Resilient Cities
Through Sustainable Urban and Peri-urban Agrifood Systems

Lead: Simon Heck (s.heck@cgiar.org)
Deputy Lead: Silvia Alonso (s.alonso@cgiar.org)

Proposal
November 23, 2021

Table of contents

A list of acronyms used in this Proposal can be found here

Summary table

Initiative name	**Resilient Cities Through Sustainable Urban and Peri-urban Agrifood Systems**
Primary Action Area	**Resilient Agrifood Systems (RAFS)**
Geographic scope	**Global, with priority activities in Bangladesh, Philippines, Kenya, Ethiopia, Ghana, and Peru**
Budget	**US$25M**

1. General information

Initiative name: Resilient Cities Through Sustainable Urban and Peri-urban Agrifood Systems

Primary CGIAR Action Area: Resilient Agrifood Systems (RAFS)

Lead: Simon Heck, s.heck@cgiar.org

Deputy Lead: Silvia Alonso, s.alonso@cgiar.org

Initiative Design Team members and affiliations:

IDT member	Affiliation
Silvia Alonso	CGIAR
Danny Coyne	CGIAR
Pay Drechsel	CGIAR
Simon Heck	CGIAR
Laura Munro	FCDO
Deanna Olney	CGIAR
Soroush Parsa	CGIAR
Gordon Prain	Independent Consultant

Pepijn Schreinemachers	World Vegetable Center
Rene van Veenhuizen	RUAF Global Partnership

2. Context

2.1 Challenge statement

By 2050, more than two in three people on the planet will live in an urban environment, including over 5.5 billion in LMICs[1]. The agrifood sector will play a central role in humanity's transition to an urban world over the next generation[2]. Local and global agrifood systems need to step up and adapt to feed and nourish expanding urban populations, reduce human and environmental health risks, and secure economic opportunities for the urban poor. The COVID-19 pandemic[3] and climate emergencies have further highlighted the urgency for research and innovation to help strengthen food system resilience on a rapidly urbanizing planet. Securing a future for productive, green, and livable cities with healthy populations has become a global priority[4] [5] [6]. Countries in CGIAR target regions are struggling to keep pace with the implications of rapid urbanization and are demanding technically sound, equitable and scalable solutions in the agrifood sector[7]. Key challenges for agrifood action in urban and peri-urban (abbreviated as UPU in this proposal; see Annex 1 for the full list of acronyms) environments include growing pollution and environmental degradation, increasing social and economic inequalities, growing competition for land and water resources, and weak or absent agrifood governance structures.

Agrifood systems can rise to meet these challenges. Harnessing the tremendous urban capacities for innovation and supported by scientific research, UPU agrifood systems can generate technological, institutional and social change that can secure food and livelihoods for future urban generations. CGIAR research is well positioned to provide global leadership in this process, building on previous[8] and ongoing[9] research together with our partners. Within an integrated UPU resilience perspective, five entry points stand out for immediate research action:

(i) Making UPU food production (vegetables, livestock and fish) more efficient, safer, and sustainable by improving smallholder access to better technologies, practices, services and clean production environments;
(ii) Improving informal urban food markets and rural-urban supply chains through access to appropriate technologies (storage, processing) and business development services that strengthen economic opportunities for women and youth;
(iii) Improving urban food environments and creating demand for and access to healthier diets for the urban poor to counteract the rising double-burden of overnutrition and undernutrition[10], and diet-related NCDs;
(iv) Supporting innovations for a circular bioeconomy by turning urban (food) waste and wastewater into safe and efficient resources for food production, driven by public-private partnerships; and
(v) Developing improved research capacities and tools to support UPU agrifood governance, innovation services, and investment planning for sustainable agrifood sector growth.

In addressing these challenges, the *Resilient Cities Through Sustainable Urban and Peri-urban Agrifood Systems* Initiative (Resilient Cities, for short) will approach UPU agrifood systems as part of highly dynamic urban systems rather than as extensions of rural agricultural systems and foster new research collaborations across different urban economic and social sectors.

Unlike in rural areas, the agrifood sector often has low visibility and support within the urban policy and investment context – resulting in missed economic and social opportunities and increased health and environmental risks. An important part of the challenge, therefore, is to engage urban stakeholders and policy makers more effectively in agrifood systems policy and technical dialogues.

2.2 Measurable 3-year (end-of-Initiative) outcomes

1. **At least 10,000 small-scale producers** in UPU zones can access and utilize improved technologies, skills, know-how and management tools for safer, more sustainable and more efficient vegetable, livestock and fish production. Reducing the excessive use of agrochemicals and increasing the use of nature-positive alternatives will increase availability of diverse, nutritious and safe foods from less polluted UPU environments.
2. **At least 10,000 local MSMEs** in food processing, marketing and agrifood service sectors can access and utilize business development toolkits, improved technologies, knowledge and skills, with strong participation by women and youth. These investments will generate increased employment and incomes and will help improve availability and affordability of nutritious foods among low-income UPU consumers.
3. **Municipal authorities and their public and private sector partners in at least six cities** adopt evidence-based approaches, tools, and business models for planning, implementing, and monitoring investments in a circular bioeconomy (safe food waste and wastewater reuse) and/or strategies to mitigate environmental and human health risks including waterborne, foodborne, and zoonotic diseases, informing new guidelines by global scaling partners such as FAO or WHO.
4. **At least 4 million consumers benefit from nutrition programs** in public, civil society and private sector that use evidence-based UPU food environment and consumption toolkits, including approaches to increase women's decision-making power and to improve diet quality and nutritional status.
5. **Urban planners and stakeholders participating in global networks of more than 200 cities representing over 400 million consumers** use, promote and further improve Research and Innovation tools and approaches developed by research and training institutions and civil society groups to accelerate UPU agrifood system development and strengthen urban resilience.

2.3 Learning from prior evaluations and impact assessments (IA)

Resilient Cities responds to the need for an integrated research approach to UPU agrifood systems within CGIAR by linking existing high-quality yet fragmented research on key elements of these systems through a common resilience research agenda. The current proposal capitalizes on the strengths, opportunities and weaknesses highlighted in the 2021 Synthesis on Learning from a decade of CGIAR Research Programs[11] and the 2017 Global Food Policy Report[12] on urbanization.

Resilient Cities leverages CGIAR's strengths, building on partnerships with NARES and universities, working closely with policymakers at all levels, and furthering legacy research on urban agriculture (see Section 2.5) and One Health. The Initiative's research agenda includes approaches to recover and reuse solid and liquid urban waste highlighted as a priority in the 2019 evaluation of Resources, Recovery and Reuse Sub-program of the Water, Land and

Ecosystems CRP[13]; as well as tools to assess and improve diet, nutrition and health outcomes recommended in the 2020 evaluation of the Agriculture for Nutrition and Health CRP[14].

Resilient Cities also addresses weaknesses identified in the Synthesis of Learning from a Decade of CGIAR Research Programs[15]. First, we apply a strong poverty and social inclusion focus in our research and innovation strategy by prioritizing livelihood, diet and nutrition constraints among poor urban women and youth. Second, we engage a wide range of stakeholders throughout the research process, from priority setting to design, implementation, and evaluation. This will increase accountability to stakeholder demand and will allow us to receive feedback and adjust research focus and modalities.

Annex 2 provides a list of demand, innovation and scaling partners who will be involved in the Initiative.

2.4 Priority-setting

Resilient Cities bases its prioritization on recent global and regional analyses of UPU agrifood systems and of strategic entry points for research[16] [17] [18] to strengthen their resilience. To capture diverse and dynamic urban food supplies effectively and to account for the influence of urban demand on the overall food system, we will adopt and further advance a CRFS[19] approach. This will allow us to identify and pursue impactful research questions within a widely accepted systems framework encompassing territorial, economic, social and ecological perspectives.

The six target countries for 2022–2025 are Peru, Ghana, Kenya, Ethiopia, Bangladesh, and the Philippines. These countries were selected on the following criteria: (i) They represent key UPU food system challenges of global significance; (ii) Stakeholders in these countries have expressed demand for CGIAR research to support their ongoing or incipient efforts to address these challenges; and (iii) CGIAR has capacity and partnerships in place to provide this support. Within these countries we will focus on urban centers that offer the most impactful opportunities for innovation and learning, including secondary or tertiary cities. Selected research activities will be pursued in additional countries with ongoing related CGIAR research projects such as in Burkina Faso, Rwanda, Sri Lanka and Cambodia. Consultations were held with global partners such as FAO, RUAF, GAIN, and the World Bank, with in-country stakeholders and other related CGIAR Initiatives to verify this country selection approach (see Section 2.6).

Research priorities have been identified through discussions with partners and stakeholders in each target country, and analyses of previously published studies[20], and will be refined through multi-stakeholder platforms[21]. Research methodologies[22] will be adapted to the urban environment. Specific research activities will be prioritized with city stakeholders and partners and will vary according to demand and not all WPs will be equally implemented in each city.

Research will be organized in five Work Packages (WP) focused on separate but linked research areas with cross-cutting contributions to strengthening UPU agrifood system resilience[23]. Priority research activities will address efficiency and safety of UPU vegetable production and small livestock keeping (*WP1*); informal urban food markets and supply chains (*WP2*); opportunities for circular bioeconomy and enhanced food safety (*WP3*); improving urban food environments for healthier diets (*WP4*); and strengthening urban food governance and innovation capacities (*WP5*). Research strategies will pay attention to linkages across these research domains, for example by working with peri-urban producers, market vendors, and consumer groups to identify leverage points for markets to differentiate and reward food safety[24], and consumers to value food safety attributes[25]. Similarly, human and environmental health is a particular challenge in UPU agrifood systems that requires innovative and integrative approaches across sectors and stakeholder groups in environments where risk awareness is limited[26]. This also extends to tackling the enormous amounts of organic (food) waste generated in cities that can be turned into opportunities for private sector investments in the circular economy[27] through targeted research and innovation support. Success in any of these areas will depend on the effective engagement of stakeholders[28] such as local governments, CSOs, food producers, and private sector companies.

2.5 Comparative advantage

Over the last two decades, international research on UPU food systems across the Global South has been mainly driven by CGIAR and (with a focus on Francophone countries) CIRAD[29]. Through Urban Harvest (2000–2010)[30], the CGIAR system-wide Initiative on UPU agriculture, and the Rural-Urban Linkages (RUL) flagship (2012–2021)[9] of the Water, Land and Ecosystems CRP, CGIAR has two decades of experience in analyzing UPU agricultural systems and related urban challenges such as safe wastewater irrigation, documented in more than 1,000 CGIAR publications[31]. This research has been carried out in close collaboration with urban stakeholders and international scaling partners such as FAO[32], UNEP, WHO, and RUAF — generating an influential set of international public goods[33]. CGIAR and partners have developed methodologies and gender-sensitive indicator frameworks[34] tailored to the multi-stakeholder UPU context that have been adopted by international urban food system networks involving over 200 cities[35]. WHO, and RUAF — generating an influential set of international public goods[36]. CGIAR and partners have developed methodologies and gender-sensitive indicator frameworks[37] tailored to the multi-stakeholder UPU context that have been adopted by international urban food system networks involving over 200 cities[38].

This record now positions the Initiative to effectively tackle a higher order of research challenges and guide the scaling of solutions generated so far. Importantly, for the first time, the Initiative will bring together separate UPU research streams across CGIAR Centers into an integrated resilience approach. Through the proposed Center of Excellence for UPU Agrifood Systems, CGIAR will fill a critical global gap by convening research, demand and scaling partners from the Global South and North to develop and pursue a resilience-focused research agenda that responds to the urgent demand from cities and their stakeholders in LMICs.

2.6 Participatory design process

Resilient Cities consulted widely with stakeholders and technical experts from the start of the design phase. Annex 3 provides an overview of consultations held. The IDT includes representatives from five CGIAR Centers, the World Vegetable Center, RUAF[39], and a funder agency. An International Advisory Group of 'demand brokers' and experts from the World Bank, FAO, donor agencies, and universities advises the IDT. We engaged global city networks such as MUFPP[40], ICLEI[41], and C40[42], pooling the perspectives and priorities of more than 2,500 city and regional governments on urban food systems.

The IDT followed a two-track consultation process. First, Work Package teams reached out to national experts to capture their perspectives on specific research demands. For example, detailed discussions were held with senior staff of the Department of Agriculture in the **Philippines** who lead a national urban agriculture program, resulting in a clear set of research priorities for inclusion in this proposal.

Research demands for **Bangladesh** were explored through consultations with prospective implementing partners actively involved in food system work in Dhaka. These included GAIN, WUR, and FAO.

In **Ghana**, consultations with long-term partners have identified clear research and development priorities building on more than 20 years of urban agrifood systems research led by IWMI.

In **Peru**, the Initiative will operate through 'Lima 2035' led by CIP, a vision for the city's future agrifood system, that was developed in consultation with more than 600 stakeholders from the general public, CSOs, local and national government and the private sector. Linkages will also be pursued with the Food Smart Cities program of Rikolto[43], an international NGO supported by IDRC.

In **Kenya**, the IDT consulted with the Nairobi City County to ensure alignment with the City's new Food Strategy[44]. Opportunities for collaboration were discussed with Mazingira Institute[45] for piloting of research tools, governance analyses and strengthening women's engagement; as well as with Tradecare Africa Ltd[46] to improve efficiencies and smallholder benefits in vegetable and fruit value chains to urban markets.

In **Ethiopia,** consultations with the Urban Agriculture Commission, Addis Ababa, the Ethiopian Institute of Agricultural Research, and the Ministry of Agriculture confirmed the urgent demand for research and technology support to expand and diversify the supply and marketing of vegetables among urban populations.

Secondly, we held broader discussions with multilateral organizations and international programs. The IDT presented the Initiative to more than 400 participants at the 7th Global Forum of MUFPP in October 2021[47] and received detailed feedback from cities and their technical partners. Joint meetings with leaders of FAO's urban agenda programs, including CRFS[48] and the new Green Cities Initiative[6] led to a clear understanding of the complementarities between our Initiatives in research, training, investment planning, and policy engagement. Similarly, we will collaborate with WFP's evolving Urban Strategy[49] to strengthen their evidence base.

A major partnership is evolving with the World Bank's Global Agriculture and Urban Practices[50] who are joining forces to address urgent investment needs and opportunities in urban food systems. The IDT will participate in the new Community of Practice on Urban Food Systems hosted by the World Bank through joint webinars.

Annex 4 provides a set of Letters of Support from many of these stakeholders and partners that reflect their priority demand for the Initiative and lays out possible complementarities with their own work.

2.7 Projection of benefits

The projections below transparently estimate reasonable orders of magnitude for impacts which could arise as a result of the impact pathways set out in the Initiative's Theories of Change. Initiatives *contribute* to these impact pathways, along with other partners and stakeholders.

For each Impact Area, projections consider breadth (numbers reached), depth (expected intensity of effect per unit) and probability (a qualitative judgement reflecting the overall degree of certainty or uncertainty that the impact pathway will lead to the projected order of magnitude of impact).

Projections will be updated during delivery to help inform iterative, evidence-driven, dynamic management by Initiatives as they maximize their potential contribution to impact. Projected benefits are not delivery targets, as impact lies beyond CGIAR's sphere of control or influence.

2.7.1 Nutrition, health and food security

Impact Indicator: # cases communicable and noncommunicable diseases averted

Challenge**:** Where services like sanitation and waste management are outpaced by rapid urbanization, risks of waterborne, foodborne & zoonotic diseases are amplified. For example, 29.3 Mha of downstream irrigated croplands are affected by wastewater from urban areas with low levels of wastewater treatment that are home to 885 million urban consumers[51].

Breadth**:** We have tested 'farm to fork' solutions to cost-effectively (<US$50/DALY) avert up to 70% of DALYs[52] caused by the consumption of contaminated vegetables, reducing morbidity and mortality. In five cities in Ghana, around 700,000 urban dwellers consume raw salad greens as part of street food resulting in a QMRA estimated 477,000 cases of diarrhea annually. This is equivalent to a loss of about 12,000 DALYs of which we could avert 8,400 DALYs (70%)[53]. Total: At least 2 million urban dwellers benefitting (three countries).

Depth: **Substantial,** several 1,000 DALYs averted with a 0.1% mortality rate; weighting: 5–10.

Probability: **Medium (50–80%),** taking into consideration Government budget priorities and time gaps between understanding behavior change to the roll out of safe practice campaigns.

Impact indicator: # people meeting micronutrient requirements

Challenge**:** Poor quality diets are a primary cause of malnutrition which affects one-third of the world population, and are the leading cause of disease worldwide[54]. The urban poor are particularly affected by inadequate access to safe, health and affordably diets and social and health services which makes them susceptible to poor health and nutrition outcomes[55].

Breadth: Using estimates of the cost of an affordable diet from the recent SOFI report[56] as a proxy for adequate intake of micronutrients and population estimates from the six focus countries, we estimate that approximately 102 million people living in large cities are unable to afford a healthy diet. Improving diets could save one in five lives and avert an average of 16% of DALYs[51]. If successful innovations are scaled, we assume an improvement in the diets amongst ~1.5% of the vulnerable urban population. Total: 1.53 million people (80% women or youth).

Depth: **Lifesaving**, 20% (306,000); weighting 50+. **Transformative**, 50% (765,000); weighting 10–50. **Perceptible**, 30% (459,000); weighting 0.1–0.5.

Probability: **Medium (30–50%)** given the high priority given to nutrition and related issues like anemia and non-communicable disease prevalence in our focus countries.

2.7.2 Impact Area: Poverty reduction, livelihoods and jobs

Impact Indicator: # poor people benefiting from relevant CGIAR innovations

Challenge**:** The average growth of the urban population in low-income countries has been greater than 4% over the past 50 years[57] alongside the growth of urban poverty. Two- thirds of the population in LMICs live in slums or informal settlements[58], which account for the majority of current global population growth. Urban employment in LMICs, including agriculture, is between 50 and >90% informal[59]. It is estimated that in some cities in SSA, 40–60% of all employment is in the informal food sector[60]. Currently, a large percentage of informal sector jobs are classified by ILO as survival work and a smaller percentage as commercial MSMEs with potential for growth[61].

Breadth: A range of production, marketing, enterprise and communications tools will be applied across *WP1*, *WP2* and *WP3* specifically designed to increase decent work opportunities in food production, marketing and in the circular bioeconomy, strengthening 50% of informal sector jobs involved in MSMEs (estimated 30% of total food enterprises) and moving a conservative 20% of the survival enterprises (estimated at 70% of all food enterprises) to market enterprises. Total enterprises reached is based on the following formula: Urban working population/% informal/% in food sector/50%MSMEs+20% survival enterprises. **TOTAL:** 4 million (60% women or youth) in four countries.

Depth: **Transformative,** 50% of beneficiaries (survival enterprises); weighting 10–50. **Substantial,** 50% (income improvements among MSMEs); weighting 5–10.

Probability: **Medium (30–50%)**: *WP5* will contribute to an enabling environment that will strengthen the probability of achieving the projected benefits. This will be through strengthening evidence, tools and capacities for both policies protecting the agricultural spaces in peri-urban and urban areas, supporting repositioning and diversification of food markets to offer better income opportunities to producers and vendors and strengthening incentives and regulations to increase decent work. By engaging national governments and regional and global city networks, additional 20 cities will be recruited by 2030, beyond the initial 10 cities targeted in 2022–2025.

2.7.3 Impact Area: Gender equality, youth and social inclusion

Impact Indicator: # women benefiting from relevant CGIAR innovations

Challenge**:** Globally, 50% of women[62], compared to 76% of men, are in the workforce. In LMICs, the informal sector is the primary source of employment for women, especially own account businesses in the food sector[59], providing opportunities for the poor but also exposing them to low pay, lack of security, and unsafe working conditions. Women are especially represented in street vending and other precarious occupations[58].

Breadth: By working with the informal sector in target cities, we will support 50% of the informal sector jobs involved in women owned commercial MSMEs (estimated 30% of commercial MSMEs are owned by women) and moving a conservative 20% of the survival enterprises (estimated 70% of these are owned by women) to market enterprises.

The total number of women and youth reached is calculated by adding the women and youth benefitting through informal survival and commercial enterprises (Section 2.7.2) and through investments in diet improvement (Section 2.7.1). **TOTAL:** 3.6 million women or youth in four countries.

Depth: **Significant**, weighting: 1–5.

Probability: **Medium (30–50%).** *WP5* will help strengthen the enabling urban environment for women and youth to benefit from innovations. *WP1*, *WP2* and *WP4* will target women and youth in specific nodes in the food systems, i.e., production, marketing, food environment and consumption, through capacity development, gender-sensitive public policies that support marginalized groups, and strengthening the participation of women in private sector associations.

2.7.4 Impact Area: Climate adaptation and mitigation

Impact Indicator: # climate adaptation investments

Challenge**:** Methane emitted from organic (food) waste dumped on urban landfills is considered the third major anthropogenic source of CH_4, and it contributes approximately 11% of the total anthropogenic CH_4 emissions[63]. Reducing organic waste (especially food waste) and increasing resource recovery for reuse can help mitigate these GHG emissions, while recycling nutrients for agriculture (which saves also on GHG emissions[64]). Less than 2% of the nutrients entering cities are recycled back into the agricultural production cycle[65], but contribute to environmental pollution. Food waste management[66] and Resource Recovery for Reuse (RRR) are major components for climate change adaptation and food system sustainability (see Peak-Phosphorous[67]). Improved production innovations will additionally focus on water and nutrient efficient practices that conserve water and reduce excess chemical inputs.

Breadth: Transfer and adapt circular economy Innovation Packages (RRR technologies, RRR business models, RRR training[68]) based on multi-criteria feasibility studies[69] targeting organic domestic (food waste and septage) and agro-industrial waste. Currently, about 60 business models[70] for food waste reduction and resource recovery are available. **TOTAL:** At least USD 100 million invested in better urban organic waste management.

Depth: **Substantial,** weighting: 5–10.

Probability: **Medium (30–50%) to High (50–80%)** based on current feasibility studies for developing banks investing in urban waste management and sanitation.

2.7.5 Impact Area: Environmental health and biodiversity

Impact Indicator: # ha under improved management

Challenge**:** Agricultural intensification to feed rapidly growing cities[71] as well as human waste[48] in urban sewage contribute globally to water quality degradation affecting significantly ecosystem health and biodiversity[72]. The highly intensive UPU vegetable systems also facilitates pest and disease manifestation, increasing reliance on, use and misuse of synthetic pesticides. This has negative impacts on the environment and biodiversity[73].

Breadth: We will develop and promote best management practices for water quality and standards for UPU settings in countries relying on FAO guidelines targeting up to 6 Mha in participating countries in Africa and Asia by 2030[48]. Improved, more efficient and safer cropping practices will additionally be promoted. **TOTAL:** At least 6 Mha under improved management.

Depth: **Substantial,** weighting: 5–10.

Probability: **Very high (>80%)** expectation of achieving these impacts by 2030 through partnership with FAO, modelled on previous successful partnerships with UN agencies[74].

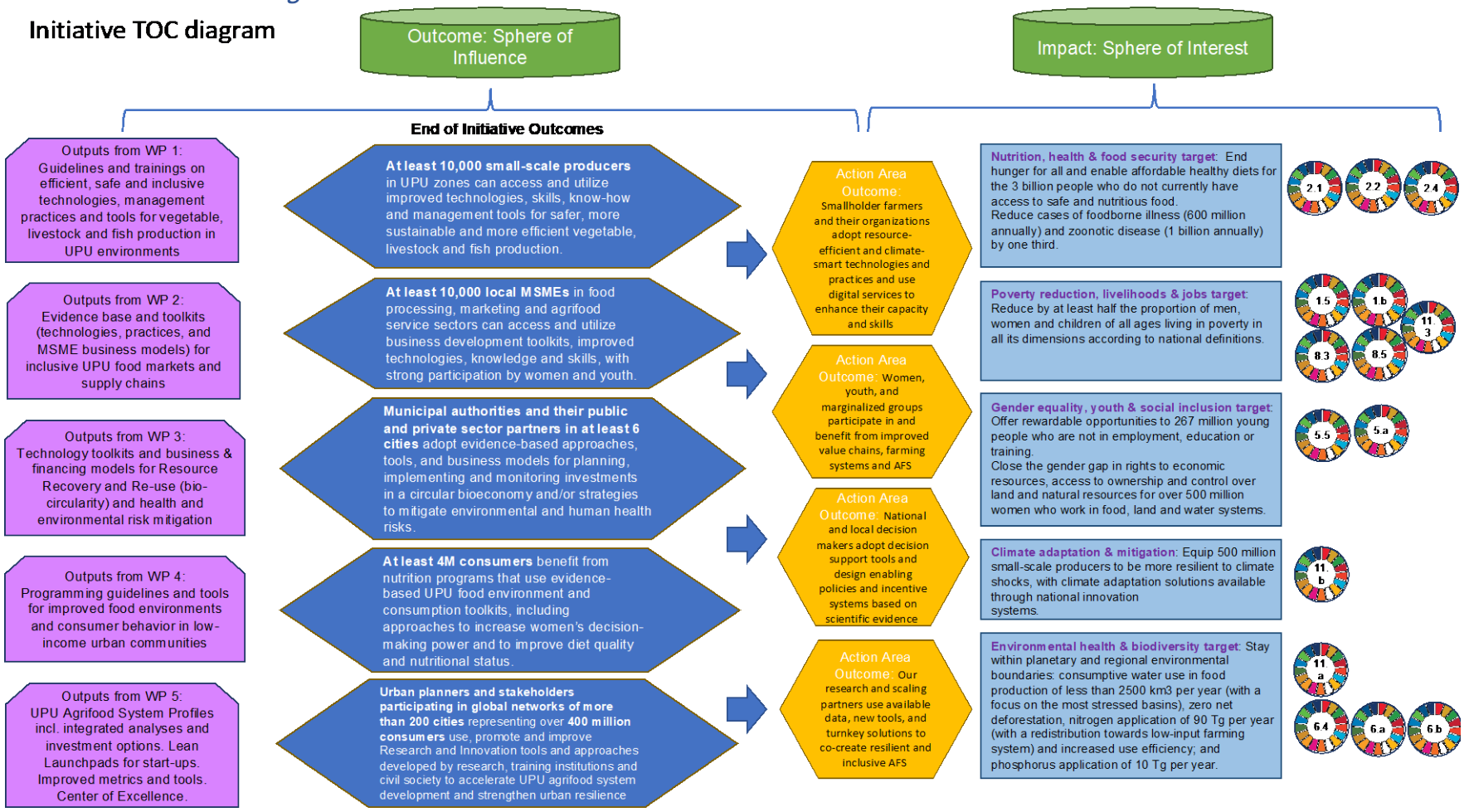
Summary table of projected benefits:

Impact Area	Impact indicator	Breadth	Depth		Probability
Nutrition, health & food security	*# cases communicable and non-communicable diseases averted*	At least 2 million urban dwellers benefitting (3 countries)	**Substantial.** Several 1,000 DALYs averted with a 0.1% mortality rate.	Weighting 5–10	**Medium: 30–50%** expectation of achieving these impacts by 2030
	# people meeting micronutrient requirements	1.53 million people (80% women or youth)	**Lifesaving**: 20% (306,000). **Transformative**: 50% (765,000). **Perceptible**: 30% (459,000)	Weighting 50+ Weighting 5–10 Weighting 0.1–0.5	**Medium: 30–50%** expectation of achieving these impacts by 2030
Poverty reduction, livelihoods & jobs	*# poor people benefiting from relevant CGIAR innovations*	4 million (60% women or youth) in 4 countries.	**Transformative** 50% of beneficiaries (survival to enterprise) **Substantial** 50% (income improvements among MSMEs)	Weighting 10–50 Weighting 5–10	**Medium: 30–50%** expectation of achieving these impacts by 2030
Gender equality, youth & social inclusion	*# women benefiting from relevant CGIAR innovations*	3.6 million women or youth in 4 countries.	**Significant**	Weighting 1–5	**Medium: 30–50%** expectation of achieving these impacts by 2030
Climate adaptation & mitigation	*# $ climate adaptation investments*	At least US$100 million invested in better urban organic waste management.	**Substantial**	Weighting 5–10	**Medium (30–50%) to High (50–80%)** expectation of achieving these impacts by 2030
Environmental health & biodiversity	*# ha under improved management*	At least 6 million ha under improved management	**Substantial**	Weighting 5–10	**Very high**: >80% expectation of achieving these impacts by 2030

3. Research plans and associated theories of change (TOC)

3.1 Full Initiative TOC

3.1.1 Full Initiative TOC diagram



Contributions to the SDG Targets are explained in Annex 5.

3.1.2 Full Initiative TOC narrative

Responding to stakeholder demand for research and innovation, the Initiative will support a vibrant, largely informal UPU agrifood sector to help improve sustainability, equity and growth of opportunities and mitigate risks for human and environmental health. The Initiative takes a systems approach to developing and delivering science-based solutions, recognizing the integrated nature of UPU agrifood challenges and stakeholder interests, and addressing these as part of broader and highly dynamic urban systems (rather than as a mere extension of rural agricultural systems). Within this systems approach, research is organized in five Work Packages (WPs) that, although inter-related, are driven by distinct stakeholder demand and target specific high-impact entry points where research can help unlock positive change in the short to medium term.

Importantly, these five WPs reinforce each other to enable key stakeholder groups adopt and apply new and improved technologies, tools and knowledge and create integrated Outcomes at institutional, enterprise, market, or policy levels. The Initiative will co-convene multi-stakeholder platforms to facilitate dialogue on policy and investments and promote the use of evidence-based tools and approaches *(WP5).* The main assumptions behind these Outcomes for each set of stakeholders (next users) are:

- **Producers** will benefit from access to improved technologies and skills *(WP1)* which they are willing to apply to respond to better market access *(WP2)* and increased consumer demand for fresh, safe, and nutritious foods from peri-urban production zones *(WP4).* They will also benefit from improved management and re-use of waste *(WP3)*, and better land and water governance *(WP5).*
- **UPU consumers** will benefit from the increased supply of safe and nutritious food produced in UPU environments (*WP1*) and made accessible to them through efficient markets (*WP2*) operating in a food environment that stimulates healthy eating (*WP4*).
- **Municipal authorities** and their public sector partners are keen to improve their planning and monitoring of the agrifood sector *(WP5)* and realizing this will increase employment *(WP2),* reduce health risks *(WP3),* reduce costs from waste *(WP3)*, and offer additional revenue opportunities over time *(WP1, 2, 3).*
- **Micro-Small-Medium-Scale Enterprises** in the informal agrifood sector will adopt technologies and practices *(WP2)* that increase their profit margins and/or stabilize or grow their business. They will respond to incentives from consumer demand for nutritious food *(WP4)* and for increased food safety *(WP3).* They will participate in multi-stakeholder platforms *(WP5)* to voice their priorities for services, infrastructure, and policy support.
- **Research and training institutes** have urgent demand for suitable research methodologies and tools *(WP5)* to keep pace with the rapidly changing UPU agrifood sector, where rural agriculture approaches have not been adequate. Their engagement in all WPs will be critical for capacity development of local research and training providers to respond to this dynamic demand.

The Outcomes thus achieved will contribute significantly to RAFS Action Area Outcomes and CGIAR Impact Areas, particularly by harnessing the large opportunities in UPU environments that can have country-wide and global impacts. Specifically, the Initiative will help improve the quality and efficiency of peri-urban production of highly nutritious, perishable foods,

including vegetables, livestock products, and fish from aquaculture, and thus make these foods safer and more widely available and accessible to larger segments of low-income urban consumers and reduce the carbon footprint of food supply chains. This also includes the adoption of bio-circular technologies and management approaches that can recover and re-use waste and wastewater from the urban economy and feed the back safely into food production.

Secondly, the urban agrifood sector sustains many millions of informal jobs and businesses mainly for women and youth (and incorporating large numbers of migrants) that the Initiative will help strengthen and upgrade so that these groups can benefit from new technologies and new market contexts. Thirdly, municipalities and their partners adopting improved science-based tools and approaches for investment planning and policy, will be an impactful driver of wider positive changes towards sustainable agrifood systems given the importance of urban markets and the political influence of cities at national level. Fourthly, the Initiative is harnessing the capabilities of urban information infrastructure and diverse research and knowledge providers to develop improved, efficient, and participatory monitoring and forecasting tools and metrics. This will help update and upgrade the capacity of agrifood system research and innovation partners and enable them to include the critically important urban factors more effectively in their analyses and decision making.

3.2 Work Package TOCs

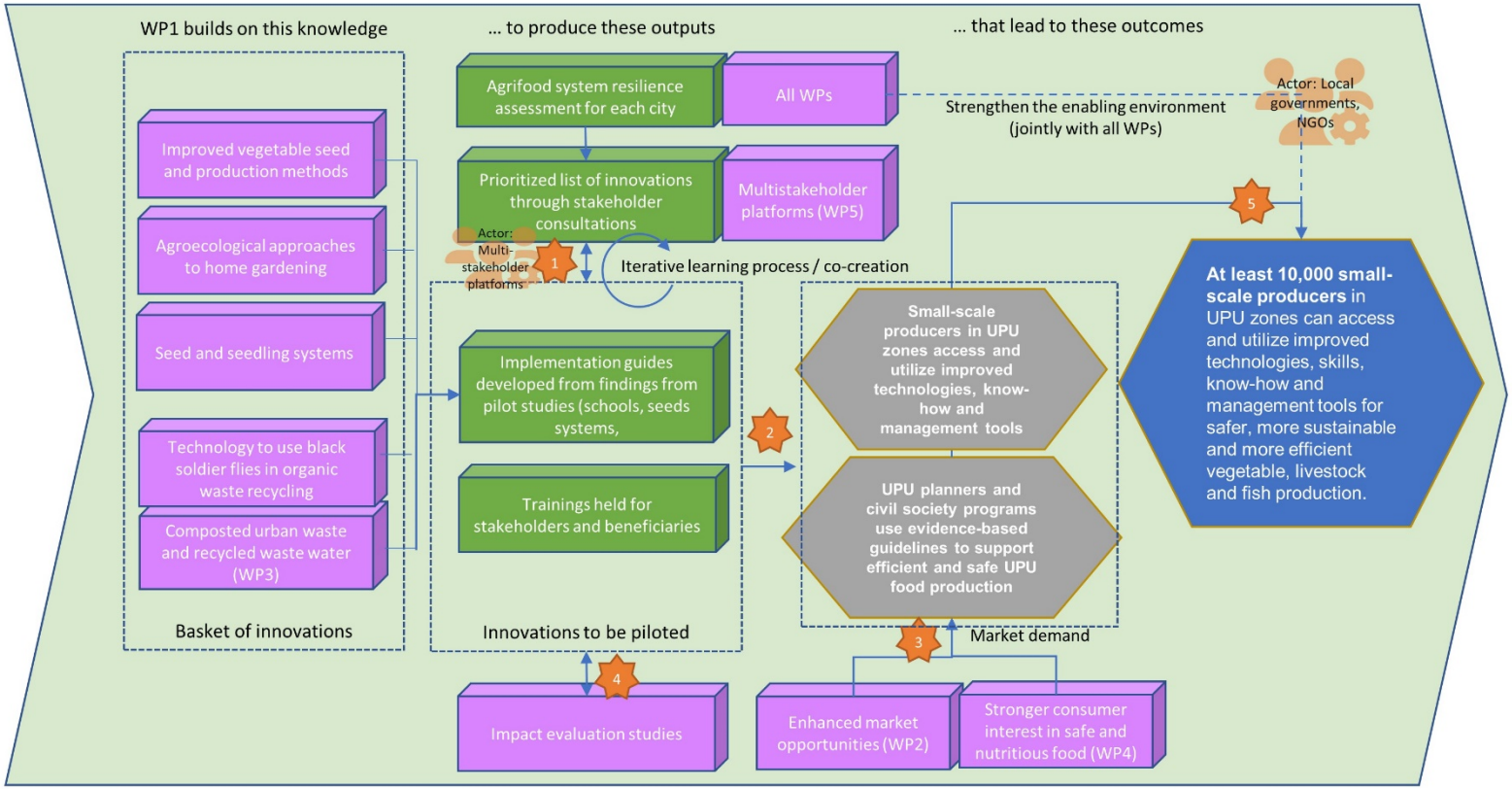
Work Package 1: Enabling sustainable production of nutritious foods in (peri-) urban zones

Work Package title	***WP1*: Enabling sustainable production of nutritious foods in (peri-) urban zones**
Work Package main focus and prioritization	*WP1* focuses on the safe, sustainable and equitable production of nutrient-dense foods in UPU environments. It will identify, adapt, pilot and scale technologies and institutional innovations together with local partners and in collaboration with local governments. The WP will particularly promote women and youth in urban food production systems while the ultimate goal is for the urban poor to have increased access to safe and nutritious food. All innovations will be demand-led and informed by multistakeholder platforms (*WP5*), markets (*WP2*) and consumers (*WP4*), while production inputs will partly come from recovered urban organic food waste (*WP3*).
Work Package geographic scope (global/region/ country)	*WP1* will focus on Bangladesh, Philippines, Kenya and Ethiopia with research priorities varying by location.

The science

Research question	Methods	Key outputs	Linkage to other WPs	Countries
1. What are the key factors in UPU food production that support or constrain agrifood system resilience?	Resilience assessment through data mining, stakeholder consultations	City agrifood system resilience assessments contributing to city profiles	*WP2-5* (joint activity)	All focus countries
2. What are the key enabling/constraining factors for women and youth to participate in, benefit from and be empowered through safe and sustainable UPU food production?	Action research approach using initial rapid assessment, group formation, capacity strengthening using participatory methods, and process evaluation.	Implementation guide with evidence based on a pilot study; at least 300 women and youth trained in food production per country	Coordinate with *WP2* so that production fills existing market needs. Work with WP3 to address food safety, zoonotic risk and close nutrient cycles	KEN, ETH
3. What is the impact of the National UPU Agriculture Program of the Philippines on a broad range of livelihood outcomes?	Impact evaluation using a mixed methods approach to attribute outcomes to the program and to identify key behavioral factors facilitating or impeding change	Journal article describing evidence and lessons learned	Coordinate with *WP4* to study impact on diets Link to *FRESH* to strengthen evidence basis for fruit and vegetable interventions	PHL
4. What are the key factors that empower poor urban communities to take up urban food production aimed at improving the quality of people's diets?	Action research approach using a pilot in which urban schools are used as a community-based platform to promote urban food production and healthy eating.	Implementation guide with evidence based on a pilot study; at least 200 women and students trained in food production	Coordinate with *WP4* to add a behavior change component	BGD, KEN
5. What is the effect of improved seed and seedling systems on urban and peri-urban food safety and production?	Rapid assessment, business identification, capacity building, impact assessment	Implementation guide with evidence based on a pilot study; 200 people trained in seed and seedling production and business management per country	Coordinate with *WP2* as part of input markets supporting urban food production systems Link to *FRESH* to strengthen safety and productivity of vegetables	BGD, PHL, KEN, ETH
6. What are the key factors enabling or impeding the use of treated urban waste as an input in urban and peri-urban food production?	Rapid assessment, business model development around a pilot (e.g., composting of urban organic waste or use of black soldier flies to produce fish or livestock feed), capacity building, impact assessment	Implementation guide with evidence based on a pilot study; at least 100 people trained per country	Coordinate with *WP3* on nutrient recycling Link to *Aquatic Foods* and *Livestock, Climate and System Resilience* on animal feed Link to *Nature-positive Solutions* on sustainable production methods	KEN, ETH

Theory of Change WP1: Enabling sustainable production of nutritious foods in (peri-) urban zones



Explanation of causal linkages in TOC diagram:

Causal linkage	From result (name)	To result (name)	Geographical dimension	Actor type (with examples)	Assumption
1	Stakeholder consultations	Identification of innovations for piloting	All target countries	Stakeholders and researchers, local govt. offices, NGOs	Stakeholder consultations and assessments identify priorities that are realistic to adapt and pilot within the Initiative.
2	Piloted innovations (guidelines developed and trainings implemented)	Smallholder food producers and other stakeholders trained	All target countries	Researchers, NGOs, Smallholder food producers (50% women; 50% youth)	Sufficient women and youth, as well as other stakeholders, show interest in the training
3	Market demand	Smallholder food producers and other stakeholders trained	All target countries	Smallholder food producers (50% women; 50% youth), government, civil society	Smallholder producers have sufficient market incentives to increase food production. Demand for UPU production approaches by other stakeholders
4	Piloted solutions	Impact evaluation studies	All target countries	Smallholder producers	The solutions can be piloted with a large enough sample of food producers to allow impact evaluation.
5	Smallholder food producers and other stakeholders trained	Increased use of improved technologies and management tools for food production	All target countries	Smallholder food producers (50% women; 50% youth)	Key external constraints faced by smallholder producers can be overcome within the project period.

The theory of change

Urban and peri-urban food production systems serve multiple functions: they supply healthy food to urban consumers, create jobs and income, and improve the quality of urban life by greening urban environments, promoting social inclusion and offering opportunities for recreation[75] [76]. However, food production near cities can be challenging. Typical constraints include land tenure insecurity, access to water and other inputs, pollution of soil and water with chemicals and pathogens, and the social conflicts that surround these issues[77].

Expanding food production close to urban centers requires a good understanding of these enabling and constraining factors, which is addressed through city agrifood system assessments. We will particularly look at the factors affecting the participation of women and youth to inform our intervention designs. We will establish a regular dialogue with change actors including civil society organizations, food producers, municipal governments and entrepreneurs to refine research questions and co-design interventions to the best extent possible.

The research questions identified are informed by in-country consultations and therefore vary by location. For instance, the Philippines already has a large urban food production program and the interest of the Department of Agriculture research priority was to study the program's impact. Technical and institutional innovations will be designed, adapted and piloted with local research partners such as local universities. Capacity strengthening and technical support will be provided to help local food producers to adopt the innovations. Each pilot will

be evaluated for the purpose of learning, and results will be shared with key change actors to influence the enabling environment.

We will directly benefit 1,800 urban-and peri-urban food producers through increased access to improved technologies, know-how and management tools. Some of these will setup or expand their business, for instance seedling nurseries, that will benefit at least 10,000 smallholder food producers. We will mainly contribute to the Impact Area 'Poverty reduction, livelihoods and jobs', but also to the other four Impact Areas.

The complexity of urban and peri-urban food systems with multiple and sometimes competing interests is a key risk. We will address this through close collaboration with local governments that have leverage to engage a cross-spectrum of stakeholders, while recognizing that different government agencies may also have conflicting interests. Recognizing that not all approaches may work equally well, we will test a range of different interventions to reduce risk. Other assumptions/risks are that the stakeholder consultations identify options that are realistic to adapt and pilot and have potential to be brought to scale; that food production constraints can be overcome; and that pilots include a large enough sample of food producers to allow for a meaningful impact evaluation.

We will work closely with all WPs. In particular, we will work with WP3 on the use of treated organic food waste as a growing media for vegetables and safely recycled wastewater for irrigation; and with WP2 on marketing and processing. We will also work with other Initiatives such as FRESH on production technologies and impact evaluation, and Nature-positive Solutions on reducing agrochemical use and increasing diversity.

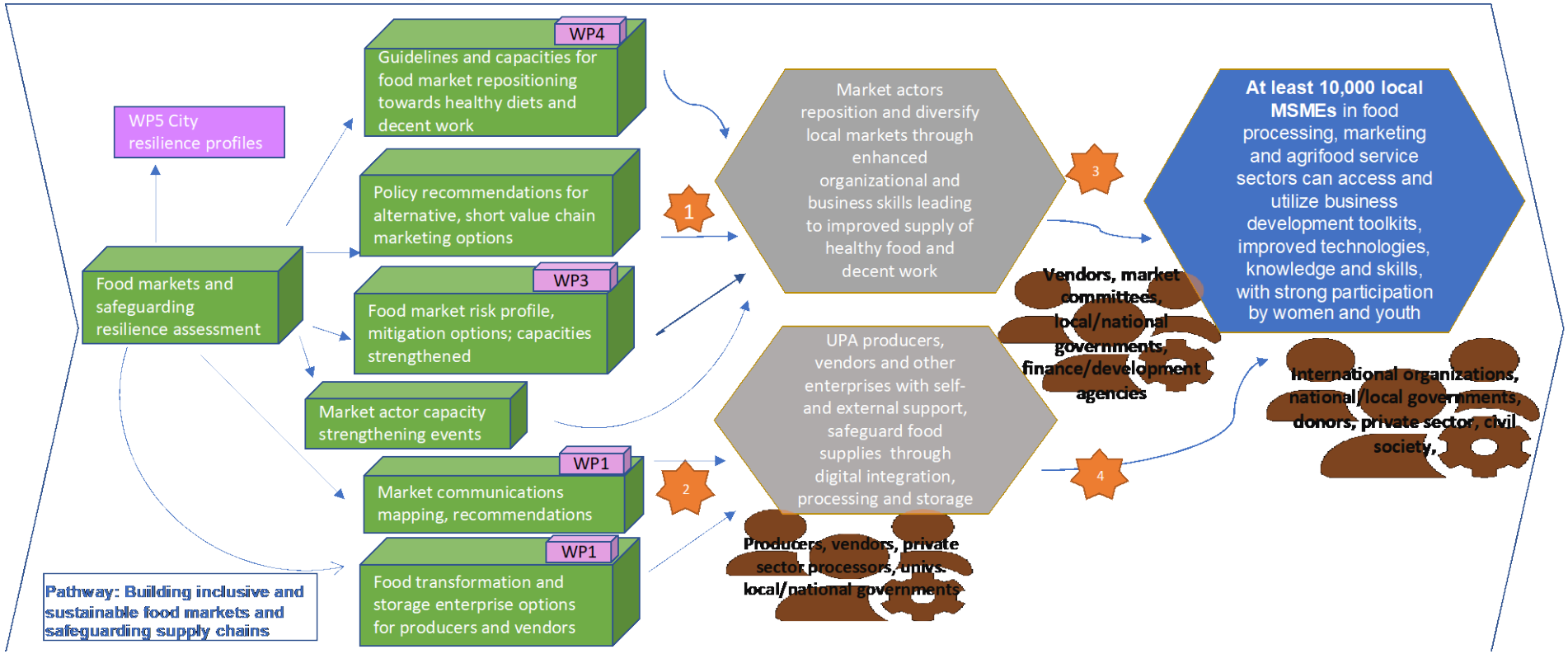
Work Package 2: Building inclusive and sustainable food markets and safeguarding supply chains

Work Package title	***WP2*: Building inclusive and sustainable food markets and safeguarding supply chains**
Work Package main focus and prioritization	*WP2* seeks to identify ways that urban food marketing contributes to city resilience through two pathways: Building on the socio-cultural benefits and convenience of local 'wet' markets for low-income consumers and the linked network of mostly informal vendors, we will help reposition these markets as sources of decent employment especially targeting improved access for women and youth, as promoters of healthy foods, and diversified through local producer linkages in green markets. The second pathway seeks to safeguard food supply against losses and waste through digital platforms that will be developed between sellers and buyers, opening institutional markets (e.g., schools, hospitals) to local food supply and scaling innovative, low-cost post-harvest processing and storage options.
Work Package geographic scope (global/region/ country)	*WP2* will focus on Bangladesh, Philippines, Kenya and Ghana primarily, with additional work in Ethiopia and Peru.

The science

Research question	Methods	Key outputs	Linkage to other WPs	Countries
1. How does food marketing and the current safe-guarding of food supply affect urban resilience?	Resilience assessment based on adaptation indicators from related agrifood system[78] and urban resilience[79] frameworks, assessments[80] and stakeholder dialogue/ consultations[81]	Markets and safeguarding resilience assessments contributing to city profiles	*WP5*	All focus countries
2. What are the leverage points among market system actors and institutions that can lead to healthier diets for consumers and more decent work for vendors?	Rapid market assessments, stakeholder consultations, vendor surveys. Adapted business school capacity development tool[82] and market systems method[83].	Guidelines for market repositioning, new roles and functions, consumer outreach; enterprise capacities enhanced; publications	*WP4, WP5*	BGD, PHL, KEN, PER
3. How can existing or new types of markets, such as institutional or farmers' markets, help expand short value-chain food supplies from local producers?	Constraints & opportunity analysis (literature review). Multi-visit market surveys, FGDs.	Policy recommendations on alternative institutional market food tenders and provisioning and piloting plans for green markets	*WP1, WP5*	BGD, PHL, KEN, GHA, ETH
4. What are the wet market, vendor and processing practices that pose the biggest risks to the quality and safety of food for urban consumers and how can they be mitigated?	Food handling and preparation assessments; desk review of good practices; random testing of market samples[84]. Safe practices training.	Traffic light system for risk levels from different elements of food marketing; good practice guidelines	*WP3*	BGD, PHL, KEN, GHA, ETH
5. How can improved digital communication among food producers and vendors lead to greater profitability, reduced losses and more equitable benefit-sharing in the urban food system?	Digital monitoring of producer-vendor communications; Assessment of spoilages; Communications mapping in relation to demand, supply and prices for specific foods	Waste assessment; Options for revised use of mobile communications, joint producer-vendor digital platforms	*WP1*	BGD, PHL, KEN, ETH
6. What are the likely entry points and constraints for small-scale enterprise engagement with urban food transformation and profitable use of storage?	Stakeholder consultations; rapid assessments of processing enterprises/storage facilities; surveys.	Food transformation and storage options for reduced waste, increased employment; capacity strengthening	n/a	BGD, PHL, KEN, GHA, PER

Theory of Change WP2: Building inclusive and sustainable food markets and safeguarding supply chains



Explanation of causal linkages in TOC diagram:

Causal linkage	From result (name)	To result (name)	Geographical dimension	Actor type (with examples)	Assumption
1	*WP2* Research	Public and private sectors, universities, civil society	S/SE Asia; E/W Africa; LAC	Market committees, local govt. offices, vendor associations	Economic and social benefits of more efficient and inclusive market perceived by local government and vendors
2	*WP2* Research	Public and private sectors, civil society	S/SE Asia, E/W Africa	Market/processing enterprises, finance agencies, MNOs	Public and private sector actors and investors recognize the economic, social and environmental benefits of waste-reducing, income-boosting technologies/practices
3	Target local/national governments, market committees, vendor organizations	International orgs., national/local governments in new locations, donors, private sector, CSOs.	Other countries in S/SE Asia, E/W Africa, LAC.	WB, FAO, WFP, UNEP, city networks, national governments	Cities, national governments, private sector and international agencies see urban market systems transformation as part of solution to urban diet, employment and environmental challenges
4	Target local /national governments, food processors, storage operators	International orgs., national/local governments in new locations, private sector donors, CSOs.	Other countries in S/SE Asia, E/W Africa, LAC	WB, FAO, WFP, UNEP, city networks, national governments	Cities, national governments, private sector and international agencies see reduced wastage and increased safeguarding of healthy urban food supplies as part of solution to urban diet, employment and environmental challenges

The theory of change

Together with *WP5*, this WP will assess the role of food marketing and safeguarding (reducing food waste and losses and adding value) in city resilience, contributing to an Initiative-wide urban resilience analysis for target countries. This can help clarify the repositioning of wet markets and the linked network of informal vendors as suppliers of healthy diets (with *WP4*) and as expanded sources of inclusive, decent work. To help reduce urban carbon footprints we will increase short value chain marketing options for producers (with *WP1*) and vendors, working with public and private sector innovation partners, with other IDTs, such as Rethinking Food Markets and Value Chains for Inclusion and Sustainability[85], and with scaling partners to stimulate policy recommendations.

Working with WP3, public sector food safety specialists, the private sector and policy actors, we will implement a dual-track approach to food safety, identifying potential health and environmental risks in marketing systems, recommending on the one hand mitigation measures in those systems (*WP2*), and policy change and new regulations (WP3). As part of Initiative-wide efforts to contribute to a circular bioeconomy within target cities, *WP2* and *WP1* will identify options for reduced food losses and waste through building digital platforms between buyers and local sellers with support from tech-smart young women and men vendors and producers. Safeguarding food supplies and adding value will also be pursued through investment in food processing and storage start-ups led by young women and men.

Co-development of outputs with innovation partners will lead to two kinds of outcomes. Market repositioning and diversification will be taken up as business opportunities by vendors and local producers, and by municipal and national governments as infrastructure and 'green' initiatives to reduce carbon footprints and provide healthier food and decent employment.

The other outcome will involve vendor and producer digital alignment of demand and supply and an expansion of inclusive enterprise and reduction of losses and waste through processing and storage start-ups. Full advantage will be taken of the large numbers of urban scaling partners, including national and local governments seeking innovations to address urban health, employment and climate change challenges, knowledge-sharing city networks, and multilateral organizations with the potential to finance scaling efforts.

The two Innovation Packages in this WP have dual core innovations: food market repositioning and diversification on the one hand, and food safeguarding on the other. Each core innovation is supported by several complementary innovations which will vary by site. Scaling readiness will most likely apply to elements of the package, such as the repositioning of diet promotion and messaging, or improved inclusiveness through facilities for women. These issues are further discussed in section 4.1.

For the MELIA framework, horizontal learning with partners will be a key component of the MELIA for this WP, ensuring that the different innovation partners are aligned in pursuit of outputs.

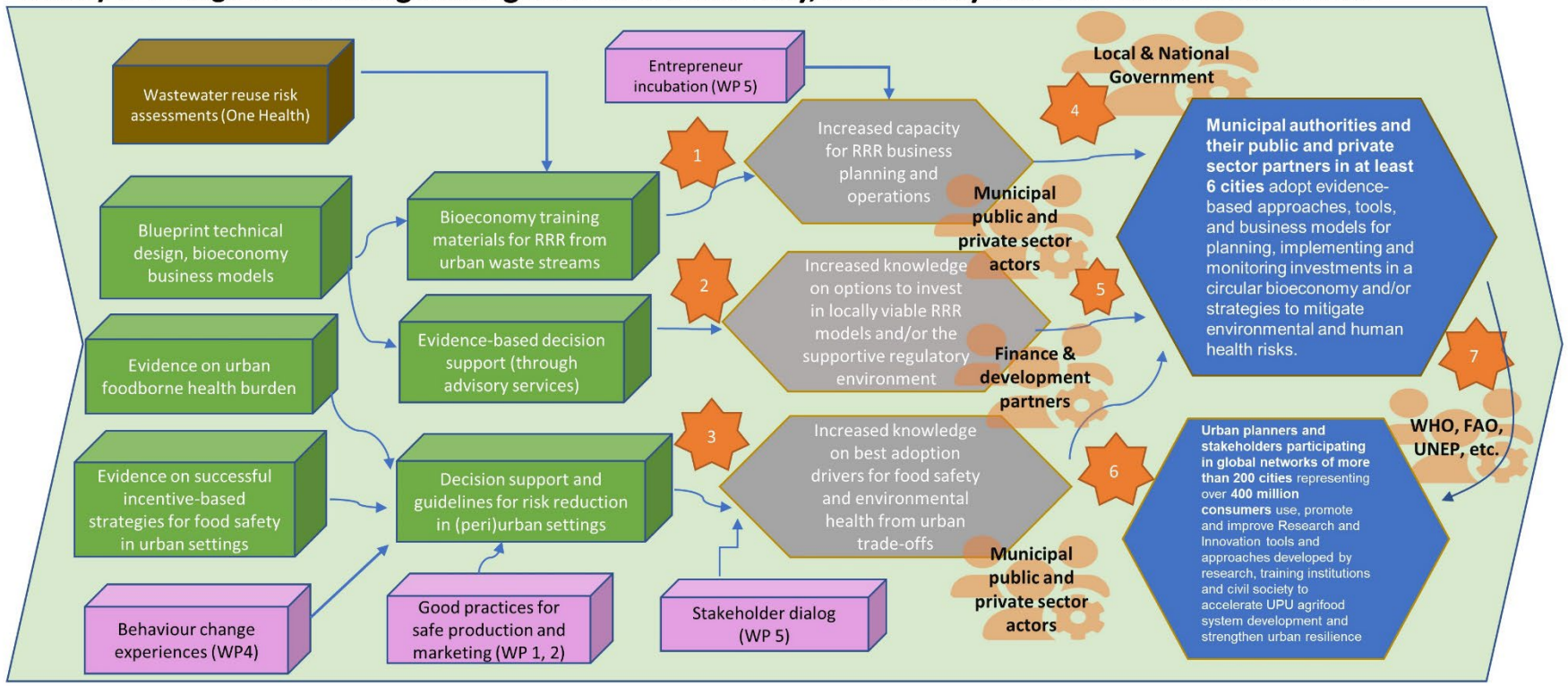
Work Package 3: Strengthening circular bioeconomy, food safety and the urban environment

Work Package title	***WP3:* Strengthening circular bioeconomy, food safety and the urban environment**
Work Package main focus and prioritization	Urban environmental pollution affects crop and animal production in UPU farming systems and food safety. Conversely, urban wastewater and food waste offer business opportunities through resource recovery for agriculture. *WP3* will: (i) support private and public actors and their development partners with RRR technologies, business and finance models for a more circular bioeconomy; (ii) support municipal authorities with adoptable strategies and guidelines to maintain food safety in the growing informal UPU food production systems and supply chains; and (ii) agencies like FAO/WHO with the support of guidelines linking urban food and environmental health.
Work Package geographic scope (global/region/country)	A regional focus on West and Central Africa, East and Southern Africa, and South Asia, with country focus on Ghana, Kenya, Ethiopia and Sri Lanka, and support of ongoing projects with FAO in CWANA in the first three years. The work will be expanded to cover additional countries, latest in phase II of the Initiative.

The science

Research question	Methods	Key outputs	Linkage to other WPs	Countries
1. What are the key factors enabling or inhibiting circular resource flows, specifically for food waste, in UPU environments that thus affect agrifood system resilience?	Literature review; application of CRFS toolbox and MUFPP indicator framework, as well as regulatory and financial incentive systems analysis	Recommendations for incentive system for more resilient city metabolisms. Review papers. Blueprint for design, testing and scale of circular bioeconomy business models. Evidence-based decision support system (advisory services). Training materials for industry, civil society, government and development organizations	*WP5*	GHA, KEN, ETH, LKA
2. What supports or hinders the uptake of proven RRR institutional and business models in different settings?	Feasibility studies based on Otoo et al. 2016[66]; literature review (country comparison, analysis of regulatory and financial incentive systems, and their impact)		*WP5*	GHA, KEN, ETH, LKA
3. Which sustainable finance mechanisms help maximize entrepreneurs' ability to monetize the positive externalities from resource recovery from which society and nature benefit?	Literature and key expert surveys, analytical hierarchy process (AHP) and goal programming (GP) model		*WP5*	GHA, KEN, ETH, LKA
4. What gender-sensitive approaches to food safety management have successfully improved food quality and reduce food-related health-risks in informal urban food systems in LMICs?	Comparative inter-country analysis of experiences with incentive-based approaches (for behavior change via social marketing or gender sensitive nudging), regulations, and educational awareness creation within and outside the urban food system.	Recommendations for urban authorities on effective food safety campaigns, and recommendations e.g., WHO and FAO guidelines.	*WP2, WP4*	GHA, KEN, ETH
5. What is the relative and absolute contribution of different health hazards (foodborne diseases) within urban food systems to burden of disease?	Desk review, risk assessments, epidemiological studies of burden of disease.	Tools for burden of disease estimation. City-specific estimates of burden of foodborne disease.	n/a	GHA, KEN, ETH
6. Which specific urban challenges, opportunities and practices require consideration in national Food Safety and Environmental Health guidelines and curricula to facilitate their application, adoption, and impact in high-risk UPU settings?	Stakeholder consultations and comparative inter-country survey of regulations and guidelines with particular attention to informal wastewater irrigation, zoonosis, UPU milk and meat markets.	Evidence-based materials for capacity development of stakeholders of urban food safety and environmental health.	*WP5*	GHA, KEN, ETH, LKA

Theory of Change WP3: Strengthening circular bioeconomy, food safety and the urban environment



Explanation of causal linkages in TOC diagram:

Causal linkage	From result	To result	Geographical dimension	Actor type	Assumptions
1	Bioeconomy training materials for RRR from urban waste streams	Public and private partners acquire knowledge on RRR planning and PPP operations	West Africa; South Asia	Waste authorities and other govt. agencies working in PPPs with the private sector	Expressed demand, and consequent support, in viable RRR solutions and PPPs remains high in the target countries; financial support of IDT will be as projected
2	Evidence-based decision support (through advisory services)	Development and investment agencies acquire knowledge on options to invest in locally viable RRR models and/or the supportive regulatory environment	West Africa; South Asia	AfDB, ABD, World Bank, BMGF	Demand in circular bioeconomy remains high; financial support of IDT will be as projected
3	Decision support and guidelines for risk reduction in (peri)urban settings	City authorities gain knowledge and understanding on best approaches for food safety and environmental health management in urban settings	West and East Africa	City authorities	Food safety in urban settings remains a high priority for national and local governments amidst other priorities
3	Decision support and guidelines for risk reduction in (peri)urban settings	Private businesses gain knowledge and understanding on best approaches for food safety and environmental health management in urban settings	West and East Africa	Private industry	Active participation of private industry organizations in the development of guidelines and its subsequent dissemination.
4	Increased capacity for RRR business planning and operations	Municipal authorities and Municipal authorities and their public and private sector partners in at least 6 cities adopt evidence-based approaches, tools, and business models for RRR and/or strategies for environment and health risk management	West Africa; South Asia	National and local govt. (e.g., city authorities, Ministry of Finance)	Our business models are bankable, and partners see (financial/economic) returns on investments
5	Increased knowledge on options to invest in locally viable RRR models and/or the supportive	Municipal authorities and Municipal authorities and their public and private sector partners in at least 6 cities adopt	West and East Africa	Authorities in pilot cities based on demand (e.g., local health and environmental authorities)	Expressed demand to address health and environmental risks remains high

Causal linkage	From result	To result	Geographical dimension	Actor type	Assumptions
	regulatory environment	evidence-based approaches, tools, and business models for RRR and/or strategies for environment and health risk management			
6	Increased knowledge on best adoption drivers for food safety and environmental health from urban trade-offs	Municipal authorities and Municipal authorities and their public and private sector partners in at least 6 cities adopt evidence-based approaches, tools, and business models for RRR and/or strategies for environment and health risk management	West and East Africa	Authorities in pilot cities based on demand	Budget for pilots and field studies is available. Interest on food safety in urban settings by national and local governments and development organizations remains high.
7	Municipal authorities and Municipal authorities and their public and private sector partners in at least 6 cities adopt evidence-based approaches, tools, and business models for RRR and/or strategies for environment and health risk management	Urban planners and stakeholders participating in global networks use, promote and improve Research and Innovation tools to accelerate UPU Agrifood System development and strengthen urban resilience	West and East Africa, South Asia	WHO, FAO, UNEP, others	Revisions of (inter)national guidelines are conducted within the time span of the Initiative. CGIAR solutions can address a gap for inclusions in (inter)national guidelines.

The theory of change

WP3 works through two complementary impact pathways: The first impact pathway is based on demand-driven (i) advisory services, (ii) capacity development, and (iii) support of the RRR investment climate building on uptake partnerships established under WLE (see Golden Eggs[86]). The pathway will specifically target the verification and transferability of previously identified[87] and tested RRR Innovation Packages of technologies and business models (Innovation 3.1; Annex 5) in different countries and contexts, using multi-criteria feasibility studies. The activities will build on over 60 business models for food waste, septage and wastewater reduction or valorization[88] with are based on empirical examples and collaboration with business incubators, using the Business Model Canvas approach[89], as well as a combined AHP and GP model[90] for the investment climate analysis. The proposed scaling readiness concept (section 4.1) will be extended to better capture market, regulatory and

institutional readiness as well as business options given that most innovations are already successfully running[91].

Working across the IDT priority countries, the target groups include both the public and private sector in the urban waste and agriculture interface and, for scaling, their bilateral and multi-national development (finance) partners, to identify and prioritize gender-sensitive[67] investment options for turning urban waste streams (food waste, wastewater) into resources for agriculture, instead of polluting soils, water and air (GHG emissions from landfills). An actual implementation of solutions will commence in **Phase II**, based on the outcomes of the scaling readiness assessment (section 4.1). The projection is to catalyze investments in improved waste management at the level of over US$100 million (see Section 2.7). This **impact pathway** has been positively evaluated[13] under WLE where we supported, among others, the set-up and out-scaling of several award winning[92] PPPs in the organic waste[93] and wastewater sectors[94] (Innovation 3.2; Annex 5).

The second impact pathway targets the connection between environmental and human health, and food safety in particular, which is significantly affected in densely populated UPU settings, e.g., through urban pollution of irrigation water sources (wastewater irrigation turning waterborne diseases into foodborne diseases) or the introduction of foodborne hazards during processing, distribution and retailing of food in polluted and unhygienic urban settings (i.e., abattoirs, or street food markets).

The pathway builds on pilot-tested[95] approaches[96] to food safety management (Innovation 3.3; Annex 5). It also builds on ongoing CRP research and partnerships[13] targeting national authorities and internationally accepted standards by FAO, WHO, CODEX ALIMENTARIUS, etc. The pathway will address gender- and urban-specific challenges and opportunities for increasing the adoption and impact of new or existing (national and international) guidance documents on good hygiene, water quality and food safety practice. The evidence generated will contribute to the good on-farm practices (*WP1*), food safety research along urban supply chains (*WP2*), and work with *WP4* to identify gender-sensitive strategies for behavior change towards healthier diets. It will work with *WP5* on stakeholder dialogues and capacity development. *WP3* will link closely with the IDTs on **Nature Positive Solutions, Livestock, Climate and System Resilience** and **One-Health**.

Work Package 4: Improving food environments and consumer behavior for nutrition

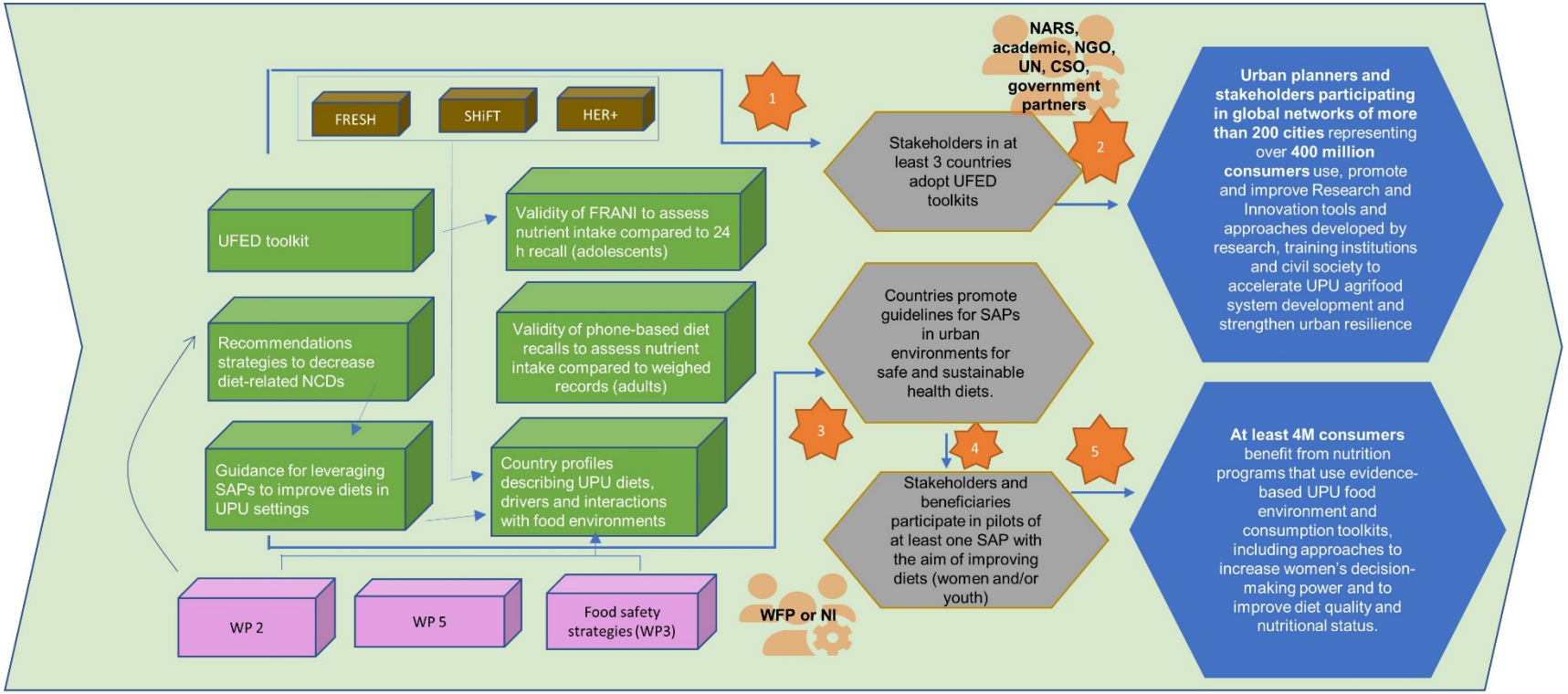
Work Package title	***WP4:* Improving food environments and consumer behavior for nutrition**
Work Package main focus and prioritization	Rapidly increasing urbanization coupled with the increasing global prevalence of the double burden of malnutrition (coexistence of overweight/obesity and undernutrition), indicates an urgent need to understand and improve UPU food environments, diets and their interaction[97]. Poor quality diets contribute to malnutrition and diet-related NCDs[51]. Issues of accessibility, availability, affordability, and desirability hinder dietary improvements[98]. This WP will characterize food environments, dietary patterns their drivers and variations across seasons for key target groups (e.g., women and adolescents). A toolkit for assessing UPU food environments and diets and guidance for how to improve these will be created based on reviews and experimental evidence.
Work Package geographic scope (global/region/country)	Over the 2022–2031 period, this WP will be implemented in up to 10 countries. During the first three years (2022– 2025), the WP will be implemented in Ghana, the Philippines, Burkina Faso, Rwanda, and Sri Lanka.

The science

Research question	Methods	Key outputs	Linkage to other WPs	Countries
1. How do food environments and diets, and in particular of women and youth, affect urban resilience?	Literature reviews Resilience assessments Surveys	Resilience assessments focused on food environment and diets contributing to *UPU Agrifood System Profiles*	*WP5*	GHA, PHL, BFA, RWA, LKA
2. How can the diet and over- and under-nutrition problems facing low-income consumers (especially women, adolescents and young children) in UPU settings be improved? How do solutions differ by life stage and geography? How do they vary with the (regulatory) food environment?	Literature review Secondary data analyses Dietary assessment Food environment assessments	Country profiles describing UPU diets, their drivers, and how they interact with food environments	*WP2*, *WP3* and *WP6*	Desk review (all target countries) Secondary data analysis (GHA) Diet and food environment assessments (PHL, RWA, and LKA)
3. How can dietary assessment methods be improved in urban settings to lower time and financial costs while obtaining high quality data?	FRANI pilot among adolescents Phone survey method compared to weighed records for adult and adolescent respondents	Assessment of the validity using FRANI to collect dietary data compared to 24 h diet recall in GHA and LKA. Assessment of the validity of 24h diet-recall data collected through phone-based surveys compared to weighed records in LKA.	n/a	FRANI pilot in GHA and LKA Phone survey method in LKA
4. What combination of assessments are necessary to	Food environment assessments	UFED toolkit that includes an inventory	*WP2* and *WP6*	GHA, LKA, PHL (depending on

Research question	Methods	Key outputs	Linkage to other WPs	Countries
provide a clear picture of the diet, nutrition, and food environment situations of UPU consumers?	Dietary assessments	of food environment and dietary assessment methods with recommendations on what combinations to use in UPU settings		budget or potential collaboration with FRESH) Possible collaboration with SHiFT (BGD and ETH)
5. How can existing nutrition modeling tools be extended to identify optimal strategies or combination of interventions that lowers diet related NCDs in low-income UPU populations?	Impact modeling	Recommendations of optimal strategies or combinations of interventions to lower diet-related NCDs in low-income UPU populations	n/a	GHA (adolescents) BFA (school-age children). Could also be explored for LKA
6. How can SAPs be leveraged to improve the diets and nutritional status of low-income consumers (especially women, adolescents and young children) in UPU settings?	Literature review Impact evaluation	Guidance as to how to leverage SAPs for improved diets and nutrition in UPU populations	*WP1, WP6*	Global literature review Impact evaluation location to be identified with partners implementing relevant SAPs (e.g., governments, WFP or NI).

Theory of Change WP4: Improving food environments and consumer behavior for nutrition



Explanation of causal linkages in TOC diagram:

Causal linkage	From result (name)	To result (name)	Geographical dimension	Actor type (with examples)	Assumption
1	UFED toolkit that includes an inventory of food environment and dietary assessment methods with recommendations on what combinations to use in UPU settings	Stakeholders in at least 3 countries adopt UFED toolkits	At least six target or secondary countries	Innovation and demand partners (e.g., WFP, NI, FAO)	There is demand for the UFED toolkit and dissemination opportunities
2	Stakeholders in at least 3 countries adopt UFED toolkits	Urban planners and stakeholders participating in global networks of more than 200 cities representing over 400 million consumers use, promote and further improve urban-focused research and innovation tools and approaches	At least six target or secondary countries	Innovation and demand partners (e.g., Urban stakeholders)	UFED toolkit is accessible, understandable and perceived to be useful by innovation and demand partners
3	Guidance for leveraging SAPs for safe and sustainable healthy diets in UPU settings	Countries promote guidelines for SAPs in urban environments for safe and sustainable health diets	All target countries	Demand and scaling partners (WFP, NI, FAO)	There is demand for the SAP guidance for UPU settings and opportunities for dissemination
4	countries promote guidelines for SAPs in urban environments for safe and sustainable healthy diets	Stakeholders and beneficiaries participate in pilots of at least one SAP with the aim of improving diets (women and/or youth)	At least one target or secondary country	Demand and scaling partners (WFP, NI)	SAP guidance is perceived as a starting point for iterative joint improvement over time with key partners
5	Stakeholders and beneficiaries participate in pilots of at least one SAP with the aim of improving diets (women and/or youth)	At least 4 million consumers benefit from nutrition programs that use evidence-based UPU food environment toolkits	At least six target or secondary countries	Demand and scaling partners (e.g., government, WFP)	SAP programs have funding and desire to adapt design to improve diets

The theory of change

Starting from the urgent need to understand the food environments and dietary patterns of key populations in UPU settings in LMICs to inform prioritization of program and policy action, this WP will develop country profiles that describe UPU food environment, diets, drivers of existing food environments and diets, their interactions and how they vary across key target groups and geographies. In addition, the Work Package will pilot innovations in dietary and food environment assessments with the aims of creating a toolkit (UFED) that can be used by a range of stakeholders and validating cost and time efficient dietary assessment methods.

The toolkit will provide the tools necessary for assessing food environments and diets in UPU environments that will support evidence-informed decisions for program and policy action to improve food environments for increasing access, availability, and desirability of safe and sustainable healthy diets. Validating novel dietary assessment methods can lower the cost

(time and monetary) of collecting high quality dietary data. This WP will conduct desk reviews, collaborate with other Initiatives and pilot innovations in SAPs to understand how to best leverage SAPs for improving diet quality especially among women and youth. This workstream will lead to the development of guidance for leveraging SAPs to improve diets in UPU settings.

Country briefs, toolkit and guidance will be created and disseminated through key partners (e.g., government, UN, NGO, CSO and academic partners) in at least six countries. Dissemination activities will be undertaken through workshops, presentation at regional, national, and international fora, and through engaged capacity strengthening activities to the extent possible. We will aim to work with partners (either WFP or NI) to pilot innovations in SAPs in one or more countries to improve diet quality among women and/or youth. We expect that results from the pilot tests will be used by CGIAR and other partners to inform and refine the guidance for leveraging SAPs in UPU settings for improved diets. Taken together these outcomes are expected to contribute to the overall outcomes of this Initiative related to use of research and innovations by research and training institutions and to the outcomes of at least 4 million consumers benefiting from nutrition programs that use the evidence-based urban food and environment and consumption toolkit to inform program design.

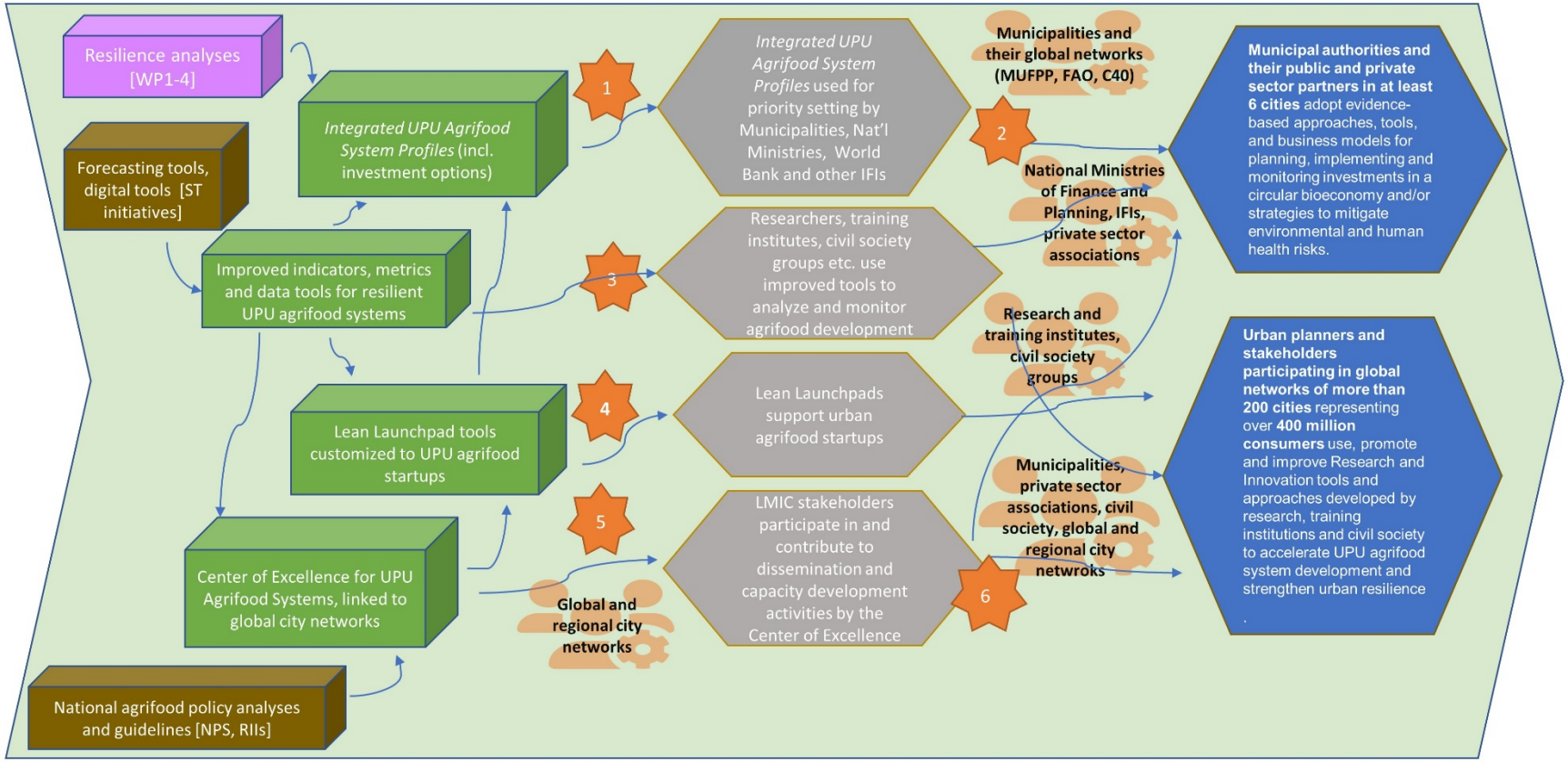
Work Package 5: Strengthening the evidence base and research and innovation capacities for UPU Agrifood System governance and growth

Work Package title	**Strengthening the evidence base and research and innovation capacities for UPU Agrifood System governance and growth**
Work Package main focus and prioritization	This WP will develop a cross-sectoral and multi-level UPU Agrifood Systems resilience framework, bridging related approaches in food systems and urban resilience frameworks. *WP1-4* will contribute evidence on key pillars of resilience to *WP5* to produce integrated *Urban Food System Profiles* for participating cities. Targeting young urban entrepreneurs, the WP will promote and further develop a *Lean Launchpad* approach for urban agrifood startup enterprises to translate research outputs into marketable innovations. The WP will establish a virtual *Center of Excellence for Urban Agrifood Systems* to provide knowledge, research and capacity development support for stakeholders engaged in policy development, investment planning, research and development programming.
Work Package geographic scope (global/region/country)	This WP will operate in Bangladesh, Philippines, Ethiopia, Kenya, Ghana and Peru, as well as through our global and regional partnerships with RUAF, FAO and MUFPP – reaching more than 100 cities in total.

The Science

Research question	Methods	Key outputs	WP links	Countries (2022-2024)
1. What are the main determinants, enablers, and constraints for resilience of selected urban food systems; and what investment opportunities exist to strengthen resilience?	Cross-sectoral synthesis of agrifood and urban resilience analyses; based on quantitative data, recent studies, and qualitative research with key stakeholders.	*UPU Agrifood System Profiles*, including investment options. Journal articles and policy briefs.	All WPs contribute sectoral resilience analyses (production, markets, diets, bioeconomy).	BGD, PHL, ETH, KEN, GHA, PER
2. What are suitable indicators, metrics and data tools to support integrated system-level resilience assessments of UPU Agrifood Systems?	Selection, piloting and adaptation of indicators, methods, and tools from (rural) agrifood system and urban resilience frameworks.	Indicators, metrics and data tools published. Training modules developed and available through e-learning platforms.	All WPs contribute to adaptation of indicators, metrics and tools through piloting and stakeholder feedback.	Global selection and dissemination. Piloting in BGD, PHL, KEN, GHA, PER
3. What strategies and approaches are most effective for supporting young scientist-entrepreneurs to uptake, refine and scale food systems research products for city resilience?	Testing a 'Lean Launchpad' approach to technology entrepreneurship training.	Lean Launchpad tools available, customized to UPU agrifood startups	All WPs offer research entry points and science support for interested startups.	Piloting this approach in PER. From 2024, adaptation to KEN, PHL.
4. How can the fast expanding and diverse knowledge, innovation and evidence base on UPU Agrifood Systems best be shared to support stakeholders in LMICs?	Institutional analyses of pertinent global initiatives, city networks and knowledge management options	Center of Excellence for UPU Agrifood Systems operational and linked to global and regional city networks	n/a	Global scope.

Theory of Change WP5: Strengthening the evidence base and research & innovation capacities for UPU agrifood system governance and growth



Explanation of causal linkages in TOC diagram:

Causal linkage	From result	To result	Geographical dimension	Actor type	Assumption
1	Integrated UPU Agrifood System Profiles developed	Integrated UPU Agrifood System Profiles used for priority setting	Global standardized approach customized to selected cities in BGD, KEN, PHL, GHA, PER	Municipal authorities (e.g., Dhaka, Manila) IFIs (World Bank)	Municipalities and their partners continue to invest in UPU agrifood sector. World Bank and other IFIs respond to demand from their clients.
2	*Integrated UPU Agrifood System Profiles* used for priority setting	Municipal authorities and their public and private sector partners in at least 6 cities adopt evidence-based approaches, tools, and business models for planning, implementing and monitoring investments in a circular bioeconomy and/or strategies to mitigate environmental and human health risks.	Global standardized approach customized to selected cities in BGD, KEN, PHL, GHA, PER	Municipal authorities, planning agencies, private sector	Municipalities and their partners continue to invest in UPU agrifood sector Access to evidence base and tools
3	Improved indicators, data tools and metrics developed	Research & training institutes and civil society use improved indicators, data tools and metrics	Global standardized approach customized to selected cities in BGD, KEN, PHL, GHA, PER	Universities, private sector research providers, environmental and food rights groups	Partners see benefit from using improved indicators, data tools and metrics Access to capacity development opportunities
4	Lean Launchpad approach adapted to urban agrifood startups	Lean Launchpads support agrifood startups	Piloted in PER in 2022–2025	Startup enterprises, training providers	Young entrepreneurs motivated to invest in agrifood startups Access to trainings and other Lean Launchpad functions
5	Center of Excellence for UPU Agrifood Systems operational	LMIC stakeholders participate in and contribute to the Center of Excellence	Global facility	Local and national governments, civil society groups, research organizations, IFIs, private sector, universities	LMIC stakeholders have access to virtual facility and to capacity development activities

Causal linkage	From result	To result	Geographical dimension	Actor type	Assumption
					Research and development partners willing and able to share knowledge
6	LMIC stakeholders participate in and contribute to the Center of Excellence	Urban planners and stakeholders participating in global networks of more than 200 cities representing over 400 million consumers use, promote and improve Research and Innovation tools and approaches	Global standardized approach customized to selected cities in BGD, KEN, PHL, GHA, PER	Multi-stakeholder platforms, municipal authorities, private sector associations	Food systems remain high on cities' agenda Stakeholders from formal and informal sectors can actively participate

The theory of change

This WP will serve three functions for the overall Initiative. First, it will integrate sectoral analyses of resilience in *WP1-4* into a Resilient UPU Agrifood Systems framework to generate integrated resilience analyses (*Profiles*) at city level. Second, it will produce a set of customized tools (indicators, metrics, data tools, capacity development modules) to enable stakeholders and next users to pursue UPU resilience analyses and use these for prioritizing investment opportunities, policy development, or social action plans. Third, it will establish platforms for stakeholder and partner engagement at two levels – *Lean Launchpad* innovation facilities for urban agrifood startup enterprises, and a global virtual *Center of Excellence* for exchange and learning in support of LMIC UPU Agrifood System initiatives.

Our theory of change is that by focusing minds on the integrative and topical Resilience concept and by underpinning this focus with practical tools for action and platforms for engagement, we will be able to influence UPU stakeholders in public and private sectors to consider new knowledge, evidence and guidelines that will improve governance and enabling conditions for UPU agrifood sector growth. For 2022–2025, Resilient Cities will select cities that have expressed urgent demand for collaboration and that have a demonstrated commitment to support agrifood policy and innovation.

Active participation of stakeholders and next users in the co-development of *Integrated UPU Agrifood System Profiles* will be essential for capturing diverse and competing perspectives, accessing relevant data, and laying the foundation for the active use of these knowledge products. This sense of ownership will be reinforced through their participation in piloting of knowledge tools (indicators, metrics, data tools) and in capacity development activities. Given the multi-functionality and complexity of UPU Agrifood Systems, stakeholders will come from agrifood and other economic, social and environmental sectors, representing both formal (municipalities and regional governments) and informal (community food labs and consumer rights groups) institutions, and operating both locally, at City-Region level and nationally. We will build on existing partnerships and platforms to convene stakeholders and work within available agrifood frameworks and guidelines (such as by MUFPP and FAO) to utilize existing

momentum, capacities, and accountabilities for creating uptake and use of our research products.

Enabling stakeholders to follow through on improved opportunities within an improved policy environment requires continued capacity development and access to technologies and services. In this regard, the WP will customize a *Lean Launchpad* approach for young urban entrepreneurs in formal and informal UPU agrifood startup enterprises to generate marketable innovations. Technical and business trainings will prepare these startups to drive local innovation in highly dynamic environments. Similarly, the WP will work through local urban food labs, informal innovation platforms, to enable women and youth in the urban food system to identify and act on their priority interests, test new business ideas, and build coalitions for change.

Responding to demand for a global research platform to support LMIC efforts, Resilient Cities will establish a virtual Center of Excellence for UPU Agrifood Systems. The Center will be co-hosted by CGIAR and global partners such as MUFPP and will provide a consolidated platform for sharing evidence, research methodologies and tools, training modules and other capacity development opportunities, and access to technological and institutional innovations.

4. Innovation Packages and Scaling Readiness Plan

Resilient Cities will bring together more than twenty Innovation Packages and partnerships for scaling developed through several CGIAR research programs. We will integrate these into a coherent scaling approach that harnesses the capacities and vitality of urban systems and their stakeholders. Through *WP1-4*, we will pursue a subset of the Innovation Packages initially identified during the consultation process (see Annex 6). These include Innovations that are ready for scaling and/or already linked to scaling partnerships, such as circular bioeconomy models (*WP3*) that will be shared more widely through existing cooperation agreements with FAO, World Bank and other scaling partners. We will also select Innovations at an initial stage of development, such as for peri-urban vegetable production (*WP1*) or informal urban food markets (*WP2*). In addition, through *WP5*, the Initiative will identify agrifood scaling strategies that are most effective in urban systems, applying principles of Scaling Readiness and related approaches and starting with an assessment of enabling and constraining factors across formal and informal sectors.

Resilient Cities seeks consideration for the Second Wave starting on Light Track with three Innovation Packages in Q2 2023, and moving to Standard Track to develop Scaling Readiness Assessment Reports and Scaling Strategies for these three Innovation Packages from Q1 2024, equivalent to 0–25% of the portfolio by end of 2024.

The Initiative allocated US$500,000 to implement the Innovation Packages and Scaling Readiness plan (2023: US$200,000; 2024: US$300,000). Dedicated activities, deliverables, indicators, and line-items are included in the Management Plan's MELIA and Budget sections.

5. Impact statements

5.1 Nutrition, health and food security

Challenges and prioritization: Nearly 200 million children[99] under-five suffer from undernutrition worldwide, alongside 38 million affected by overweight. This double burden of malnutrition is particularly prominent in urban settings. Unsafe food is estimated to cause more than 600 million illnesses[100] and nearly half a million deaths annually. The Initiative will work to make food chains that feed urban areas more efficient and shorter, thus constraining the food systems' environment and health impacts, and to support healthier food environments to ensure the urban poor have increased access to safe and nutritious diets.

Research questions: Several research questions address these challenges: studies to decipher the diet and nutrition problems facing low-income consumers, and how SAPs can improve diets and nutritional status of consumers in UPU settings; looking at community-based platforms, and promoting the role of women and youth, to best stimulate UPU food production and healthy food behavior; identifying leverage points among market system actors and institutions that can lead to healthier diets and more decent work for vendors; and approaches to food safety management that can improve food quality and reduce food waste and food-related health-risks in informal UPU systems.

Components of Work Packages: *WP4* works on profiling urban food environments and factors influencing diets, with attention to key target groups (e.g. women and adolescents). *WP1* will focus on the adaptation and scaling of technologies and institutional innovations that increase production of nutrient-dense foods in UPU settings. Strengthening market actor linkages and promoting technologies to reduce losses and waste, *WP2* will help reposition informal markets as catalyzers of nutritious foods and promoters of healthy diets. *WP3* will support municipal authorities with locally relevant strategies to maintain food safety and engage with food safety agencies worldwide to develop of LMIC-relevant food safety guidelines. *WP5* will provide knowledge and research support for multi-stakeholder policy dialogue working through existing urban food systems platforms and regional and global city networks.

Measuring performance and results: The Initiative will monitor the number of people meeting minimum micronutrient requirements and the number of cases of communicable and non-communicable diseases, both of which will be based on community surveys and official country statistics. Moreover, it will monitor one Action Area outcome indicator, the STi 2.1 Diet quality score, monitored through community-based surveys.

Partners: The Initiative will maximize impact by ensuring innovations are demand-led and informed by multi-stakeholder platforms, markets actors and consumers. The Initiative will work with municipalities and local and national governments to jointly validate research approaches and findings. It will also engage private industry to ensure technologies and innovations are locally relevant.

Human resources and capacity development of Initiative team: The Initiative Team will include nutritionists, behavior change researchers, food safety specialists and epidemiologists with strong experience in field-level and policy research and in program design and evaluation. They will source the latest methodologies and evidence through their science networks and will mentor and train junior researchers and local research partners in critical research skills pertaining to nutrition, health and food security in UPU environments.

5.2 Poverty reduction, livelihoods and jobs

Challenges and prioritization: Escaping rural poverty is an important driver of rural-to-urban migration. However, insufficient jobs are created to absorb the growing urban population and urban poverty is an increasing problem. The UPU agrifood sector can play an important role in creating jobs in production, postharvest processing, transport and vending. As the agrifood sector is largely informal and many jobs are low-skilled, it is a challenge and a priority to create jobs that offer decent work with fair payment and security; and to prioritize opportunities for women and youth.

Research questions: Resilient Cities will promote job creation and livelihood enhancement for people in the UPU agrifood sector. Research questions focus on identifying key constraints to income generation from food production or marketing of food or organic wastes, and technical and institutional innovations along the value chain that can increase the quantity and quality of jobs created alongside increasing food supplies. The Initiative will design and pilot interventions and assess their effect on poverty reduction, livelihoods and jobs.

Components of Work Packages: *WP1* focuses on quality job creation in UPU food production systems. *WP3* contributes to job creation in organic waste recycling, which can be an input to food production. *WP2* focuses on job creation in food marketing. Consumer demand (*WP4*) is a key driver of food production and marketing.

Measuring performance and results: Job creation will be monitored through two primary pathways and one supporting pathway. The 'capacity pathway' monitors business capacity development and its application among MSMEs involved in food production, different types of food marketing and businesses associated with waste recovery, reuse and recycling. Indicators for both quantifying increases in income streams from the agrifood system as well as assessment of work quality will be used, the latter drawing on the ILO toolkit on mainstreaming decent work[101] and other resources. The second pathway monitors changes in market infrastructure and organization to increase access to and diversification of work environments and opportunities.

Partners: Local government organizations have a key role in addressing particular constraints to or creating incentives for UPU food production. Private sector organizations will be important partners in the area of food processing, trade, and organic waste recycling. CSOs will be important partners for stimulating local food production inside communities.

Human resources and capacity development of Initiative team: The impact on poverty reduction, livelihoods and jobs will be achieved through a coordinated approach involving all Work Packages. However, the emphasis will on *WP1* (food production), *WP2* (processing and marketing), and *WP3* (organic waste recycling) as these are most directly related to income and jobs. Expertise will include agronomists, value chain experts, postharvest specialists, and social scientists including gender experts. Partnerships with educational institutions in the partner countries will be sought to strengthen in-country capacity in this area.

5.3 Gender equality, youth and social inclusion

Challenges and prioritization: Social norms, economic competition and poor governance continue to marginalize different groups based on their age, gender and other socio-demographic characteristics[102] [103]. Empowering these groups through transformative processes is a central element of the Initiative[104]. Under urbanization pressures, these groups are often excluded from access to productive resources such as land and water and have limited access to food. Women and youth in particular are forced into accepting low-paying, often high-risk jobs in the informal sector[56], to be living in crowded unsanitary conditions, having poorer diets and limited access to healthcare. Children in general, and young adolescent girls specifically, tend to be most at risk[105]. Addressing some of these issues through food system-based approaches can help improve the health and nutrition of women and youth, increase their access to decent employment and empower them to have greater agency in their own lives.

Research questions: How to best support women and youth in peri-urban areas to access land and water for production of nutritious, safe vegetables for urban markets (*WP1*)? How to use community-based platforms to stimulate UPU production and healthy food behavior (*WP1*)? How can changes in market infrastructure and organization make them more accessible and safe workspaces for women and youth (*WP2*)? How can business development skills and enterprise planning tools be made more gender and age responsive (*WP2, WP3*)? How can SAPs be leveraged to improve the diets and nutritional status of low-income consumers in UPU settings (WP4)? What strategies are most effective for identifying and supporting networks of entrepreneurially oriented young women and men scientists to take up, refine and scale food systems research products for city resilience (*WP5*)?

Components of Work Packages: All WPs explicitly aim to understand how to work with women and youth and address their needs in UPU agrifood settings. *WP1*, *WP2* and *WP5* will investigate how to improve employment and livelihood opportunities for women (*WP1, WP2*) and youth (*WP1* and *WP5*). *WP2* includes a focus on repositioning markets to provide better and safer access for women and youth and design gender transformative business capacity development tools. *WP4* includes a specific focus on understanding the diet, health and nutrition challenges facing women, adolescents and young children living in UPU settings and co-designing innovations to address these challenges. All WPs will collect gender-disaggregated data and data on relevant socio-demographic indicators to better understand reach and benefit patterns among different groups.

Measuring performance and results: In this Initiative the most relevant indicators are the number of women, youth and marginalized groups who report input into productive decisions, ownership of assets, access to and decisions on credit, control over use of own or household income, leisure time and responsibilities outside the household. Where feasible we will assess the impact of innovations on women's empowerment[106].

Partners: Innovation partners include NARES, municipal officers, universities, private sector and international organizations (WFP, RUAF, FAO, others). Demand and scaling partners include government stakeholders, municipal government and networks, and international organizations (WFP, FAO, development banks, others).

Human resources and capacity development of Initiative team: Team members working on this Impact Area include nutritionists, economists, and social scientists. To improve the equity

of the Initiative itself, we will work equitably with a wide range of stakeholders within the target countries in the co-design of the innovations.

5.4 Climate adaptation and mitigation

Challenges and prioritization: The global agrifood system is responsible for about 21–37% of annual anthropogenic greenhouse gas emissions[107], particularly methane and nitrous oxide. Increasing demand for animal-sourced food products is one of the key drivers of these emissions. It is therefore important to increase the consumption of healthy and sustainable diets and urban food systems are at the frontline of this challenge. Changes in the food habits and food preferences of urban residents could help to transform agrifood systems, thereby reducing greenhouse gas emissions from the agrifood system.

Research questions: Key research questions guiding our work in this Impact Area include: How can we close nutrient cycles by converting urban organic waste into a useful input for crop and livestock production? What technologies, business models and policies can help reduce food losses in urban food systems through more efficient marketing and processing?

Components of Work Packages: *WP1* will contribute technical and institutional innovations to stimulating safe and sustainable food production in UPU areas, including the potential use of organic waste as an agricultural input. *WP2* will focus on enhancing market systems and processing to reduce food losses. Substituting short for long value chains will also contribute to reducing greenhouse gas emissions associated with transport. *WP3* focuses on closing nutrient cycles by collecting and transforming organic waste. *WP4* will promote consumer demand for sustainable and healthy diets, which is an important driver for overall food system change.

Measuring performance and results: The key outcome indicator for this Impact Area is the amount of new investment in better urban organic waste management. Technologies and business models are available at different stages of Scaling Readiness, and we will track their uptake and document investments made (*WP3*). Through *WP2* and *WP4*, we will work to reduce food waste along the market chain and will measure reductions achieved through specific interventions at different nodes in this chain.

Partners: Resilient Cities will partner with local government organizations, which have a key interest in climate change adaptation and mitigation as many cities are highly vulnerable to the effects of climate change. Collaboration with higher-level government agencies and ministries will also be pivotal in introducing incentives promoting food production in UPU areas. Private sector organizations will be important partners in the area of food processing, trade, and organic waste recycling. CSO partnerships will help stimulate local food production inside communities.

Human resources and capacity development of Initiative team: Creating impact on climate change adaptation and mitigation requires changes to the functioning of food systems. Such changes can only be achieved through coordinated action across the Work Packages within Resilient Cities. It will require the expertise of agronomists, market experts, experts in organic waste management, social scientists, and nutritionists. Capacity building of national partners in UPU food production, marketing and processing will be important.

5.5 Environmental health and biodiversity

Challenges and prioritization: UPU systems are likely affected by urban pollution and waste and can also contribute to environmental health (including human health) hazards where intensive systems on limited space (e.g., controlled-environment agriculture) rely significantly on agro-chemicals or contribute to the spread of zoonotic diseases. Both challenges have been incorporated into the IDT and will be part of the research of *WP1-3*.

Research questions: How can informal food production systems and food markets in LMIC transition towards increased food safety, e.g., by incentivizing behavior change[108] especially in view of health risks due to zoonosis[109], or from urban milk and meat markets (*WP2,3*)**.** How can we increase the adoption of safety practices along the food chain of wastewater irrigated vegetables[110] in line with the WHO 2006 guidelines (*WP 2,3*)? How do we minimize agro-chemical use for sustainable agricultural intensification in UPU systems (*WP1*)?

Components of Work Packages: *WP1* will address sustainable farming practices; *WP2* focuses on efficient and safe marketing practices; and *WP3* explores (i) options and strategies for the adoption of risk reducing practices across the value chains drawing on proven guidelines and modules for gender-sensitive education/awareness creation, incentivizing behavior change, nudging and social marketing, and appropriate regulations, and (ii) business options on how to turn urban waste from a hazard into a valuable resource.

Measuring performance and results: Two of the formulated outcomes under Section 2.2. reference environmental and human health: At least 10,000 small-scale producers in UPU zones can access and utilize improved technologies, skills, know-how and management tools for safer, more sustainable and more efficient vegetable, livestock and fish production. A reduction of excessive agrochemical use by at least 30% for selected crops and increased availability of diverse, nutritious and safe foods from less polluted UPU environments. Municipal authorities and their public and private sector partners in at least six cities adopt evidence-based approaches, tools, and business models for planning, implementing, and monitoring investments in a circular bioeconomy (safe solid waste and wastewater reuse), food supply chains, and/or strategies to mitigate environmental and human health risks including waterborne and foodborne and zoonotic diseases.

Partners: Municipal health and waste management departments for demand, social marketing and behavior change institutes like 17 Triggers[111] for innovations, and for scaling e.g. WHO and FAO based on existing collaborations. The work will link closely to the One-health initiative and its partner network.

Human resources and capacity development of Initiative team: The Initiative Team will include CGIAR scientists with expertise in environmental and human health and with strong collaborative research networks in these fields. At least one senior Initiative Team scientist will also be a member of the One Health Initiative Team, and a detailed collaboration plan with One Health will be developed within the first three months of launch.

6. Monitoring, evaluation, learning and impact assessment (MELIA)

6.1 Result framework

CGIAR Impact Areas				
Nutrition, health and food security	**Poverty reduction, livelihoods and jobs**	**Gender equality, youth and social inclusion**	**Climate adaptation and mitigation**	**Environmental health and biodiversity**
Collective global 2030 targets (The collective global 2030 targets are available centrally here to save space).				
• End hunger for all and enable affordable healthy diets for the 3 billion people who do not currently have access to safe and nutritious food. • Reduce cases of foodborne illness (600 million annually) and zoonotic disease (1 billion annually) by one third.	• Lift at least 500 million people living in rural areas above the extreme poverty line of US$1.90 per day (2011 PPP). • Reduce by at least half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions.	• Offer rewardable opportunities to 267 million young people who are not in employment, education or training • Close the gender gap in rights to economic resources, access to ownership and control over land and natural resources for over 500 million women who work in food, land and water systems.	• Equip 500 million small-scale producers to be more resilient to climate shocks, with climate adaptation solutions available through national innovation systems.	• Stay within planetary and regional environmental boundaries: consumptive water use in food production of less than 2500 km3 per year (with a focus on the most stressed basins), zero net deforestation, nitrogen application of 90 Tg per year (with a redistribution towards low-input farming system) and increased use efficiency; and phosphorus application of 10 Tg per year
Common impact indicators that your Initiative will contribute to and will be able to provide data towards (refer to page 5 of Guidance for MELIA for selection of appropriate indicators)				
# of people meeting minimum micronutrient requirements # of cases of communicable and non-communicable diseases	# of people benefiting from relevant CGIAR innovations # of people assisted to exit poverty	# of women benefitting from relevant CGIAR innovations # of youth benefitting from relevant CGIAR innovations	# of people benefiting from climate-adapted innovations	# ha under improved management # km3 consumptive water use in food production
SDG targets				
2.1, 2.2, 2.4	1.5, 1.b, 8.3, 8.5, 11.3	5.5, 5.a	11.b	6.4, 6.a, 6.b, 11.a

Regional Agrifood Systems	
Action Area outcomes	**Action Area outcome indicators**
RAFS 1 - Smallholder farmers use resource-efficient and climate-smart technologies and practices to enhance their livelihoods, environmental health and biodiversity	RAFSi 1.1 Number of resource-efficient and climate-smart technologies at stage IV (uptake by next user), disaggregated by type
RAFS 2 - Research and scaling organizations enhance their capabilities to develop and disseminate RAFS-related innovations	RAFSi 2.1 Number of organizations.
RAFS 3 - Public and private financial resources are invested to fund climate-smart business models.	RAFSi 3.1 Total amount (US$) invested in climate smart business models
ST & RAFS & GI 1 - Women and youth are empowered to be more active in decision making in food, land and water systems	STRAFSGIi 1.2 Number of women, youth and people from marginalized groups who report input into productive decisions, ownership of assets, access to and decisions on credit, control over use of income, work balance, and visiting important locations
ST & RAFS 2 - National and local governments utilize enhanced capacity (skills, systems and culture) to assess and apply research evidence and data in policy making process	STRAFSi 2.1 Number of policies/ strategies/ laws/ regulations/ budgets/ investments/ curricula (and similar) at different scales that were modified in design or implementation, with evidence that the change was informed by CGIAR research
ST 1 - Farmers use technologies or practices that contribute to improved livelihoods, enhance environmental health and biodiversity, are apt in a context of climate change, and sustain natural resources.	STi 1.3- Measurable implications of adoptions such as production, profitability, input use, product quality and associated price, environmental and health damage avoided, livelihood, and employment
ST 2 – Consumers have the information, incentives and wherewithal to choose healthy diets	STi 2.1 Diet quality score

Table C

Initiative and Work Package outcomes, outputs and indicators											
Result type	Result	Indicator	Unit of measurement	Geographic scope	Data source	Data collection method	Frequency of data collection	Baseline value (outcome only)	Baseline year (outcome only)	Target value	Target year
Cross-cutting											
Outcome	At least 10,000 small-scale producers in UPU zones can access and utilize improved technologies, skills, know-how and management tools for safer, more sustainable and more efficient vegetable, livestock and fish production. Reducing the excessive use of agrochemicals and increasing the use of nature-positive alternatives will increase availability of diverse, nutritious and safe foods from less polluted UPU environments.	# of producers reached	Number	Ghana, Kenya, Ethiopia, Peru, Philippines, Bangladesh	Primary data collection	Farmer surveys	Annual	0	2022	10,000	2025
Outcome	At least 10,000 local MSMEs in food processing, marketing and agrifood service sectors can access and utilize business development toolkits, improved technologies, knowledge and skills, with strong participation by women and youth. These investments will generate increased employment and incomes and will help improve availability and affordability of nutritious foods among low-income UPU consumers.	# of MSMEs	Number	Ghana, Kenya, Ethiopia, Peru, Philippines, Bangladesh	Primary data collection	Stakeholder surveys	Annual	0	2022	10,000	2025
Outcome	Municipal authorities and their public and private sector partners in at least 6 cities adopt evidence-based approaches, tools, and business models for planning, implementing, and monitoring investments in a circular bioeconomy (safe solid waste and wastewater reuse) and/or strategies to mitigate environmental and human health risks including waterborne, foodborne, and zoonotic diseases.	# of cities adopting evidence-based approaches	Number	Ghana, Kenya, Ethiopia, Peru, Philippines, Bangladesh	Primary data collection	Process tracing	End-of-Initiative	0	2022	6	2025
Outcome	At least 4 million consumers benefit from nutrition programs in public, civil society and private sector that use evidence-based UPU food environment and consumption toolkits,	# of cities adopting evidence-	Number	Ghana, Kenya, Philippines, Bangladesh,	Primary data collection	Process tracing	End-of-Initiative	0	2022	6	2025

Initiative and Work Package outcomes, outputs and indicators											
Result type	Result	Indicator	Unit of measurement	Geographic scope	Data source	Data collection method	Frequency of data collection	Baseline value (outcome only)	Baseline year (outcome only)	Target value	Target year
	including approaches to increase women's decision-making power and to improve diet quality and nutritional status.	based approaches		Sri Lanka, Rwanda							
Outcome	Urban planners and stakeholders participating in global networks of more than 200 cities representing over 400 million consumers use, promote, and further improve Research and Innovation tools and approaches developed by research and training institutions and civil society groups to accelerate UPU Agrifood System development and strengthen urban resilience	# of planning agencies and stakeholder groups that use and promote urban-focused research and innovation tools	Number	Ghana, Kenya, Ethiopia, Peru, Philippines, Bangladesh	Primary data collection	Process tracing	End-of-Initiative	0	2022	12	2025
Work Package 1 - Enabling sustainable production of nutritious foods in (peri-) urban zones											
Output	Resilience assessments of UPU food production contributing to *Integrated UPU Agrifood System Profiles (WP5)*	# of assessments	Number	Kenya, Ethiopia, Philippines, Bangladesh	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	4	2025
Outcome	**Small-scale producers in UPU zones access and utilize improved technologies, know-how and management tools**	# of producers	Number	Kenya, Ethiopia, Philippines, Bangladesh	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	10,000	2025
Output	Implementation guide on how to promote women and youth to produce nutritious and safe vegetables for urban markets	# of guides	Number	Kenya, Ethiopia	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	1	2025
Output	At least 300 women and youth trained in food production per country	# of people trained	Number	Kenya, Ethiopia	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	600	2025
Output	Implementation guide for improving seed and seedling systems to promote UPU food production	# of guides	Number	Kenya, Ethiopia, Philippines, Bangladesh	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	1	2025
Output	At least 200 people trained in food production and business management per country	# of people trained	Number	Kenya, Ethiopia, Philippines, Bangladesh	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	800	2025

Initiative and Work Package outcomes, outputs and indicators											
Result type	Result	Indicator	Unit of measurement	Geographic scope	Data source	Data collection method	Frequency of data collection	Baseline value (outcome only)	Baseline year (outcome only)	Target value	Target year
Outcome	**UPU planners and civil society programs use evidence-based guidelines to support efficient and safe UPU food production**	# of UPU plans and programs using improved guidelines	Number	Kenya, Ethiopia, Philippines, Bangladesh	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	8	2025
Output	Journal article summarizing findings from impact evaluation of the National UPU Agriculture Program of the Philippines	# of journal articles	Number	Philippines	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	1	2025
Output	Implementation guide on the use of schools as platforms to stimulate UPU food production and healthy food behavior	# of guides	Number	Bangladesh	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	1	2025
Output	At least 200 women and students per country trained in food production	# of people trained	Number	Bangladesh, Kenya	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	400	2025
Output	Implementation to exploit the re-use of urban waste in UPU food production	# of guides	Number	Kenya, Ethiopia, Philippines, Bangladesh	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	1	2025
Output	At least 100 people trained in food production and business management per country	# of people trained	Number	Kenya, Ethiopia	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	200	2025
Work Package 2 - Building inclusive and sustainable food markets and safeguarding supply chains											
Output	Market and safeguarding resilience assessments contributing to *Integrated UPU Agrifood System Profiles (WP5)*	# of assessments	Number	Ghana, Kenya, Ethiopia, Peru, Philippines, Bangladesh	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	6	2025
Outcome	**Market actors and institutions, with self- and external support, reposition and diversify local markets to provide safe, healthy diets and decent work**	% increase of selected nutritious foods available in low-income market segments	Number	Kenya, Peru, Philippines, Bangladesh	Primary data collection	Process tracing evaluation	Baseline and end-of-Initiative	0	2022	20%	2025

Initiative and Work Package outcomes, outputs and indicators											
Result type	Result	Indicator	Unit of measurement	Geographic scope	Data source	Data collection method	Frequency of data collection	Baseline value (outcome only)	Baseline year (outcome only)	Target value	Target year
		# MSMEs generating increased decent work opportunities	Number	Kenya, Peru, Philippines, Bangladesh		Annual reporting process	End-of-Initiative	0	2022	5,000	2025
Output	Guidelines for market repositioning including new roles and functions and consumer outreach	# of guides	Number	Kenya, Peru, Philippines, Bangladesh	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	4	2025
Output	Adapted business school capacity development method/market systems development tools	# of methods	Number	Kenya, Peru, Philippines, Bangladesh	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	4	2025
Output	Policy recommendations on the use of institutional market food tenders/provisioning arrangements and piloting plans for green markets to expand short value-chain food supplies from local producers.	# of policy reports	Number	Kenya, Philippines, Bangladesh, Peru	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	4	2025
Output	Food market risk profile and mitigation options developed, with necessary capacity strengthening needs identified	# of innovations	Number	Kenya, Peru, Philippines, Bangladesh	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	1	2025
Output	Vendor enterprise capacities strengthening undertaken	# capacity strengthening events	Number	Kenya, Peru, Bangladesh, Philippines	Training reports	Reporting process	End-of-Initiative	N/A	N/A	12	2025
Outcome	**UPU producers and marketing enterprises safeguard food supplies through digital integration, processing and storage**	# MSMEs using at least one innovation to safeguard food supplies	Number	Kenya, Peru, Philippines, Bangladesh		Annual reporting process	End-of-Initiative	0	2022	5,000	2025
Output	Joint producer-vendor digital platforms for food marketing and waste reduction	# of innovations	Number	Kenya, Peru, Philippines, Bangladesh	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	4	2025
Output	Food transformation and storage entry points identified for reduced waste, increased employment and market actor storage and processing capacity strengthening needs identified	# of innovations	Number	Kenya, Philippines, Bangladesh. Peru	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	1	2025
Work Package 3 – Strengthening circular bioeconomy, food safety and the urban environment											

Initiative and Work Package outcomes, outputs and indicators											
Result type	Result	Indicator	Unit of measurement	Geographic scope	Data source	Data collection method	Frequency of data collection	Baseline value (outcome only)	Baseline year (outcome only)	Target value	Target year
Output	Bioeconomy, food safety and environmental resilience assessments contributing to *Integrated UPU Agrifood System Profiles (WP5)*	# of assessments	Number	West Africa, South Asia	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	4	2025
Outcome	**Increased capacity for RRR business planning and operations**	# of businesses acquiring new RRR knowledge	Number	West Africa, South Asia	Training events	Pre- and post-training assessments	End-of-Initiative	0	2022	10	2025
Output	Training materials on circular bioeconomy options linking waste management and agriculture published for industry, civil society, government, and development organizations	# of training material packages	Number	Global	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	1	2025
Output	Blueprint for design, testing and scale of circular bioeconomy business models published	# of publications	Number	2 countries in West Africa and South Asia	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	1	2025
Outcome	**Increased knowledge on options to invest in locally viable RRR models and/or the supportive regulatory environment**	# of public finance and development agencies acquiring new knowledge on RRR financing models	Number	Global	Stakeholder meetings and training events	Annual reporting process	End-of-Initiative	0	2022	3	2025
Output	Evidence-based decision support system (for advisory services) operational	# of support systems	Number	West Africa, South Asia	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	1	2025
Outcome	**Increased knowledge on best adoption drivers for food safety and environmental health from urban trade-offs**	# of institutions participating in workshops, training, and dissemination events	Number	Global	Project reports	Annual reporting process	End-of-Initiative	0	2022	10	2025

Initiative and Work Package outcomes, outputs and indicators											
Result type	Result	Indicator	Unit of measurement	Geographic scope	Data source	Data collection method	Frequency of data collection	Baseline value (outcome only)	Baseline year (outcome only)	Target value	Target year
Output	Decision support and guidelines for human and environmental health risk reduction in (peri)urban settings	# guidelines tools	Number	Global	Project reports	Annual reporting process	End-of-Initiative	0	2022	1	2025
Output	Evidence on urban burden health burden	# of publications	Number	West Africa, South Asia	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	2	2025
Output	Evidence on successful incentive-based strategies for food safety in urban settings	# of training material packages	Number	West Africa, South Asia	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	2	2025
Work Package 4 – Improving food environments and consumer behavior for nutrition											
Output	Diet and food environment resilience assessments contributing to *Integrated UPU Agrifood System Profiles (WP5)*	# of profiles	Number	Ghana, Kenya, Ethiopia, Peru, Philippines, Bangladesh, Rwanda, Sri Lanka	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	8	2025
Outcome	**Stakeholders in at least 3 countries adopt UFED toolkits**	# of countries	Number	Ghana, Kenya, Ethiopia, Peru, Philippines, Rwanda, Sri Lanka	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	3	2025
Output	UFED toolkit that includes an inventory of food environment and dietary assessment methods with recommendations as to what combinations to use in UPU settings	# of toolkits	Number	Ghana, Philippines, Sri Lanka	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	1	2025
Outputs	Assessment of the validation of using FRANI to assess nutrient intake compared to 24 h recalls in adolescents in GHA and LKA	# of validation assessments	Number	Ghana, Sri Lanka	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	2	2025
Outputs	Assessment of the validation of using phone-based dietary survey compared to a weighed record	# of validation assessments	Number	Sri Lanka	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	1	2025
Outcome	**Countries promote guidelines for SAPs in urban environments for safe and sustainable health diets.**	# of countries	Number	Ghana, Kenya, Ethiopia, Peru,	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	3	2025

Initiative and Work Package outcomes, outputs and indicators											
Result type	Result	Indicator	Unit of measurement	Geographic scope	Data source	Data collection method	Frequency of data collection	Baseline value (outcome only)	Baseline year (outcome only)	Target value	Target year
				Philippines, Rwanda, Sri Lanka							
Outcome	**Stakeholders and beneficiaries participate in pilots of at least one SAP with the aim of improving diets (women and/or youth)**	# of pilots	Number	Sri Lanka, Kenya, Rwanda, Philippines	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	1	2025
Output	Guidance for leveraging SAPs to improve diets in UPU settings published	# of guidance	Number	Global	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	1	2025
Output	Recommendations of optimal strategies or combinations of interventions to lower diet-related NCDs among low-income populations in UPU settings	# of recommendation lists	Number	Ghana, Burkina Faso	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	2	2025
Work Package 5 – Strengthening the evidence base and research & innovation capacities for UPU Agrifood System governance and growth											
Outcome	***Integrated UPU Agrifood System Profiles* used for priority setting by Municipalities, National Ministries, World Bank and other IFIs**	# Profiles actively used	Number	Ghana, Kenya, Ethiopia, Peru, Philippines, Bangladesh	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	4	2025
Output	Integrated UPU Agrifood System Profiles (incl. investment options) published	# of assessments	Number	Ghana, Kenya, Ethiopia, Peru, Philippines, Bangladesh	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	6	2025
Outcome	**Researchers, training institutes, civil society groups etc. use improved tools to analyze and monitor agrifood development**	# tools actively used	Number	Ghana, Kenya, Ethiopia, Peru, Philippines, Bangladesh	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	3	2025
Output	Improved indicators, metrics and data tools for resilient UPU Agrifood Systems published	# publications of indicators, metrics and data tools	Number	Global review and adaptation through pilots in Bangladesh,	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	3	2025

Initiative and Work Package outcomes, outputs and indicators											
Result type	Result	Indicator	Unit of measurement	Geographic scope	Data source	Data collection method	Frequency of data collection	Baseline value (outcome only)	Baseline year (outcome only)	Target value	Target year
				Philippines, Kenya, Ghana, Peru							
Output	Training modules developed and e-learning courses launched	# training modules available for e-learning	Number	Global, with translations into relevant languages	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	4	2025
Outcome	**Lean Launchpads support urban agrifood startups**	# urban agrifood startups supported	Number	Peru	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	10	2025
Output	Lean Launchpad tools customized to UPU agrifood startups	# of training material packages	Number	Peru	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	1	2025
Output	Young scientists trained to pursue evidence-based science entrepreneurship	# young scientists trained	Number	Peru	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	20	2025
Outcome	**LMIC stakeholders participate in and contribute to dissemination and capacity development activities by the Center of Excellence for UPU Agrifood Systems**	# LMIC stakeholders actively participating	Number	Global	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	100	2025
Output	Center of Excellence for UPU Agrifood Systems launched	Launch completed	Yes/no	Global	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	Yes	2022
Output	Knowledge sharing events and capacity development sessions held targeting LMIC demand	# of knowledge sharing and capacity development events	Number	Global	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	8	2025
Output	Review papers on key topics in UPU Agrifood Systems pertinent to LMICs	# of review paper published	Number	Global	Project reports	Annual reporting process	End-of-Initiative	N/A	N/A	3	2025

6.2 MELIA plan

Monitoring, evaluation, and learning

For monitoring, evaluation and learning we will use a three-pronged approach to monitor progress towards completing the outputs and achieving the outcomes identified across the Work Packages and for the Initiative as a whole. For this we will either use a CGIAR-managed monitoring system or will create one if necessary. Through this system we will track achievement of planned outputs and gather data related to the expected outcomes that can be easily quantified. WP leaders will update their annual plan quarterly by indicating if activities are on track, delayed or need to be cancelled and offering feedback on any challenges they are facing in carrying out their annual work plans. We will use this combination of quarterly and annual reporting to make any adjustments to Work Package plans and budgets over the course of the three-year period.

The second part of our strategy will be to conduct annual rapid assessments and interviews with key stakeholders to take the pulse of the Initiative and its progress along the expected TOC. The focus of these assessments will be around capacity development, policy engagement, and adoption of technologies for strengthening urban food system resilience. As our resilience concept builds on related resilience frameworks developed recently by our partners, bridging in particular food system resilience[112] and urban resilience[76] frameworks, we will work with these partners to define indicators and baselines for tracking progress of our Initiative.

The third part of our strategy will be to evaluate the pathways towards success and failures that our Initiative might be experiencing. Given the short time frame of this first phase we will commission an evaluation of the Initiative in the second year with the expectation that activities will have had the chance to get up and running. This timing will also allow us to learn from the evaluation and understand what is working and what needs to be improved and to adjust our plans for the second three-year phase accordingly.

Impact assessments

In addition to these activities, we will also conduct causal impact assessments of selected interventions within or across WPs. These will be focused on critical TOC assumptions that can be assessed within the three-year timeframe, such as linkages between interventions designed to increase production, availability, or consumption of nutritious foods in UPU environments. Results from these assessments will be reviewed together with partners and stakeholders, will generate lessons and evidence for future programming, and will identify new knowledge gaps that will be targeted by the next round of impact assessment research.

Secondly, we will use process tracing methodologies to design evaluation activities that will help us understand, from a largely qualitative perspective, how the Initiative's activities are influencing external program and policy designs as laid out in our TOC. The results from these studies will help us reassess TOC assumptions and risks and, as may be necessary, adjust our approaches and methodologies, partner or stakeholder selection and collaboration models. Importantly, these studies will be designed and reviewed through a Scaling Readiness lens so that our learning and adjustments will also improve the scalability and scaling success of our innovations through by our scaling partners.

6.3 Planned MELIA studies and activities

Type of MELIA study or activity	Result or indicator title that the MELIA study or activity will contribute to	Anticipated year of completion	Co-delivery of planned MELIA study with other Initiatives	How the MELIA study or activity will inform management decisions and contribute to internal learning
Baseline studies	Will contribute to all end-of-Initiative outcome indicators	2023	To be identified during inception phase, depending on city selection	Will inform relative focus and emphasis of interventions in different cities. Will provide basis for subsequent impact evaluations. Will strengthen complementarities with related resilience monitoring frameworks[113] and increase responsiveness of CGIAR as a research partner.
Causal impact assessment learning studies	Increased efficiency of peri-urban food production, resulting in increased availability of nutritious foods in low-income urban markets, and in increased consumption of these foods by target beneficiaries	2025	*WP1, WP2, WP4* FRESH, Rethinking Markets	Will inform coordination and sequencing of research and delivery activities at production, market and food environment levels
Adoption and diffusion studies	MSMEs in informal sector adopting improved technologies, business plans, and safety practices	2025	*WP1, WP2, WP3, WP4* One Health, Rethinking Markets, and RII South Asia	Will inform approaches to engage with urban informal agrifood sector and determine how to customize agrifood dissemination strategies to the urban context
Process tracing	Understand how and to what extent next users of capacity development interventions (specifically policymakers and entrepreneurs) have improved their capacities and/or competences	2025	*WP5* National strategies and policies	Will inform capacity development approaches in urban policy and innovation context – with possible linkages to national approaches

7. Management plan and risk assessment

7.1 Management plan

The IMT, composed of lead, deputy lead, WP leaders, MELIA coordinator and country leads (some positions may be held simultaneously), will oversee planning, implementation and internal review of activities. The IMT will apply principles of adaptive management to steer the Initiative towards impact in complex and dynamic UPU environments. During the Inception Phase, the IMT will work with partners and stakeholders to update and sync the Initiative's TOCs, MELIA Plan and Scaling Readiness Plan, and defining verifiable stage-gating criteria, milestones and targets for each WP. By Month 3, the team will produce an integrated and well-sequenced IIP based on this initial prioritization. The IIP will include 6-monthly MELIA Review & Planning meetings (see Section 6.2) to capture progress and learning against milestones and underlying TOC assumptions, and to update the IIP on a rolling basis jointly with partners and stakeholders. Annually, the Initiative will produce a MELIA Report that documents the evolution of the IIP, results achieved, setbacks encountered, and the learning

that took place. This Annual Report will be accompanied by an Annual IIP and Budget for the coming year.

In support of this adaptive management approach, the Initiative will undertake selected analyses of specific TOC assumptions that warrant detailed attention. These brief studies will, for example, focus on incentives and barriers for change in the informal urban sector, or targeting strategies for gender and social inclusion outcomes. Insights from these analyses will be discussed with partners and stakeholders at the six-monthly Review & Planning meetings and may lead to revisions of the IIP, including technical approaches, Scaling Readiness Plan, milestones, stakeholder engagement and MELIA Plan.

7.2 Summary management plan

Initiative start date	Timelines												Description of key deliverables
	2022			2023				2024				2025	
Work Packages	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	
Work Package 1: Production			1			2		3a			3b		1. Implementation Guide for promoting women- and youth-led enterprises in UPU vegetable production for urban markets. 2. At least 300 women and youth led enterprises trained in better UPU vegetable production for urban markets. 3. Report (a) and journal article (b) on impact evaluation of National UPU Agriculture Program of the PHL.
Work Package 2: Markets				1				2				3	1. Market system resilience assessment contributing to city profiles. 2. Guideline documents for market repositioning in four countries based on identification of leverage points in selected fresh markets. 3. Digital communications mapping among food producers and traders on transactions, prices and spoilage and options for improved digital communications.
Work Package 3: Circular bioeconomy			1					2				3	1. UPU water quality guidelines for agriculture. 2. Drivers and barriers for the circular urban bioeconomy in the Global South (review article). 3. Publication on changing behavior to increase urban food safety (PhD thesis, papers).
Work Package 4: Food environment				1				2			3		1. UFED diagnostic and programming toolkit published. 2. Publications on impact modeling for optimal strategies to lower diet related NCDs among low-income populations in UPU settings 3. Guidance for UPU SAPs to promote safe and sustainable healthy diets disseminated in at least six countries.
Work Package 5: Integrated analysis				1		2					3		1. Urban Food System Profiles published (first city). 2. Metrics and data tools published and available to users. 3. E-learning modules operational.
Innovation Packages & Scaling Readiness							1					2	1. Documented scaling ambition, vision of success and roadmap for use of Scaling Readiness for three Core Innovations. 2. Evidence-based Scaling Readiness assessment reports and related scaling strategies for three Innovation Packages.
MELIA				1	2				3				1. CGIAR-managed MEL system operational and producing first Annual Report. 2. First Annual Rapid Appraisal with key stakeholders provides feedback on main processes. 3. Study report on Urban Informal Sector Diffusion informs Initiative strategy for this key pathway.
Project management	1				2				3				1. Initiative Inception Review with key partners and stakeholders to agree on Implementation Plan. 2. First Annual Management Review & Planning meeting to consider MEL results and adopt changes to Implementation Plan. 3. Second Annual Management Review & Planning meeting to consider MEL results and adopt changes to Implementation Plan.

7.3 Risk assessment

Top 5 risks to achieving impact	Description of risk	Likelihood	Impact	Risk score L x I	Mitigations
		1-5	1-5		
#1 Urban governance and enabling environment for agrifood sector development is weak	Within LMIC urban economies and policies, the agrifood sector receives little policy attention, in part because of its largely informal nature. To secure a sustainable and safe future and to realize the growth potential of the sector, key policy and planning support is required in areas like access to land, water, and services for enterprises involved in food production and marketing. Creating and/or safeguarding this support will be important for the impact of the Initiative.	3	3	9	Targeted interactions with policy and planning authorities to co-develop policy support priorities and pathways. Facilitation of multi-stakeholder platforms that articulate demand for policy and planning support. Through evidence and monitoring tools and skill development, enable accountability to stakeholders.
#2 Limited capacity of urban authorities in LMICs to follow through on innovations and recommendations	The Initiative expects that LMIC cities will be keen to adopt and invest in innovations and research products customized to their priorities. However, capacity in terms of human and financial resources, skills and institutional processes can be very limited, in particular in poorer urban centers outside the main capital cities. This can limit the scale and intensity of uptake of Initiative outputs beyond initial adoption.	4	3	12	Training and capacity development are integral parts of the Initiative, implemented through specialized partners. Fostering new partnerships for the urban agrifood sector. Harnessing regional and global city networks for capacity support and learning.
#3 Inadequate funding in short term to raise profile of key research and innovations	'Urban food systems' is a comparatively new area of investment for funders. While there is strong momentum amongst WB, ADB and others to establish a formal financing mechanism for this area, this may take throughout 2022 to be operational. On the other hand, the timing is excellent for CGIAR to establish our role in this area and to co-develop strategies and priorities with funders and major partners.	3	3	9	Close dialogue with prospective funders. Joint series of seminars with WB and their clients in 2022.
#4 COVID and insecurity risks in priority countries	Disruptions of movement and work from COVID-19 and associated public health measures can severely interfere with implementation of the Initiative. In some countries (e.g., ETH) insecurity from conflict adds to this risk.	3	3	9	Adjust selection of countries/cities as needed. Work through partners with strong operational capacity in locations at risk.
#5 Ineffective linkages with related Initiatives	To realize the full value of the Initiative's essential focus on urban food systems for the entire CGIAR portfolio, effective two-way	2	3	6	Coordination between Initiative teams for final design and during inception phase to

Top 5 risks to achieving impact	Description of risk	Likelihood	Impact	Risk score L x I	Mitigations
		1-5	1-5		
	linkages with other Initiatives are required: To link with innovations, methods and tools for customization for the urban context or for rural-urban research collaboration on selected issues; and to harness insights into urbanization as a key driver of food systems transformation for broader CGIAR programming.				develop a joined-up approach. Selection of high visibility areas for joint research across initiatives. Co-location of research activities where sensible.

8. Policy compliance, and oversight

8.1 Research governance

Researchers involved in the implementation of this Initiative will comply with the procedures and policies determined by the System Board to be applicable to the delivery of research undertaken in furtherance of CGIAR's 2030 Research and Innovation Strategy, thereby ensuring that all research meets applicable legal, regulatory and institutional requirements; appropriate ethical and scientific standards; and standards of quality, safety, privacy, risk management and financial management. This includes CGIAR's Research Ethics Code[114] and to the values, norms and behaviors in CGIAR's Ethics Framework[115] and in the Framework for Gender, Diversity and Inclusion in CGIAR's workplaces[116].

8.2 Open and FAIR data assets

Researchers involved in the implementation of this Initiative shall adhere to the terms of the Open and FAIR Data Assets Policy[117].

The Resilient Cities Initiative will align with the OFDA Policy's Open and FAIR requirements, ensuring:

- Rich metadata conforming to the CGIAR Core Schema[118] to maximize findability, including geolocation information where relevant.
- Accessibility by utilizing unrestrictive, standard licenses and depositing assets in open repositories. The specific licenses and repositories will be selected during the Inception Phase in coordination with the CGIAR System Management Office.
- Wider access through deposition in open repositories of translations and requiring minimal data download to assist with limited internet connectivity.
- Interoperability by annotating dataset variables with ontologies where possible (controlled vocabularies where not possible).
- Adherence to Research Ethics Code[111] (Section 4) relating to responsible data (through human subject consent, avoiding personally identifiable information in data assets and other data-related risks to communities) based on IRB clearance.

9. Human resources

9.1 Initiative team

Category	Area of expertise	Short description of key accountabilities
Cross-cutting		
Research	Food systems & resilience analysis. Program management.	Integrated resilience research across WPs; Initiative management; global stakeholder engagement
Research	Gender and social inclusion	Key research on gender and inclusion across WPs, ensuring uptake in WP workplans and analyses.
Research	Innovation systems research	Design, implement and evaluate Lean Launch pilots. Guidelines & training material for scaling successful pilots.
Research	MELIA coordination	Develop and implement MELIA Plans, supporting 6-monthly and annual review & planning meetings
Research support	Knowledge management and communications	Coordinate knowledge management plan and functions, incl. OA transfer. Internal and external communications.
Research support	Country-level coordination and partnership management	Country operations and stakeholder engagement. Co-convening of policy and technical forums.
Production Work Package		
Research	Vegetable agronomy, sustainable intensification	Technology adaptation research for UPU vegetable production. Capacity dev. of NARES & partners.
Research	Small-scale livestock production and marketing	Technology adaptation and delivery for safe and efficient UPU livestock production. Capacity dev. of NARES & partners.
Markets Work Package		
Research	Market systems analysis, supply & demand forecasting	UPU and CRFS studies on food supply and demand, input markets, service sector, labor markets, informal retailing.
Research	Agrifood enterprise development (informal)	New approaches and metrics for strengthening the informal urban food sector.
Food and nutrition Work Package		
Research	Nutrition, food environment, and food consumption	Knowledge Hub for urban nutrition programming options. UFED tools and metrics.
Research	Behavior change approaches (social, institutional)	Urban consumer behavior change strategies and tools.
Circular economy Work Package		
Research	Resource Recovery and Reuse (circular bioeconomy)	Adaptive research on key RRR technologies and associated business models.
Research	Food safety, environmental health, disease surveillance	Food safety analyses, tools for urban food-borne disease estimates, guidelines for urban food safety campaigns.
Research	Public-private partnership models, investment options	Develop and pilot PPP models for scaling RRR innovations. Analysis of investment options.
Governance and capacity Work Package		
Research	Policy and governance analysis	Analysis of (multi-sectoral) UPU governance and policy processes (formal and informal) affecting resilience
Research support	Capacity development	Implement Capacity Dev Plan with partners & stakeholders, incl. e-learning. Documentation of capacity outcomes.

9.2 Gender, diversity and inclusion in the workplace

The Initiative Team will be composed of around 50 researchers and other professionals with significant (>30%) time allocation to this Initiative. At least 20 members will be women. Team members will come from CGIAR priority countries in Africa, Asia and Latin America (together forming at least 80% of the Team) as well as from the Global North. Leadership will be devolved to empower and support diverse Team members in country and regional offices and to foster peer support and learning across disciplines and geographies. The Initiative Team will include a wide range of relevant academic disciplines and professions, reflecting CGIAR's proven advantage of combining bio-physical and social sciences and emphasizing new

competencies of specific relevance to this Initiative such as innovation science, circular bioeconomy, digital tools or urban planning.

Among the 12-person IMT (see Section 7.1) at least six members will be women and at least six members will come from the Global South.

The Initiative Team and the IMT are thus expected to meet CGIAR's gender target of a minimum of 40% women in professional roles and is comprised of individuals from diverse backgrounds. Women, minorities, and other under-represented groups will hold leadership roles in the Initiative Team. This will be seen in the composition of our IMT and will extend to the fair allocation of leadership activities and accountabilities. As the Initiative Team will grow over time, we will further promote and support the leadership roles for women, minorities and other under-represented groups following the guidance outlined in *CGIAR's GDI Inclusive Recruitment Toolkit*[119].

9.3 Capacity development

Resilient Cities will provide extensive capacity development opportunities for the Initiative Team as well as for external partners. Within the first three months of launch, all members of the IMT will complete training on inclusive leadership. Within the first six months, all members of the wider Initiative Team and main collaborators from partner organizations will complete training on gender, diversity, and inclusion, including on safeguarding and whistleblowing. The Initiative kick-off events (global and country level) will include sessions on CGIAR's values code of conduct, research ethics, and the range of learning opportunities available within CGIAR.

Resilient Cities will engage a Capacity Development Specialist to coordinate both internal and external capacity development activities, compile and manage a repository of all UPU training materials, and document and assess capacity outcomes as part of regular reviews of the Initiative's TOC. In all main research and research support areas, we will identify senior staff to mentor junior colleagues and to link them to additional external training and professional development opportunities. In this regard, we will prioritize and monitor the participation of female, minority, and other under-represented staff.

Resilient Cities will implement technical, scientific, and professional training programs as part of pursuing research and innovation. These will include selected PhD- and MSc-level training as well as short courses for scientists and professionals from NARES and other partners and will be provided by our university and training partners. In addition, we will produce and promote free e-learning modules on key technical and policy topics and support the participation of staff and partners in global and national platforms and learning events that we will facilitate with our scaling partners through the Center of Excellence.

10. Financial resources

10.1 Budget

10.1.1: Activity breakdown

USD	2022/2023	2023/2024	2024/2025	Total
Crosscutting across Work Packages	906,460	2,044,571	1,995,499	4,946,530
Work Package 1	992,324	1,488,486	1,488,486	3,969,296
Work Package 2	680,823	1,450,823	1,450,823	3,582,469
Work Package 3	799,672	1,598,853	1,600,544	3,999,069
Work Package 4	799,371	1,598,382	1,595,763	3,993,516
Work Package 5	821,350	1,618,885	1,568,885	4,009,120
Innovation Packages & Scaling Readiness	0	200,000	300,000	500,000
Total	**5,000,000**	**10,000,000**	**10,000,000**	**25,000,000**

10.1.2: Geographic breakdown

USD	2022/2023	2023/2024	2024/2025	Total
Global	1,250,000	2,500,000	2,500,000	6,250,000
East and Southern Africa	100,000	100,000	100,000	300,000
Kenya	596,629	1,193,258	1,193,258	2,983,145
Ethiopia	354,845	993,566	1,069,923	2,418,334
West and Central Africa	100,000	100,000	100,000	300,000
Ghana	542,479	1,030,710	1,010,710	2,583,899
South Asia	100,000	100,000	100,000	300,000
Bangladesh	695,486	1,530,069	1,524,569	3,750,124
Southeast Asia	100,000	100,000	100,000	300,000
Philippines	656,298	1,445,576	1,405,576	3,507,450
Latin America and Caribbean	-	-	-	-
Peru	504,263	806,821	795,964	2,107,048
Central and West Asia and North Africa	-	100,000	100,000	200,000
Total	**5,000,000**	**10,000,000**	**10,000,000**	**25,000,000**

Annexes

Annex 1: Acronyms
Annex 2: Partners
Annex 3: List of consultations
Annex 4: Letters of support
Annex 5: Contributions to SDG targets
Annex 6: Innovations

References

[1] United Nations Conference on Trade and Development. https://unctadstat.unctad.org/EN/

[2] Tefft J, Jonasova M, Adjao R, Morgan A. 2017. Food systems for an urbanizing world. Knowledge product. Washington, DC: World Bank; Rome, FAO. https://documents1.worldbank.org/curated/en/454961511210702794/pdf/Food-systems-for-an-urbanizing-world-knowledge-product.pdf

[3] Swinnen J, McDermott J, eds. 2020. *COVID-19 and global food security*. Washington, DC: IFPRI. https://doi.org/10.2499/p15738coll2.133762

[4] Acharya G, Cassou E, Jaffee S, Ludher EK. 2021. *RICH Food, Smart City: How Building Reliable, Inclusive, Competitive, and Healthy Food Systems is Smart Policy for Urban Asia.* Washington, DC: World Bank. https://openknowledge.worldbank.org/handle/10986/35137

[5] Lall SV, Lebrand MSM, Park H, Sturm DM, Venables AJ. 2021. *Pancakes to Pyramids: City Form to Promote Sustainable Growth (English).* Washington, DC: World Bank. http://documents.worldbank.org/curated/en/554671622446381555/City-Form-to-Promote-Sustainable-Growth

[6] FAO Green Cities Initiative. https://www.fao.org/green-cities-initiative/en/

[7] AGRF. 2020. *Feed the City, Grow the Continent. AGRF Virtual Summit 2020 Report*. The African Green Revolution Forum. https://agrf.org/agrf2021-old/wp-content/uploads/2021/06/AGRF-Summit-Report-web-2020.pdf

[8] Urban Harvest (CGIAR system-wide initiative 2000-2010). http://cipotato.org/wp-content/uploads/publication%20files/fact-sheets-flyer-leaflet/002592.pdf

[9] Rural-Urban Linkages Research Program on Water, Land and Ecosystems (2012-2021). https://wle.cgiar.org/research/themes/rural-urban-linkages

[10] Popkin BM, Corvalan C, Grummer-Strawn LM. 2020. Dynamics of the double burden of malnutrition and the changing nutrition reality. *The Lancet* 395(10217):65-74. https://www.sciencedirect.com/science/article/abs/pii/S0140673619324973

[11] Negroustoueva S, Jay-Yina KE. 2021. *Synthesis of learning from a decade of CGIAR research programs unpacks 'big picture' insights, lessons, and actionable recommendations for One CGIAR.* CGIAR Evaluation. https://cas.cgiar.org/evaluation/news/2021-synthesis-learning-decade-cgiar-research-programs-unpacks-big-picture-insights

[12] International Food Policy Research Institute. 2017. *2017 Global Food Policy Report.* Washington, DC: International Food Policy Research Institute. https://doi.org.10.2499/9780896292529

[13] Sally H, Merrey D. 2019. *Outcome evaluation of research for development work conducted in Ghana and Sri Lanka under the Resource, Recovery and Reuse (RRR) subprogram of the CGIAR Research Program on Water, Land and Ecosystems (WLE).* Colombo, Sri Lanka: IWMI https://wle.cgiar.org/outcome-evaluation-research-development-work-conducted-ghana-and-sri-lanka-under-resource-recovery

[14] CAS Secretariat (CGIAR Advisory Services Shared Secretariat). 2020. *CGIAR Research Program 2020 reviews: Agriculture for Nutrition and Health*. Rome: CAS Secretariat Evaluation Function.

[15] CAS Secretariat (CGIAR Advisory Services Shared Secretariat). 2021. *Synthesis of Learning from a Decade of CGIAR Research Programs.* Rome: CAS Secretariat Evaluation Function. https://cas.cgiar.org/sites/default/files/images/Publications/2021%20Synthesis_Report.pdf

[16] Foundation for Food and Agriculture Research. *Urban Food Systems Research Vision.* https://foundationfar.org/what-we-do/research/urban-food-systems-research-vision/

[17] van Bers C, Delaney A, Eakin H, et al. 2019. Advancing the research agenda on food systems governance and transformation. *Current Opinion in Environmental Sustainability* 39: 94-102. 10.1016/j.cosust.2019.08.003.

[18] Knorr D, Khoo CSH, Augustin MA. 2018. Food for an Urban Planet: Challenges and Research Opportunities. *Frontiers in Nutrition* 4:73. doi: 10.3389/fnut.2017.00073

[19] Blay-Palmer A, Santini G, Dubbeling M, Renting H, Taguchi M, Giordano T. 2018. Validating the City Region Food System Approach: Enacting Inclusive, Transformational City Region Food Systems. *Sustainability* 10(5):1680. https://doi.org/10.3390/su10051680

[20] Graefe S, Buerkert A, Schlecht E. 2019. Trends and gaps in scholarly literature on urban and peri-urban agriculture. *Nutrient Cycling in Agroecosystems* 115:143–158. https://doi.org/10.1007/s10705-019-10018-z

[21] Dubbeling M, de Zeeuw H. Multi-stakeholder policy formulation and action planning for sustainable urban agriculture development. *RUAF Working Paper Series.* Leusden, The Netherlands: RUAF Foundations. https://ruaf.org/document/multi-stakeholder-policy-formulation-and-action-planning-for-sustainable-urban-agriculture-development/
[22] RUAF. 2021. *Urban Agriculture Magazine 5.* https://ruaf.org/document/urban-agriculture-magazine-no-5-methodologies-for-research-policy-development-planning-and-implementation/
[23] RUAF. 2009. Building resilient cities. *Urban Agriculture Magazine* 22. https://ruaf.org/document/urban-agriculture-magazine-no-22-building-resilient-cities
[24] Kang'ethe E, Grace D, Alonso S, Lindahl J, Mutua F, Haggblade S. 2020. Food safety and public health implications of growing urban food markets. In: *AGRA, Africa Agriculture Status Report. Feeding Africa's cities: Opportunities, challenges, and policies for linking African farmers with growing urban food markets.* Issue 8. Nairobi, Kenya: Alliance for a Green Revolution in Africa (AGRA). p 101–119. https://cgspace.cgiar.org/handle/10568/109386
[25] Keraita B, Drechsel P. 2015. *Consumer perceptions of fruit and vegetable quality: certification and other options for safeguarding public health in West Africa.* Colombo, Sri Lanka: IWMI. https://www.iwmi.cgiar.org/publications/iwmi-working-papers/iwmi-working-paper-164/
[26] Drechsel P, Karg, H. 2013. Motivating behaviour change for safe wastewater irrigation in urban and peri-urban Ghana. *Sustainable Sanitation Practice* 16:10-20. https://cgspace.cgiar.org/handle/10568/40209
[27] Senanayake D, Reitemeier M, Thiel F, Drechsel P. 2021. *Business models for urban food waste prevention, redistribution, recovery and recycling.* Colombo, Sri Lanka: IWMI CGIAR Research Program on Water, Land and Ecosystems (WLE). https://cgspace.cgiar.org/handle/10568/113841
[28] Cabannes Y, Marocchino C. (eds). 2018. Integrating Food into Urban Planning. London: UCL Press; Rome: FAO. https://ruaf.org/document/integrating-food-into-urban-planning/
[29] French Agricultural Research Centre for International Development. https://www.cirad.fr
[30] Urban Harvest. http://cipotato.org/wp-content/uploads/publication%20files/fact-sheets-flyer-leaflet/002592.pdf
[31] CGSpace, A Repository of Agricultural Research Outputs. https://cgspace.cgiar.org/discover
[32] FAO. 2018. *On-farm practices for the safe use of wastewater in urban and peri-urban horticulture. A training handbook for Farmer Field Schools in sub-Saharan Africa.* 2nd ed. Rome: FAO https://cgspace.cgiar.org/handle/10568/98220
[33] http://www.iwmi.cgiar.org/Publications/Success_Stories/PDF/2013/issue_21-making_waves_in_the_field_of_informal_wastewater_use.pdf
[34] https://www.fao.org/documents/card/en/c/cb4181en/
[35] https://www.milanurbanfoodpolicypact.org/the-milan-urban-food-policy-pact-monitoring-framework-handbook-and-resource-pack/
[36] IWMI. 2014. IWMI Making waves in the field of informal wastewater use. *Success Stories.* Colombo, Sri Lanka: IWMI. http://www.iwmi.cgiar.org/Publications/Success_Stories/PDF/2013/issue_21-making_waves_in_the_field_of_informal_wastewater_use.pdf
[37] Carey J, Cook B. 2021. *The Milan Urban Food Policy Pact monitoring framework: A practical handbook for implementation.* Rome: FAO. https://www.fao.org/documents/card/en/c/cb4181en/
[38] MUFPP. 2021. *Monitoring Framework Handbook and Resource Pack.* https://www.milanurbanfoodpolicypact.org/the-milan-urban-food-policy-pact-monitoring-framework-handbook-and-resource-pack/
[39] RUAF, Global Partnership on Sustainable Urban Agriculture and Food Systems. https://ruaf.org
[40] Milan Urban Food Policy Pact. https://www.milanurbanfoodpolicypact.org
[41] ICLEI, Local Governments for Sustainability. https://www.iclei.org
[42] C40 Cities. https://www.c40.org
[43] Rikolto Food Smart Cities. https://www.rikolto.org/en/focus-areas/food-smart-cities
[44] Nairobi City County food System Strategy. https://www.devolutionhub.or.ke/file/90185692-nairobi-city-county-food-system-stra.pdf
[45] Mazingira Institute. http://mazinst.org
[46] Tradecare Africa. https://www.tradecareafrica.com
[47] MUFPP. 2021. Insights from the 7th Global Forum. https://www.milanurbanfoodpolicypact.org/insights-from-the-7th-global-forum-part-2/

[48] FAO City Region Food Systems Program. https://www.fao.org/in-action/food-for-cities-programme/overview/crfs/en/
[49] World Food Programme. 2018. WFP's role in urban areas. https://executiveboard.wfp.org/document_download/WFP-0000069611
[50] World Bank. Urban Development. https://www.worldbank.org/en/topic/urbandevelopment
[51] Thebo AL, Drechsel P, Lambin, EF, Nelson, KL. 2017. A global, spatially-explicit assessment of irrigated croplands influenced by urban wastewater flows. *Environmental Research* 12:074008
[52] Drechsel P, Seidu R. 2011. Cost-effectiveness of options for reducing health risks in areas where food crops are irrigated with treated or untreated wastewater. *Water International* 36(4):535-548.
[53] Seidu R, Drechsel P. 2010. Cost-effectiveness analysis of interventions for diarrhoeal disease reduction among consumers of wastewater-irrigated lettuce in Ghana. In Drechsel P, Scott CA, Raschid-Sally L, Redwood M, Bahri A. Eds. *Wastewater irrigation and health: assessing and mitigating risk in low-income countries.* London, UK: Earthscan; Ottawa, Canada: IDRC; Colombo, Sri Lanka: IWMI. p.261-283.
[54] Afshin A, Sur PJ, Fay KA, *et al.* 2017. Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017**.** *The Lancet* 393(101840):1958-1972.
[55] Vilar-Compte M, Burrola-Méndez S, Lozano-Marrufo A, *et al.* 2021. Urban poverty and nutrition challenges associated with accessibility to a healthy diet: a global systematic literature review. *International Journal for Equity in Health* 20:40. https://doi.org/10.1186/s12939-020-01330-0
[56] FAO, IFAD, UNICEF, WFP, WHO. 2020. *The State of Food Security and Nutrition in the World 2020*. *Transforming food systems for affordable healthy diets*. Rome: FAO. https://doi.org/10.4060/ca9692en
[57] UN, World Urbanization Prospects. 2018. https://population.un.org/wup/
[58] The World Bank, Data. https://data.worldbank.org/indicator/EN.POP.SLUM.UR.ZS?view=chart&locations=XM
[59] International Labour Organization. 2018. Women and men in the informal economy: a statistical picture. 3rd ed. Geneva: ILO.
[60] Rural Infrastructure and Agro-Industries Division, and the Nutrition and Consumer Protection Division of the Agriculture and Consumer Protection Department of FAO. 2007. *Promises and Challenges of the informal food sector in developing countries.* Rome: FAO. https://www.fao.org/publications/card/en/c/43dd21da-0c02-50f3-9663-b0ef0e667ae0
[61] International Labour Organization. 2020. *Answering key questions around informality in micro and small enterprises during the COVID-19 crisis.* Geneva: ILO.
[62] UN Women. https://interactive.unwomen.org/multimedia/infographic/changingworldofwork/en/index.html
[63] Singh CK, Kumar A, Roy SA. 2018. Quantitative analysis of the methane gas emissions from municipal solid waste in India. *Scientific Reports* 8:2913. https://doi.org/10.1038/s41598-018-21326-9
[64] Favoino E, Hogg D. 2008. The potential role of compost in reducing greenhouse gases. *Waste Management and* Research 26(1):61-69. doi:10.1177/0734242X08088584
[65] Ellen MacArthur Foundation. Cities and circular economy for food. https://ellenmacarthurfoundation.org/cities-and-circular-economy-for-food
[66] United Nations Environment Programme. 2021. *Food Waste Index Report 2021.* Nairobi: UNEP. https://www.fao.org/platform-food-loss-waste/resources/detail/en/c/1378978/
[67] Mayer BK, Baker LA, Boyer TH, et al. 2016.Total Value of Phosphorus Recovery. *Environmental Science and Technology* 50(13):6606–6620. https://doi.org/10.1021/acs.est.6b01239
[68] Rural-Urban Linkages Solutions, CGIAR Research Program on Water, Land and Ecosystems. https://wle.cgiar.org/research/themes/rural-urban-linkages/solutions
[69] Otoo M, Drechsel P, Danso G, Gebrezgabher S, Rao K, Madurangi G. 2016. *Testing the implementation potential of resource recovery and reuse business models: from baseline surveys to feasibility studies and business plans*. Colombo, Sri Lanka: International Water Management Institute (IWMI). CGIAR Research Program on Water, Land and Ecosystems (WLE). doi:10.5337/2016.206
[70] Taron A, Drechsel P, Gebrezgabher S. 2021. *Gender dimensions of solid and liquid waste management for reuse in agriculture in Asia and Africa.* Colombo, Sri Lanka: IWMI. CGIAR Research Program on Water, Land and Ecosystems (WLE). https://doi.org/10.5337/2021.223
[71] Mateo-Sagasta J, Zadeh SM, Turral H. 2018*. More people, more food, worse water? a global review of water pollution from agriculture.* Rome: FAO. https://www.fao.org/3/CA0146EN/ca0146en.pdf

[72] Wear SL, Acuña V, McDonald R, Font C. 2021. Sewage pollution, declining ecosystem health, and cross-sector collaboration. *Biological Conservation* 255: 109010. https://doi.org/10.1016/j.biocon.2021.109010
[73] Bon H, Huat J, Larrot L, Sinzogan A, Martin T, Malézieux E, Vayssières JF. 2014. Pesticide risks from fruit and vegetable pest management by small farmers in sub-Saharan Africa. *Agronomy for Sustainable Development* 34(4):723-736
[74] IWMI. 2014. *IWMI Making waves in the field of informal wastewater use.* In: Success Stories Colombo, Sri Lanka: IWMI.
[75] van Veenhuizen R. 2006. *Cities Farming for the Future.* In: R. van Veenhuizen. Cities farming for the future: urban agriculture for green and productive cities. Leusden, The Netherlands: RUAF/IDRC/IIRR. https://www.idrc.ca/en/book/cities-farming-future-urban-agriculture-green-and-productive-cities
[76] Lal R. 2020. Home gardening and urban agriculture for advancing food and nutritional security in response to the COVID-19 pandemic. *Food Security* 12(4): 871-876. https://link.springer.com/article/10.1007/s12571-020-01058-3
[77] Wilson RT. 2018. Domestic Livestock in African Cities: Production, Problems and Prospects. *Open Urban Studies and Demography Journal* 4:1-14. https://openurbanstudiesanddemographyjournal.com/VOLUME/4/PAGE/1/ABSTRACT/
[78] FAO City Region Food Systems Program. https://www.fao.org/in-action/food-for-cities-programme/overview/crfs/en/
[79] The Rockefeller Foundation. 2015. City Resilience Framework. https://www.rockefellerfoundation.org/wp-content/uploads/100RC-City-Resilience-Framework.pdf
[80] Jones L, Tanner T. 2015. *Measuring 'subjective resilience'. Using people's perceptions to quantify household resilience.* In: ODI working paper *423* London: ODI.
[81] Prain G, Naziri D. 2020. *The role of root and tuber crops in strengthening agri-food system resilience in Asia. A literature review and selective stakeholder assessment. Food Resilience Through Root and Tuber Crops in Upland and Coastal Communities of the Asia-Pacific (FOODSTART+) Project*. Lima, Peru: International Potato Center.
[82] CGIAR Research Program on Roots, Tubers and Bananas. https://www.rtb.cgiar.org/farmer-business-schools/
[83] USAID. A framework for inclusive market system development. https://www.marketlinks.org/sites/default/files/resource/files/Market_Systems_Framework.pdf
[84] Karanja K, Njenga M, Prain G, et al. 2010. Assessment of Environmental and public health hazards in wastewater used for urban agriculture in Nairobi, Kenya. *Tropical and Subtropical Agroecosystems* 12:85-97. https://www.revista.ccba.uady.mx/ojs/index.php/TSA/article/download/367/296
[85] CGIAR Initiative. Rethinking food markets and value chains for inclusion and sustainability. https://www.cgiar.org/initiative/29-rethinking-food-markets-and-value-chains-for-inclusion-and-sustainability
[86] CGIAR. 2021. The 36 golden eggs for the 2021 transfer market place. https://storage.googleapis.com/cgiarorg/2021/07/GE-Book.Finalv3-1.pdf
[87] Otoo M, Drechsel P. (Eds.) 2018. *Resource recovery from waste: business models for energy, nutrient and water reuse in low- and middle-income countries*. Oxon, UK: Routledge - Earthscan. https://cgspace.cgiar.org/handle/10568/93011
[88] Models for water, energy and nutrient recovery (https://cgspace.cgiar.org/handle/10568/93011)
Models for food waste prevention (https://cgspace.cgiar.org/handle/10568/113841)
Models for wastewater aquaculture (https://cgspace.cgiar.org/handle/10568/114589)
Models for fecal sludge management and reuse (https://cgspace.cgiar.org/handle/10568/109662)
Models for [insect] protein generation from organic waste (https://cgspace.cgiar.org/handle/10568/105751)
Models for sewage sludge reuse (forthcoming)
[89] BMI, Business model canvas. https://www.businessmodelsinc.com/about-bmi/tools/business-model-canvas/
[90] Gebrezgabher S, Taron A, Amewu S. 2019. Investment climate indicators for waste reuse enterprises in developing countries: application of analytical hierarchy process and goal programming model. *Resources, Conservation and Recycling* 144:223-232. doi: 10.1016/j.resconrec.2019.01.049
[91] Danso G, Drechsel P, Cofie OO. 2021. A Guide to scaling Resource Recovery and Reuse business innovations in Africa and Asia. *WLE and IWMI RRR Brief*. (weblink forthcoming)
[92] SEED, JVL-YKMA Recycling Plant. https://seed.uno/enterprise-profiles/jvl-ykma-recycling-plant

[93] CGIAR, Research Program on Water, Land and Ecosystems. *Commendation from the government of Ghana on IWMI and WLE's work on organic fertilizers*. https://wle.cgiar.org/news/commendation-government-ghana-iwmi-and-wles-work-organic-fertilizers
[94] CGIAR, Research Program on Water, Land and Ecosystems. *IWMI's wastewater aquaculture reuse project wins Sanitation Challenge for Ghana*. https://wle.cgiar.org/iwmi's-wastewater-aquaculture-reuse-project-wins-sanitation-challenge-ghana
[95] ILRI. 2021. Safe Food, Fair Food for Cambodia final workshop. *Workshop report.* Nairobi, Kenya: ILRI. https://cgspace.cgiar.org/handle/10568/115418
[96] ILRI. MoreMilk: Making the most of milk. https://www.ilri.org/research/projects/moremilk-making-most-milk
[97] Reyes L, Bhandari S, Constantinides S, Frongillo E, Blake C. 2021. Recommended actions in global nutrition initiatives that link food environment and food choice. *Current Developments in Nutrition* 5(2):565. https://doi.org/10.1093/cdn/nzab043_017
[98] Farrell P, Thow AM, Abimbola S, Faruqui N, Negin J. 2018. How food insecurity could lead to obesity in LMICs: When not enough is too much: a realist review of how food insecurity could lead to obesity in low- and middle-income countries. *Health Promotion International* 33(5):812-826. https://academic.oup.com/heapro/article/33/5/812/3852249
[99] Tacoli C. 2019. The urbanization of food insecurity and malnutrition. *Environment and Urbanization* 31(2):371-374. doi:10.1177/0956247819867255
[100] WHO estimates of the global burden of foodborne diseases: foodborne disease burden epidemiology reference group 2007-2015. https://apps.who.int/iris/bitstream/handle/10665/199350/9789241565165_eng.pdf
[101] International Labour Organization. 2008. *Toolkit for mainstreaming employment and decent work.* Geneva: ILO.
[102] Development Initiatives. *2020 Global Nutrition Report: Action on equity to end malnutrition.* Bristol, UK: Development Initiatives.
[103] Badstue L, Elias M, Kommerell V, Petesch P, Prain G, Pyburn R, Umantseva A. 2020. Making room for manoeuvre: addressing gender norms to strengthen the enabling environment for agricultural innovation, *Development in Practice* 30(4):541-547. doi:10.1080/09614524.2020.1757624
[104] Halliday J, Joshi D, Young, L, van Veenhuizen, R. 2020. Gender in urban food systems. *Urban agriculture magazine* no 37. https://ruaf.org/assets/2020/07/UA-Magazine-37_web.pdf
[105] Chant S, Klett-Davies M, Ramalho J. 2017 *Challenges and potential solutions for adolescent girls in urban settings: a rapid evidence review*. London: Gender and Adolescence: Global Evidence. https://www.gage.odi.org/wp-content/uploads/2019/01/Young-Female-Adolescents-in-Urban-Areas-RER-FINAL.pdf
[106] Malapit HJ, Pinkstaff C, Sproule K, Kovarik C, Quisumbing AR, Meinzen-Dick RS. 2017. *The Abbreviated Women's Empowerment in Agriculture Index (A-WEAI).* IFPRI Discussion Paper 1647. Washington, DC: IFPRI. http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/131231
[107] Mbow C, Rosenzweig C, Barioni LG, et al. 2019. Food security. In: *Climate Change and Land: An IPCC Special Report on Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems*. Eds. PR Shukla, J Skea, E Calvo Buendia, et al. Geneva: IPCC.
[108] Alvarez SA, Grace D, Nguyen-Viet H. 2021. Informal food markets: what it takes to make them safer. The Conversation. https://theconversation.com/informal-food-markets-what-it-takes-to-make-them-safer-161601
[109] Lore T. 2021. *New study explores wet markets and the risk of emerging zoonotic diseases.* International Livestock Research Institute. https://www.ilri.org/news/new-study-explores-wet-markets-and-risk-emerging-zoonotic-diseases
[110] Karg H, Drechsel P. 2011. Motivating behaviour change to reduce pathogenic risk where unsafe water is used for irrigation. *Water International* 36(4):476-490. http://dx.doi.org/10.1080/02508060.2011.594684
[111] https://www.17triggers.com
[112] Carey J, Dubbeling M. 2017. *City Region Food System Indicator Framework.* City Region Food System Toolkit. Leusden, The Netherlands: RAUF Foundation. https://ruaf.org/document/city-region-food-system-indicator-framework/
[113] Resilience monitoring frameworks used by our scaling partners include, for example:

https://www.fao.org/3/i9255e/i9255e-CRFS-Indicator-Framework.pdf
https://www.fao.org/in-action/food-for-cities-programme/toolkit/crfs-assessment/indicator-framework/en/ and https://www.rockefellerfoundation.org/report/city-resilience-framework/

[114] CGIAR Research Ethics Code. 2020. https://cgspace.cgiar.org/bitstream/handle/10568/113003/CGIAR-Research-Ethics-Code-Approved-3Nov2020.pdf

[115] CGIAR Ethics Framework. 2019. https://cgspace.cgiar.org/bitstream/handle/10568/113007/CGIAR-Ethics-Framework-Sept-2020.pdf?sequence=1&isAllowed=y

[116] CGIAR Framework for Gender, Diversity and Inclusion in CGIAR's Workplaces. 2020. https://cgspace.cgiar.org/bitstream/handle/10568/113007/CGIAR-Ethics-Framework-Sept-2020.pdf?sequence=1&isAllowed=y

[117] CGIAR System Management Office. 2021. CGIAR Open and FAIR Data Assets Policy. Montpellier: CGIAR System Management Office. https://cgspace.cgiar.org/handle/10568/113623

[118] CGIAR Core Schema. https://github.com/AgriculturalSemantics/cg-core

[119] CGIAR Inclusive Recruitment. A gender, diversity and inclusion toolkit for people and culture practitioners. https://storage.googleapis.com/cgiar-gdi/2021/04/183cd8cd-gdi-recruitment-toolkit-22april2021-final.pdf