



CGIAR Research Initiative on Fruit and Vegetables for Sustainable Healthy Diets

Annual Technical Report 2024

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Title: Annual Technical Report 2024: CGIAR Research Initiative on Fruit and Vegetables for Sustainable Healthy Diets

Suggested citation: CGIAR Research Initiative on Fruit and Vegetables for Sustainable Healthy Diets. 2025. Annual Technical Report 2024: CGIAR Research Initiative on Fruit and Vegetables for Sustainable Healthy Diets. Montpellier, France: CGIAR System Organization. <u>https://hdl.handle.net/10568/174142</u>



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

Acknowledgements

This work is part of the CGIAR Research Initiative on Fruit and Vegetables for Sustainable Healthy Diets. We would like to thank all funders who supported this research through their contributions to the CGIAR Trust Fund: <u>https://www.cgiar.org/funders</u>.

Table of contents

CGIAR Technical Reporting 2024	1
Section 1: Fact sheet, executive summary and budget	2
Section 2: Progress towards End of Initiative outcomes	4
Section 3: Work Package progress	10
Section 4: Quantitative overview of key results	18
Section 5: Partnerships	22
Section 6: CGIAR Portfolio linkages	23
Section 7: Key result story	24

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

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

The 2024 CGIAR Technical Report comprises:

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

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

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

The diagram below illustrates these relationships.



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

Section 1: Fact sheet, executive summary and budget

Initiative name	Fruit and Vegetables for Sustainable Healthy Diets (FRESH)
Initiative short name	Fruit and Vegetables for Sustainable Healthy Diets
Initiative Lead	Deanna Olney (<u>D.Olney@cgiar.org</u>)
Science Group	Systems Transformation
Start – end date	04 April 2022 – 31 December 2024
Geographic scope	Countries Benin · Philippines · Sri Lanka · United Republic of Tanzania
OECD DAC Climate marker adaptation score ¹	Score 1: Significant The activity contributes in a significant way to any of the three CGIAR climate-related strategy objectives—namely, climate mitigation, climate adaptation, and climate policy—even though it is not a principal focus of the activity.
OECD DAC Climate marker mitigation score ¹	Score 1: Significant The activity contributes in a significant way to any of the three CGIAR climate-related strategy objectives—namely, climate mitigation, climate adaptation, and climate policy—even though it is not a principal focus of the activity.
OECD DAC Gender equity marker score ²	Score 1A: Gender accommodative/aware Gender equality is an objective, but not the main one. The Initiative 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/fruit-and-vegetables-for-sustainable-healthy-diets-fresh/

¹ The Organisation for Economic Co-operation and Development (OECD) Development Assistance Committee (DAC) markers refer to the OECD DAC <u>Rio Markers</u> <u>for Climate</u> and the <u>gender equality policy marker</u>. For climate adaptation and mitigation, scores are: 0 = Not targeted; 1 = Significant; and 2 = Principal. ² The CGIAR Gender Impact Platform has adapted the OECD gender marker, splitting the 1 score into 1A and 1B. For gender equality, scores are: 0 = Not targeted; 1A = Gender accommodative/aware; 1B = Gender responsive; and 2 = Principal.

These scores are derived from Initiative proposals, and refer to the score given to the Initiative overall based on their proposal.

EXECUTIVE SUMMARY

The CGIAR Research Initiative on Fruit and Vegetables for Sustainable Healthy Diets (FRESH) aimed to increase fruit and vegetable (F&V) intake by developing and evaluating context-specific, end-to-end approaches that address issues related to the desirability, affordability, accessibility, and availability of F&V. FRESH activities took place in Benin, Tanzania, Sri Lanka, and the Philippines, along with some exploratory work in Fiji, with the overall goal of increasing F&V intake and in turn, diet quality, nutrition, and health outcomes, while also improving livelihoods, empowering women and youth, and mitigating negative environmental impacts. These goals directly aligned with each of the five CGIAR Impact Areas.

FRESH was implemented by core partners from five CGIAR Centers: the International Food Policy Research Institute (IFPRI), the International Maize and Wheat Improvement Center (CIMMYT), the Alliance of Bioversity International and CIAT (ABC), the International Water Management Institute (IWMI), and the International Potato Center (CIP). These Centers worked in close collaboration with the World Vegetable Center (WorldVeg), Applied Horticultural Research (AHR), University of Sydney (USYD), the Institute of Development Studies (IDS), Wageningen University & Research (WUR), University of California at Davis (UC Davis), Sokoine University of Agriculture, Tanzania (SUA), Wayamba University of Sri Lanka (WYB), and the Philippines Department of Science and Technology–Food and Nutrition Research Institute (DOST-FNRI), among other global and national partners.

FRESH's end-to-end approach was designed to tackle the interconnected barriers to F&V intake, working across the value chain through demand, food environment, supply, and enabling environment. This approach was operationalized through six Work Packages (WPs). On the demand side, WP1 focused on understanding dietary behaviors and codesigning interventions to increase the desirability of F&V. WP5 explored the food environment, aiming to improve the accessibility and affordability of F&V in markets. The supply-focused WPs addressed constraints to the availability of F&V by strengthening seed systems (WP2), promoting safe and sustainable production (WP3), and reducing postharvest losses (WP4). Connecting these components, WP6 worked to enhance the enabling environment by engaging stakeholders and building capacity. In 2024, FRESH made significant progress toward WP and End of Initiative outcomes (EOIOs) across its focal countries.

Building on foundational work from previous years, FRESH made strides in generating evidence to develop demandside interventions. WP1 conducted scoping reviews and secondary data analyses in each focal country, broadening understandings of diets, nutritional status, and F&V consumption. Data collection took place in Tanzania and Sri Lanka as part of the ongoing end-to-end impact evaluations. Findings from this combined set of research outputs supported participatory workshops with local stakeholders to codesign strategies to increase demand for F&V.

Complementing this work, WP5 conducted food environment assessments and lived experience research in Tanzania, Sri Lanka, and the Philippines. Through methods such as PhotoVoice and market surveys, FRESH gathered insights on how consumers interact with food environments, highlighting challenges they face in accessing F&V. The resulting StoryMaps and briefs were being used to inform interventions and policies aimed at making F&V more accessible and affordable, such as the expansion of fresh food voucher benefits in the Philippines to include a higher allocation for F&V purchases.

On the supply side, FRESH made notable progress across WP2, WP3, and WP4. In Benin, 27 improved vegetable varieties were released through participatory field trials, reaching thousands of farmers. WP2 also contributed to biodiversity conservation in Sri Lanka and the Philippines through the prioritization of indigenous F&V in genebanks and crop museums. WP3 promoted sustainable production by training farmers in good agronomic practices (GAPs) and integrated pest management. In Tanzania and Sri Lanka, FRESH production hubs served as key platforms for farmers to receive hands-on training, leading to increased yields and reduced reliance on synthetic inputs. Across the focal countries, more than 11,000 farmers were reached, and through the on-farm trials, researchers were able to document the economic and environmental benefits of the piloted GAPs. WP4 addressed postharvest losses and food safety by improving handling practices, testing innovative storage solutions, and conducting food safety assessments. These efforts contributed to reducing food loss while improving the quality and safety of F&V in markets.

WP6 supported these activities by engaging with stakeholders and contributing to national roadmaps, strategies, and policies spanning agriculture to nutrition across all four countries. Science meetings and events in Tanzania, Sri Lanka, and the Philippines served as pivotal platforms for stakeholders from government, academia, and the private sector to share insights and foster future collaborations. WP6 also completed foresight analyses in Benin and Tanzania, guiding policymakers in envisioning long-term pathways for sustainable F&V systems.

FRESH's progress in 2024 reflects the culmination of research, innovation, and engagement over the past two and a half years. Through collaborative efforts, FRESH generated the evidence, partnerships, and capacity necessary to develop targeted solutions for increasing F&V intake. The integration of activities across WPs expanded impact in each focal country, demonstrating the value of FRESH's end-to-end approach as a scalable framework for addressing food systems challenges while contributing to broader nutrition and sustainability goals.

		2022 ▽	2023 ⊽	2024
PROPOSAL BUDGET	D	\$5.00M	\$6.64M	\$9.36M
APPROVED BUDGET ¹	Þ	\$6.97M	\$10.52M ²	\$10.66M ²

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

² These amounts include carry-over and commitments.

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.

SPHERE OF CONTROL		SP
Work Packages		End-of-Initiative Outcomes
WORK PACKAGE 1		END-OF-INITIATIVE OUTCOME 1
Understanding and influencing consumer behavior.	1 🕨	At least four programs to influence consumer behavior are informed by country-specific F&V profiles and menus of evidence-based approaches.
Work Package 2		
Biodiversity, genetic innovation and seed systems.	2 🕨	At least 10,000 farmers adopt improved climate-resilient vegetable cultivars across the four focus countries.
Work Package 3	l	
Safe and sustainable production systems.		END-OF-INITIATIVE OUTCOME 3
Work Package 4	3 🕨	At least 10,000 farmers adopt safe and sustainable vegetable production practices across the four focus countries.
Post-harvest and inclusive markets.	l	
		END-OF-INITIATIVE OUTCOME 4
Work Package 5 Food environments.	3 🕨	At least three Innovation Packages for improved efficiency and optimized synergies of resources in vegetable production systems are adopted by farmers across four focus countries.
		END-OF-INITIATIVE OUTCOME 5
Strengthening the enabling environment.	4 ►	At least 12 innovations for reducing postharvest losses and/or improving food safety are piloted in at least four focus countries.
		END-OF-INITIATIVE OUTCOME 6
	5 ►	At least four programs aimed at making fruits and vegetables more accessible and affordable use F&V country profiles and evidence-based guidance in their design.
	6 🕨	At least four national-level programs, regulations, laws, or policies across four countries prioritize fruits and vegetables.
	l	
		END-OF-INITIATIVE OUTCOME 8
	1-6 🕨	Web-based F&V Knowledge Hub that collates and consolidates F&V research is accessed by at least 5,000 users across at least 10 countries.

INFLUENCE

ACTION AREA OUTCOMES

- 1 National and local multi-stakeholder platforms are strengthened to become more effective and sustainable, addressing development
- trade-offs and generating strategies for effective food, land, and water systems transformation.
- $\mathbf{2}\,\cdot\,\mathbf{Research}$ institutions, government analytical units, and scaling partners
- 2 Research institutions, government analytical units, and scaling particular in the Global South have improved knowledge, skills, access to data,
 5 capacity to develop tools, innovations, and undertake research to support transformation of food, land and water systems contributing to livelihood, inclusion, nutrition, environmental and climate objectives.
- 3 Implementation partners (e.g. NARES, NGOs, private companies) actively support dissemination, uptake, and implementation of CGIAR 1 6 7 innovations.

SPHERE OF INTEREST

IMPACT AREAS

- · End hunger for all and enable affordable health diets for the 2 3 billion people who do not currently have access to safe and nutritious food.

POVERTY REDUCTION, LIVELIHOODS & JOBS

· Lift at least 500 million people living in rural areas above the 1 2 extreme poverty line of US \$1.90 per day (2011 PPP).

GENDER EQUALITY, YOUTH & SOCIAL INCLUSION

· Close the gender gap in rights to economic resources on, 3 🕨 access to ownership of, and control over land and natural resources, for more than 500 million women who work in food, land, and water systems.

CLIMATE ADAPTATION & MITIGATION

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

 Maintain the genetic diversity of seeds, cultivated plants and 2 farmed and domesticated animals and their related wild species, including through soundly managed genebanks at the national, regional, and international levels.

> Fresh fruit for sale at a market in Colombo, Sri Lanka. Credit: Sydney Honeycutt/IFPRI

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Summary of progress against the theory of change

Since its inception in 2022, FRESH collaborated with partners in Benin, Tanzania, Sri Lanka, and the Philippines to address barriers to F&V intake across the food system. In 2024, FRESH built upon previous efforts by expanding research activities, codesigning demand, food environment, and supply interventions, and integrating cross-cutting priorities such as policy engagement and capacity sharing. These efforts aligned with FRESH's theory of change, reflecting the Initiative's dedication to implementing evidence-based, scalable solutions that promote F&V intake while contributing to healthier diets, improved livelihoods, and sustainable food systems.

In 2024, FRESH's demand-side activities focused on generating evidence, codesigning interventions, and identifying successful approaches (WP1). Together with partners, FRESH completed secondary data analyses in each focal country and published scoping reviews on diets, nutritional status, and F&V intake in <u>Benin</u>, <u>Tanzania</u>, and the <u>Philippines</u>. The reviews for Sri Lanka and Fiji will be published in 2025. Primary dietary data were collected in Tanzania and Sri Lanka as part of the impact evaluations designed to assess the impact of end-to-end approaches in these two focal countries on diets and vegetable production. In addition, qualitative research on drivers of food choice was conducted in Tanzania, Sri Lanka, and Benin, contributing contextual evidence to better understand F&V consumption patterns. Findings from these diverse research activities informed participatory workshops in Tanzania and Sri Lanka, where local stakeholders engaged in the process of codesigning interventions to increase demand for F&V in their communities. Beyond country-specific activities, FRESH completed a global review of interventions aimed at increasing F&V intake, consolidating the evidence base for designing scalable demand-side strategies. These activities contributed to FRESH's theory of change outcomes by filling evidence gaps, engaging stakeholders, and generating buy-in for designing, implementing, and evaluating demand-side interventions as part of the end-to-end approach, providing a strong foundation for shifting dietary patterns in the focal countries.

To improve the accessibility and affordability of F&V in markets, FRESH continued to generate evidence on food environments (WP5). Literature reviews were conducted in each focal country, synthesizing existing research on market dynamics, food prices, and consumer access to F&V. In Tanzania and Sri Lanka, quantitative research, including a cost of diet analysis, provided further data on affordability constraints. Qualitative lived experience research was conducted in Tanzania, Sri Lanka, and the Philippines, using PhotoVoice methodology to create interactive <u>StoryMaps</u> that visualize consumer interactions with the food environment. Additionally, stakeholder workshops were facilitated as part of collaborative needs assessments, providing additional insight into food environment barriers and opportunities in the respective countries. These activities provided data to guide the ongoing development of targeted food environment interventions, while also generating stakeholder support for programs that make F&V more accessible and affordable.

FRESH's supply-side activities encompassed vegetable breeding and biodiversity (WP2), safe and sustainable production (WP3), and postharvest management (WP4). In 2024, FRESH continued to make strides in these areas, strengthening F&V supply across the focal countries. Biodiversity assessments informed the prioritization of indigenous F&V in Benin, Sri Lanka, and the Philippines, ensuring that climate-resilient, nutrient-rich varieties remain available for farmers and consumers. Building on participatory field trials conducted in 2023, improved vegetable varieties were selected in Benin, Tanzania, and Sri Lanka, providing farmers with high-quality cultivars adapted to local growing conditions. the necessary evidence for developing policies that prioritize F&V production and consumption. The ongoing evaluation of FRESH's end-to-end approach in Tanzania and Sri Lanka (led by WP1 and WP5) will continue to contribute evidence on how to increase the desirability, affordability, accessibility, and availability of F&V through effectively addressing the multiple barriers that exist across the food system.

To facilitate dialogue between researchers, policymakers, and the private sector, FRESH held high-level meetings in Tanzania, Sri Lanka, and the Philippines. In Tanzania, the 2024 FRESH Science Conference convened 150 participants, providing a platform for knowledge exchange and collaboration. A similar event in the Philippines mobilized support across government, academia, and the private sector, influencing a national resolution to increase F&V production.

The release of improved varieties took place alongside training sessions at FRESH production hubs. These hubs continued to serve as key platforms in each country for promoting sustainable production methods such as integrated pest management (IPM) and GAP. In Tanzania and Sri Lanka, farmers who adopted recommended production methods successfully reduced their reliance on synthetic fertilizers and pesticides, reporting increased yields.

In addition to improving production, FRESH advanced its postharvest work by conducting loss assessments in all four countries to identify constraints and opportunities across F&V value chains. Trials were also conducted to test innovations to reduce postharvest losses, complementing the results of food safety research in Tanzania and Sri Lanka. The expansion of these activities in 2024 directly aligned with the outcomes specified in FRESH's theory of change by increasing consumers' access to safe, healthy F&V, promoting safe and sustainable production practices, and collaborating with private sector partners to improve postharvest management.

FRESH's cross-cutting efforts in 2024

spanned the demand, food environment, and supply activities, supporting policy development, capacity sharing, and stakeholder engagement (WP6). In all four countries, policy mapping and analysis were completed to identify opportunities for integrating F&V into food and nutrition policy frameworks. FRESH continued to strengthen in-country partnerships, expanding participation in stakeholder networks and working groups. These engagements allowed FRESH to elevate F&V in national agendas and provide



By raising awareness among stakeholders, FRESH made significant progress toward increased investment in and prioritization of F&V policies and programs in the focal countries.

FRESH's progress in 2024 demonstrated its commitment to embedding evidence-based interventions within existing food system structures to ensure sustainability and long-term impact. The partner-centered approach was instrumental in ensuring that activities were relevant and scalable.

Progress against End of Initiative Outcomes

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



EOIO 1

At least four programs to influence consumer behavior are informed by country-specific F&V profiles and menus of evidenced-based approaches.



EOIO 2

At least 10,000 farmers adopt improved climate-resilient vegetable cultivars across the four focus countries.



EOIO 3

At least 10,000 farmers adopt safe and sustainable vegetable production practices across the four focus countries.



EOIO 4

At least three Innovation Packages for improved efficiency and optimized synergies of resources in vegetable production systems are adopted by farmers across four focus countries.



EOIO 5

At least 12 innovations for reducing postharvest losses and/ or improving food safety are piloted in at least four focus countries.



EOIO 6

At least four programs aimed at making fruits and vegetables more accessible and affordable use F&V country profiles and evidence-based guidance in their design.



EOIO 7

At least four national-level programs, regulations, laws, or policies across four countries prioritize fruits and vegetables.



EOIO 8

Web-based F&V Knowledge Hub that collates and consolidates F&V research is accessed by at least 5,000 users across at least 10 countries.

This EOIO is linked to WP1. Briefs for Benin, Tanzania, Sri Lanka, and the Philippines were produced that incorporated information from the Initiative's published literature reviews, secondary diet data analysis, and key stakeholder interviews. These were used to support the prioritization of target groups, platforms, and interventions to increase F&V intake through increasing demand of F&V. In Tanzania and Sri Lanka, the profiles were used in codesign processes for demand and food environment interventions. In the Philippines, through iterative stakeholder discussions, FRESH contributed to influencing a change in the national fresh food voucher program to increase the voucher allocation for F&V.

This EOIO is linked to WP2. In Benin, 27 new vegetable varieties were released. More than 3,000 farmers were reached with seed kits, each containing three from these lines to stimulate demand among farmers for the new improved lines. Commercialization began for six of these lines. In Tanzania, 288 farmers were reached with more than 1,000 seed packs of improved amaranth, and in the Philippines, 259 farmers were reached with seed of traditional vegetables. In Sri Lanka, the commercialization of the Yammi Hot chili variety began by reaching 1,200 farmers. After 2.5 years of project activities, the documented number of farmers reached with new varieties was 50 percent away from the target. Through the initiated commercialization of the developed varieties, the number of farmers reached during 2025 will surpass the target.

Across Benin, Tanzania, the Philippines, and Sri Lanka, 9,297 farmers adopted safe and sustainable agricultural practices for vegetable production. The innovation packages for safe and sustainable production were successfully implemented to enhance resource efficiency in vegetable production systems. In Sri Lanka, farmers adopted GAP, intercropping, polytunnels, and tomato grafting. In Benin, intercropping technologies, biopesticides, soil sensors, and GAP packages improved sustainability. Tanzania introduced quality seeds, IPM, drip and solar irrigation, and biopesticides. The Philippines applied GAP for key crops, integrating IPM, biological control, and improved nutrient management. These interventions collectively enhanced productivity, sustainability, and resilience in vegetable farming across the four countries.

This EOIO is directly linked to WP3 Outputs and Outcomes. Over the course of the FRESH Initiative, WP3 successfully piloted more than three Innovation Packages across the four focal countries. For example, in Benin and Tanzania, many farmers adopted the use of water-sensing technologies to promote efficient irrigation techniques, along with other bundled GAPs such as those focused on improving pest management. In the Philippines, the integrated approach combined pest and nutrient management strategies to improve sustainability, and demonstrated economic and environmental benefits of less pesticide use. In Sri Lanka, IPM along with other GAPs resulted in no GAP products from FRESH WP3 hubs having detectable levels of pesticides.

This EOIO is linked to WP4 Outputs and Outcomes. WP4 has piloted more than 12 innovations across the four focal countries. These innovations ranged from technology to maintain storage temperature, to postharvest waste reduction strategies, to measures to reduce microbial contamination and improve product quality. Examples include the "CoolBot," which uses an air conditioner and insulated room to maintain storage temperatures of 10°C or lower, heat treatments for prolonging the shelf-life of mangos and biological products to reduce postharvest rots in vegetables. WP4 researchers also piloted waste reduction strategies, such as lining baskets with leaves, reducing overloading, and packing into reusable plastic crates. Plastic crates reduced tomato damage from 26% to 8%, while cool boxes helped leafy greens stay fresh for at least 24 hours.

WP5 made progress toward supporting the design of programs that improve the accessibility and affordability of F&V. Country-specific evidence, gathered through needs assessments, surveys, and participatory research, informed ongoing codesign processes in Tanzania, Sri Lanka, and the Philippines. Milestones include codesigned intervention concepts, guidance for conducting integrated food environment assessments, and the prioritization of F&V in an existing voucher program. The evidence generated by WP5, such as briefs and StoryMaps, continued to guide the development of food environment policies and innovations across the focal countries.

In Benin, a Vegetable Seed Sector Roadmap was developed by the Initiative through a series of workshops with the Ministry of Agriculture and other stakeholders. The final document was delivered to the ministry and the team will follow up with it. In Tanzania, FRESH contributed inputs to the National Roadmap and Action Plan for Sustainable Food Systems Transformation by 2030, which was being developed by the government. FRESH also participated in preparing guidelines for establishing horticultural crop platforms. These platforms respond to objective 6 on strengthened coordination of the National Horticulture Development Strategy and Action Plan 2021–2031. Furthermore, FRESH was represented in the Nutrition-Sensitive Thematic Working Group, one of several thematic working groups of the National Multisectoral Nutrition Action Plan (NMNAP II), where the national nutrition agenda is formulated, discussed, improved, and implemented. The Science Conference in Arusha in August also helped to disseminate FRESH results to policy makers. In the Philippines, engagements led by WP1 and WP5 also contributed to influencing a change to increase the allocation for F&V in a national fresh food voucher program.

In 2024, FRESH collaborated with the CGIAR Research Initiative on Sustainable Healthy Diets to develop a joint web-based Knowledge Hub consolidating research on F&V, healthy diets, and food systems transformation. FRESH and Sustainable Healthy Diets worked with a consultant to design the site and its main components, including a searchable database and blog platform. FRESH then worked with CGIAR Communications & Outreach to develop a fully functional site mock-up. Due to delays in recruiting/contracting, site design and development took longer than expected. Progress toward this outcome was delayed. Pending official launch, the site will be promoted to external audiences, with plans to integrate into the new CGIAR Research Portfolio.

WP1: Understanding and influencing consumer behavior

WORK PACKAGE 1 **END-OF-INITIATIVE OUTCOME 1** At least four programs to influence consum behavior are informed by country-specific F profiles and menus of evidence-based 1 🕨 cific F&V approaches. Change in knowledge of the context- and population-specific dietary patterns, barriers to F&V intake and options for addressing those barriers. 1 • Diet analysis for pregnant women, young children and adolescents, disaggregated by gender, socioeconomic status and 3 🕨 rural/urban. 2 • F&V country profiles highlighting F&V intake levels, nutrient gaps, prevalence of micronutrient deficiencies, stunting and NCDs. **2** • Scaling partners support (through investment or other support) the scaling of selected innovations/interventions. 1 National-level fruit and vegetable programs, regulations, laws or policies. 1 1 3 · Menu of options of behavioral innovation/intervention options 2 🕨 5 🕨 and delivery platforms mapped to population groups. 3 · National or sub-national governments invest in behavioral change innovations/interventions or integrate them into ongoing 4 Iterative co-design workshops to select target groups, contextualize new and existing evidence, select interventions/platform combinations to test and develop. 3 🕨 programs 4 • Academic partners express interest in collaborating on evaluating the selected innovation(s)/intervention(s). 6 1 5 • Country-specific piloting plans for behavioral innovations/interventions. 4 5 6 · Analysis of intervention uptake and changes in knowledge, diets and nutritional outcome

Work Package 1 progress against the theory of change

WP1 was implemented by core partners IFPRI, CIP, ABC, UC Davis, SUA, DOST-FNRI, and WYB, along with other partners. In 2024, the team continued to progress on achieving the WP's outputs and outcomes.

To further the understanding of country-specific dietary patterns, programs, and policies, WP1 completed country-level briefs that incorporated data from literature reviews, key informant interviews, and secondary diet data analysis, such as the analysis of dietary intake patterns of men and women from rural farming households in Sri Lanka and from a nationally representative survey across multiple age and sex groups in the Philippines (forthcoming). These briefs were published for Sri Lanka and Benin, with briefs for Tanzania and the Philippines forthcoming in 2025 (Output 1). Additionally, to better understand dietary patterns, F&V intake, and nutritional challenges in the focal countries, WP1 reviewed existing literature and national level survey data and published associated reviews for the Philippines, Tanzania, and Benin, with reviews for Sri Lanka and Fiji forthcoming in 2025 (Output 2). To learn from existing program evaluations, researchers also undertook a global review of interventions to increase F&V intake; the first paper in this series and the introductory paper were published, with the second paper and

accompanying perspectives paper to be published in 2025 (Output 3). Results from these reviews were presented in a few FRESH events in 2024 and will be presented at international conferences in 2025.

WP1 continued leveraging their strong partnerships to ensure that activities align with national priorities, can address research and programming gaps, and support uptake of results generated by invested stakeholders. These engagements were part of an iterative process across all four countries wherein workshop participants contextualized new and existing evidence to codesign innovative solutions to increasing F&V intake (Output 4). Formal codesign workshops for demand and food environment interventions to shift consumer behavior toward increased F&V intake and overall healthier diets were held in <u>Tanzania</u> and Sri Lanka in 2024 (Output 5). Implementation of these interventions as part of the end-to-end approach and associated evaluations will begin in 2025.

Lastly, baseline studies for the evaluation of FRESH's end-to-end approaches in Tanzania and Sri Lanka were completed as well as a one-year follow-up survey in Tanzania. <u>Impacts</u> on vegetable production and dietary intake were in the process of being analyzed.

WP2: Biodiversity, genetic innovation and seed systems



END-OF-INITIATIVE OUTCOME 2

At least 10,000 farmers adopt improved climate-resilient vegetable cultivars across the four focus countries.

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END-OF-INITIATIVE OUTCOME 8
National-level fruit and vegetable programs,
regulations, laws or policies.
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Work Package 2 progress against the theory of change

WP2 was implemented by WorldVeg and ABC, in close partnership with country and regional partners including the Tanzania Agriculture Research Institute, Institut National des Recherches Agricoles du Bénin (INRAB), African Vegetable Breeding Consortium, University of Abomey-Calavi (UAC), Plant Genetic Resources Centre, Sri Lanka, and the International Institute for Rural Reconstruction (IIRR), Philippines, among others. WP2 focused on facilitating farmers' access to quality seed of stress-tolerant and nutritious vegetable varieties. Variety trials for 27 lines, including tomato, pepper, okra, and amaranth, were accomplished in Benin, and the national seed committee session approved the release of these lines as new vegetable varieties. In Tanzania, the release of 19 tomato and pepper lines was near completion, and in Sri Lanka, a chili hybrid developed by Onesh Seed was launched for commercialization. (Output 8).

In Benin, FRESH supported a hybrid breeding training that reached 30 staff from 20 seed companies. The Regional Training in Genomics and Plant Breeding, organized by UAC, provided 20 participants with hands-on training in genomics, bioinformatics, experimental designs, and breeding.

A situational analysis of the vegetable seed sector in Sri Lanka was performed across 24 Agriculture Instructor Divisions under the

Department of Agriculture. Survey results on farmer perceptions and preferences concerning vegetable seed were presented at a workshop attended by 103 stakeholders from the public and private sectors, extension services, and academia. In Tanzania, 27 stakeholders participated in a seed systems workshop to review the implementation of regional regulations and assess constraints and opportunities. Strategic actions were proposed to national regulatory bodies to improve the enabling environment for vegetable seed systems (Output 10).

FRESH established two crop museums in Muñoz and Talavera, Nueva Ecija, Philippines, to conserve and propagate indigenous vegetables (IVs) and to serve as hubs for capacity building and distributing planting material for local farmers as part of the end-toend approach. IIRR trainings and seed kits reached more than 175 trainees, including 143 farmers. IV seed kits were distributed to 83 farmers, as well as local schools, barangays, and agriculture offices.

The Plant Genetic Resources Centre in Sri Lanka prioritized 10 crops for exploration, characterization, and ex situ conservation. This resulted in the collection of 502 germplasm samples; 414 were multiplied, 240 were characterized, and 143 were conserved in the genebank.

WP3: Safe and sustainable production systems



Work Package 3 progress against the theory of change

The objective of WP3 was to advance safe and sustainable vegetable production across Tanzania, Benin, the Philippines, and Sri Lanka by promoting improved cultivation practices, training farmers and extension personnel, and enhancing access to agricultural innovations.

In Tanzania, FRESH trained 3,739 farmers in Kilimanjaro and Arusha Regions on GAPs, reaching an additional 1,000 community members through media outreach (Output 12). Nine technology packages were implemented, and 2,371 farmers gained access to quality inputs (Output 13). Fifty demonstration plots showcased nutrientdense crops, supported by five lead farmers. The interventions improved soil, plant, and environmental health through enhanced pest management and water-use efficiency. Key partners included government agencies, private seed companies, and research institutes.

In Benin, FRESH targeted tomato and Gboma production, training 350 farmers and engaging 302 participants in results-sharing workshops in Allada and Ouidah. GAP adoption was expanded through field days for 156 farmers and collaboration with NGOs, reaching an additional 400 farmers. Infographics on key technologies were distributed to 380 farmers, and 10 extension officers received training. FRESH also introduced sensor-based monitoring for soil nutrients and irrigation, benefiting 2,079 farmers (Output 12). In the Philippines, GAP adoption was piloted and scaled in Nueva Ecija and Bulacan through 27 field demonstration sites and training sessions (Output 12). The integrated approach combined pest and nutrient management strategies to improve sustainability. A total of 570 farmers and extension officers received training, while six farmer cooperators facilitated knowledge transfer to an additional 296 farmers. Farmers' Field Days highlighted the success of pesticidefree vegetable cultivation, attracting 147 participants and reinforcing the economic and environmental benefits of reducing chemical inputs. Availability and access to GAP inputs were improved through connecting farmers' cooperatives and associations with Regional Crop Protection Centers and the private sector (Output 13).

In Sri Lanka, two vegetable production hubs were established in Welimada (intensive vegetable cultivation system) and Balangoda (rice-based system) to develop and scale sustainable practices (Output 14). Trials with 150 farmers focused on carrots, cabbage, tomatoes, and green beans, complemented by real-time climate and agronomic advisories. Training programs covered GAPs, polytunnel cultivation, and IPM for farmers and extension staff. FRESH distributed 12 polytunnels and 10 sprinkler irrigation kits (Output 13), held 25 field days, and established eight large-scale demonstration fields (Output 12). Farmer guidebooks and videos were developed to support broader adoption.

WP4: Post-harvest and inclusive markets



Work Package 4 progress against the theory of change

WP4 partners—AHR, USYD, WUR, University of the Philippines, Industrial Technology Institute of Sri Lanka, WorldVeg, UAC, and others— leveraged their expertise to assess food safety risks, evaluate postharvest losses (Output 15), develop intervention strategies (Output 17), and improve functioning within F&V value chains (Output 19).

In the Philippines, FRESH conducted an economic assessment of the market, finding a significant and growing gap between local supply and demand for fresh produce, driven in part by postharvest losses of 20 to 40 percent. To address this, WP4 successfully piloted the "CoolBot," an intervention that uses a simple air conditioner and insulated room to maintain storage temperatures of 10°C or lower. A demonstration unit was installed in Saraiya, an important production area supplying markets in Manila. Other interventions included improved packaging, heat treatments of mangos, and better ripening practices.

Value chain research in Benin focused on waste within tomato supply chains, revealing that overpacking in deep baskets reduced growers' potential returns by 23 to 45 percent. WP4 researchers identified waste reduction strategies, such as lining baskets with leaves, reducing overloading, and packing into reusable plastic crates. The crate hire system used in <u>Nigeria</u> could have significant benefits in Benin, reducing waste and improving quality for consumers. In Sri Lanka, FRESH assessed farmer practices and postharvest losses across six key F&V value chains (papaya, mango, pineapple, tomato, bean, and cabbage). Losses ranged from 15 to 24 percent, with value decreasing during transport and storage. Mango waste could be reduced by using postharvest waxes to extend shelf life. Residue testing of 164 F&V samples found pesticide residues on nearly half, with most detections exceeding maximum residue limits. Gotukola, papaya and pineapple were the most contaminated products tested. Encouragingly, no GAP products from FRESH WP3 hubs contained detectable pesticides.

Similar pesticide levels were reported in Tanzania, with ongoing analysis of samples from markets and WP3 hubs by the Tanzania Plant Health and Pesticides Authority. Microbial testing revealed high rates of E. coli contamination, with 70 percent of leafy vegetable samples and 35 percent of "ready-to-eat" salad samples containing potentially harmful levels (> 100 CFU/g). To address postharvest concerns, WP4 piloted a range of targeted interventions. Plastic crates reduced tomato damage from 26 percent to 8 percent, while cool boxes helped leafy greens stay fresh for at least 24 hours. Additional low-cost solutions, such as evaporative cooling, misting, and the Cool-Bot, were demonstrated to reduce losses and enhance product quality.

WP5: Food environments

WORK PACKAGE

21 · Collaborative needs assessment reports, produced with key stakeholders focused on F&V food environments in FRESH focus countries.

 22 · Country specific food environment profiles incorporating mixed methods (surveys, qualitative research, affordability and geospatial analysis).
 23 · Comparative policy processes and case study reports/papers to understand an equitable policy environment for potential policy options.

24 · Menu of options of innovations, approaches, regulations, incentives, programs and policies for creating fruit and vegetable-rich food environment.

- 25 · Intervention co-design workshops.
- 26 · Country specific pilot/impact evaluation plans and results dissemination.

OUTCOMES

- 21 **13** Increased awareness among key stakeholders of food environment characteristics and options for addressing accessibility constraints across contexts and population groups.
 - 14 Partners support the implementation and evaluation of programs addressing Food Environment constraints through public and private innovations across contexts and population groups.

END-OF-INITIATIVE OUTCOME 6

5 At least four programs aimed at making fruits and vegetables more accessible and affordable use F&V country profiles and evidence-based guidance in their design.

END-OF-INITIATIVE OUTCOME 8

5 National-level fruit and vegetable programs, regulations, laws or policies.

Work Package 5 progress against the theory of change

WP5 aimed to increase stakeholder awareness of food environments, identify constraints to the accessibility of F&V, and codevelop solutions with national stakeholders. With support from core partners—IFPRI, ABC, WorldVeg, and IDS—WP5 began by assessing existing evidence and understanding key characteristics of F&V food environments in each focal country. Findings were synthesized and documented in country briefs.

In Tanzania, Sri Lanka, and the Philippines, collaborative needs assessment workshops were held to engage stakeholders and identify priorities (Output 21). These were followed by lived experience research in Sri Lanka and Tanzania, providing rich insights into local food environment contexts captured through StoryMaps. Similar research methodology led to the development of a practical guide for conducting integrated food environment assessments. This approach was shared during a learning lab at the Delivering for Nutrition in South Asia Conference (D4N) in Colombo in December 2024.

In Tanzania, WP5 began formative research in 2023 as part of the end-to-end impact evaluation (Output 22). Scoping visits to four open-air markets and surrounding food environments helped classify vendor types, supporting the design of survey tools. A census and seven rounds of bimonthly follow-up surveys were conducted to assess retail outlets, vendors, and markets in the sample areas. Preliminary findings were presented at the FRESH Science Conference in Arusha in August 2024. The survey data, alongside the lived experience research, will guide the design and implementation of food environment interventions.

In Sri Lanka, the end-to-end impact evaluation was set up in May 2024, including a similar food environment assessment. Unlike Tanzania, the Sri Lanka assessment also included an urban sample. Some of the initial findings were presented at D4N in 2024. In Sri Lanka, WP1 and WP5 worked together in the process of codesigning interventions that will be implemented in the evaluation sample. The codesign process follows the <u>human-centered design approach</u> developed by the Global Alliance for Improved Nutrition (GAIN).

In the Philippines, WP5 explored schools as key settings to enhance F&V consumption among children, including the production and consumption of indigenous F&V. A separate study investigated factors influencing the availability of IVs in urban markets, emphasizing the importance of consumer awareness, improved supply chains, and access to education, particularly for urban women.

WP6: Strengthening the enabling environment



Work Package 6 progress against the theory of change

WP6 researchers from IFPRI, WorldVeg, and USYD conducted research on the policy landscape shaping the F&V sector (Output 27), strengthened the capacity of stakeholders to apply the end-toend approach (Output 28), and collaborated with local partners on strategic foresight (Output 29).

USYD and WorldVeg analyzed the role of F&V in national and regional policies in Benin, Tanzania, the Philippines, and Sri Lanka. After an initial mapping of policy actors and policies based on stakeholder workshops and document analysis, the team focused on specific policy topics in each country. In 2024, the role of regional economic blocks—such as ASEAN in Southeast Asia and ECOWAS in West Africa—in the F&V sector was further analyzed. The general findings highlight the importance of strengthening multisectoral collaboration and improving policy integration and equity considerations to promote F&V consumption.

The end-to-end approach was also analyzed through a global scoping literature review of food systems interventions aimed at increasing the availability, affordability, accessibility, and acceptability of F&V. Analyzing 881 scientific papers, the review showed that only 17 percent of studies were implemented in low- and middle-income countries, and 50 percent of the interventions aimed to influence a

single aspect (mostly acceptability), with 3 percent of interventions addressing all five aspects.

To bridge the gap between research and application, FRESH engaged with various actors in the enabling environment by conducting a series of activities to promote the end-to-end approach and encourage cross-sectoral exchange on increasing F&V production and consumption, among other related topics. These engagements included science meetings in Sri Lanka and the Philippines, as well as a larger conference in Tanzania, and were carried out through existing multistakeholder platforms such as the Arusha Sustainable Food Systems Platform in Tanzania and the National Platform of Actors in Vegetable Value Chains in Benin, or through groups convened by FRESH. Furthermore, in both Tanzania and Benin, researchers from WUR, WorldVeg, and IFPRI conducted a foresight analysis in collaboration with local stakeholders to critically explore the future role of F&V in local food systems under alternative scenarios. The exercise contributed to building expertise, fostering consensus, and providing actionable insights for the future of food systems. The resulting report was well received by the government and other stakeholders.

Fresh fruit and vegetables at a market in Colombo, Sri Lanka. Credit: Sydney Honeycutt/IFPRI 1240

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WORK PACKAGE	PROGRESS RATING & RATIONALE
1	WP1 aimed to have four programs informed by outputs generated under WP1. This occurred in three of four focal countries; in two countries, this was driven largely by FRESH partners and associated stakeholder groups, and in the Philippines, the WP able to influence a national-level program design. In Benin, WP1 was delayed by funding and time constraints. The three programs will be evaluated in the coming years.
2	On track Through the first two and a half years of the Initiative, WP2 reached about half of the intended 10,000 farmers. Given that the Initiative was cut short, along with the initiated commercialization of the developed varieties, this is considered to be on target, as the number of farmers reached during 2025 is expected to exceed the target.
3	On track WP3 reached 11,950 farmers and extension workers through on-farm trials and training at demonstration plots, farmer field days, and the use of media outreach and infographics. WP3 also successfully piloted more than three Innovation Packages across the four focal countries.
4	WP4 has piloted more than 12 innovations across the four focal countries. These innovations ranged from innovations to maintain storage temperatures, to postharvest waste reduction innovations to measures to reduce pesticide use and improve product quality. Examples include low-cost cooling solutions (e.g. the "CoolBot," and optimized evaporative cooling), heat treatments and biologicals for rot control. WP4 researchers also piloted waste reduction strategies, such as lining baskets with leaves, reducing overloading, and packing into reusable plastic crates. Plastic crates reduced tomato damage from 26% to 8%, while cool boxes helped leafy greens stay fresh for at least 24 hours.
5	WP5 made progress toward supporting the design of programs that improve the accessibility and affordability of F&V. However, progress was somewhat delayed but accelerated in the last year. Country-specific evidence gathered through needs assessments, surveys, and participatory research informed ongoing codesign processes in Tanzania, Sri Lanka, and the Philippines and will continue to guide the development of food environment innovations, programs, and policies across the focal countries. Two of these innovations will be tested as part of the end-to-end approach in the coming years.
6	WP6, in coordination with WP1, WP2, WP4 and WP5, influenced national level programs, laws and/or policies in all four countries. For example, in Benin, a Vegetable Seed Sector Roadmap was delivered to the Ministry of Agriculture. In Tanzania, FRESH contributed inputs to the National Roadmap and Action Plan for Sustainable Food Systems Transformation by 2030. FRESH also participated in preparing guidelines for establishing horticultural crop platforms that respond to objective 6 on strengthened coordination of the National Horticulture Development Strategy and Action Plan 2021–2031. FRESH was also represented in the Nutrition-Sensitive Thematic Working Group, one of several thematic working groups of the NMNAP II. In the Philippines, engagements led by WP1 and WP5 contributed to influencing a change to increase the allocation for F&V in a national fresh food voucher program.
	Definitions



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



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



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

Section 4: Quantitative overview of key results

This section provides an overview of results reported and contributed to, by the CGIAR Initiative on Fruit and Vegetables for Sustainable Healthy Diets from 2022 to 2024. These results align with the <u>CGIAR Results Framework</u> and Fruit and Vegetables for Sustainable Healthy Diets's theory of change. Further information on these results is available through the <u>CGIAR Results Dashboard</u>.

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

OVERVIEW OF RESULTS BY CATEGORY



From 2022 to 2024, FRESH reported a total of 194 results, encompassing capacity sharing for development, innovation development, knowledge products, and other outputs.



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

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

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

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

The results contributed to all five CGIAR Impact Areas, with most (143) contributing directly to the Impact Area on Nutrition, Health, and Food Security, followed by Environmental Health and Biodiversity (90) and Poverty Reduction, Livelihoods, and Jobs (56).



KNOWLEDGE PRODUCTS BY TYPOLOGY

FRESH produced a total of 82 knowledge products between 2022 and 2024.



One result can impact multiple countries and can therefore be represented multiple times.

The reported results took place in the regions of West Africa, East Africa, South Asia, and Southeast Asia. Most results were related to activities in FRESH's focal countries: Benin, Tanzania, Sri Lanka, and the Philippines.



NUMBER OF INDIVIDUALS TRAINED BY THE INITIATIVE

Long-term trainees: Long-term training refers to training that goes for three or more months.
 Short-term trainees: Short-term training refers to training that goes for less than three months.

From 2022 to 2024, FRESH trained over 2,000 individuals through capacity sharing efforts. Activities included farmer field days, technical workshops for extension agents and seed producers, biodiversity trainings, and enumerator trainings for data collection.

INNOVATIONS USERS BY ACTOR TYPE



INNOVATIONS BY TYPOLOGY



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

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

CAPACITY DEVELOPMENT INNOVATION Innovations that strengthen capacity, including farmer, extension or investor decision-support services; accelerator/includator programs; manuals, training programs and curricula; online courses. OTHER INNOVATION Unknown or the type does not work for the innovation.

NUMBER OF INNOVATIONS AND THEIR READINESS LEVELS

0		Pipeline overview # of innovations
9	PROVEN INNOVATION The innovation is validated for its ability to achieve a specific impact under uncontrolled conditions	
8	UNCONTROLLED TESTING The innovation is being tested for its ability to achieve a specific impact under uncontrolled conditions	0
7	PROTOTYPE The innovation is validated for its ability to achieve a specific impact under semi-controlled conditions	0
6	SEMI-CONTROLLED TESTING The innovation is being tested for its ability to achieve a specific impact under semi-controlled conditions	2
5	MODEL/EARLY PROTOTYPE The innovation is validated for its ability to achieve a specific impact under fully-controlled conditions	2
4	CONTROLLED TESTING The innovation is being tested for its ability to achieve a specific impact under fully-controlled conditions	3
3	PROOF OF CONCEPT The innovation's key concepts have been validated for their ability to achieve a specific impact	3
2	FORMULATION The innovation's key concepts are being formulated or designed	0
1	BASIC RESEARCH The innovation's basic principles are being researched for their ability to achieve a specific impact	0
0	IDEA The innovation is at idea stage	1

FRESH reported 11 innovations at different stages of development. Examples include seed kits with improved vegetable varieties (WP2), safe and sustainable production practices (WP3), and postharvest management strategies (WP4). These innovations reached farmers, extension agents, and policy actors across the four focal countries.

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FRUIT AND VEGETABLES FOR SUSTAINABLE HEALTHY DIETS'S EXTERNAL PARTNERS

Over the past three years, FRESH's partnerships evolved and expanded as the Initiative scaled up its activities. FRESH was implemented by a group of core partners—five CGIAR Centers (IFPRI, CIMMYT, ABC, IWMI, and CIP), alongside WorldVeg, AHR, USYD, IDS, WUR, UC Davis, SUA, WYB, and DOST-FNRI, as well as other national and global partners. These partnerships were a critical component of FRESH's end-to-end approach, working across the value chain and linking to policy environments in each focal country.

In Benin, FRESH worked closely with the National Horticulture Platform, led by the African Center for Equitable Development. The platform brings together food system actors from government, academia, and the private sector—including small and medium enterprises, seed producers, farmer associations, and consumers. In 2024, FRESH collaborated with core members of the platform and researchers from UAC and University of Parakou to produce a <u>foresight analysis</u> of Benin's F&V sector. The report was presented to the Ministry of Agriculture, with plans to disseminate recommendations across the country in 2025. Additionally, FRESH engaged with INRAB, UAC, and local seed companies to develop and introduce improved vegetable varieties.

In Tanzania, FRESH continued to strengthen its relationship with the Arusha Sustainable Food Systems Platform, co-led by Arusha City Council and Rikolto. Two stakeholder meetings were held to share progress across WPs and conduct a collaborative needs assessment on food environments. The <u>FRESH Science Conference</u> was held in August 2024, convening more than 150 stakeholders. The event included field visits to FRESH production hubs and a local F&V market. At the national level, FRESH remained engaged with the Nutrition-Sensitive Technical _Working Group—part of the NMNAP II led by the Ministry of Livestock and Fisheries—linking FRESH activities to broader policy priorities. FRESH also partnered with GAIN in Tanzania to codesign demand and food environment interventions that could address the context-relevant barriers to increasing the intake of F&V with key stakeholders, including potential beneficiaries.

In the Philippines, ongoing participation in national stakeholder groups demonstrated a growing interest in FRESH's end-to-end approach. Partnerships with DOST-FNRI and IIRR provided a foundation for connecting with local partners, supporting efforts ranging from indigenous F&V conservation to school-based interventions. FRESH organized the <u>Science and Innovations Forum</u> in Manila in July 2024, which offered a platform for policymakers, researchers, and civil society actors to exchange insights on food systems and F&V, opening opportunities for future collaborations.

In Sri Lanka, partnerships grew through targeted collaboration with government agencies, research institutions, and the private sector. FRESH's work with the Plant Genetic Resources Centre informed national seed systems strategies, while partnerships with the Department of Agriculture supported the establishment of F&V production hubs. A national stakeholder <u>Science Meeting</u> was held in December 2024, allowing FRESH researchers to share updates and initiate conversations about continuing work moving forward. The meeting was co-organized with stakeholder group members who had ongoing engagement with FRESH's end-to-end approach. As in Tanzania, FRESH partnered with GAIN to facilitate two workshops with community members to codesign demand and food environment interventions.

Across all countries, FRESH's partnerships were instrumental in aligning activities with national needs, enabling the cocreation of strategies to increase F&V production and consumption. The Initiative's growing network of partners effectively generated support for F&V research, policies, and programs, creating a strong foundation for continued progress toward sustainable healthy diets across the focal countries.

FRUIT AND VEGETABLES FOR SUSTAINABLE HEALTHY DIETS'S INTERNAL NETWORK OF COLLABORATIONS



In 2024, FRESH supported global, regional, and national efforts in advancing research by strengthening collaborations and facilitating information sharing to learn from other actors in the food system. FRESH supported and participated in nutrition-focused global and regional events. FRESH was among the 10 Initiative cohosts of a regional conference, Delivering for Nutrition in South Asia. This year's event was convened in Sri Lanka, one of the four FRESH focal countries, providing an excellent opportunity for in-country partners to share ongoing research and receive feedback from a regional and global audience. In the Philippines, FRESH worked alongside the CGIAR Research Initiative on Resilient Cities to identify synergies and share findings with key stakeholders. FRESH also partnered with the USAID Horticulture Innovation Lab to conduct mixed methods research to understand investments in research and development in the F&V sector.

In the Philippines, FRESH WP2 worked with the CGIAR ClimBeR Initiative to support climate adaptation in rural areas, promoting fruit trees to enrich existing biodiversity. A key focus was the use of multi-storied systems as a micro-climate manipulation strategy to reduce temperatures above and below ground. The conservation of soil life was also featured via residue management, cover cropping, and mulching. In Quezon, 11 barangays established climate-smart agriculture demonstration sites focused on multistory agroforestry, reaching over 500 farmers. Women played a prominent role in this effort, which also prioritized nutrition through increased fruit consumption. In Capiz, six upland barangays implemented fruit tree-based agroforestry as an adaptation strategy, and in Cavite, five barangays enhanced existing coffee-based agroforestry systems with fruit trees. Across three provinces, over 15,000 fruit tree seedlings were distributed, strengthening the resilience of smallholder farmers to climate risks while promoting sustainable and diversified farming systems.

FRESH continued to engage with other CGIAR Initiatives that shared the primary research goals of improved health, diet, and nutrition outcomes. As an example, there continued to be a shared interest in standardizing tools and methodologies, as well as learning from each other's experiences across these Initiatives. Therefore, researchers from FRESH and two other CGIAR Initiatives—Sustainable Healthy Diets and Resilient Cities—continued hosting and participating in a hybrid seminar series to exchange information on food environment and dietary assessment research. By the end of the Initiative's cycle, the email distribution list had 200 members. In 2024, six seminars were given across a range of food environment– and diet-related topics. This exchange of information and ideas fostered cross learning among the Initiatives, enabling them to draw upon best practices and innovative approaches. This series will continue in 2025 and beyond.

FRESH innovations provided a way to foster collaborations and share learning experiences. In Sri Lanka, FRESH and the CGIAR Research Initiative on Climate Resilience worked together to pilot a mobile phone application that provides real-time climate information and agronomic advisories to farmers. This digital innovation was piloted at FRESH production hub sites. Another digital tool was piloted across Initiatives, with Resilient Cities and FRESH both testing a realtime diagnostic app driven by artificial intelligence that can assess diets and nudge app users across different countries to make betterinformed choices about healthy diets.

Strengthening Benin's seed systems with resilient vegetable varieties

Seed system innovation strengthens Benin's fruit and vegetable sector, delivering resilient varieties to more than 3,000 smallholder farmers.



Primary Impact Area



Contributing Initiative

Fruit and Vegetables for Sustainable Healthy Diets

Contributing Centers

IRRI- International Rice Research Institute

Contributing external partners

World Vegetable Center · National Institute of Agricultural Research of Benin · National Vegetable Seed Producers Association, Abomey-Calavi, Benin



Geographic scope

Countries: Benin

Smallholder farmers in Benin faced low yields due to limited access to resilient seed varieties. The CGIAR FRESH Initiative, in collaboration with the World Vegetable Center and national partners, introduced 27 improved vegetable varieties through on-farm trials, distributing seeds to more than 3,000 farmers. Early certification and seed replication began in 2024, with plans to scale production in 2025. With better access to quality inputs, farmers are improving their livelihoods and strengthening local vegetable supply chains.

High-quality seeds are essential for ensuring a stable supply of diverse, safe, and nutritious vegetables. Yet, for years, farmers in Benin struggled to obtain improved varieties suited to their growing conditions. The national seed catalog included only 10 registered local vegetable varieties, many highly susceptible to disease. With few alternatives and hybrid seeds unaffordable and inaccessible for most small-scale farmers, vegetable crop yields remained low.

This challenge was particularly evident in the Valley of Ouémé, a key vegetable production region. Tomato farms were devastated by bacterial wilt, a soilborne disease that wiped out entire harvests, forcing most farmers to abandon production altogether. As a result, vegetable supply dwindled in local markets, as did income opportunities for farmers, traders, and vendors.

The CGIAR Research Initiative on Fruit and Vegetables for Sustainable Healthy Diets (FRESH) partnered with the World Vegetable Center to introduce improved vegetable varieties in Benin with good resistance or tolerance to local biotic and abiotic constraints. A rigorous selection process identified 27 promising okra, tomato, amaranth, and pepper varieties. Participatory on-farm trials were conducted throughout the country, enabling farmers to assess the varieties' performance firsthand.

FRESH worked closely with the National Institute of Agricultural Research of Benin to fast-track variety registration in the national seed catalog. To ensure the new seeds could reach farmers as quickly as possible, the Ministry of Agriculture, through the National Seed Service, allowed seed multiplication to begin before the official release. FRESH partnered with three local seed companies to start seed production.

FRESH also invested in strengthening the capacity of Benin's seed system. Seed company staff were trained in seed production and marketing, enabling them to produce and distribute the varieties more effectively. More than 3,000 seed samples were distributed to farmers so that they could test the varieties themselves. The first certified seed production was completed in 2024, paving the way for commercialization.

With improved access to disease-resistant, high-yielding seeds, farmers in Benin are better positioned to increase production, enhance their livelihoods, and contribute to a more stable food supply. By partnering with local seed companies, FRESH laid the foundation for a sustainable system that ensures continued access to quality seed, reducing reliance on seed imports. As production increases, markets will benefit from the steadier supply, while consumers will have greater access to fresh, nutritious vegetables at more affordable prices. Through this holistic approach, FRESH contributed to a food system that is more resilient and nutritionsensitive, benefiting farmers, consumers, and communities across Benin.

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I improved my technical know-how in seed production and marketing through the capacity strengthening supported by FRESH. Vegetable seed producers used to have very limited access to vegetable varieties, limiting our profitability as we all end up producing the same variety. With the newly released varieties, we have more choices to better serve farmers. The varieties are well adapted to local production conditions, and we are ready to meet the demand being created through field days and seed kit distribution. The first batch of seed of the released varieties was certified and will hit the market soon.

Mr. Hyacinthe Eke, Head of the <u>Seed Cooperative Jardin Pour</u> Tous and Head of the National Vegetable Seed Producers Association, Abomey-Calavi, Benin



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CGIAR Initiative on Fruits and Vegetables for Sustainable Healthy Diets (FRESH)



2023 key result story

Engaging stakeholders to shape nutrition policy

Fruit and Vegetables for Sustainable Healthy Diets



