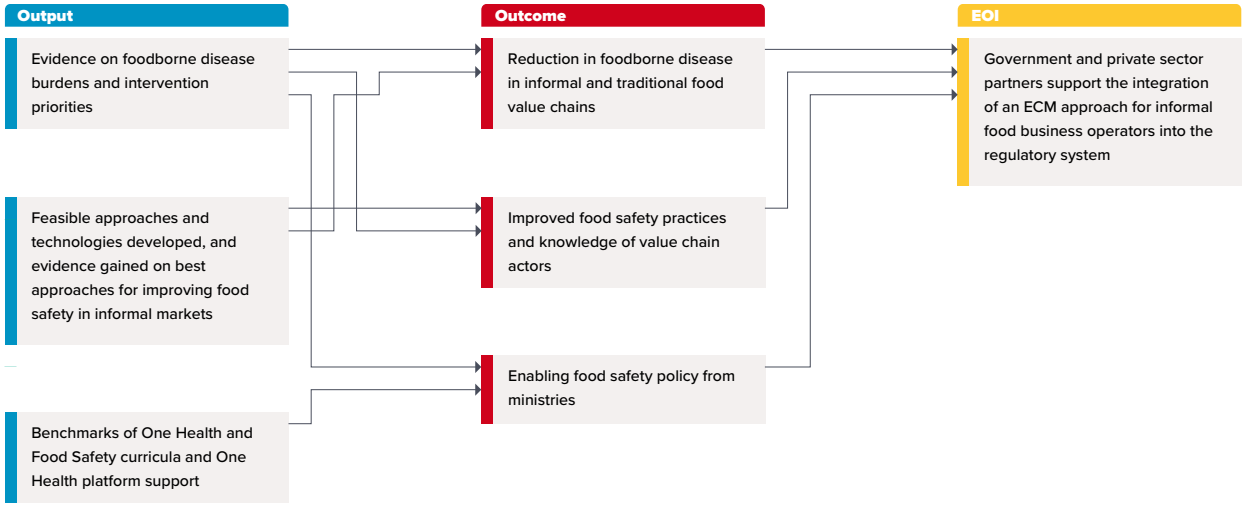
Molecular screening. We trained veterinary officers from Rwanda and Burundi on serologic and molecular screening procedures for Rift Valley fever virus (RVFV) in June 2022 when they had an outbreak of the disease. At the same time, we developed procedures for whole genome sequencing for genotyping of the virus. A publication revealed that the RVFV viruses that were circulating in the region could be clustered into type C. These activities advanced regional collaborations on laboratory screening of emerging and re-emerging zoonotic agents.

Slaughterhouse. We have designed a mobile phone-based surveillance system for selected slaughterhouses in Kenya to enhance their participation in syndromic surveillance for zoonotic diseases. Stakeholder consultation meetings were held to design approaches for linking these facilities to existing disease surveillance systems maintained by the Department of Veterinary Services (DVS) in Kenya.

Integrated surveillance. We published an output demonstrating the potential of conducting biosurveillance activities for multiple pathogens in humans, livestock, and wildlife. Most surveillance studies focus on one pathogen at a time, yet many infectious pathogens co-occur in the same hosts or ecologies. We are finding immense value in using integrated approaches and are currently preparing further outputs to share our novel findings.

Hotspot maps. We published an output on anthrax hotspot mapping which drew on analysis of secondary data collected in a bilateral project that ended in 2019. The analysis involved partners from local public and animal health institutions to enhance the dissemination and application of the map. While the study focused on Kenya, it developed capacity on hotspot mapping using machine learning algorithms that is currently applied to other zoonoses (e.g., Crimean-Congo hemorrhagic fever, Ebola).

Work Package 2:
Food safety



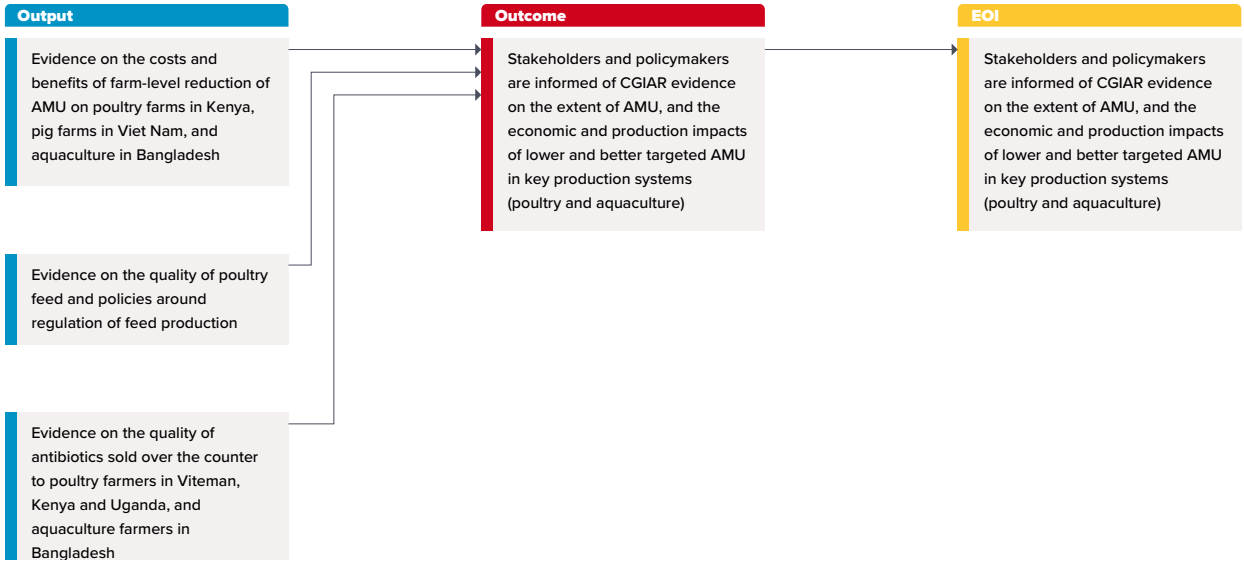
Work Package 2 progress against the theory of change

Food safety risks. We developed a number of outputs to characterize food safety risks in Viet Nam and Cambodia, such as exploring food safety knowledge, needs, and priorities, quantitative risk assessment of salmonellosis, and cross-contamination of Salmonella in food preparation at household level.

Food safety in informal markets. In Viet Nam, stakeholders were consulted on the food safety challenges and intervention options building on the previous works. A food safety intervention in informal markets was developed and piloted in 2022. This includes the protocols for an RCT to involve 68 pork markets in 5 provinces in Viet Nam with an enabling, capacitating, and motivating (ECM) approach. In Ethiopia, a stakeholder consultation workshop was hosted to develop a similar intervention that will be piloted in early 2023 with 400 semi-informal meat vendors in Addis Ababa. We also helped build an enabling environment through contributing knowledge and experience to different platforms. We proposed integrating the national food safety technical working group into the Viet Nam One Health Partnership as a way of strengthening the involvement of government partners in food safety research and policy discussions, which was accepted and implemented by government partners. In Ethiopia, we convened a meeting with the Ethiopian Steering Committee of One Health to develop a technical food safety working group, which received positive support with implementation to begin in 2023.

Benchmarking. Foodborne disease is an enormous health problem, but tertiary training does not well equip African professionals to manage food safety in mass domestic markets. We worked with food safety experts from East Africa to develop benchmarks for a food safety curriculum. We shared these benchmarks in a workshop report. These benchmarks will help ensure appropriate and comprehensive education as well as facilitate graduate employment and mobility. Please see more information in the key result story.

Work Package 3:
Antimicrobial resistance (AMR)



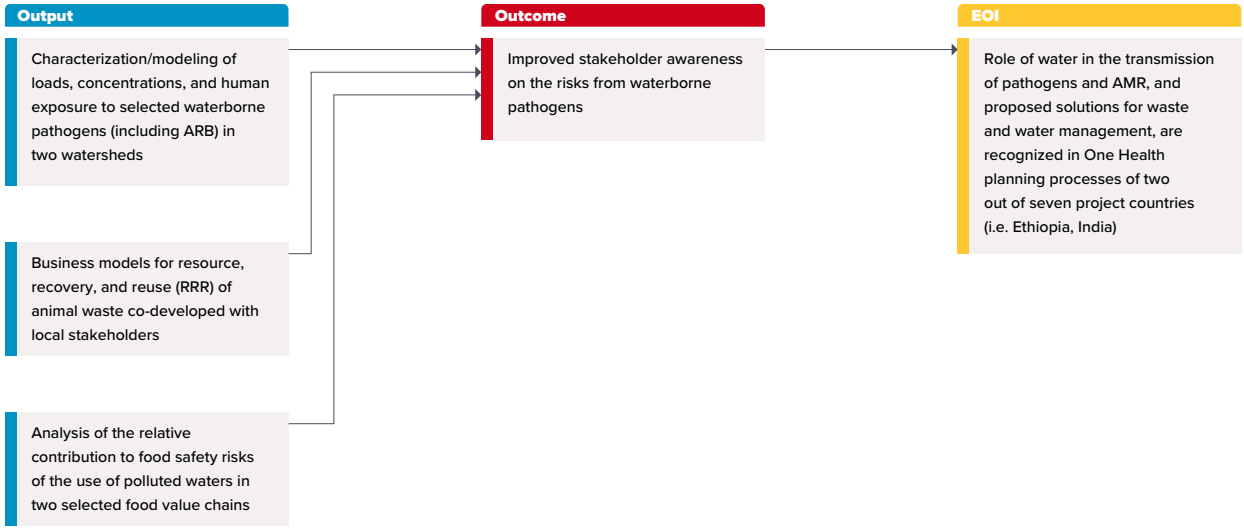
Work Package 3 progress against the theory of change

AMU and AMR activities in aquatic food systems in Bangladesh. A harmonized survey tool has been finalized. Farmer practices and antimicrobial use (AMU) usage information were collected from 120 aquatic farms for the recently completed production cycle. Presently, longitudinal observations are being collected from the same 120 farming units for the current production cycle. Findings will be used to design the intervention study planned for late 2023. Biological samples (fish tissue, effluent water, and organic manure) are being collected repeatedly to screen for AB residues and fish/human pathogens.

AMU and AMR activities in poultry farms in Vietnam and Kenya. Similar to aquaculture, a comprehensive survey tool was developed for poultry. Between June and August 2022, we mapped 1,000 poultry farms in three counties in Kenya (Kiambu, Machakos, and Kajiado) to identify a sample population and get data on farm demographics, e.g., flock sizes and type of production. Between October and December 2022, we completed an observational study on 130 farms with up to four repeated farm visits to capture data on expenditures (e.g., feed, vaccines, antimicrobials, etc.), poultry health (sickness and mortality), AMU, vaccinations, and current biosecurity measures in place. In addition, the drug bin method was used to collect farm-level antibiotic use and biological samples from poultry, feed, and water for microbiological, residues, and aflatoxin analysis, which will be carried out in 2023.

AMR governance and quality. We are identifying gaps in the current national AMR policies, regulations on antimicrobial use the veterinary antimicrobial supply chain, and understanding the AMR national and sub-national governance structures and stakeholders. Additionally, standard operating procedures to investigate drug quality and quantify residues in different matrices have been developed and piloted, which will allow studies on drug quality to be undertaken in 2023.

Work Package 4:
Water



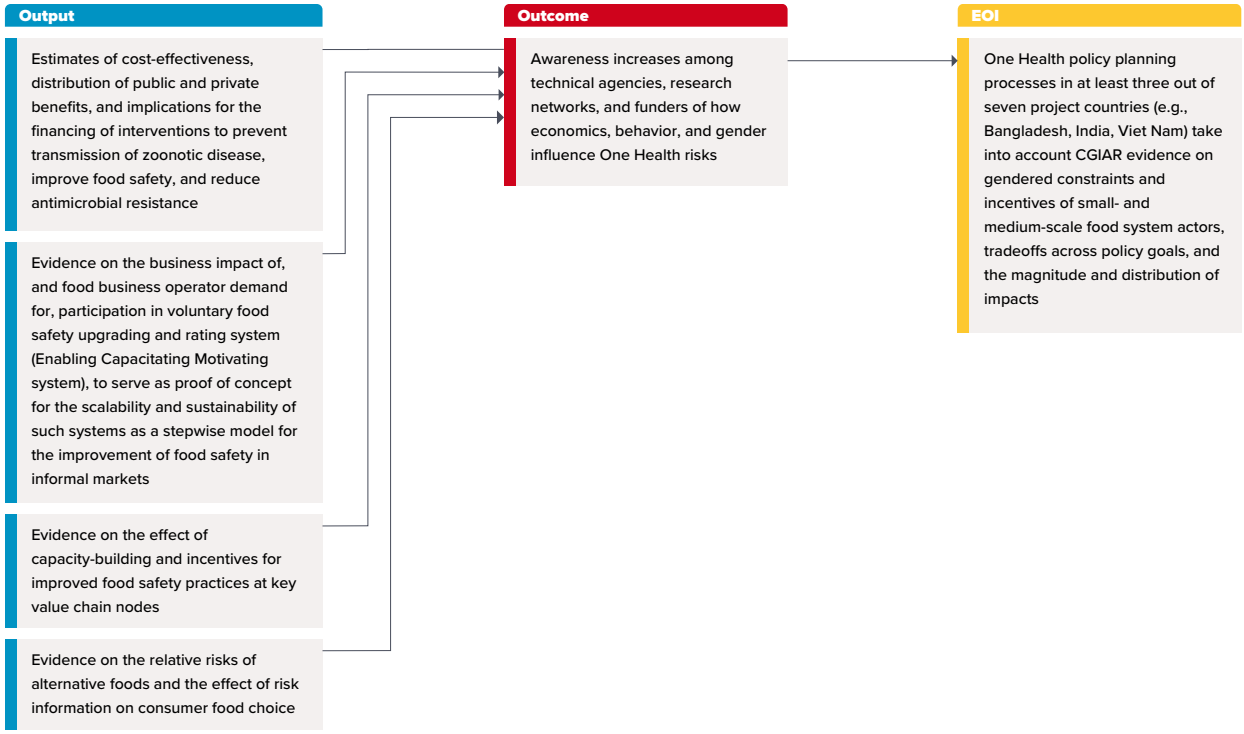
Work Package 4 progress against the theory of change

Characterization and modeling of zoonotic pathogens in watersheds. Watersheds were selected according to predefined criteria and stakeholder consultations (Akaki in Ethiopia and Song in India). Monitoring plans and stakeholder analysis for uptake were developed in Ethiopia and are in development in India. Data collected from the first water quality monitoring camp in Ethiopia was analyzed, resulting in an improved understanding of urban wastewater pollution impacts on river microbiomes and associated hazards in the Akaki catchment, Addis Ababa, Ethiopia. We also published a water quality modeling framework for evaluating antibiotic resistance in aquatic environments, which will be used in upcoming studies to quantify relative contribution of livestock to water pollution as well as test the effectiveness of pollution control measures on health.

Business models for resource, recovery, and reuse (RRR) of livestock waste. An online survey was disseminated for identification and pre-characterization of cases on RRR from animal waste in low- and middle-income countries (LMICs). A long list of RRR cases is in development, with 70 cases identified so far. A total of four RRR cases were characterized in detail. Business models from successful cases will be synthesized and promoted for adoption and replication in selected sites.

Water safety risks and interventions in critical points along the livestock value chain. We worked with work packages to integrate data collection on water access throughout the Initiative. For example, we integrated input questions about water source into food safety surveys in Viet Nam, which will help to generate food safety interventions that address water-related risks.

Work Package 5:
Economics, governance, and behavior



Work Package 5 progress against the theory of change

Cost-effectiveness and public/private benefits. We published an opinion piece, A One Health approach to plant health, in which we argue for the incorporation of One Health thinking and cost-benefit analysis to address tradeoffs at the intersection of environmental, human, and animal health. We developed a study design evaluating the impacts of a slaughterhouse hygiene intervention in Western Kenya on public health and market share.

Food safety rating business impact. Study designs to measure business impacts of food safety rating programs in Viet Nam and Ethiopia have been developed and, in the case of Viet Nam, piloted.

Capacity and incentives for food safety. A paper showing that the joint incentives of safer food for own consumption and premium prices led farmers to adopt a food safety technology. Study protocols were developed and ethical clearance obtained for RCTs testing the impact of incentives for better hygiene practices at animal slaughter and meat retail.

Relative food risk and consumer behavior. Results from an experimental study indicate that providing consumers information on the relative food safety risk of alternative foods increases consumption of the safer option. This supports the assumption that consumer demand can drive adoption of better practices among food business operators. We published a paper on bacterial contamination of milk, showing that consumer behavior can lead to higher rates of post-purchase contamination in food perceived as safer at purchase, a caveat to consider when evaluating the impact of market-level interventions.

A live chicken vendor weighs a chicken in Hung Yen province, Vietnam. Photo credit: Nguyen Ngoc Huyen/ILRI

Work Package progress rating

WORK PACKAGE	TRAFFIC LIGHT / RATIONALE	
1		Most of the activities have commenced, although more time was used initially to develop the required tools and research compliance certificates.
2		We are on track to deliver outputs that will contribute to Work Package and Initiative outcomes by the end of 2024.
3		We are on track to deliver outputs that will contribute to Work Package and Initiative outcomes by the end of 2024.
4		We have selected sites, built partnerships, and designed and validated (most) methodological approaches as promised for 2022.
5		We are on track to deliver outputs that will contribute to Work Package and Initiative outcomes by the end of 2024.

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

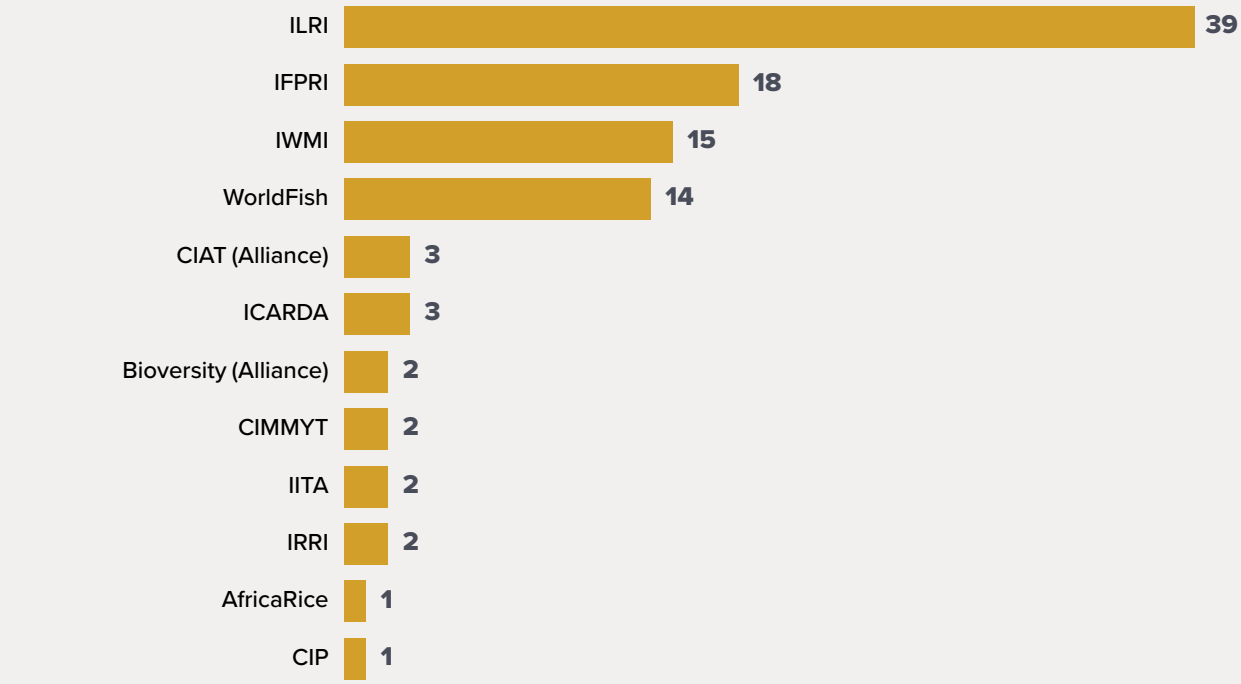
Section 4 Initiative key results

This section provides an overview of 2022 results reported by One Health. These results align with the CGIAR Results Framework and One Health's theory of change. Further information on these results is available through the CGIAR Results Dashboard.

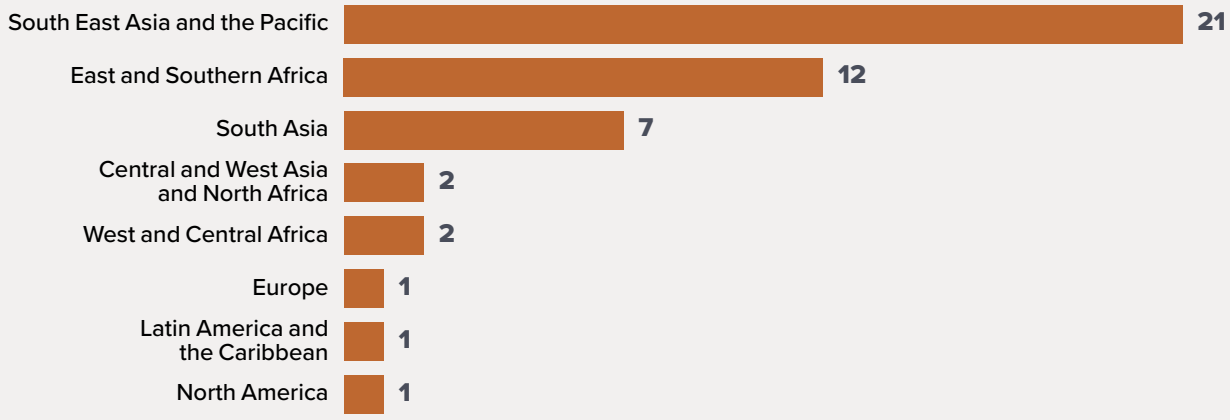
Overview

Results	Outputs		Outcomes
53	6 Innovation development	46 Knowledge products	1 Innovation use

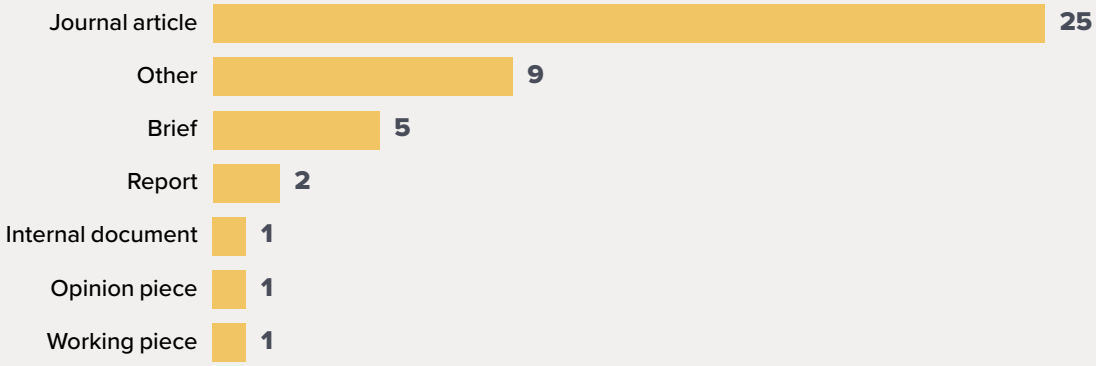
Contributing CGIAR Centers



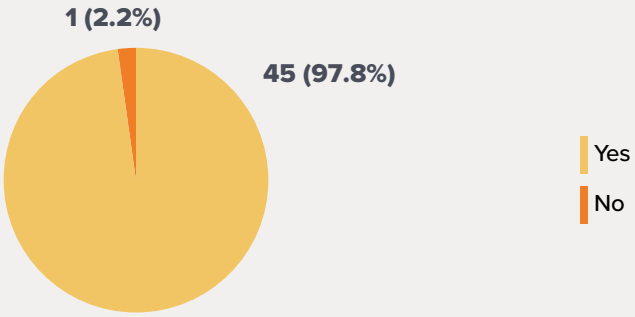
Results by region



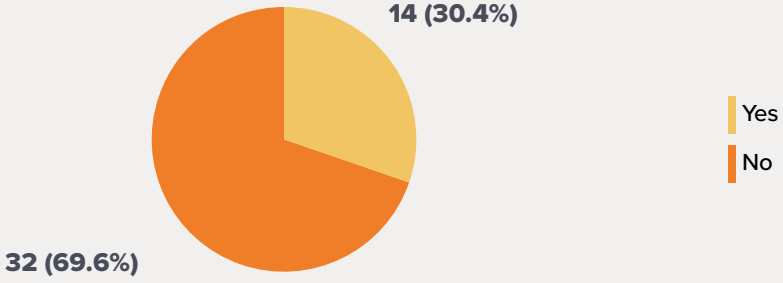
Knowledge products by category



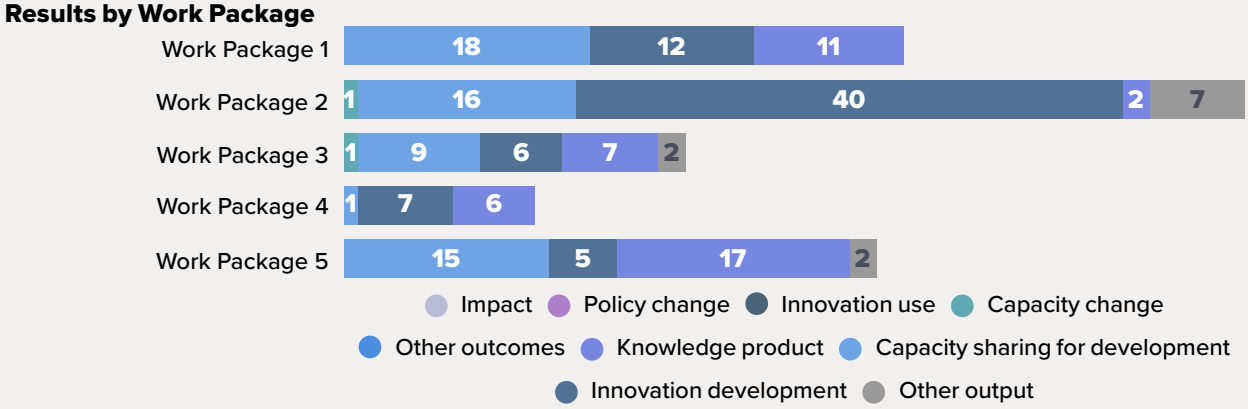
Open access



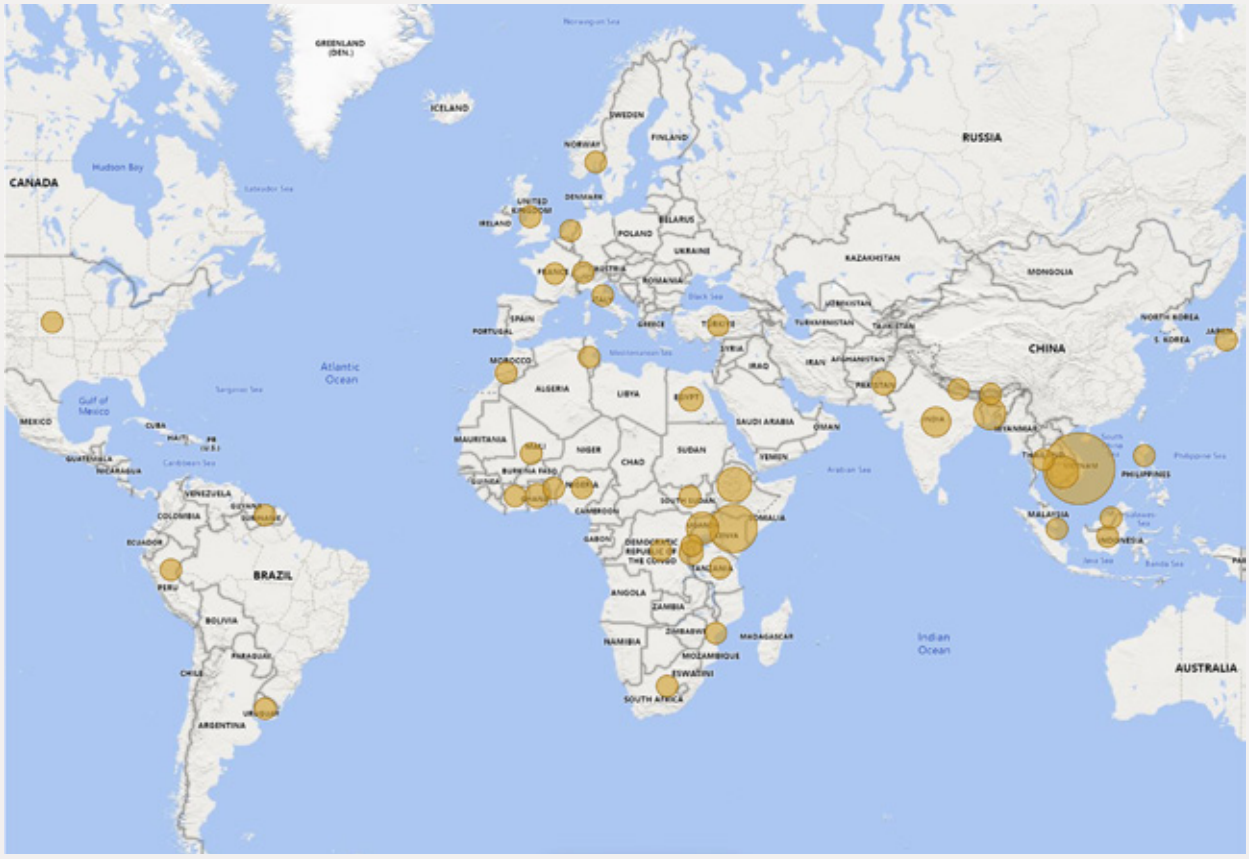
Web of science core collection



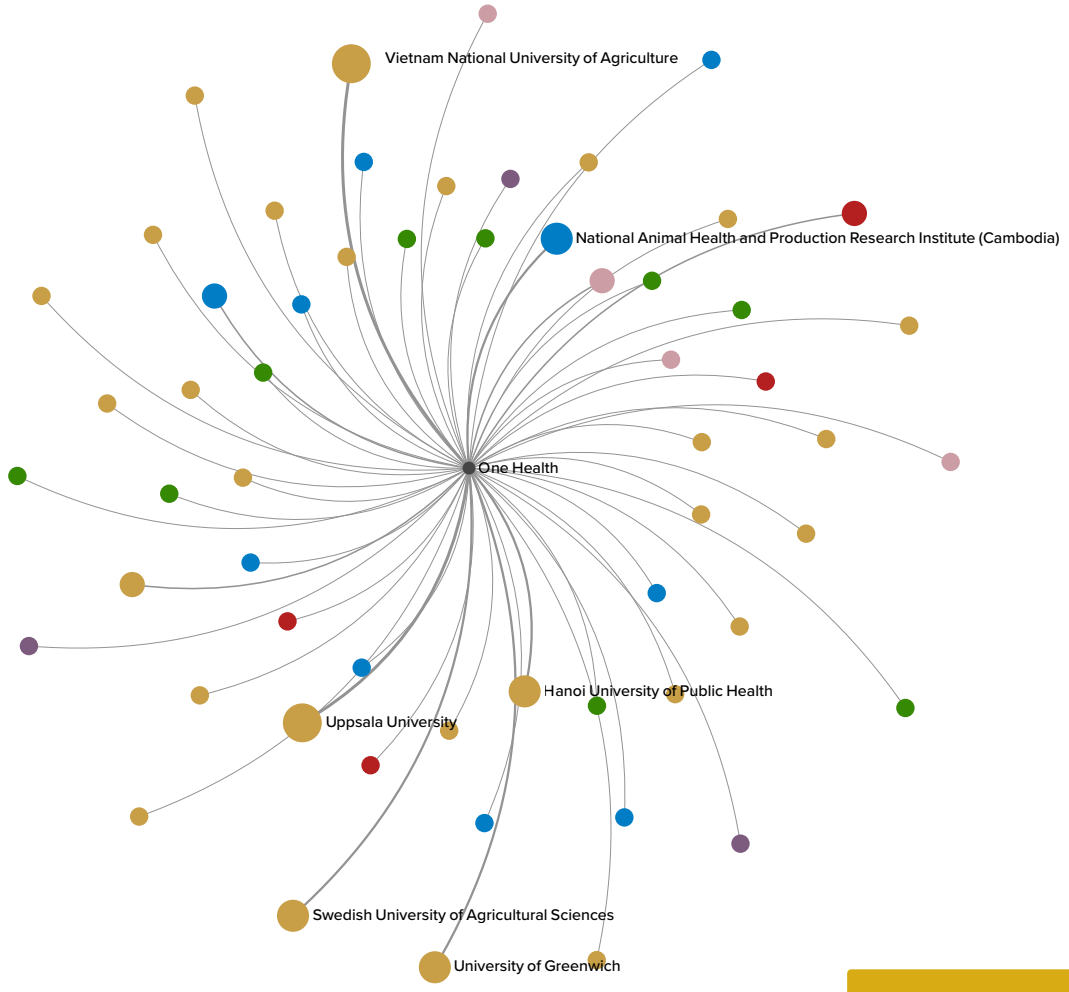
Results by Work Package



Results by country



Section 5 Impact pathway integration – External partners



Partners typology	# of partners	% of partners
Research organisations and universities (National)	28	48.3%
Research O&U (NARS)	10	17.2%
Government (National)	4	6.9%
Research O&U Intl. (Universities)	4	6.9%
Research O&U Intl. (General)	3	5.2%
All Other Categories	9	15.5%

Top five institution types

All other categories · Government (National) · Not applicable · Research O&U Intl. (General) · Research O&U Intl. (Universities) · Research O&U (NARS) · Research O&U (National) (Universities)

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 One Health's impact pathways

In our first year, the CGIAR Research Initiative on One Health engaged with partners — including local research and government institutions — to validate study objectives and develop research designs. Our academic collaborators have strong networks in national policy circles and can act as champions to promote the evidence generated through the initiative, moving it toward policy impact, and governmental partners are potential adopters of the innovations we develop and scale.

In Ethiopia, building on previous work, our Initiative continues to partner with Addis Ababa University and Addis Ababa Water and Sewerage Authority, and to increase capacities in the monitoring of waterborne pathogens to better understand pollution sources and microbial hazards in the watershed for more targeted remedial actions. In Western Kenya, we have engaged officials in five county governments through a meeting to discuss the gaps between the regulations governing slaughterhouse hygiene and practice, and we plan to engage meat inspectors in the delivery of an intervention to close this gap. This type of engagement of government entities throughout the research process is expected to generate ownership of the evidence we produce, and to increases the likelihood of its application to policy.

In Viet Nam, we have developed strong partnerships with the National Institute of Veterinary Research and Hanoi University of Public Health to conduct risk-based prioritization, implementation, and evaluation of interventions and integration of research outputs into government policies and programs. We worked with Viet Nam One Health institutions to integrate the national food safety working group into the Viet Nam One Health Partnership (OHP) to engage more government partners in food safety discussion. A similar contract was drawn between the International Livestock Research Institute (ILRI) and Centre Suisse de Recherches Scientifique en Côte d'Ivoire. In India, the project is partnering with the Indian Institute of Technology Roorkee, the Indian Institute of Technology Delhi, and BAIF, which have strong networks with researchers, policymakers, and local communities in the country.

Finally, we are working closely with private sector partners. In Kenya, the development of a mobile phone surveillance system is being developed in partnership with a private information and communication technology company called Badili Innovations. The University of Liverpool is also a key partner involved in the implementation of the integrated One Health surveillance and control measures for zoonotic diseases in Kajiado County.

Section 6 Impact pathway integration – CGIAR portfolio linkages

A civet kept on farm for consumption, Thai Nguyen Province, Vietnam. Photo credit: Vu Ngoc Dung/ILRI

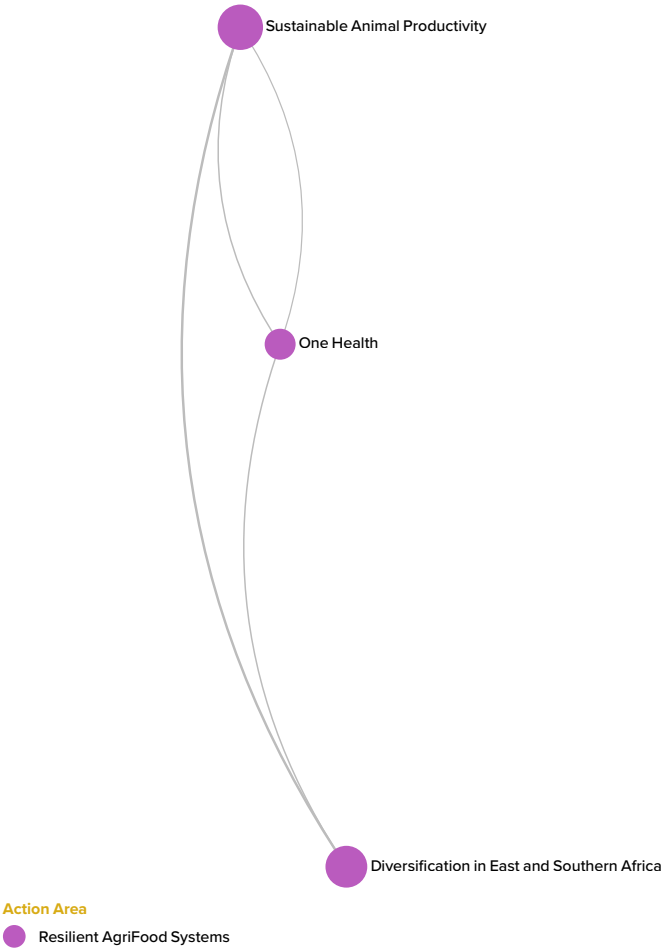
Portfolio linkages and One Health's impact pathways

Work Package 1. Several bilateral projects implemented at ILRI support One Health capacity development in the same countries selected for Work Package 1. Some of these projects, e.g., the One Health Research, Education and Outreach Centre in Africa, are also supporting integrated One Health interventions for multiple zoonoses.

Work Package 2. Several bilateral food safety projects across Asia and Africa focus on the assessment of health and economic risks of foodborne diseases in traditional markets. Work Package 2 is currently developing interventions at the markets to reduce these risks by engaging consumers and governmental stakeholders.

Work Package 3. The AMR partnership formed in the CGIAR AMR Hub continues with the same four CGIAR Centers in this Initiative. We are leveraging knowledge and networks from ongoing bilateral projects to inform Initiative activities. Similarly, we are using the approaches of the Initiative for other bilateral projects (e.g., drug bin survey tool in Malawi and Uganda).

Work Package 4. The work on business models on RRR of animal waste builds on a larger program from the International Water Management Institute (IWMI) on RRR from fecal sludge and municipal wastewater. The work on modeling zoonotic pathogens and AMR in watersheds builds upon work of the CGIAR AMR Hub.



Name	Action Area	Total Connections	Total Results
Sustainable Animal Productivity	RAFS	3	9
Diversification in East and Southern Africa	RAFS	2	8
One Health	RAFS	3	5

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)

Work Package 5. The International Food Policy Research Institute (IFPRI) is testing the impact of voluntary food safety surveillance with informal groundnut processors in Ghana, through a project funded by the US Agency for International Development (USAID) Feed the Future Peanut Innovation Lab. This model is similar to the food safety upgrading approach being tested among traditional meat vendors in Viet Nam and Ethiopia.

We also produced high-quality outputs with other CGIAR Research Initiatives, including **Sustainable Animal Productivity** and **Diversification in East and Southern Africa**. Additionally, we attended many international events to promote the initiative, such as: 2022 UN Climate Change Conference (COP27) "Links between climate change and zoonotic diseases emergence"; Food and Agriculture Organization (FAO) Science and Innovation Forum – FAO and Wageningen University & Research (WUR) event; World Health Organization (WHO) "SAGO" Scientific Advisory Group for the Origins of Novel Pathogens; Quadripartite's Technical Group on AMR and Use Integrated Surveillance; WHO Expert Committee on African Trypanosomiasis; Foreign, Commonwealth and Development Office of the United Kingdom (FCDO) talk on One Health agenda; and IUCEA food safety benchmarks.

Section 7 Adaptive management

RECOMMENDATION	SUPPORTING RATIONALE
Review scope of work and clarify Work Package deliverables and associated resources and timeframes.	In year 1, Work Package leads committed to high-level deliverables by the end of the Initiative. From year 2 onward, we are committing to a more detailed work plan with specific intermediate outputs and deliverable dates to ensure we are on track to achieve the targeted impacts.
Implement One Health activities in different phases.	There are many planned activities in many different countries. Phasing (with entry to some countries delayed to phase 2 from 2025) will allow us to better focus and manage our work given budget constraints.
Improve external communications, including developing a microsite, promoting the program, and developing stories that demonstrate our collective impact.	Increasing the visibility of our work could help to further our impact as well as identify other potential collaborators who work in the same space.
Develop integrated research and monitoring systems, including internal systems to track progress toward stated outputs/outcomes.	Coordinating data collection such that it can capture both research and reporting needs has several advantages, including reduced research fatigue of participants, reduced information burden for researchers, and improved tracking of adherence to initiative design.
Expand integration across Work Packages.	While some Work Packages already work closely on specific projects, there are opportunities to further integrate our work and improve collective impact, including through improved information-sharing and identification of synergies.

Section 8 Key result story

Fruit and vegetables on sale alongside other food items in a local market in Addis Ababa, Ethiopia. Photo credit: Geraldine Klarenberg/ILRI

Curriculum benchmarking deployed to boost food safety for the East African Community's 300 million inhabitants

The burden of foodborne illness from eating unsafe food poses a threat to the health of the East African Community's 300 million inhabitants. The International Livestock Research Institute (ILRI), in partnership with the IUCEA, has developed undergraduate food safety curriculum benchmarks toward building the capacity of the region's food safety professionals to ensure the production and sale of safe food and, ultimately, improved health and food security.

Food safety is critical for health, nutrition, and development. Formal and informal food businesses employ millions of people — many of them women — and can improve profits, reduce waste, and contribute to development goals when products are safe and of good quality.

But the burden associated with unsafe food is huge. Thirty-one priority food hazards caused 600 million illnesses and 420,000 deaths globally in 2010, resulting in a burden of 33 million disability-adjusted life years (DALYs)[1]. Heavy metals caused an additional 1 million illnesses, over 56,000 deaths, and more than 9 million DALYs in 2015[2]. The annual health burden of foodborne disease is more than 42 million DALYs per year — comparable with that of tuberculosis or malaria.

Reflective of this concern, food safety is one of the key priorities of the CGIAR Initiative on One Health, which employs a holistic One Health approach to reduce AMR, improve food and water safety, and manage zoonotic diseases, leading to better human, animal, and environment health.

Africa has the highest per capita foodborne disease burden of any continent, and the East African Community is particularly affected. In Kenya, Tanzania, and Uganda, the 2019 cost from loss of productivity due to foodborne diseases was estimated at US$800 million, US$600 million, and US$400 million respectively[3]. There are few food

safety inspectors, and most of them are concentrated in the export and high-end food commodity markets, meaning local and more informal markets, where most of the population shops, are left largely unexamined[4]. Food safety is also a critical component of enhancing fair trade and market access across the region, in accordance with the African Union Malabo Declaration's goal of threefold growth in intra-African trade in agricultural commodities by 2025.

For the East African Community to lower the public health costs associated with foodborne disease, food safety professionals are urgently needed. But many tertiary institutes in the region have out-of-date curricula that are not tailored for local contexts and do not adequately cover the informal sector.

In this context, the IUCEA worked with ILRI and the FAO to develop curriculum benchmarks for a bachelor of science program in food safety to serve as a yardstick for curriculum developers in universities in the East African Community.

The IUCEA was uniquely placed for this task because it coordinates higher education and research for the East African Community, including developing curriculum benchmarks for tertiary education that set out core competencies that employers can expect all graduates to possess, ensuring that tertiary education is of satisfactory standard and aiding in student, graduate, and staff mobility.

To develop the benchmarks, ILRI collaborated with a technical working group of experts from universities in the East African Community partner states, while in-country stakeholders were engaged through an e-Delphi consultative approach.

The IUCEA ran the final review and validation, and the benchmarks were approved in 2022. The curriculum covers a wide range of subject areas, ranging from food microbiology and human anatomy to science communication, value chains, and climate change[5].

Building on this success, ILRI and partners will implement a survey to assess the capability of universities to implement the food safety benchmarks and identify what support is needed to ensure the curriculum benchmarks are integrated into curricula. This development supports the Food Safety Strategy for Africa 2022–2036. If adopted within IUCEA's membership of 133 universities in East Africa alone, thousands of undergraduate students would have improved access to relevant and quality food safety education and be better equipped to contribute to food safety improvement in the region.

"ILRI and partners will implement a survey to assess the capability of universities to implement the food safety benchmarks and identify what support is needed to ensure the curriculum benchmarks are integrated into taught curricula. Building on this momentum, ILRI is working with IUCEA to develop the benchmarks for MSc of One Health."

Hung Nguyen-Viet, scientist, International Livestock Research Institute

References

1 *Havelaar, A.H., Kirk, M.D., Torgerson, P.R., Gibb, H.J., Hald, T., Lake, R.J., Praet, N., Bellinger, D.C., de Silva, N.R., Gargouri, N., Speybroeck, N., Cawthorne, A., Mathers, C., Stein, C., Angulo, F.J. and Devleesschauwer, B., on behalf of World Health Organization Foodborne Disease Burden Epidemiology Reference Group. 2015. World Health Organization global estimates and regional comparisons of the burden of foodborne disease in 2010. PLOS Medicine 12(12): e1001923.* https://doi.org/10.1371/journal.pmed.1001923

2 *Gibb, H.J., Barchowsky, A., Bellinger, D., Bolger, P.M., Carrington, C., Havelaar, A.H., Oberoi, S., Zang, Y., O'Leary, K. and Devleesschauwer, B. 2019. Estimates of the 2015 global and regional disease burden from four foodborne metals – arsenic, cadmium, lead and methylmercury. Environmental Research 174: 188–194.* https://doi.org/10.1016/j.envres.2018.12.062

3 *Jaffee, S., Henson, S., Grace, D., Ambrosio, M. and Berthe, F. 2020. Why food safety matters to Africa: Making the case for policy action. In: Resnick, D., Diao, X. and Tadesse, G. (eds), Sustaining Africa's agrifood system transformation: The role of public policies. ReSAKSS 2020 Annual Trends and Outlook Report. Washington, D.C. and Kigali, Rwanda: International Food Policy Research Institute (IFPRI) and AKADEMIYA2063. pp. 112–129.* https://doi.org/10.2499/9780896293946_10

4 *Mutua, F., Masanja, H., Chacha, J., Kang'ethe, E., Kuboka, M. and Grace, D. 2021. A rapid review of foodborne disease hazards in East Africa. ILRI Discussion Paper 42. Nairobi, Kenya: ILRI.* https://hdl.handle.net/10568/116679

5 *Kang'ethe, E.K., Mutua, F. and Hung Nguyen-Viet. 2022. Benchmarks for food safety curriculum in the East African Community. Nairobi, Kenya: ILRI.* https://hdl.handle.net/10568/119527

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LINKS TO IMPACT AREAS

Primary Impact Area:

Other relevant Impact Area(s): None

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

- Reduce cases of foodborne illness (600 million annually) and zoonotic disease (1 billion annually) by one third.

GEOGRAPHIC SCOPE

Region: East Africa
Country: Burundi, DRC, Kenya, Rwanda, South Sudan, Tanzania, Uganda

KEY CONTRIBUTORS

Contributing Initiative: CGIAR Initiative on One Health
Contributing Center: ILRI
Contributing external partners: Food and Agriculture Organization of the United Nations; Inter-University Council of East Africa; University of Burundi; University of Nairobi; University of Rwanda; Ministry of Health, South Sudan; Sokoine University of Agriculture; Makerere University

LINK TO CGIAR RESEARCH PROGRAMS

None

COVER PHOTO: A woman with fish caught using gill net in Bangladesh.
Photo credit: Md. Masudur Rahaman/WorldFish