



As endorsed by the CGIAR System Council’s 13th meeting on 9-10 June 2021 (Decision reference SC/M13/DP3), following approval by the CGIAR System Board on 18-19 May2021 (Decision reference SB/M20/DP4)

# **CGIAR 2022-24 Investment Prospectus:** **Pooling funds for research and innovation** **to transform food, land and water systems**

## Contents

<b>Section 1: Purpose and scope of 2022-24 Investment Prospectus</b> .....	2
Purpose .....	2
Scope .....	2
Process to date.....	2
Process going forward .....	3
Features of CGIAR Initiatives .....	3
Risk management.....	4
<b>Section 2: Prospectus of proposed investments</b> .....	5
CGIAR theory of change and projected benefits .....	5
Summary of the prospectus at CGIAR level .....	11
Sequencing and target funding of the prospectus .....	13
Systems Transformation Action Area .....	15
Resilient Agrifood Systems Action Area.....	22
Genetic Innovation Action Area.....	29
Regional Integrated Initiatives .....	34
Impact Area Platforms .....	38
<b>Annex: Preliminary CGIAR Initiative Outlines</b> .....	39

## Section 1: Purpose and scope of 2022-24 Investment Prospectus

### Purpose

1. To propose a prospectus of CGIAR programming for support through pooled funding, including a proposed budget envelope and approach to sequencing of CGIAR Initiatives within each Action Area.

### Scope

2. The Investment Prospectus covers the 2022-24 business plan period.
3. While the CGIAR 2030 Research and Innovation Strategy covers all research and innovation work carried out by CGIAR, the 2022-24 Investment Prospectus only covers work financed with pooled funding.
4. Taking a prospectus approach, the document provides a set of potential CGIAR Initiatives to be supported as funds become available during the 2022-24 business plan period.
5. In practice, the Investment Prospectus is dynamic; recognizing that research priorities may need to pivot in response to external events and that additional concepts may be included during the 3-year timeframe.
6. 3-year CGIAR Initiatives will be launched sequentially through the 2022-24 period, and thus many or most will run into the subsequent business plan period.
7. The Investment Prospectus is organized by Action Areas. Each Initiative is placed under a primary Action Area which corresponds to the management unit of a Science Group. However most Initiatives will involve internal and partner capacities across more than one Action Area – and all will seek to achieve results across the five Impact Areas identified in the CGIAR 2030 Research and Innovation Strategy.
8. A set of preliminary CGIAR Initiative outlines are presented under each Action Area; these will undergo substantial further co-design before being submitted as full proposals. Each proposal will be subject to endorsement and presentation by the System Board to the System Council for review and approval ahead of funding.

### Process to date

9. The principles and processes for identification, development and sequencing of Initiatives within this Investment Prospectus are presented in the System Council document “Process to develop 2022-24 Investment Plan and CGIAR Initiatives”.<sup>1</sup>
10. The CGIAR Executive Management Team (EMT) has been closely advised by three Investment Advisory Groups, aligned with the three Action Areas, in the identification of Initiatives. Investment Advisory Groups comprise System Council members (funder and regional representatives), ISDC members and external experts identified by System Council members.

---

<sup>1</sup> Document SC11-04a at <https://www.cgiar.org/meeting-document/11th-cgiar-system-council-meeting/>.

11. The Investment Advisory Groups have advised EMT on the identification of Initiatives based on data-driven and consultation processes.
12. The Initiative outlines have been prepared by Initiative Design Teams. Each Initiative Design Team was led by two CGIAR members of staff, appointed by EMT on the basis of excellence, and of balanced skills, geographies and genders, from a roster of self-nominated candidates. These leads and co-leads in turn built teams and advisory groups from across the CGIAR System and from a variety of partners.
13. The System Board approved the Investment Prospectus for submission to the System Council for approval of the strategic priorities set out therein, appreciating that further enhancement of the Investment Prospectus is intended over the forthcoming months, and with the understanding that the Board's comments will be used in future development of both the CGIAR research portfolio as a whole, and the individual Initiatives.

### Process going forward

14. The Initiatives are presented at an early stage of design, for consideration for further development, not for any guarantee of future funding.
15. Three Science Group Directors will direct the overall strategies and implementation of the Action Areas, including further design of Initiatives. They will ensure that the Initiatives add up to a prioritized and joined-up strategic set of results and programming within and across the Action Areas. The Science Group Directors will also ensure coherence with bilaterally funded work which, while being beyond the scope of this Investment Prospectus, is a major part of the CGIAR Portfolio.
16. The Science Group Directors will be advised by the Investment Advisory Groups, and will chair the groups on behalf of EMT.
17. The Initiative Design Teams will be tasked by EMT via the Science Group Directors to make any needed adjustments to group membership and to enter the next phase of design: preparation of concepts and full proposals. This phase will include regional and stakeholder consultations, additional priority-setting processes, and the development of detailed theories of change. Again, this work will be guided by the Investment Advisory Groups.
18. As full proposals are finalized and confirmed by EMT, they will be submitted by the System Board for consideration for funding by the System Council, who will draw on the advice of ISDC in their decision. The first set of submissions are expected in September 2021.

### Features of CGIAR Initiatives

19. CGIAR Initiatives are major, prioritized areas of investment that bring capacity from within and beyond CGIAR to bear on well-defined, major challenges.
20. CGIAR Initiatives meet a common set of design principles, articulated in System Council documentation<sup>2</sup> and in guidance to the Initiative Design Teams, and

---

<sup>2</sup> Document SC11-04a at <https://www.cgiar.org/meeting-document/11th-cgiar-system-council-meeting/>

evaluatable through the ISDC quality of research for development criteria. Initiatives will come with evaluatable results frameworks and clear reporting of results against investment.

21. Initiatives are variously targeted at global, regional and country levels, based on triangulation of global significance, regional relevance and investor preferences, and involve partners at all phases from design to scaling.
22. All CGIAR Initiatives target multiple wins across the five Impact Areas, and each Initiative full proposal will include a short strategy and intended quantified impact for each Impact Area, acknowledging that it is neither possible nor appropriate for all Initiatives to address all Impact Areas equally.

### Risk management

23. CGIAR recognizes that taking and managing risks is an integral part of delivering on its strategy. As an innovation-driven system, CGIAR cannot succeed without taking risks and pursuing opportunities. The successful delivery of the Investment Prospectus will be based on a coherent approach which combines the management of strategic risks and of projected impacts, allowing risk/return management at System, Action Area and Initiative levels. As an element of good governance, this will provide accountability to funders while maintaining organizational space to innovate to achieve impact against complex problems.

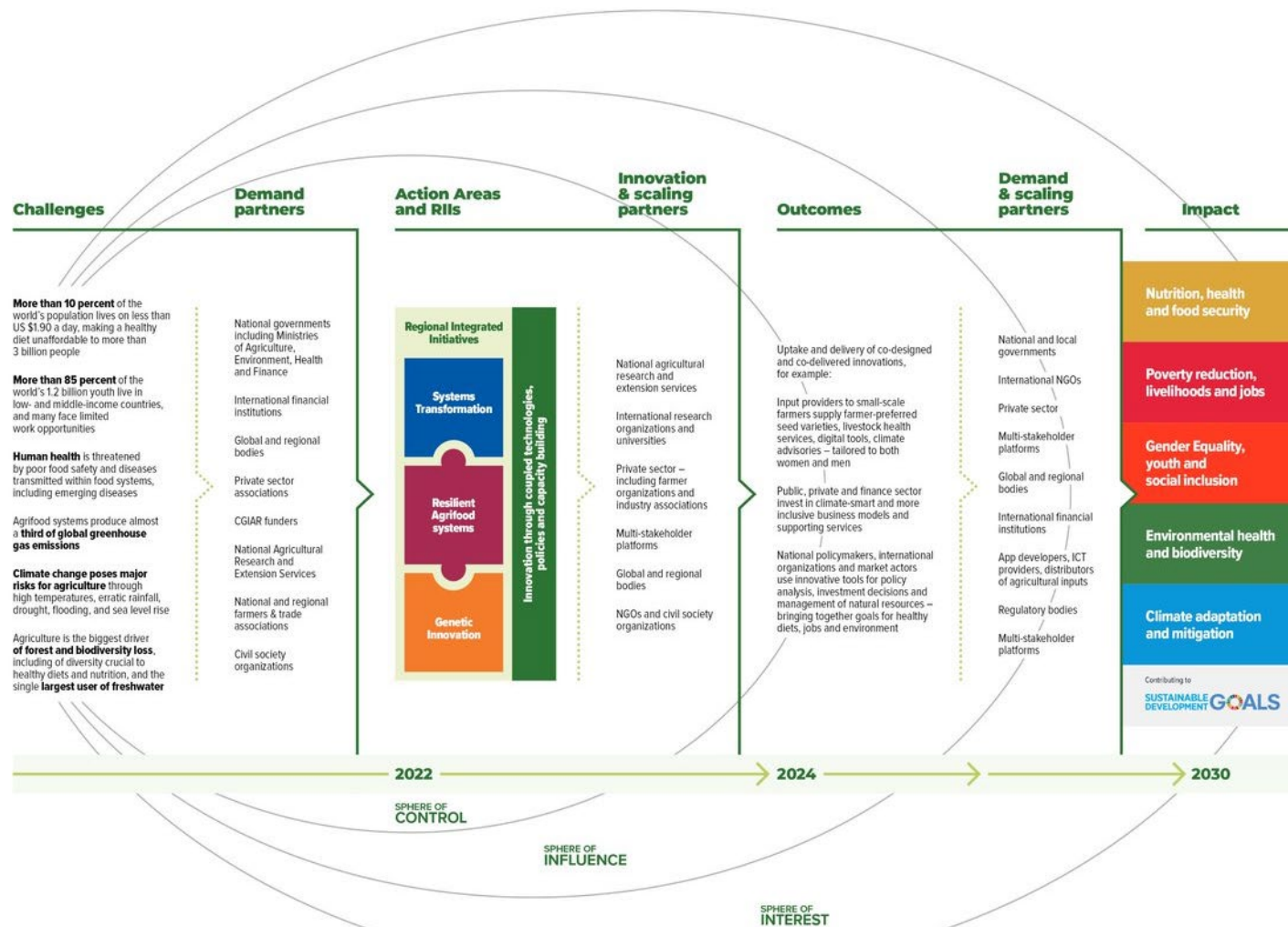


## Section 2: Prospectus of proposed investments

### CGIAR theory of change and projected benefits

24. CGIAR seeks to drive change through innovation systems towards a world with sustainable and resilient food, land and water systems that deliver more diverse, healthy, safe, sufficient and affordable diets, and ensure improved livelihoods and greater social equality, within planetary and regional environmental boundaries.
25. CGIAR's theory of change is framed by the 2030 Research and Innovation Strategy, and illustrated in Figure 1. CGIAR will strategically connect to and work with demand partners that are key agents of change in food, land and water systems in a climate crisis. Dialogue with these partners will identify specific challenges and barriers to transformation which CGIAR research and innovation can play an impactful role in resolving. CGIAR will work with innovation partners and scaling partners to develop priority innovation packages – interlinked actions across technology, capacity building and policy – which can bring innovations to scale through relevant pathways such as market roll-out, public policy reform and diffusion via civil society partners.
26. The 2030 Research and Innovation Strategy frames CGIAR's priorities strongly within the climate crisis as the foremost challenge of this decade. The Strategy notes that the challenge of climate change is not single-issue or one-dimensional – and nor are the solutions. Building resilience in food, land and water systems entails building resilience not only to climate change but also to conflict and crises, such as economic and health shocks. Hence CGIAR's intent is to achieve impact across five interrelated Impact Areas for lasting solutions in the food, land and water arena.
27. The speed at which climate change is progressing, and the growing set of risks and uncertainty associated with climatic, health and economic crises, intensifies the need for active research capacities with strong and sustained levels of investment.

Figure 1. CGIAR theory of change



28. In support of the case for investment, this Investment Prospectus – and the 2030 CGIAR Research and Innovation Strategy to which it contributes – builds on a track record drawn from 50 years of research and collaboration to accelerate innovative solutions to achieve multiple goals across all Impact Areas.
29. CGIAR has already lifted millions of people out of hunger and poverty; recent research shows CGIAR has reduced the number of people living in absolute poverty by over 70 million over the past 40 years.<sup>3</sup> Our research portfolio has delivered a 10-fold long-term return on investment.<sup>4</sup> The CGIAR wheat breeding program alone has yielded, over a 10-year period, between USD 73 and 101 for every USD 1 invested, providing yearly economic benefits of USD 2.2 to 3.1 billion.<sup>5</sup>
30. The diffusion of modern crop varieties has reduced infant mortality by between 13% and 30% across low-income and middle-income countries – averting between 3 and 6 million infant deaths each year.<sup>6</sup> CGIAR’s micronutrient-fortified crops have reached over 20 million people in recent years, averting damage to health, physical and cognitive development.<sup>7</sup> CGIAR science reaches scale through commercial markets: for example DNA fingerprinting recently found CGIAR-improved maize being used by 63% of all maize-producing households in Ethiopia.<sup>8</sup> CGIAR research has tripled agricultural yields in Europe and North America,<sup>9</sup> and has significantly reduced global food prices.<sup>10</sup>
31. To estimate the range of potential future benefits of investing in CGIAR, Table 1 below presents projections from a foresight exercise that considers future scenarios for global and regional food systems under a changing climate. It shows the potential benefits that could arise from a reformed and ambitiously capitalized CGIAR System, alongside higher levels of complementary investment in agricultural development in the Global South, relative to a business-as-usual scenario.<sup>11</sup> Table 2 shows regional projections for all six CGIAR regions across the five Impact Areas. A companion paper describes the methodology and data.<sup>12</sup>
32. The results suggest continued strong effects of CGIAR research and innovation on alleviation of hunger and poverty. For example, with complementary investments, CGIAR could lift 180 million people from being at risk of hunger, with significant impacts in all regions. Projected benefits to nutrition include potential increases of

<sup>3</sup> Laborde, D., Martin, W., Tokgoz, S. and Vos, R. (2020) ‘Contributions of CGIAR R&D to Global Poverty Reduction’, Mimeo.

<sup>4</sup> [https://supportagresearch.org/assets/pdf/Payoff\\_to\\_Investing\\_in\\_CGIAR\\_Research\\_final\\_October\\_2020.pdf](https://supportagresearch.org/assets/pdf/Payoff_to_Investing_in_CGIAR_Research_final_October_2020.pdf)

<sup>5</sup> <https://repository.cimmyt.org/handle/10883/4822>

<sup>6</sup> <https://www.sciencedirect.com/science/article/pii/S0167629619311282>.

<sup>7</sup> <https://www.cgiar.org/news-events/news/biofortified-crops-address-the-worlds-hidden-hunger/>.

<sup>8</sup> <https://www.icrisat.org/new-study-cgiar-innovations-reach-nearly-80-of-ethiopias-rural-households/>.

<sup>9</sup> Evenson, R.E., Rosegrant, M.W. (2003). The economic consequences of crop genetic improvement programmes. In: Evenson, R.E., Gollin, D. (Eds.), *Crop Variety Improvement and its Effect on Productivity: the Impact of International Agricultural Research*. CABI Publishing, Cambridge, MA, pp.473–497.

<sup>10</sup> Evenson, R.E., Rosegrant, M.W. (2003). The economic consequences of crop genetic improvement programmes. In: Evenson, R.E., Gollin, D. (Eds.), *Crop Variety Improvement and its Effect on Productivity: the Impact of International Agricultural Research*. CABI Publishing, Cambridge, MA, pp.473–497.

<sup>11</sup> The central scenario assumes a total CGIAR portfolio of USD 2bn per year, an increase in research efficiency in line with CGIAR reform, and an increase in finance for complementary development activities such as irrigation and transport under a changing climate. The scenarios draw from and build on an extensive modelling exercise undertaken in 2017. Additional modelling has been undertaken to illustrate the potential benefits of CGIAR on climate adaptation and gender.

<sup>12</sup> Prager, S. and Kruseman, G (2021) *Projected Benefits of CGIAR research*.

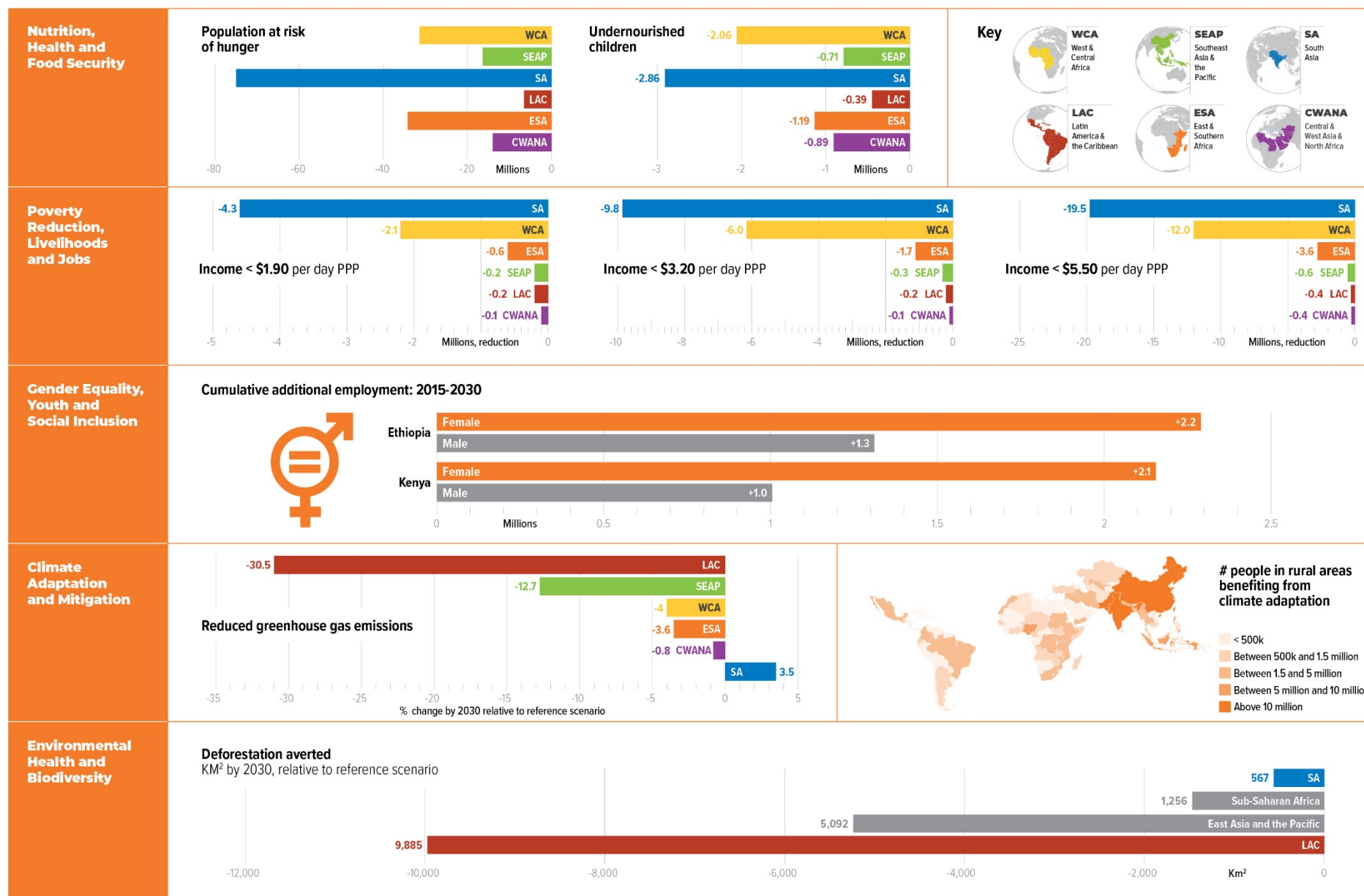
between 4% and 10% in availability of protein and vital micronutrients among poor consumers.

33. CGIAR innovations have the potential, with partners, to improve the adaptive capacity of 200 million rural people by 2030, with 120 million benefiting from greater resilience to climatic variability, and improvements in productivity of 25% compared to the baselines projected under climate change. Associated environmental benefits include a 10% reduction in irrigated water abstraction, and, with the right governance interventions, a 2-million-hectare reduction in deforestation relative to reference scenario by 2030 – equivalent to averting a third of the loss of forest in the Brazilian Amazon over the last decade.
34. Given the early stage of Initiative design, these projections only provide a high-level, illustrative, order-of-magnitude approximation of expected benefits. More detailed projections across Impact Areas will be developed by each Initiative in coming months. The numbers below nonetheless illustrate that CGIAR has, with partners, the strong potential to deliver globally significant impact to 2030 and beyond.

**Table 1. Illustrative benefits of investment in CGIAR innovation alongside complementary investment in agricultural development in the global south.**

Impact Area	Impact Indicator	Illustrative Impacts by 2030 relative to reference scenario	Interpretation
<b>Nutrition, Health and Food Security</b>	Population at risk of hunger.	A global reduction of <b>30%</b> , or <b>up to 180m people</b> .	These significant effects emerge from the global food systems and economic modelling as a result of yield increases driven by specific investments in development of high yielding varieties, more efficient research and improved use of inputs.  These are in some senses relatively conservative estimates, as they do not consider the additional impact that would be expected from programs taking biofortified produce to scale.
	Undernourished children.	A global reduction of over 5%, equivalent to <b>~8 million children</b> .	
	Improvements in micronutrient and protein availability.	An increase in iron, magnesium, zinc, vitamin A and protein availability of between <b>~4% and ~10%</b> .	
<b>Poverty Reduction, Livelihoods and Jobs</b>	Reduction in absolute poverty.	<b>~7 million people</b> lifted out of extreme poverty (\$1.90 2011 PPP). <b>~18 million</b> lifted above \$3.20/day (2011 PPP, consistent with WB LMIC poverty threshold). <b>~37 million</b> lifted above \$5.50/day (2011 PPP, consistent with WB UMIC poverty threshold).	As CGIAR innovations increase agricultural productivity, resilience and food systems efficiency, fueling agricultural sector growth, food security increases and prices fall. This benefits entire populations, including those in extreme poverty. This high-level systems analysis does not capture the additional impact of targeted innovation packages addressing the specific demands of those in or vulnerable to extreme and relative poverty.
<b>Gender Equality, Youth and Social Inclusion</b>	Reduced gender inequality in employment.	Increase in female employment <b>almost double</b> that of male, in projections for Ethiopia and Kenya.	These projections consider the impact of agricultural research on productivity, growth and existing gender patterns within labor markets. They do not consider the influence that we expect the CGIAR focus on gender to have on changing these labor market patterns.
<b>Climate Adaptation and Mitigation</b>	Reduced emissions.	<b>~0.6 Gigatonnes</b> CO <sub>2</sub> e annual emissions avoided, <b>~12%</b> below reference scenario.	Globally significant reductions in emissions, driven by reductions in land use change in Latin America and South East Asia due to greater farm productivity.  These benefits are driven by the adoption of climate smart agriculture practices and climate information services in climate hazard areas, using the Evidence for Resilient Agriculture database on yields and variance, and geospatial datasets on climate hazards. Scaling up both improved varieties and improved agronomy could more than double economic benefits compared to improved varieties alone, suggesting integrative programs that bundle several innovations amplify impact.
	# people benefiting from adaptation.	Over <b>200 million people</b> in rural areas, in regions facing climate hazards.	
	Productivity increase.	Increase of <b>over 25%</b> by 2030.	
	Reduced exposure to yield variability.	Reduction in interannual yield variability for at least <b>120 million people</b> .	
<b>Environmental Health and Biodiversity</b>	Agricultural water use.	<b>~10% reduction</b> in irrigated water use and <b>~10% increase</b> in utilizable rainwater	These effects arise due to investments in, and take up of, innovations which improve efficiency of irrigation infrastructure, soil management and water harvesting.  As climate change degrades existing farmland, and population growth increases demand, the pressure to convert forested land increases. The impact of CGIAR innovations and complementary investments are anticipated to partly offset this.
	Deforestation averted.	<b>2m hectare (45%), reduction</b> relative to reference scenario by 2030 – equivalent to averting a third of the last decade's Brazilian Amazon deforestation.	

**Table 2. Illustrative regional impacts by 2030.**

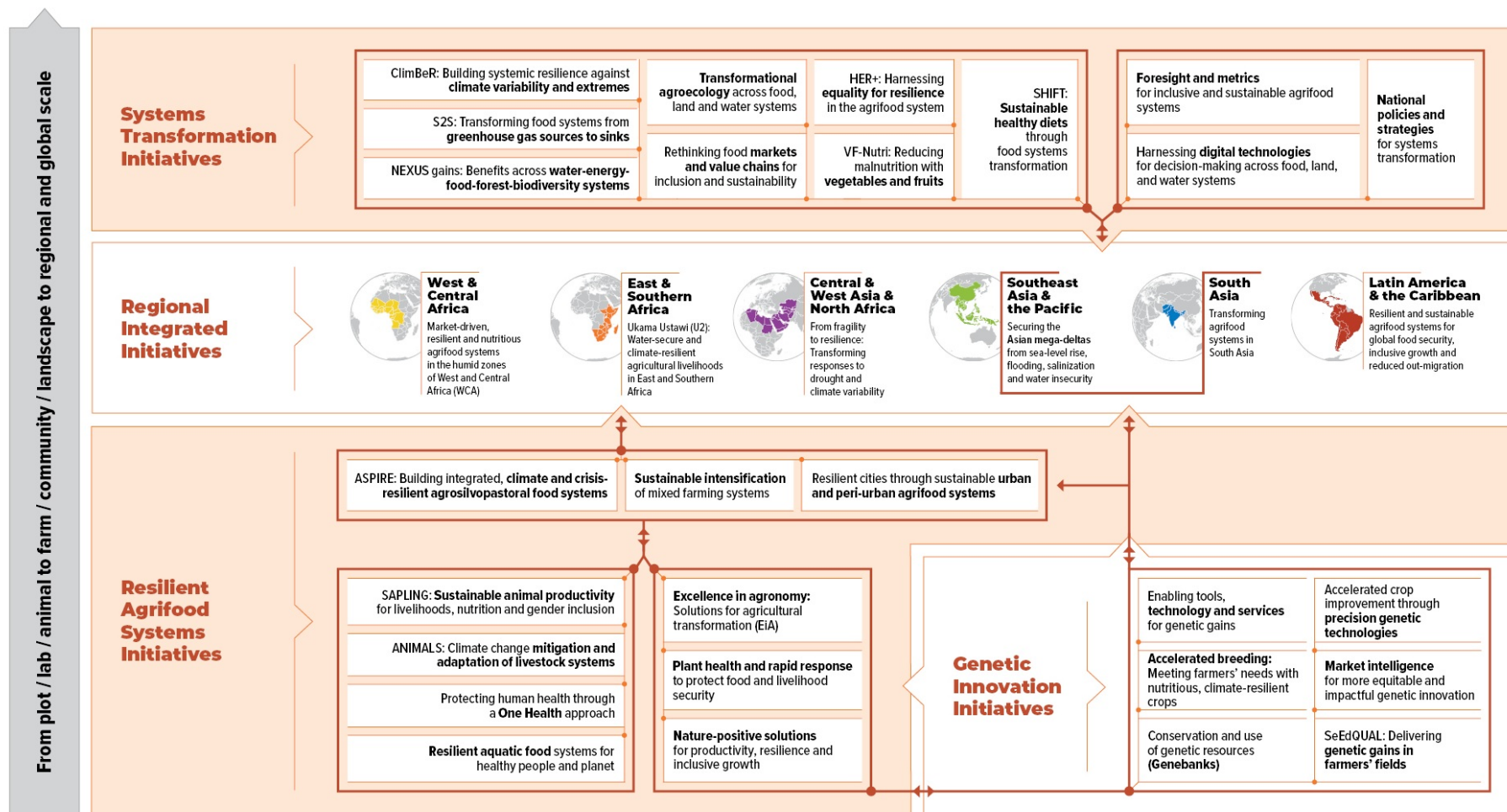




## Summary of the prospectus at CGIAR level

35. The 33 Initiatives are grouped into the three Action Areas plus a fourth closely linked group, a set of Regional Integrated Initiatives (Figure 2).
36. All Action Areas and the Regional Integrated Initiatives will work together, not in silos. Specific mechanisms to bridge across the Action Areas include (i) CGIAR Initiatives drawing on the capabilities of multiple Science Groups; (ii) five cross-cutting Impact Area Platforms; (iii) the continued oversight of the Investment Advisory Groups; and (iv) a Portfolio Performance Management Team that includes the Regional Directors to ensure a strong focus on demand.
37. Below this level the Initiatives fall into eight clusters: two in Systems Transformation, three in Resilient Agrifood Systems, one each in Regional Integrated Initiatives and Genetic Innovation, and finally an Initiative on cross-cutting data-centered solutions (Figure 2).
38. The two clusters in Systems Transformation are: Initiatives that focus on specific themes and impacts that are central to systems transformation, with a clear thematic focus; and Initiatives that contribute to systems transformation across themes by improving data and tools and influencing policy and investment decisions.
39. Resilient Agrifood Systems has three clusters: Crops; Livestock & aquatic foods; and Farming systems. The three Initiatives in the Farming systems cluster address drylands, non-drylands and urban-rural farming systems respectively; these will be designed to address farming system-specific challenges that need concerted problem-solving that is less suited to the Regional Integrated Initiatives or the more deeply thematic subject-specialist Initiatives in the Crops and Livestock & aquatic foods clusters.
40. Given the tight set of dependencies among the Initiatives in the Genetic Innovation Action Area, they are presented as one cluster, including the Genebanks and plant breeding. For reasons of operational pragmatism, animal breeding is included in Resilient Agrifood Systems.
41. Six Regional Integrated Initiatives will integrate the work from the Genetic Innovation, Systems Transformation and Resilient Agrifood Systems Action Areas towards an integrated response to local identified demands that support the transformation of food systems towards the five Impact Areas. The Initiatives will work particularly closely with regional partners and with CGIAR's regional and country teams. The aspiration depending on levels of investment is for these to grow over time to increasingly act as the conduit of demand from regional partners and stakeholders to CGIAR research and innovation teams, and simultaneously as a key pathway for uptake of research findings and innovations.
42. Five Impact Platforms will support the Initiatives and Action Areas in impact strategies, metrics and partner engagement, as well as participation in the Portfolio Performance Management Team; as these Platforms do not directly deliver research, they are not shown in Figure 2, but are included in the target funding.

Figure 2. Prospectus of CGIAR Initiatives grouped by cluster and by Action Area





### Sequencing and target funding of the prospectus

43. 3-year Initiatives will be designed, reviewed, approved and launched on a rolling basis throughout the 2022-24 business cycle.
44. EMT, acting on the advice of the Science Group Directors and the Investment Advisory Groups, will commend Initiatives for submission to the review cycle as they reach the required level of maturity. This is a key stage-gate in the design process.
45. The set of Initiatives in the Investment Prospectus have equal priority, reflecting the prior deliberations of the Investment Advisory Groups; the sequencing of Initiatives for submission will not reflect differences in importance of the Initiatives.
46. The first set of Initiatives will be submitted to the review cycle by 30 September 2021, for consideration by the System Board and the ISDC ahead of presentation to the System Council to take a funding decision in December 2021.
47. There will be no penalty for later submissions of Initiative proposals if more design time is needed; Initiatives will be approved and launched on a rolling basis during this and future business cycles and the 3-year funding period can run into the next business cycle.
48. Target ranges for pooled funding by Initiative and for the whole prospectus for the 2022-24 business cycle are shown in Table 3. The targets provided represent the best current estimates of Initiative costs and the proposed distribution of pooled funding. Target funding figures below USD 30 million indicate Initiatives with an anticipated USD 30 million budget that may start later in the business cycle.
49. The target ranges for funding apply to the pooled funding within the 2022-24 business cycle, and must be understood in the wider context of CGIAR ambitions over a 10 year time horizon from all funding sources, as laid out in CGIAR's Resource Mobilization, Communication and Advocacy Strategy.

Table 3. Target funding of CGIAR Initiatives

Action Area	Proposed Initiative title	2022-24 pooled funding target range in millions USD	
RII / RAFS	Resilient and sustainable LAC agri-food systems	30	45
RII / RAFS	From fragility to resilience in Central and West Asia and North Africa	30	45
RII / RAFS	Market-driven, resilient and nutritious agri-food systems in the humid zones of West and Central Africa	30	45
RII / RAFS	Ukama Ustawi (U2): water secure and climate resilient agricultural livelihoods in East and Southern Africa	30	45
RII / RAFS	Securing the Asian mega-deltas against sea-level rise, flooding, salinization and water insecurity	30	45
RII / RAFS	Transforming Agri-Food Systems in South Asia	30	45
ST	NEXUS Gains: Realizing Multiple Benefits Across Water-Energy-Food-Forest-Biodiversity Systems	25	30
ST	ClimBeR: Building Systemic Resilience against Climate Variability and Extremes	30	30
ST	Transformational agroecology across food, land and water systems	30	30
ST	Transforming food systems from greenhouse gas sources to sinks	25	30
ST	Rethinking Food Markets and Value Chains for Inclusion and Sustainability	30	30
ST	SHiFT: Sustainable Healthy Diets through Food Systems Transformation	30	30
ST	VF-Nutri: Reducing Malnutrition with Vegetables and Fruits	25	30
ST	Foresight and metrics to accelerate inclusive and sustainable agri-food system transformation	25	30
ST	National Policies and Strategies for Food, Land and Water Systems Transformation	25	30
ST	HER+: Harnessing equality for resilience in the agrifood system	25	30
ST	Harnessing Digital Technologies for Timely Decision-Making across Food, Land, and Water Systems	30	30
RAFS	ASPIRE – building integrated agrisilvopastoral food systems resilient to climate change and other crises	30	30
RAFS	Sustainable Intensification of Mixed Farming Systems	30	30
RAFS	Resilient Cities through Sustainable Urban and Peri-urban Agrifood Systems	25	30
RAFS	Plant Health and Rapid Response to protect Food and Livelihood Security	30	30
RAFS	Excellence in Agronomy – Solutions for Agricultural Transformation	20	85
RAFS	Nature-positive solutions: enhancing productivity and resilience	25	30
RAFS	Sustainable Animal Productivity for Livelihoods, Nutrition and Gender inclusion	20	85
RAFS	Actions for Innovative climate change Mitigation & Adaptation of Livestock Systems	30	30
RAFS	Protecting human health through a One Health approach	30	30
RAFS	Resilient Aquatic Foods for Healthy People and Planet	30	30
GI	Accelerated Breeding: Meeting Farmers' Needs with Nutritious, Climate-Resilient Crops	20	85
GI	Enabling tools, technology and services for genetic gains	20	85
GI	Market intelligence for more equitable and impactful genetic innovation	30	30
GI	Accelerated crop improvement through precision genetic technologies	25	30
GI	SeEdQUAL delivering genetic gains in farmers' fields	30	30
GI	Conservation and use of genetic resources (Genebanks)	45	50
PLATFORM / ST	Platform on Climate Adaptation & Mitigation	6	9
PLATFORM / ST	Platform on Poverty Reduction, Livelihoods & Jobs	6	9
PLATFORM / ST	Platform on Nutrition, Health & Food Security	6	9
PLATFORM / ST	Platform on Gender, Youth & Social Inclusion	6	24
PLATFORM / ST	Platform on Environmental Health & Biodiversity	6	9
	<b>Total pooled funding target range for 2022-24 business cycle</b>	<b>950</b>	<b>1380</b>

## Systems Transformation Action Area

### A) Fit of the Investment Prospectus within CGIAR's 10-year strategy for Systems Transformation

50. Increasing productivity and reducing poverty, hunger and malnutrition requires innovations and policies to eliminate the constraints that the poor face in accessing productive resources, knowledge, finance and markets. Appropriate national policies and global actions are needed to address global warming, environmental degradation, water misuse, and loss of biodiversity. Strategies to deal with shocks and conflict – the major drivers of acute food insecurity – are also critical.
51. Agricultural, environmental, energy, health, and societal challenges and risks are emergent properties of complex, interconnected sets of systems. Addressing these will require coordinated action across political and organizational boundaries and scales: from local to global levels, and across the private, public and civil society spheres.
52. The 2030 Research Strategy emphasizes how CGIAR will engage with global, regional and national partners to co-generate an evidence base on innovative policies and market-relevant solutions essential for systems change. It also emphasizes the need to engage with policymakers and stakeholders in the public and private sector to facilitate policy reforms and innovation strategies.
53. In the Systems Transformation Action Area, CGIAR commits with partners to forge ambitious new multi-sectoral policies and strategies for food, land and water systems transformation in 50 countries across six regions, via 10 ambitious Initiatives described in this Investment Prospectus. This agenda, funded through pooled funding, will deliver the central ambitions and scope of the overall Action Area, which will also include bilateral funding.
54. In doing so, the Systems Transformation Action Area will also enhance the impact of technological innovations developed in the Resilient Agrifood Systems and Genetic Innovation Action Areas. Bundling of these innovations will reinforce their impact.

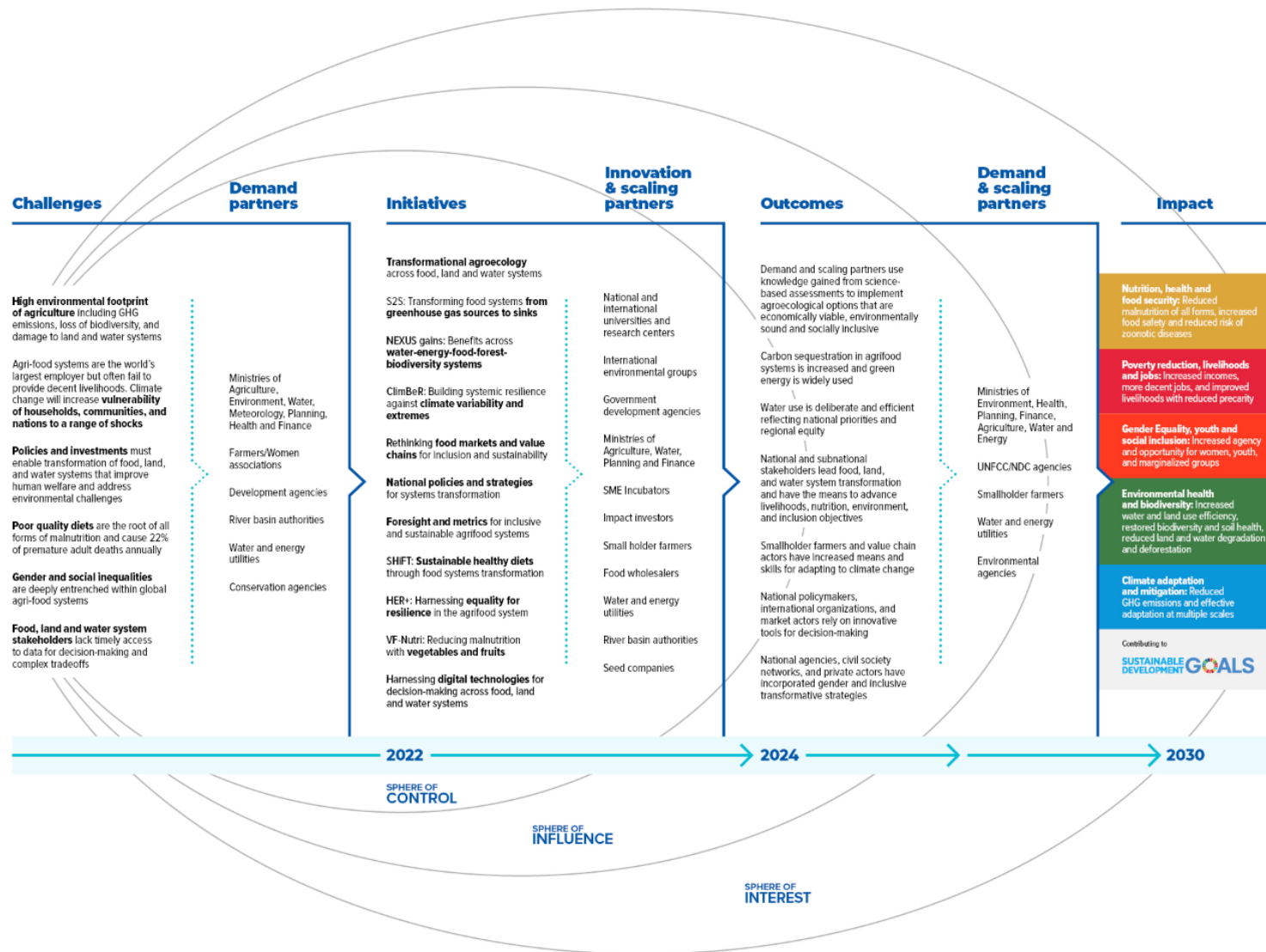
### B) Theory of change

55. The Systems Transformation Action Area will inform and guide catalytic change to achieve impact across CGIAR's five Impact Areas, resulting in improved, safer diets; increased incomes; more agency and opportunity for women, youth and marginalized groups; greater adaptive capacity under climate change; and a lower environmental footprint of food systems through increased water use efficiency, biodiversity and reduced greenhouse gas emissions.
56. Achieving these impacts will require effective policy strategies, practical solutions, and close work with partners to achieve change at scale. CGIAR will work with partners to generate and utilize interdisciplinary research to identify transformative, inclusive strategies, innovations and policies. Partnerships with policymakers, the private sector and civil society will enable utilization of CGIAR's innovative tools and

data for decision-making – including those developed by the Resilient Agrifood Systems and Genetic Innovation Action Areas – to transform food, land and water systems.

57. In support of this work, science-based assessments and enhanced foresight will provide smallholder farmers, value chain actors and development agencies with increased means and skills to adapt to climate change. Through understanding and co-ownership cultivated through effective partnerships with national and subnational stakeholders, these advanced analytics will inform policy reform priorities, national budget allocations and major investments.
58. The theory of change for Systems Transformation is illustrated in Figure 3.

Figure 3. Systems Transformation theory of change



### C) Action Area priorities for the 3-year business cycle

59. The System Transformation Action Area proposes a strategic set of 11 linked Initiatives. These build on existing strengths, address key environmental and social challenges and focus on areas with high potential for impact. Together they will operate at global, national, landscape and sectoral levels, delivering synergies within and across Action Areas.
60. Eight of the 11 Initiatives focus on specific themes and impacts that are central to systems transformation: climate change, biodiversity, sustainability and resilience; better nutrition and healthy diets; inclusion, food security and poverty.
61. Three of the Initiatives contribute to systems transformation across themes, by improving data and tools, enhancing foresight, measuring impacts, identifying investment priorities and integrating into transformation strategies at global and national levels, and influencing decisions in public and private sectors.
62. The relationships between food systems and climate change, biodiversity and sustainability are multiple and complex. Five Initiatives aim to study important components of these relationships and to identify and measure the impact of innovations and policy systems: these address climate resilience (ClimBeR), shifting agrifood systems from net carbon sources to net carbon sinks, rethinking markets and value chains (Re-MVC), reducing the environmental footprint of food, and water management in the context of forests, biodiversity and energy.
63. Billions of people do not choose or cannot afford healthy diets. To transform food systems for better nutrition and health, the SHiFT Initiative will work with partners to improve consumer behavior, nutrition policy and the food environment through technological options, innovations in key services, and policy strategies. The VF-Nutri Initiative focuses explicitly on reducing malnutrition by enhancing the availability and affordability of vegetables and fruits among poor consumers, closely aligned with SHiFT and the Resilient Cities through Urban and Peri-urban Agrifood Systems initiative (in the RAFS Science Group). Nutrition and diets are also influenced by agricultural and food subsidies globally, which will be addressed by the Re-MVC Initiative.
64. Food systems are not inclusive. Transforming systems to make them more inclusive and allow for equal opportunities are important for poverty reduction, food security, improved gender equity, opportunities for youth, and resilience. Inclusion is closely related to resilience as the poor are disproportionately affected by various shocks (climate, economic or conflict). Acute food insecurity is particularly associated with shocks and forced migration. The organization of value chains and markets can strongly affect inclusion and the resilience of the food system. The Re-MVC Initiative analyzes how policies and innovations can enable value chains to be more inclusive, sustainable and resilient, while the HER+ Initiative aims to identify policies and innovations and build capacity to empower marginalized social groups, and the ClimBeR initiative focuses on enhancing inclusiveness through resilience innovations.
65. Impactful innovations and policy reforms for global systems transformation require global and local assessments, evaluations, identification of priorities and structural engagement with decision-makers. Three Initiatives contribute to systems

transformation in a cross-thematic way, across all three CGIAR Action Areas: these address foresight, national transformation strategies and digital tools and data.

66. The set of Initiative outlines for Systems Transformation is presented in the Annex and summarized in Table 4.

#### D) Summary of key partners and partnerships

67. Systems Transformation will work with a strategic array of partners worldwide, including national governments, local governments, non-governmental organizations (NGOs), multilateral institutions, regional organizations, private sector firms and groups, think tanks, academia, and research networks. Some key partners involved are not traditionally associated with agricultural research but are critical for generating impacts, such as ministries of finance and planning, and international finance institutions.
68. Demand partners will include national governments, including ministries of agriculture, environment, water, planning, health and finance, meteorology agencies, farmer/women's associations, development agencies, river basin authorities, water and energy utilities, conservation agencies, and strategic analytical units such as the Kenyan Institute for Public Policy Research and Analysis.
69. Innovation partners will include national and international universities and research centers, think tanks, international environmental groups, ministries of agriculture, water, planning and finance, small- and medium-sized enterprise incubators, impact investors, and academic networks like the African Research Universities Alliance and the African Economic Research Consortium.
70. Scaling partners will involve both private and public sector organizations, with identification within countries and regions reflecting existing critical capabilities. They will also include national, regional and local government, the UN Framework Convention on Climate Change and other UN agencies, smallholder farmers, private sector service providers, water and energy utilities, financial and insurance institutions, and specific regional organizations such as the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation.

#### E) Summary of Initiatives and target pooled funding

**Table 4. Synthesis of CGIAR Initiatives in the Action Area on Systems Transformation**

Initiative title	Summary	3-year target pooled funding (million USD)
<b>Thematic Initiatives</b>		
<b>ClimBeR: Building Systemic Resilience against Climate Variability and Extremes</b>	This Initiative aims to build more climate-resilient systems to withstand predicted climate variability and extremes. It aims to achieve this by generating knowledge about climate-security as an imperative for climate resilience and transforming that into action by connecting knowledge, innovations and institutions to specific regional and national challenges. The objective is to deliver impact-at-scale for 20 million farmers by 2024.	30

<b>Transforming Food Systems from Greenhouse Gas Sources to Sinks (S2S)</b>	This Initiative aims to reduce GHG emissions and increase carbon sinks in food systems. The Initiative will analyze how socio-technological innovations, business models and policies can contribute to GHG mitigation, while integrating consumer demand, ecosystem conservation, supply chain efficiency, and food loss/waste reduction into climate action planning.	25-30
<b>Rethinking Food Markets and Value Chains (Re-MVC) for Inclusion and Sustainability</b>	This Initiative aims to induce change in market behaviors and policies to achieve inclusive value-added sharing, large-scale remunerative job creation, food security and adoption of sustainable production and distribution practices along food value chains. This Initiative will provide the necessary knowledge base to influence policy and market behavior to foster process innovations for efficient value-chain integration for fairer income sharing, greater job creation, and adoption of sustainable practices. Together with scaling partners, the Initiative will provide evidence on the effectiveness and scalability of piloted bundles of interventions.	30
<b>Transformational agroecology across food, land and water systems</b>	This Initiative will analyze the impact of agroecological approaches to food production, and aims to minimize adverse environmental impacts, improve farmer-consumer connectivity, and inclusive relationships among food system actors. Through technical, socio-economic and policy innovation pathways, the Initiative will develop and scale agroecological innovations for small-scale farmers (~20% more farmers and ~20% increase in the area within exemplar landscapes) and other agricultural and food-system actors across different socio-ecological contexts in seven low and middle-income countries (LMIC).	30
<b>NEXUS Gains: Realizing Multiple Benefits Across Water-Energy-Food-Forest-Biodiversity Systems</b>	This Initiative aims to stimulate integrated management of water, energy, land, and ecosystems, including biodiversity and forests, for inclusive, sustainable development in transboundary river basins. It will develop innovative approaches to improve water productivity in the integrated water-energy-food-forest-biodiversity nexus with private sector actors; and measure impacts on sustainability and inclusion. This Initiative will contribute to improved cross-sectoral, multi-stakeholder governance at community, national and regional levels.	25-30
<b>SHiFT: Sustainable Healthy Diets through Food Systems Transformation</b>	This Initiative aims to identify transformative policies and innovations, strengthen capacity, and develop robust metrics and tools to guide decision-making towards food system transformations that support and enable consumption of sustainable diets for all, while improving livelihoods, income, gender equity and social inclusiveness. Starting from the diet, nutrition, and health challenges faced by the poor and vulnerable in LMICs, this Initiative aims to identify effective policy options, strengthen capacity, and develop robust metrics and tools to guide decision-making towards transforming food systems to promote and achieve sustainable healthy diets for all and improve livelihoods, gender equity, and social inclusiveness.	30
<b>VF-Nutri: Reducing Malnutrition with Vegetables and Fruits</b>	This Initiative aims to generate knowledge for innovations and enhanced public policy and private sector strategies to reduce malnutrition by increasing access of the poor to vegetables and fruits. The Initiative will work with partners to address the full spectrum of barriers to higher vegetable consumption among poor households, from breeding and seed systems (working with World Vegetable Center) through to marketing, public procurement, consumer awareness and food environments. The Initiative will coordinate very closely with SHiFT and the resilient cities through sustainable urban and peri-urban agrifood systems initiative sharing common approaches, but is presented as its own Initiative to highlight the importance of vegetables and fruits in healthy sustainable diets. This is a newer area of work for CGIAR and an Initiative outline is not yet available in the annex to this Investment Prospectus.	25-30
<b>HER+: Harnessing equality for resilience in the agrifood system</b>	This Initiative aims to conduct research that pinpoints effective strategies to achieve gender equality and social inclusion across the AFS. This requires interventions and outcomes that foster empowerment; lead to greater technology adoption and livelihood security by bundling socio-technical	25-30



	<p>innovations; build resilience by leveraging large-scale social protection programs; and make governance and public investment inclusive, transparent and efficient. Its objective is to support women, youth and marginalized groups to expand their voice and agency, acquire and control assets, adapt to climate change and shocks, and access better markets, financial and public services.</p>	
<b>Cross-thematic Initiatives</b>		
<p><b>Foresight and metrics to accelerate inclusive and sustainable agrifood system transformation</b></p>	<p>To provide the evidence and capacity needed to make the complex choices that shape the future of food, land and water systems, this Initiative will improve and combine two foresight elements that are too often provided separately: rigorous analytics and close interaction with decision-makers. Systematic engagement, including annual forums with national governments, regional organizations and donor agencies, will help assess and articulate foresight needs, identify plausible and desired futures, create appropriate metrics, develop and apply fit-for-purpose interdisciplinary analytical tools, share results, and discuss implications for policies and investments that support inclusive, sustainable system transformation under uncertainty.</p>	25-30
<p><b>National Policies and Strategies for Food, Land and Water Systems Transformation</b></p>	<p>This Initiative will support prioritization of investments and policy reforms that transform food, land and water systems at the national level by closely engaging country stakeholders and decision-makers. The Initiative will work with partners to develop new tools and adapt and apply a range of existing One CGIAR tools to national and sub-national policies and investments, developing transformative strategies and plans that lead to more sustainable and equitable outcomes and provide investment entry points for funders, the private sector and others. This requires co-designing transformative programs, policies, and strategies that crowd-in multiple funding sources and support implementation and analysis using political economy tools.</p>	25-30
<p><b>Harnessing Digital Technologies for Timely Decision-Making across Food, Land, and Water Systems</b></p>	<p>This Initiative aims to support inclusive agricultural transformation and sustainable food-land-water systems management by strengthening the digital ecosystem and improving information systems to generate timely and actionable information. Digital technologies accelerate the inclusive agricultural transformation and improve natural resource management by providing insights to policymakers, producers, consumers, businesses and other actors throughout the food-land-water system, addressing the systemic constraints and inequities in information flows.</p>	30

## Resilient Agrifood Systems Action Area

### A. Fit of the Investment Prospectus within CGIAR's 10-year strategy for Resilient Agrifood Systems

71. As outlined in CGIAR's 2030 Research and Innovation Strategy, providing human and planetary health from agrifood systems, alongside decent jobs, livelihoods and incomes, requires innovations at the field, farm and community levels – making maximum use of genetic innovations and the wider context of socio-economic transformations.
72. The digital revolution and an ever-more connected world mean that the 'how' of food production is ripe for innovation. Farm earnings or cost savings can, and should, be achieved hand in hand with reduction of agriculture's environmental footprint, and the building of resilience in the face of risk. Innovations on-farm and in the food supply chain likewise may create openings for women's empowerment and exciting job possibilities for youth and thus reduce migration pressure
73. The full portfolio of Resilient Agrifood Systems work will include pooled and bilateral funding. The plans for pooled funding outlined in this Investment Prospectus – a set of 10 strategically linked Initiatives – will provide the foundation for the Action Area.
74. It is important that key disciplinary research keeps innovating by developing new technologies and practices interlinked with building of capacity and policy in public and private sectors – so that the new technologies and practices reach impact at scale. The Initiatives should lead to transformational change by providing platforms for cross-disciplinary and cross-sectoral partnerships in innovation systems, particularly with National Agricultural Research and Extension Systems (NARES), Advanced Research Institutions (ARIs) and the private sector.
75. Research will explore multiple context-relevant development pathways for production systems. These include agroecological approaches that leverage ecosystem functioning, technology-based approaches that optimize small-scale producers' access to and use of modern inputs, practices that generate products fit for market and circular economy approaches that aim to eliminate waste and keep resources in use.

### B. Theory of change

76. Agrifood systems, and in particular small-scale producers, are increasingly exposed to climate hazards, limiting their capacity to invest in more productive and sustainable production practices and business models resulting in large gaps in livestock, fish and crop productivity. At the same time the agriculture sector contributes substantially to global greenhouse gas emissions, land degradation and depletion of water resources. Inequalities in access to innovations, capacity development, and services for women and young people continue to exist.
77. The Resilient Agrifood Systems Action Area will tackle these interlinked challenges through a coherent set of three Crop<sup>13</sup> Initiatives, four Livestock & aquatic foods

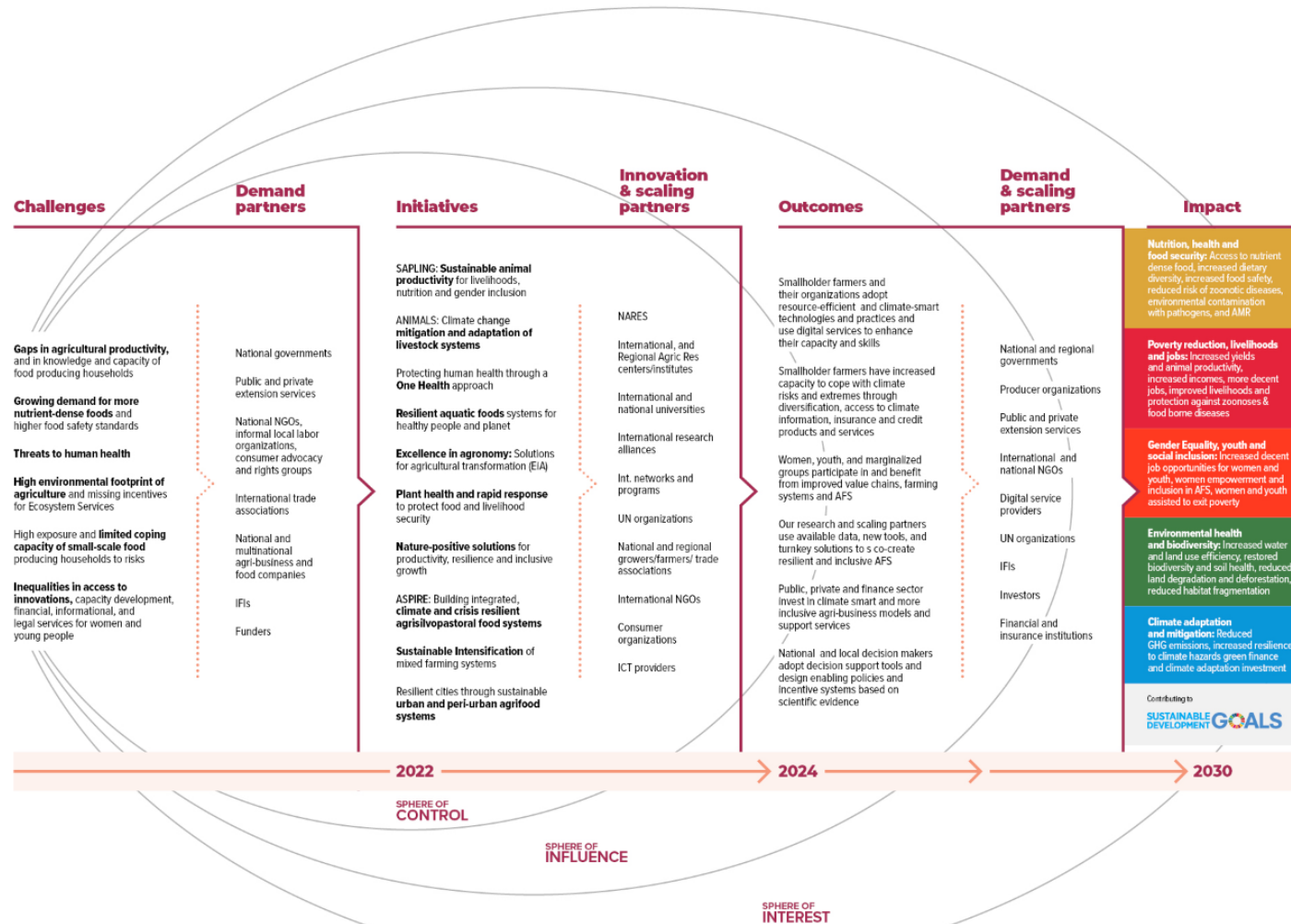
---

<sup>13</sup> Includes vegetables and horticulture

Initiatives, and three Farming systems Initiatives which will partner with public and private research and development organizations and complement each other in expected outcomes and impacts.

78. The Crop and Livestock & aquatic foods Initiatives will develop and deliver technologies, practices, and climate risk management strategies that will measurably increase productivity, resilience and incomes and help producers, businesses, organizations and governments adapt to climate change and contribute to sustainability goals. For example, adoption of CGIAR innovations by smallholder dairy farmers in five East African countries could reduce GHG emissions by between 8% and 16% by 2030, increase milk yields by over 60% and create thousands of new jobs.
79. The growing demand for nutrient-dense safer food and more diverse diets will be met by informing the design of investment by governments, NGOs and the private sector on more environmentally sustainable, socially inclusive and safer (based on One Health principles) food production and value chains, with consideration given to the most important agrifood systems.
80. Systemic challenges of drylands will be addressed by targeting livestock-based systems, where rangelands are dominant, and mixed crop-livestock systems with high risk of crop failure in low rainfall areas. Priorities include targeting livestock productivity increases, optimization of water and fertilizer use and developing insurance products to de-risk dryland production while restoring landscapes and soil health.
81. The three Farming systems Initiatives will integrate and adapt innovations from the Crop and Livestock & aquatic foods Initiatives by assessing the synergies and trade-offs of social and technical innovations and by co-developing and promoting tailored decision-support tools, business models and digital services. Vegetables will be a central component of farming systems research and innovation.
82. The expected outcomes will result in more decent jobs, stable livelihoods, gender equality and affordable nutritious food, and generate co-benefits for soil health, water security, biodiversity and climate change.
83. The theory of change for Resilient Agrifood Systems is illustrated in Figure 3.

Figure 4. Resilient Agrifood Systems theory of change



### C. Action Area priorities for the 3-year business cycle

84. The Initiatives in the Resilient Agrifood Systems Action Area were identified based on the need to increase agricultural productivity sustainably and increase availability of safe, nutrient-dense foods, reduce threats to human health, improve the environmental footprint, increase the resilience of smallholder agriculture and reduce social inequalities. Their focus will include mixed farming systems and horticulture, linking closely with the work on sustainable healthy diets in the Systems Transformation Action Area.
85. The Crop and Livestock & aquatic foods Initiatives will deliver scalable technologies and tools to address these priorities such as reduced plant pests and diseases, and higher crop, livestock and fish productivity with reduced environmental footprint and solutions for increasing agrobiodiversity and preventing pollution. The three Farming systems Initiatives have been prioritized based on their contribution to food and nutrition security, and the potential for efficient and sustainable water and land management solutions and scale of impact in terms of people or land area
86. The wellbeing of small and medium scale farmers, livestock keepers and fisherfolk will be at the center of this research while generating new opportunities for women and young people. Digital technology will be harnessed for data and information capture, e.g. through earth observation or mobile telephony, data analysis and information dissemination to farmers and others. Greater engagement with the private sector to both co-create solutions and facilitate their scaling will be a prominent feature.
87. Priorities include building on previous CGIAR research and innovation that has previously delivered benefits at scale across the five Impact Areas, while also introducing newer research areas such as those on urban and peri-urban food systems.
88. The set of Initiatives outlines for Resilient Agrifood Systems is presented in the Annex and summarized in Table 5.

### D. Summary of key partners and partnerships

89. Demand partners include national governments such as ministries of agriculture, livestock, environment and finance; agencies e.g. food safety, meteorological services, environmental management authorities; international finance institutions; and NGOs. Increasingly the private sector is seeking research solutions, and engagement with private companies and their international associations such as the International Fertilizer Association or the International Dairy Federation will be important.
90. Innovation partners provide expertise to complement capacity within CGIAR. These include NARES (with regional research organizations such as the Forum for Agricultural Research in Africa and the Pacific Association of Agricultural Research Institutions providing coordination), international research institutes and universities, international research alliances such as EcoHealth Alliance and the Global Research Alliance on Agricultural Greenhouse Gases. National and regional farmers/trade associations, food companies, app developers, ICT providers and

distributors of agricultural inputs will also provide complementary innovation capacity.

91. Scaling partners are important for delivering on CGIAR's mission. These include national and local governments, international NGOs such as the International Union for Conservation of Nature and The World Wide Fund for Nature, and national NGOs such as citizen innovation labs and social movements. This also includes international organizations – international financial institutions, UN agencies and regional integration bodies such as the African Union and the Association of Southeast Asian Nations. The private sector is critical to scaling: e.g. app developers, ICT providers, distributors of agricultural inputs and financial and insurance institutions such as Africa Agriculture and Climate Risk Enterprise.

## E. Summary of Initiatives and target pooled funding

**Table 5. Synthesis of CGIAR Initiatives in the Action Area on Resilient Agrifood Systems**

Initiative title	Summary	3-year target pooled funding (million USD)
<b>Crops</b>		
<b>Excellence in Agronomy: Solutions for Agricultural Transformation (EiA)</b>	The vision of success of EiA is to deliver by 2030 higher and more stable yields through agronomic gain for millions of smallholder farming households in prioritized farming systems, with emphasis on women and young farmers for measurable impact on food/nutrition security, income, water use, soil health and climate resilience. The Initiative will work on climate resilient multiple cropping systems, including mixed systems. The overarching objective is to deliver gender- and youth-responsive agronomic solutions to smallholder farmers via demand-driven Use Cases in prioritized regions, underpinned by large pools of actionable data and decision support tools.	20-85
<b>Nature-Positive Solutions: Enhancing productivity and resilience, while safeguarding the environment, and promoting inclusive growth within communities</b>	This Initiative will reshape production systems in selected countries to meet the food demands of growing populations by adopting agro-ecological principles including stewarding biodiversity, and improving soil, and water management within integrated nature-positive solutions. By working with stakeholders, the Initiative will tackle the root causes of environmental degradation from agricultural production and enhance provision of ecosystem services using biodiversity and water to increase productivity and resilience while safeguarding nature and promoting inclusive growth.	25-30
<b>Plant Health and Rapid Response to protect Food and Livelihood Security</b>	The Initiative aims to enable targeted LMICs in Africa, Asia and Latin America to respond effectively to the plant health threats, thereby protecting food security and livelihoods of smallholders and communities, especially in the face of climate change. The core purpose of this Initiative is to preserve agriculture-based economies of LMICs in Africa, Asia and Latin America from devastating pest and disease incursions/outbreaks by leveraging/building viable networks across an array of national, regional and global institutions. Together with innovation partners, the Initiative will co-develop analytical frameworks to identify, characterize, predict and manage plant health threats.	30
<b>Livestock and aquatic foods</b>		

<b>Protecting human health through a One Health approach</b>	The One Health approach recognizes the interconnections between the health of people, animals, and their shared environment. This Initiative will demonstrate how food systems can be redesigned based on One Health principles along the entire value chain to benefit human, animal and environmental health. Research on disease ecology, particularly at interfaces of contact among livestock and people will be the primary focus of work on emerging zoonoses, while threats to human health through food safety and antimicrobial resistance will be tackled along value chains. This Initiative will also strengthen the capacity of governments to develop, implement and scale standards and incentives that are achievable for small-scale informal sector value chain actors and enforceable by regulatory bodies.	30
<b>Sustainable Animal Productivity for Livelihoods, Nutrition and Gender inclusion (SAPLING)</b>	SAPLING will fill critical productivity and value-chain competitiveness gaps by developing a pipeline of new and existing demand-driven health, genetics, feed and market-systems innovations, including climate-smart and digital solutions. This Initiative will promote approaches to ensure benefits of increased productivity translate into healthy, sustainable diets through consumption of safe animal source foods. SAPLING will support inclusive development in 7 value chains with high potential for small- and medium-scale producers and co-create innovation packages that address technology requirements and necessary market structures, capacity and policies, and work with “next user” partners as a starting point to achieve scale.	20-85
<b>Resilient Aquatic Foods for Healthy People and Planet</b>	This Initiative aims to accelerate the transition towards an aquatic food system that is regenerative rather than extractive. By 2024, in the 11 target countries, 30% of AqFS production will come from the sustainable and efficient use of biodiverse inland freshwater systems and coastal wild and farm production environments. These AqFS will evidence improvement in social equity, climate-preparedness, and micronutrient yields. They will offer desirable employment for youth and contribute to a 10 % increase in per capita aquatic food consumption for the 3.6 billion fish-consuming people in our target countries.	30
<b>ActioNs for Innovative climate change Mitigation &amp; Adaptation of Livestock Systems (ANIMALS)</b>	ANIMALS aims to stimulate inclusive and market-driven adaptation and mitigation pathways along ten value chains. It will promote 10 interventions, new business models, and products that benefit producers, input suppliers, market actors, and consumers, help to reduce the environmental footprint of livestock value chains in five countries, and encourage private livestock enterprises to increase their commitments to sustainable production. These interventions will expand business opportunities, improve access to bundled climate information, insurance and credit services, and provide economic opportunities for women and youth in fattening operations, feed and forage production, input markets and advisory services.	30
<b>Farming systems</b>		
<b>Resilient Cities through Sustainable Urban and Peri-urban Agrifood Systems</b>	This Initiative will increase the resilience of rapidly expanding cities by strengthening UPU agrifood systems within wider City Regions. The Initiative will generate new knowledge, connect technologies to demand, co-develop and disseminate models and adaptive strategies for businesses and guidelines for public sector planning, and engage with governance processes to achieve 1) Sustainable intensification of UPU vegetable (link with the vegetable initiative), livestock and fish production, 2) Vibrant, equitable, safe and sustainable UPU food market systems, 3) Improved environmental and human health in UPU food production, marketing and consumption, 4) Improved food environments, consumer choices and women's empowerment and 5) Inclusive governance to enable UPU agrifood sector growth.	25-30
<b>Sustainable Intensification of Mixed Farming Systems</b>	This Initiative aims to achieve the increased food production needed to support the growing global population without compromising the needs of future generations. This Initiative focuses on SI to deliver more productive and equitable livelihoods for current and future actors in crop-tree-livestock farming systems (subsequently called mixed farming systems, MFS), along with a reduced environmental footprint. When those within these farming systems share this	30

	vision and contribute to co-designing and sustainably intensifying MFS, productivity, income generation, and resilience are significantly improved. This Initiative aims to lift 50 million households out of poverty and provide healthy diets by 2030.	
<b>ASPIRE - building integrated agrisilvopastoral food systems resilient to climate change and other crises</b>	ASPIRE aims to strengthen the resilience of pastoral agrifood systems to climate change and other crises, while optimizing opportunities for the system to grow productively under water-stressed dryland conditions. This will be done in partnership with communities, development actors and governments building capacity and optimizing opportunities for delivering impact at scale. ASPIRE's objective is to enhance the security, health, productivity and capacities of people, land and livestock by (re)building the resilience of pastoral agrifood systems through innovations in rangeland, livestock and water management, and by facilitating a political, financial and institutional enabling environment.	30



## Genetic Innovation Action Area

### A. Fit of the Investment Prospectus within CGIAR's 10-year strategy for Genetic Innovation

92. Rapid improvement of the quality of crop varieties is fundamental for supplying the world's food and nutrition security, and for supporting the livelihoods of millions of people. Achieving the necessary replacement rate for crop varieties is a critical success factor for adaptation — to climate, but also to changing market conditions, nutritional demands and environmental constraints. To address these challenges, CGIAR commits with partners to improving genetic gains in farmers' fields: the tangible benefits from genetic improvement, measured in terms of multiple demand-led traits. Metrics of success will include faster adoption of new varieties, with shorter average lifetime of varieties.
93. The full portfolio of CGIAR work in the Genetic Innovation Action Area will include pooled and bilateral funding. The pooled-funded Initiatives laid out in this Investment Prospectus will provide CGIAR's core broad-based capacity in plant genetic resources availability and use, pre-breeding, mechanization, data management systems, genotyping and phenotyping.
94. CGIAR will work to improve capacities in-house and among key partners on product profiles that respond to end-user demands, data management systems, and better connection of seeds and propagation materials to value chain activities.
95. Key opportunities include prioritization of breeding product profiles based on market intelligence, discovery and use of novel genetic diversity from genebanks, strategic use of precision genetic technologies, and co-creation and implementation of demand-driven product development and deployment with national agricultural systems, stronger application of health criteria to breeding programs to improve their contribution to nutrition and health, and stronger application of environmental criteria to improve contributions to sustainable farming systems.
96. Development of the Initiative outlines into full proposals will include improving cohesion and multiplicative effects of their outputs and their interdependent roles in achieving the theory of change. Greater cohesion will be achieved not only between the Initiatives in this Action Area but also with the Regional Integrated Initiatives and with the Systems Transformation and Resilient Agrifood Systems Action Areas.

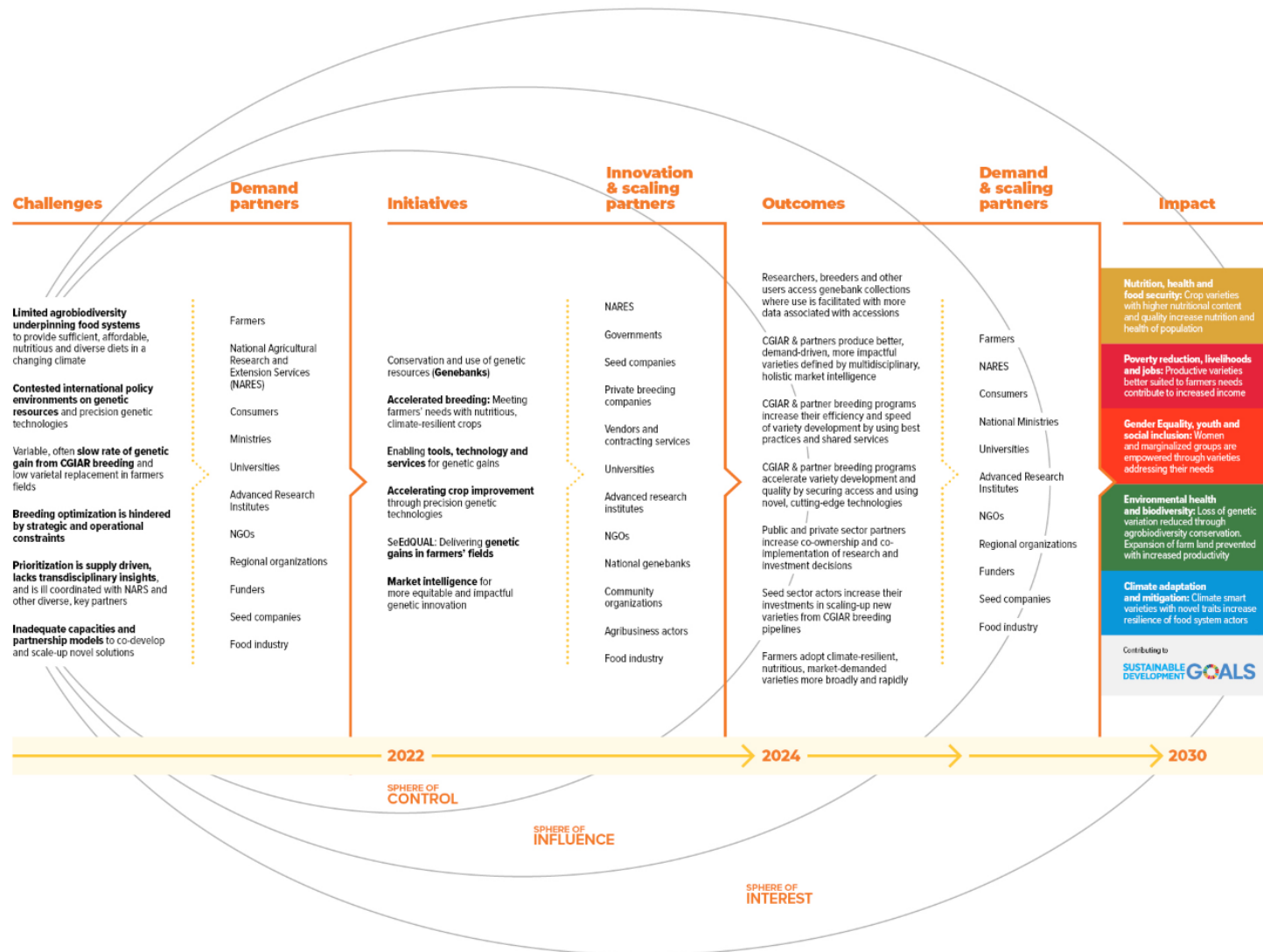
### B. Theory of change

97. The Genetic Innovation Action Area leads stewardship of genetic resources and addresses barriers to achieving rapid improvement of crop varieties, increasing genetic gain and varietal turn over in farmers' fields. It will do so through (1) the conservation of genetic resources in genebanks and facilitating and expanding their use by breeders and other stakeholders; (2) prioritizing breeding investments in market segments with highest potential for impact; (3) developing new crop varieties delivering higher rates of genetic gain in farmers' fields; (4) accelerating crop improvement through precision genetic technologies; (5) enabling tools, technology and shared services to enhance efficiency and effectiveness of CGIAR and

partners' breeding programs; and (6) increasing seed sector actors' investments and effectiveness in scaling-up access for farmers to new varieties.

98. Building on CGIAR and partners' capabilities, the Action Area will co-create new partnership models with NARES and the private sector for priority setting, research, breeding and the scaling up of varieties. An enabling environment for testing and scaling will be achieved by working synergistically with the Action Areas on Resilient Agrifood Systems and Systems Transformation. Investments in genetic innovations provide foundational and multiplier outputs and outcomes for many crop-related innovations such as increased yield, biofortification, pest and disease resistance, and improved environmental tolerances that, in turn, deliver benefits across all five Impact Areas.
99. The theory of change for Genetic Innovation is illustrated in Figure 5.

Figure 5. Genetic Innovation theory of change



### C. Action Area priorities for 3-year business cycle

100. CGIAR has prioritized six inter-connected thematic Initiatives based on core capacity, demand, and impact delivery dimensions. These Initiatives will work across all six CGIAR regions. Genebanks will improve the performance standards for conservation and germplasm health units; they will facilitate use of germplasm while creating a stronger and more interactive global system for benefit sharing in partnerships with national genebanks. Under a more coordinated system of breeding, crop-geography-end user combinations (product profiles) will drive investment decisions. Product profiles will include consideration of market preferences (taking gender into account), climate resilience and environmental footprint.
101. Precision technologies will drive identification and incorporation of new traits. Genomic assisted breeding approaches will be used for the optimization of breeding pipelines. For modernizing breeding programs, best practices in the use of tools, services and technology will be implemented through a service unit that will improve efficiency and lower the cost of genotyping, information management, mechanization and other services needed by most or all breeding programs. CGIAR will work in close collaboration with national governments, NARES and the private sector, and play a complementary role in scaling up, capacity building and seed delivery.
102. The set of Initiatives outlines for Genetic Innovation is presented in the Annex and summarized in Table 6.

### D. Summary of key partners and partnerships

103. Demand partners include farmers, public sector NARES, NGOs, the private food industry and the seed sector, nutrition and health sectors, and the Resilient Agrifood Systems Initiatives that demand varieties for sustainable, eco-friendly cropping systems.
104. Innovation partners include the NARES breeding and research programs, universities, advanced research institutes, the industry and seed sectors, and developers of complementary crops like fruits and vegetables; in short, these are partners who co-design and co-develop with CGIAR the crop varieties demanded by our clients.
105. Scaling partners are farmers, farmers' organizations, public extension services, public and private seed sectors, NGOs, and funders who ensure that innovations are accessible to farmers, including the hard to reach, socially disadvantaged, resource poor, or far-from-markets farmers, and the consumers they supply with food and nutrition.

## E. Summary of Initiatives and target pooled funding

**Table 6. Synthesis of CGIAR Initiatives in the Action Area on Genetic Innovation**

Initiative title	Summary	3-year target pooled funding (million USD)
<b>Plant breeding</b>		
<b>Accelerated breeding: meeting farmers' needs with nutritious, climate-resilient crops</b>	Quantitative genetics principles, optimized statistical designs, accelerated breeding schemes, genomics and other tools will be applied to enhance the rate of genetic gain for highly focused breeding pipelines.	20-85
<b>Accelerated crop improvement through precision genetic technologies</b>	Gene editing and other precision genetic technologies will be used to 1) enhance efficiency of use of genetic resources in parent development and 2) add value to elite lines/varieties.	25-30
<b>Enabling tools, technology and services for genetic gains</b>	A business unit will centrally coordinate and deploy services (e.g. biometrics, informatics, molecular marker services, mechanization, research station management) to increase the efficiency of breeding programs.	20-85
<b>Genebanks</b>		
<b>Conservation and use of genetic resources (Genebanks)</b>	Efficient, in-perpetuity conservation of agro-biodiversity is first. Secondly, facilitating its use through accessible data and methods for efficiently identifying useful, novel diversity for breeding.	45-50
<b>Market intelligence</b>		
<b>Market intelligence for more equitable and impactful genetic innovation</b>	Client demands, and current and future market opportunities will be surveyed and analyzed through transdisciplinary and gender lenses, including breeders, to jointly define product profiles and investment priorities to maximize adoption and impact of new crop varieties.	30
<b>Seed systems</b>		
<b>SeEdQual: Delivering genetic gains in farmers' fields'</b>	This is the marketing division for Genetic Innovation. It is also about implementing diverse approaches to scale-up the capabilities of partners to reach 'hard-to-reach' farmers with improved varieties.	30

## Regional Integrated Initiatives

### A. Vision for development of the Regional Integrated Initiatives

106. Achieving benefits at scale across all five Impact Areas will need research and innovation targeted to complex regional problems, over and above global thematic work. Regional Integrated Initiatives are formulated to address specific priority regional challenges. These challenges have been identified by triangulating scientific evidence on global significance and regional relevance, consultation and evidence of stakeholder demand, and investor preference.
107. Regional Integrated Initiatives are a key vehicle for delivering priority development solutions from integrated research and innovation. They will operate by co-identifying challenges and research foci with key partners, and by co-designing, co-creating and co-learning with these partners throughout the innovation process. Research within the Regional Integrated Initiatives are interdisciplinary – connecting crops, trees and livestock, technical and institutional innovations, and farming and food systems. They match CGIAR capabilities to regional demand and connect research and innovation at the regional level with the thematic Initiatives and Impact Area Platforms.
108. At this stage, the Regional Integrated Initiatives and the thematic Initiatives are both direct channels for impact, interacting with each other to deliver research and innovation with regional partners and stakeholders. In the longer run, with the new CGIAR operational structure in place, the Regional Integrated Initiatives have the potential – given sufficient investment – to become the main direct channel for impact, interacting closely with regional stakeholders, demand and priorities. They could then act as the conduit between regional stakeholders and the clusters of thematic Initiatives in all three Action Areas – expressing the regional demand for thematic skills and services and creating impact pathways for these skills and services.
109. Co-design of the Initiatives will involve strategic multi-stakeholder planning processes that engage with regional bodies, national governments, NARES, funders, regional development banks and other partners. CGIAR will seek to align research and innovation with regional development policies and strategies, validated and contextualized with stakeholders. Targets for Regional Integrated Initiatives, across all five Impact Areas, will be co-developed with regional partners.
110. The next stage of Regional Integrated Initiative design will include:
  - a. strategic and tactical multi-stakeholder planning processes which integrate public and private sector actors, and which link regional and global priorities;
  - b. implementation of multi-stakeholder innovation hubs for testing and generating impact;
  - c. creation of feedback loops of data and information to the science areas.
111. Knowledge management and use is critical to Initiative success. The Regional Integrated Initiatives will formalize flows and management of information and knowledge between

diverse sets of stakeholders; and will consider previously unresolved practical and relational barriers to knowledge management and use. The Initiatives will facilitate more equitable, rapidly evolving, and actionable knowledge generation and management for innovation and transformational change.

112. The Initiatives will operate through hubs or ‘living labs’; each hub has a physical infrastructure, including research platforms, modules, extension and scaling areas, which are used for networking, knowledge exchange and co-creation. In the research platforms, local partners evaluate technologies resulting from the global Initiatives and local tacit knowledge to develop research-based recommendations for farmers. In modules, farmers are connected to peers, farm advisors and other value chain actors to implement and adapt best practices from research platforms and compare them with conventional practices. Extension areas are agricultural fields where farmers test new technologies in connection with modules or research platforms. The scaling areas focus on farmer-led dissemination of knowledge and innovations.
113. This infrastructure is used to build a network of stakeholders – farmers, farm advisors, scientists, research centers, private enterprises, and government actors, among others – that collaborate around a common objective: innovation in the agrifood system to make it more sustainable, productive, profitable and resilient. The hub model considers farmers important change agents and central to the approach.
114. A structured global community of practice will systematize and accelerate theory development, set-up, testing, validation, evaluation, learning and continuous improvement of the Initiatives, as well as provide support to decision-making in public policy, value chains, finance, and other components of agrifood systems.

#### **B. Priorities for 3-year business cycle**

115. Next to the demand driven focus of the Initiatives, Regional Integrated Initiatives take a climate lens in defining their initial focus but deliver across all five Impact Areas. The priorities for each Initiative were informed by a rapid assessment of climate-related challenges to food, land and water systems using the IPCC Risk Framework and drawing from the outcomes of the regional consultations in the CGIAR-led “Two Degree Initiative” (2DI). Based on this analysis, two of the Regional Integrated Initiatives – East and Southern Africa and Asian Mega-Deltas – are closely aligned with 2DI outcomes which have been developed with considerable stakeholder consultation and the analysis of climate hazards. The other four Initiatives also draw from the analysis of climate risks and are rooted in the 2DI process but will carry out additional regional stakeholder consultations to further sharpen their focus and co-design work packages with the stakeholders.
116. With climate resilience as the overarching entry point, each Regional Integrated Initiative has a strong focus on developing, leveraging and accelerating policies, practices, technologies and services for climate-smart innovations to diversify and de-risk agriculture and to boost its sustainability, competitiveness and inclusiveness.

117. All Regional Integrated Initiatives aim to co-develop, scale and implement innovation bundles and targeted solutions that will apply new data, tools, and de-risking mechanisms for building resilience adapted to specific contexts. Digital platforms embedded with research and private sector partners will develop solutions adapted for specific stakeholders, for example, agro-advisory applications for de-risking agriculture. The Initiatives will rely on multi-stakeholder platforms for policy engagement and to provide timely feedback and adjustment mechanisms that enable beneficiaries to adopt improved practices.
118. While all Regional Integrated Initiatives aim to build resilience and work towards inclusive and sustainable food systems, the focus of research response varies depending on the regional challenges and innovation systems, policies and strategies at national and regional levels. For example, developing solutions for water security is a key priority in the Asian Mega-Deltas, Central and West Asia and North Africa and East and Southern Africa Regional Integrated Initiatives, while building competitive and nutrition-sensitive agrifood systems is the focus in Latin America and the Caribbean and West and Central Africa. Each Regional Integrated Initiative has its own theory of change adapted to regional needs, partners' priorities and strategic opportunities. In several regions migration is a major challenge where these initiatives can help by improving the livelihoods like in LA and CWANA.
119. The set of Regional Integrated Initiative outlines is presented in the Annex and summarized in Table 7.

### C. Summary of key partners and partnerships

120. Development of concepts and full proposals for the Regional Integrated Initiatives will involve strategic multi-stakeholder planning processes that engage with demand partners such as regional economic communities (such as the Common Market for Eastern and Southern Africa and the Southern African Development Community) and regional organizations, national governments, NARES, funders, regional development banks and industry associations. CGIAR research and innovation will be fully aligned with regional and national development policies and strategies, and validated and contextualized with stakeholders.
121. Regional Integrated Initiatives will be co-delivered with innovation partners, such as NARES, universities, regional and international research centers and private sector associations. Multi-stakeholder platforms will provide mechanisms for shared innovation, capacity development and generation of policy-relevant evidence. Critical scaling partners will include government extension services, private sector networks and platforms, UN agencies, regional and multilateral development banks, NGOs and funder-supported regional programs.



## D. Summary of Initiatives and target pooled funding

Table 7. Synthesis of CGIAR Regional Integrated Initiatives

Initiative title	Summary	3-year target pooled funding (million USD)
<b>Resilient and sustainable LAC agrifood systems: Driving global food security, inclusive growth, and reduced out-migration</b>	The Initiative will strengthen LAC agrifood systems' resilience, sustainability and competitiveness, enabling them to meet food security needs better, build resilience to climate change, stabilize conflict-vulnerable communities, and reduce out-migration. This will be achieved through participatory R4D innovation hubs, strengthening extension systems and shaping inclusive and transformative agrifood sector policies. The Initiative will support agrifood actors in implementing low-emission strategies, reducing GHG emissions to achieve Nationally Determined Contributions and National Adaptation Plans.	40-60
<b>Market-driven, Resilient and Nutritious Agrifood Systems in the Humid zones of West and Central Africa (WCA)</b>	This Initiative aims to build a more resilient, climate-smart, nutritious, gender-equitable and viable food production system in three humid agro-ecologies of WCA through the development and scaling of novel and inclusive production and post-harvest technologies, participatory decision-making and planning, and informed governance systems. The entry-point of this Initiative will be to create effective public-private sector partnerships and increase private sector-led market opportunities for smallholder farmers as pull factors for innovation, adoption and impact creation.	40-60
<b>From Fragility to Resilience in Central and West Asia and North Africa (F2R-CWANA): Transforming responses to drought and climate variability</b>	This Initiative will co-develop, scale and implement solutions that accelerate resilience to drought across CWANA's agrifood systems from farm to regional level. It will foster adoption of innovations to enhance the production and marketing of staple and locally important nutritious foods while restoring water resources, soil health and agrobiodiversity in CWANA's drylands. The Initiative promotes gender- and socially inclusive governance and decision-making for common benefits and opportunities across value-chains, responding to market demand and generating enhanced value-addition and employment from fork-to-farm.	40-60
<b>Ukama Ustawi (U2) Water Secure and Climate Resilient Agricultural Livelihoods in East and Southern Africa</b>	Ukama Ustawi (U2) will identify, leverage, and accelerate policies, practices, technologies, and services for climate-smart innovations to diversify and de-risk dryland agriculture in maize-based ESA areas at multiple scales science-based innovation, capacity strengthening, policy support, and collaborative governance. U2 builds off the Two Degree Initiative-Southern African Challenge success, where we partnered with 300 diverse stakeholders to co-create research for development agenda for water-secure, climate-resilient, low-emission, inclusive livelihoods and landscapes.	40-60
<b>Securing the Asian Mega-Deltas against Sea-level Rise, Flooding, Salinization and Water Insecurity</b>	This Initiative will support the creation of resilient, inclusive and productive deltas capable of maintaining socio-ecological integrity, adapting to, even thriving, in the face of climatic and other stressors, and supporting human prosperity and well-being. Achieving this will require attention to both the agro-environmental and human landscapes as interconnected social-ecological systems, whereby technical interventions are tied to broader enabling environments so that technical 'wins' manifest themselves in human development outcomes and impacts, through continued opportunities, especially for women and youth within expanding market economies.	40-60
<b>Transforming Agrifood Systems in South Asia (TAFSSA)</b>	This Initiative aims to propel evidence into impact through systematic and coordinated engagement with public and private partners across the production to consumption continuum. Operating in the region's most marginal and poverty-dense cereal-based farming systems, TAFSSA will test, adapt, target, and position agronomic technologies and practices among next-users while developing strategies to make agricultural value chains more inclusive by 2024. This will be achieved by leveraging insights from behavioral sciences and market research to galvanize actions tackling climate risks among farmers.	40-60

## Impact Area Platforms

122. Five Impact Area Platforms will work across the three Science Groups/Action Areas, bringing together networks of staff to maximize CGIAR's impact in each of the 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
123. The key roles of the Impact Area Platforms will be to: (i) work as global, intellectual hubs for their respective Impact Areas, fostering global critical thinking; (ii) build internal capacity across the Action Areas/Science Groups; (iii) advise management on the prioritization, design, and implementation of CGIAR Initiatives and bilaterally funded projects, through membership of the Portfolio Performance Management Team; and (iv) amplify CGIAR's external profile and voice.
124. In order to enact these functions, it is estimated that a budget of USD 2 million per Platform per year is required. This budget would include:
- Five full-time members of staff, including a director
  - Budget for time in and outside the system spent on commissioned work for internal capacity support and external engagement
  - Operational costs of travel and convening meetings
125. It is anticipated that the Impact Area Platform on Gender equality, youth and social inclusion may be on a different track and budget, to take forward the model agreed by the System Council in 2020.

## Annex: Preliminary CGIAR Initiative Outlines



## Accelerated Breeding: Meeting Farmers' Needs with Nutritious, Climate-Resilient Crops

### Initiative Lead and Co-Lead

Michael Quinn  
Clare Mukankusi

### Primary CGIAR Action Area

Genetic Innovation

### Estimated 2022 - 2024 Budget

\$20 - \$85 M

### Challenge

Breeding programs targeting the developing world will need to urgently deliver higher genetic gains in farmer's fields to cope with current 21st century challenges: 50%-60% greater demand for food with increased nutritional value in the face of climate change, natural resource constraints and diet-related and food safety challenges. Climate change will reduce crop productivity by about 5% for every degree of warming above historical levels[1]. This alone will require breeders to speed up current efforts substantially[2], and more so to incorporate nutritional traits into modern varieties.

However, the pace of technological modernization in breeding programs targeting the developing world is inadequate. Farmers still grow obsolete varieties, partially because they derive inadequate benefits from recent breeding efforts. Breeding programs need to better address market demands. Breeding progress needs to be greater and more rigorously verified under farmers' own conditions -- and with consumers. Partial modernization of methods and approaches has begun to take place through the Excellence in Breeding Platform (EiB) and CtEH initiative. But organization and funding of CGIAR breeding are currently not conducive for joint priority setting, strategic use of human and financial resources, and mainstreaming of the best practices needed to consistently increase genetic gains across crops.

In addition, collaboration between the CGIAR and national breeding programs varies greatly in quality and effectiveness. Duplicate and inefficient efforts prevail.

Opportunities are missed for CGIAR and NARES jointly designing, owning and implementing common strategies to strengthen local breeding sectors, increase genetic gains and drive variety turnover on-farm as part of a collaborative breeding network.

[1] Challinor AJ, Watson J, Lobell DB, Howden SM, Smith DR, Chhetri N (2014) A meta-analysis of crop yield under climate change and adaptation. Nat. Clim. Change 4: 287-291. doi:10.1038/nclimate2153.

[2] Fischer RA, Byerlee D, Edmeades GO (2014) Crop yields and food security: will yield increases continue to feed the world? ACIAR Monograph (158, Canberra, 2014), available at [http://www.regional.org.au/au/asa/2012/agriculture/7936\\_fischerra.htm](http://www.regional.org.au/au/asa/2012/agriculture/7936_fischerra.htm).

### Objective

The initiative will develop better performing, farmer-preferred crop varieties for crop-region combinations prioritized for their potential to increase incomes and reduce hunger in poverty-affected countries [3], and potentially new ones identified by MIPPI. Three objectives will set the base for achieving, by 2030, improvements of at least 1.5% p.a. genetic gain on-farm (for traits that are prioritized by distinct CGIAR impact goals), and reducing the area-weighted average age of varieties in farmers' fields to less than 15 years:

1. Climate-smart varieties addressing value chain demands: taking direction from MIPPI outputs to restructure and reorient breeding programs to develop varieties that demonstrate greater benefits (i) under farmers' actual and future growing conditions, (ii) for processors and consumers, and (iii) with more emphasis given to varieties that benefit women and marginalized groups.

2. Professionalize breeding: to systematically implement best-practice breeding and trialing approaches across breeding pipelines; replace multiple "in-house" solutions with high quality shared services established by ETTTSfGGI; and initiate organizational changes towards a single multi-crop breeding organization that pursues continuous improvement and achieves greater genetic gains.

3. Partnerships that deliver: to recast breeding networks and promote co-creation that empowers NARES and the local private sector, particularly small and medium sized enterprises (SMEs), to assume greater and clearer responsibility; and with the purpose of establishing ownership, enhancing effectiveness of individual and joint efforts, and driving variety adoption on-farm.

[3] Wiebe KD, Sulser TB, Dunston S, Rosegrant MW, Fuglie K, Willenbockel D, Nelson GC (2021) Modeling impacts of faster productivity growth to inform the CGIAR initiative on crops to end hunger. doi: 10.1371/journal.pone.0249994

### Theory of Change

Breeding programs targeting the developing world urgently need to produce higher rates of genetic gain to address the increasing demands for affordable and nutritious food under changing climates, and create new opportunities for women, marginalized farmers and local processors. With the private breeding sector still targeting only a few crops and higher-income regions, modernizing CGIAR and National Agricultural Research and Extension System (NARES) breeding programs and partnerships are key to ensuring significant variety innovations will be forthcoming, now and in future.

Building on Crops to End Hunger (CtEH) and focusing on the CGIAR Impact Areas, this initiative transforms CGIAR-NARES breeding to increase the rate of genetic gain from below 1% to >1.5% annually while significantly improving the benefit of new varieties to farmers and consumers, women and marginalized groups. Linking with the other Genetic Innovation Initiatives and exploiting advantages of a unified organization, it will: (i) apply best practices and partnership models across teams and crops; (ii) refocus CGIAR-NARES-SME breeding networks on distinct market segments and product profiles; (iii) modernize breeding approaches to shorten breeding cycles, increase selection accuracy, and pursue value from genetic resources; and (iv) implement bold models for breeding that strengthen NARES role and capacity in variety development.

The Initiative will result in crop varieties that are more likely adopted by farmers and consumers, driving down the age of varieties in farmers' fields. It will transform the local breeding sector and result in more sustainable and greater impact on incomes, nutrition, gender equality, and climate adaptation.

## Accelerated Breeding: Meeting Farmers' Needs with Nutritious, Climate-Resilient Crops

### Highlights

**Modernized breeding:** This initiative will redesign CGIAR breeding networks to increase genetic gain delivered to farmers, consumers, traders and processors through improved varieties. CGIAR will be world-leading in applying and evolving best practices, aligned with quantitative genetics principles and strategic use of proven technology while developing and attracting scientific talent.

**One CGIAR - global multi-crop breeding organization:** This Initiative will apply world-class breeding services and operations capacity from the Enabling Traits, Tools and Technology Services for Genetic Gains Initiative (ETTTsFGGI) across crops resulting in greater trial accuracy, staff safety, and cost savings. All CGIAR breeding pipelines will be optimized to deliver higher genetic gains, in the form of farmer-preferred varieties.

**Transforming partnerships:** This Initiative will strategically empower national partners to become active drivers in ongoing CGIAR-NARES-SME breeding networks. NARES and local private sector capacity will be developed in a customized manner to identify breeding objectives, collaboratively develop improved varieties, and drive variety adoption together with the SeEdQUAL initiative.

**Demand-driven breeding:** CGIAR breeding will be demand-led. Trait prioritisation will be guided by multidisciplinary research by the Market Intelligence and Product Profile Initiative (MIPPI). All breeding decisions will be made in context of client-focused product profiles broadly describing the products needed to replace obsolete varieties in farmers' fields and address One CGIAR's Impact Areas.

**Focused and prioritised Breeding:** Breeding pipelines will target specific market segments informed by MIPPI. Resources will be allocated according to each pipelines' potential to contribute to One CGIAR's Impact Areas. Resources will furthermore be optimally allocated within each pipeline to maximize the likelihood of variety adoption and utilisation.

### Work Packages

	Scope of Work	3-year Outcomes
Re-Focused Products	Based on current insights and forthcoming MIPPI input, restructure breeding pipelines to target most relevant market segments, moving away from more generic breeding approaches. Use product profiles to drive breeding decisions from crossing to variety selection. Iteratively adapt and evolve product profiles based on on-farm testing and partner consultations.	Product profiles are informed by updated social science insights, NARES, farmers and consumers input, generating varieties aligned with drivers of adoption and stakeholders' requirements. Investment cases linked to breeding pipelines will give decision makers greater confidence to make resource allocations aligned with development goals.
Re-Focused organization	Gradually establish specialized teams to focus on trait discovery, trait deployment, population improvement, and variety validation, in some instances across crops. Define and implement stage gates and handover criteria between teams to consistently pursue the prioritized product profiles, and hand-over to SeEDQUAL. Assess and learn from efficiency gains through reorganization.	Structuring and stage-gating breeding pipelines allows to systematize a culture of continuous improvement, learning and innovation where specialized yet integrated teams identify, fine-tune and streamline cutting-edge approaches. Beyond creating a modern, more efficient and responsive breeding engine, this approach more effectively attracts and develops talent and external partnerships.
Transforming NARES and SMEs	Collaboratively review CGIAR-NARES-SME crop breeding networks, define and implement approaches for NARES and SMEs to guide decision-making and assume more responsibilities in the implementation of collaborative breeding approaches, aligned with their evolving strength and mandate. Provide partners with crucial skills, tools and resources to execute their roles and responsibilities.	Local partners are motivated to engage in CGIAR-NARES-SME networks and more successful in ensuring a continuous flow of high-performing varieties, adapted to local needs, are moving towards commercialization or other forms of dissemination. Capacity development becomes an integral component, improving the network's and individual partners' performance.
Trait discovery and deployment	Identify novel sources for highly valuable and demanded traits, guided by the product profiles (e.g. climate resilience, nutrition and processing traits, new biotic threats), from CGIAR and other genetic resources. Develop and implement molecular and phenotypic selection methods and tools to support accelerated introgression into elite parents and varieties.	Coupling elite population improvement with access to valuable genetic diversity for current and emerging needs increases both the rates of genetic gain and enables a fast response to new threats (pests or diseases) or new MIPPI insights (e.g. gender relevant traits).
Population improvement and variety validation	Optimize breeding pipelines (for use of tools, traits, environments, and safety), accelerate breeding cycles, and implement best-practice phenotyping, molecular and data management approaches throughout CGIAR-NARES-SME population improvement and variety validation network, leveraging tools and services developed by Bismi. Shift trialing to better reproduce farmers' environments and management practices.	Rates of genetic gains will increase due to greater trial data accuracy, selection precision, and throughput. Expanding on-farm trialing and systematizing gender-informed user feedback will identify desirable varieties more accurately. Operations will be more efficient, quality-managed and safer.



## Accelerated Breeding: Meeting Farmers' Needs with Nutritious, Climate-Resilient Crops

### Impact Area Contributions

<b>Nutrition, health &amp; food security</b>	Increased genetic gains and variety replacement will increase the quantity of food, thereby lowering food prices and enabling poor consumers to diversify their diets. Developing biofortified varieties, with elevated zinc, iron, vitamin A content, and modified processing traits to address the higher need of adolescent girls and women for micronutrients.
<b>Poverty reduction, livelihoods &amp; jobs</b>	Farmer-and market oriented value-chain planning will result in varieties better suited to local growing conditions, anticipated climate changes, sale at local and urban markets, and processing. Adopting farmers' food security and income will increase and local jobs created along the value chain. More nutritious food improves health and livelihoods.
<b>Gender equality, youth &amp; social inclusion</b>	This initiative will work with the MIPPI to better understand how product profile choices can empower women, youth and socially marginalized people. On-farm trialing will use gender-sensitive indicators and use insights to adjust product profiles. Capacity development, choice of collaborators, and staff will follow targets to pursue gender equity.
<b>Climate adaptation &amp; greenhouse gas reduction</b>	Varieties, parents and trait discovery will pursue adaptation to forecasted climate change impacts for specific crop-region combinations, such as drought, heat, flooding propensity, or changing disease and pest profiles, and achieve targets faster[4]. The MIPPI will provide input to local, desirable coping strategies in response to climate change. [4] Atlin GN, Cairns JE, Das B (2017) Rapid breeding and varietal replacement are critical to adaptation of cropping systems in the developing world to climate change. Global food security; volume 12: 31-37
<b>Environmental health &amp; biodiversity</b>	Breeding-driven production gains reduce pressure on deforestation for production gain. This allows more land to remain in its natural state. This will be considered in the pipeline investment cases developed by the MIPPI. Traits supporting sustainable farming (e.g. direct seeded rice) will be weighted and targeted by selection.

### Impact on SDGs



### Regions

Global Central and West Asia and North Africa (CWANA), East and Southern Africa (ESA), Latin America and the Caribbean (LAC), South Asia (SA), South East Asia and the Pacific (SEA), West and Central Africa (WCA)

### Countries



## Accelerated Breeding: Meeting Farmers' Needs with Nutritious, Climate-Resilient Crops

### Innovations

- CGIAR-NARES-SME Partnership model. NARES and SME as active partners in formally-managed collaborative CGIAR-NARES-SME breeding networks, reducing inequities and strengthening local ownership and capabilities.
- Prioritisation framework. Well described CGIAR breeding portfolio that demonstrates the link between breeding pipelines, varieties developed, and the type and number of beneficiaries, allowing rationalization of public sector breeding investments.
- Novel genetic resources. Fully characterised novel sources of genetic variation for key traits on the product profile and other intractable traits, e.g. blast resistance in rice. Including traits needed today and in future climates and growing conditions.
- High value breeding parents. e.g. broadly adapted wheat lines with novel sources of genetic variance for intractable traits (e.g. climate adaptation) to be used as parents by NARES breeders and private sector reducing need for duplicated efforts by local breeding teams.
- Market preferred varieties. e.g. drought-tolerant and NUE maize varieties for East African highland farming systems to strengthen smallholders' capacity to cope with climate and weather variability and to produce despite nutrient depleted soils.

### Key Partners

<b>Demand</b>	Academic, Training and Research	Academic Institutions in the developing countries: Universities such as the World Bank-supported centers of plant breeding excellence: African Centre for Crop Improvement (ACCI) - South Africa, West Africa Centre for Crop Improvement (WACCI) - Ghana, Makerere University Regional Centre for Crop Improvement (MaRCCI) - Uganda.  Regional Agricultural Research Organizations focused on strengthening inter-regional research capacity and collaboration, e.g., West and Central African Council for Agricultural Research and Development (CORAF/WECARD), Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA)
	Government	National Breeding Programs, e.g., National Agricultural Research Organization (NARO) of Uganda, Bangladesh Rice Research Institute (BRRI).
	Private Sector	Local Seed Companies, e.g., Western Seed in Kenya, Nalweyo Seed Company (NASECO) in Uganda, Zamseed in Zambia etc. in addition to emerging start-ups focusing on root and tuber crops. Local and international processing companies, e.g., TrueFoods canning industry in Kenya.
<b>Innovation</b>	Academic, Training and Research	Academic Institutions in the developing countries: e.g. African Centre for Crop Improvement (ACCI) - South Africa, West Africa Centre for Crop Improvement (WACCI) - Ghana, Makerere University Regional Centre for Crop Improvement (MaRCCI) - Uganda  National Breeding programs, e.g., Kenya Agricultural and Livestock Research Organization (KALRO), Indian Council for Agricultural Research (ICAR)
	Other Public Sector	USAID Innovation Labs and affiliated Universities (eg Cornell University))
	Private Sector	Leading private breeding companies, e.g., Bayer, Corteva.
	Private Sector in Aid Recipient Country	Downstream local and international processing, aggregating and offtaking companies, e.g., Nutreal in Uganda, Heinz in the USA
<b>Scaling</b>	Government	Government subsidy and farmer support programs [Farmer Input Subsidy Programs (FISP)] that are active in various countries in Sub-Saharan Africa (e.g.; Zambia, Tanzania, Rwanda, Malawi)  National agricultural research and extension systems, e.g., Directorate of Agricultural Extension Services of the Ministry of Agriculture and Animal Industry (MAAIF) - Uganda, National Agricultural and Livestock Extension Program (NALEP-GoK) - Kenya, Agricultural Transformation Agency (ATA) - Ethiopia
	International NGO	International humanitarian organisations and social enterprises: e.g., One Acre Fund, Netherlands Development organization (SNV), World Vegetable Centre (WorldVeg), Catholic Relief Services (CRS), World Vision, Alliance for a Green Revolution in Africa (AGRA)
	National NGO	Community-based organizations such as Karagwe Development and Relief Services (KADERES) in Western Tanzania. Faith-based organizations (FBO's) such as the Inter Religious council of Uganda (IRCU)
	Private Sector in Aid Recipient Country	Local seed companies:, e.g. Beula in Tanzania, Dryland Seeds in Kenya, ZamSeed in Zambia, SeedCo in several African countries, Mukushi Seeds - Zimbabwe, Maslaha Seed - Nigeria, Heritage Seeds - Ghana, Sedab - Senegal

# Theory of change – Accelerated Breeding

## Challenges

- **Current rates of variety adoption** fall short of investors' expectations and farmer needs.
- **Market & customer needs** are insufficiently targeted by breeding efforts.
- **Sub-optimal approaches** for mainstreaming modern breeding approaches, sharing of learning across crops, good practices, and joint research across centers.
- **Contribution of novel varieties** toward poverty alleviation, climate resilience, and food security is insufficient.
- **Limited Integration of NARES** in variety development resulting in lack of ownership and inadequate local capacity development.
- **Limited private sector investment** due to challenges to economically establish a significant role.

## Work Packages

- **Re-Focused Products:** Restructured breeding pipelines targeting defined market segments and product profiles.
- **Re-Focused organization:** Specialized breeding teams working to stage-gated processes for product development.
- **Transformed NARES and SMEs:** Varieties developed through transformed partnerships between CGIAR, NARES and SMEs.
- **Trait discovery and deployment:** Novel genes for high value traits identified and introgressed into highly elite parental lines.
- **Population improvement and variety validation:** Varieties developed by programs optimized for use of technology, traits, environments and safety.

## Partners

- NARES
- Breeding companies
- Regulatory agencies (e.g. KEPHIS)
- Technology providers
- Universities and R&D organizations
- NGOs

## Outputs

- **Improved varieties** targeting farmers' and women's needs, nutrition and climate adaptation and where possible climate change mitigation.
- **Elite parental material:** Novel alleles aggregated faster in elite genetic backgrounds.
- **Trait discovery:** Trait targeted research draws on genetic resources to support breeding for high-value traits.
- **Partnership model:** Breeding networks that transform the role and capacity of NARES and SMEs.
- **One CGIAR:** A more agile and effective breeding organization targeting low-income farmers needs.

## Outcomes

- Seed systems provided with improved varieties enabling delivery of **higher rates of genetic gain and faster variety turnover** in farmers' fields.
- Breeding programs achieve **higher rates of genetic gain, respond rapidly** to emerging needs and threats.
- **Private investment increases** because CGIAR and partner programs better meet their needs.
- **NARES and SME** increasingly take a greater role in variety development. CGIAR leads sophisticated genomics driven networks and provides high value parental germplasm.
- **Adoption of climate-resilient, nutritive varieties** increased and accelerated.

## Impact areas

- Nutrition, health and food security:** Crop varieties with higher nutritional content and quality increase nutrition and health of population.
- Poverty reduction, livelihoods and jobs:** Productive varieties better suited to farmers needs contribute to increased income.
- Gender Equality, youth and social inclusion:** Women and marginalized groups are empowered through varieties addressing their needs
- Environmental health and biodiversity:** More sustainable farming systems supported by varieties specifically developed for such practices (e.g. direct seeded rice). Expansion of farmland prevented and water requirements reduced with increased productivity.
- Climate adaptation and mitigation:** Climate smart varieties with novel traits increase resilience of food system actors

SUSTAINABLE DEVELOPMENT GOALS

contributing to

2022

2024

2030

sphere of control

sphere of influence

sphere of interest





## Accelerated Crop Improvement through Precision Genetic Technologies

Initiative Lead and Co-Lead	Primary CGIAR Action Area	Estimated 2022 - 2024 Budget
Inez Slamet-Loedin Marc Ghislain	Genetic Innovation	\$25 - \$30 M

### Challenge

Feeding the world population of 8.5B by 2030 will require increasing crop yields, providing more nutritious and higher quality food while also making agriculture more resilient and sustainable. Currently, 15% of production is lost to pests and diseases with another 30% lost after harvest, while crop production is predicted to decline by 2-6%/decade due to climate change. Staple crops are generally poor in micronutrient content contributing to malnutrition estimated to cost \$3.5 trillion per year. Conventional crop breeding methods alone will not be sufficient to meet future demand. The modernisation of One CGIAR breeding aims to reduce the length of breeding pipelines. However, for many key target traits additional variation beyond the elite breeding and pre-breeding pools will be required. Even where beneficial alleles have been identified from crop relatives, the genetic linkage drag of poorly adapted alleles makes their incorporation into elite germplasm challenging. For other traits, useful alleles are simply not available in crop relatives but present in other crops or species. Certain intractable traits require fine-tuning of gene expression to obtain the desirable effect. One CGIAR must keep up with this pace of change in order to ensure it makes available PGT benefits to small-scale farmers and low-income consumers where there is no attractive market for private investment. In addition, the costs, skills, complex IP landscape and variable public acceptance present a challenge across the crops and regions served by One CGIAR providing a clear case for co-ordinated investment. PGT development also requires coordinated implementation of best stewardship practices.

### Objective

This initiative's main objective is to accelerate the development and delivery of value-added parental lines and the improvement of elite varieties with new traits unachievable or inefficiently attainable with conventional breeding approaches. One CGIAR PGT products will aim to reduce crop losses by ~20 % and pesticide use by ~ 50%, and/or to improve micronutrient content (reaching 30-50% estimated-average-requirement/EAR) with a reduced environmental footprint and to deploy a novel hybrid production system. Prioritization on traits, crops, and countries target for 2022-2024 will be done by overlaying demand-driven TPP, aiming first for countries with PGT enabling regulatory environments, technology opportunities and impact level in consultation with One CGIAR market-intelligence, breeding and seed-initiatives. Trait lifecycles will be managed through a stage-gate process. Alleles conferring pest and disease resistance, yield improvement, better nutrition and quality, or adaptation and mitigation to climate change will be incorporated to parental breeding lines or elite varieties. Direct editing of alleles of complex or intractable traits in elite varieties can be achieved within 2-4 years compared to the 10-15 years needed by conventional breeding. Three regional technical nodes of excellence with crop specialization will be designated from the six CGIAR centers working on biotechnology to efficiently deploy the latest technological innovations in PGT and enabling technologies. Local capacity development will make progress towards self-reliance. A One CGIAR enabling platform to accelerate PGT product adoption will be developed to harmonize internal policies, regulatory stewardship, access to proprietary technology, and compliance. The platform will facilitate effective communication to support informed decision-making for PGT products and unified key messages in relevant international forums.

### Theory of Change

Challenges of yield stagnation, malnutrition, climate change, and increasing population are putting severe pressure on agricultural and food systems, requiring accelerated deployment of more resilient varieties. This will not be achieved by conventional breeding alone. Adoption of innovative precision genetic technologies (PGT: defined as gene-editing, genetic-engineering and enabling tools), will expedite the development of more nutritious and climate-smart crops as they are able to overcome genetic linkage-drag, compatibility barriers and low allelic diversity for traits that are intractable to conventional breeding. One CGIAR will access and pursue PGT with freedom to operate in target countries from public and private sectors. Translational research will be conducted in partnership with national partners to deliver two types of products : (1) parental-breeding lines with edited alleles conferring desirable traits for breeding; (2) improvement of existing elite varieties with alleles and/or gene insertions with value-added traits. Priority traits and deployment will be determined based on demand-driven target product profiles (TPP) that address the needs of farmers, supply-chains, consumers, with One CGIAR market-intelligence, breeding, and farmer-preferred-seed initiatives utilizing gene-bank-initiative' diverse 'omics' knowledge. Regional nodes-of-excellence will be strengthened to enhance One CGIAR and local core competencies on PGT and its enabling technologies for effective development of new products, employing best stewardship practices. Successful pathways to impact will be realized by adhering to product-lifecycle management, regulatory requirements, effective partnerships in communications with relevant stakeholders, and developing local capacities throughout the product development phases. Our strategic innovations will reduce the time and cost of developing improved varieties that will contribute to all five-impact areas.

## Accelerated Crop Improvement through Precision Genetic Technologies

### Highlights

Streamlining of CGIAR biotechnology facilities and expertise through the designation of three regional nodes-of-excellence for precision genetics (LAC, Africa, Asia) from existing facilities with state-of-the-art technical capacities and crop specialization using best stewardship and data management practices. Phenotyping will continue to be done at relevant One CGIAR and target-country facilities.

Co-development of parental breeding lines through gene-editing using knowledge and/or allele-mining activities harnessed by Genetic-Innovation (GI) initiatives and private and public sector partners. Trait/crop prioritization and target countries will be decided based on demand-driven-TPP, considering gene editing technical feasibility, regulatory environments, consumer acceptance, forecast impact level.

Accelerated development and regulatory approval of existing elite varieties improved with value-added traits (e.g., pest and disease resistance and nutrition) obtained by genetic engineering but also gene editing. Deployment will be done in cooperation with breeding and seed-initiatives partnering with public/private sectors, and national-partners in stage-gated pipelines.

A One CGIAR platform for policy, biosafety, regulatory, coordinated communication, and legal expertise to obtain freedom to operate for PGT in target countries for specific traits and to apply best stewardship practices, and policy with the highest research ethics standards. This platform will be the voice of the One CGIAR in international forums.

New models of co-development that enhance local capacities in the technical, regulatory-stewardship, and communication aspects of our PGT innovations, considering downstream market/consumer demand including women and youth preferences, will be developed to ensure buy-in and foster wider local adoption to maximise impact.

### Work Packages

	Scope of Work	3-year Outcomes
One CGIAR nodes of excellence for utilization of state-of-the-art precision genetics	Gain access and develop state-of-the-art precision genetic technologies and associated enabling technologies such as allele replacement, DNA-free editing, double haploid; establish three nodes of excellence (LAC, Africa, Asia) with One CGIAR focus crop specialization and linked phenotyping facilities in relevant locations.	One CGIAR and national scientists working at nodes-of-excellence, equipped with state-of-the-art enabling tools and best practice protocols, develop efficiently novel products with impactful PGT traits for focus crops in target geographies.
Improved edited parental breeding lines for use in demand-driven TPP breeding	Use gene editing technologies to introgress novel alleles of complex or intractable traits into selected breeding lines. Allele mining will be conducted with other Genetic innovation based on Genebank "omics" knowledge. Edited parental breeding lines will be delivered to breeding pipelines.	Breeders use PGT improved parental breeding lines in their elite breeding germplasm for developing mainstream traits and, in the future release of novel varieties. One CGIAR and national scientists use feedback on trait performance in the elite breeding germplasm to develop next generation products.
Expedite improvement of existing elite varieties with market-driven TPP traits or previously intractable traits	Advance and develop PGT innovations (gene-editing and genetic-engineering) along the product development pipeline; using existing elite varieties improved for disease resistance (e.g., Xanthomonas-wilt resistant banana, late-blight resistant potato, bacterial blight resistant rice), yield, nutrition (healthier banana and rice), quality, food safety, and climate resiliency; regulatory studies and dossiers.	Agronomists, breeders and seed system partners use PGT improved elite varieties for at least 2-3 CGIAR crops for seed production in a minimum of 4 countries (e.g., One CGIAR and national scientists co-develop 5 new candidate products meeting the decision criteria of demand-driven TPP and the trait lifecycle process.
Unified One CGIAR framework for precision genetics enabling environment	Obtain freedom to operate on proprietary technologies for all One CGIAR PGT; develop licensing schemes, crop-specific stewardship principles; promote the development of functional regulatory systems within partner governments; and develop the socio-economic analysis of the PGT products.	Freedom to operate in intellectual property agreements on the One CGIAR potential products is obtained and used to develop products in target geographies. Coherent best practices of biosafety, stewardship and compliance are applied across One CGIAR locations.
One CGIAR effective communication, stakeholder engagement, outreach, and capacity development for PGT products	Develop an effective coordinated One CGIAR communication strategy on PGT products that is inclusive of partners, value chain actors, and other stakeholders; establish new models of co-development with national partners on technical and communication capacities across the product development pipeline, informed by gender and youth considerations.	One CGIAR science leaders use common principles, policies, ethics on PGT. Decision makers, farmer leaders, women and youths, and value-chain stakeholders have increased awareness on the potential of PGT technology thereby making more informed decisions. In-country ambassadors are informed and empowered with efficient key messages on One CGIAR PGT products.

## Accelerated Crop Improvement through Precision Genetic Technologies

### Impact Area Contributions

<b>Nutrition, health &amp; food security</b>	Application of precision genetics will accelerate the development and deployment of resilient varieties and contribute to meeting future demand for healthy foods. Improved varieties are expected to close the yield gap by 10-20%. Micronutrient content of a few staple crops will be improved to reach 30-50% of women/children EAR.
<b>Poverty reduction, livelihoods &amp; jobs</b>	Increased agricultural production, reduction in input costs, and improved nutrition will increase the incomes of households and improve their livelihoods. A more deliberate focus on farmer- and market-informed product profiles will stimulate and diversify opportunities for the agri-food sector and its entrepreneurs and employees.
<b>Gender equality, youth &amp; social inclusion</b>	Gender and youth participation in developing product profiles and prioritization to make decisions on target crop-traits will be emphasized, as well as the potential of enabling new income opportunities. Adoption of a gender intentional approach is essential for deployment of healthier crops. Cutting-edge technology product development attracts youth involvement in agriculture.
<b>Climate adaptation &amp; greenhouse gas reduction</b>	Varieties better adapted to climate change will be developed by targeting traits such as heat tolerance, methane reduction, and/or nitrogen-use-efficiency. The reduction of inputs resulting from the cultivation of pest and disease resistant varieties will help reduce carbon emissions from producing, transporting, and spraying pesticides to control pathogens.
<b>Environmental health &amp; biodiversity</b>	Cultivation of improved varieties with pest and disease resistance will help reduce chemical inputs currently needed to control them. Non-target organisms affected by chemicals will be restored in agricultural environments, thereby increasing soil and aboveground biodiversity.

### Impact on SDGs



### Regions

Global East and Southern Africa (ESA), Latin America and the Caribbean (LAC), South Asia (SA), South East Asia and the Pacific (SEA), West and Central Africa (WCA)

### Countries



## Accelerated Crop Improvement through Precision Genetic Technologies

### Innovations

Advanced gene editing and associated enabling technologies (e.g., allele replacement, DNA-free editing, plant transformation, transfection, tissue culture, protoplasts, double haploidy) for One CGIAR focus crops.

PGT parental breeding lines of One CGIAR crops, prioritized by traits and countries, with enhanced quality, nutrition, safety, abiotic, biotic stresses and/or other intractable traits, for screening and use in breeding programs, leading to future release in Africa, Asia and LAC.

PGT improved existing elite varieties of banana, cassava, maize, potato, rice, and/or wheat with pest and disease resistance or enriched nutritional content either submitted for cultivation approval for genetically-engineered products or receiving non-GM regulatory status for gene-edited products in 1-3 target countries.

PGT to improve maize hybrid production for African and Asian Farmers and to produce improved breeding lines and seeds (e.g., double haploid, apomixis, etc.).

A unified One CGIAR strategy and platform for development of precision genetics technologies, deregulation, deployment, and awareness of PGT products, and an enabling environment for informed decision-making.

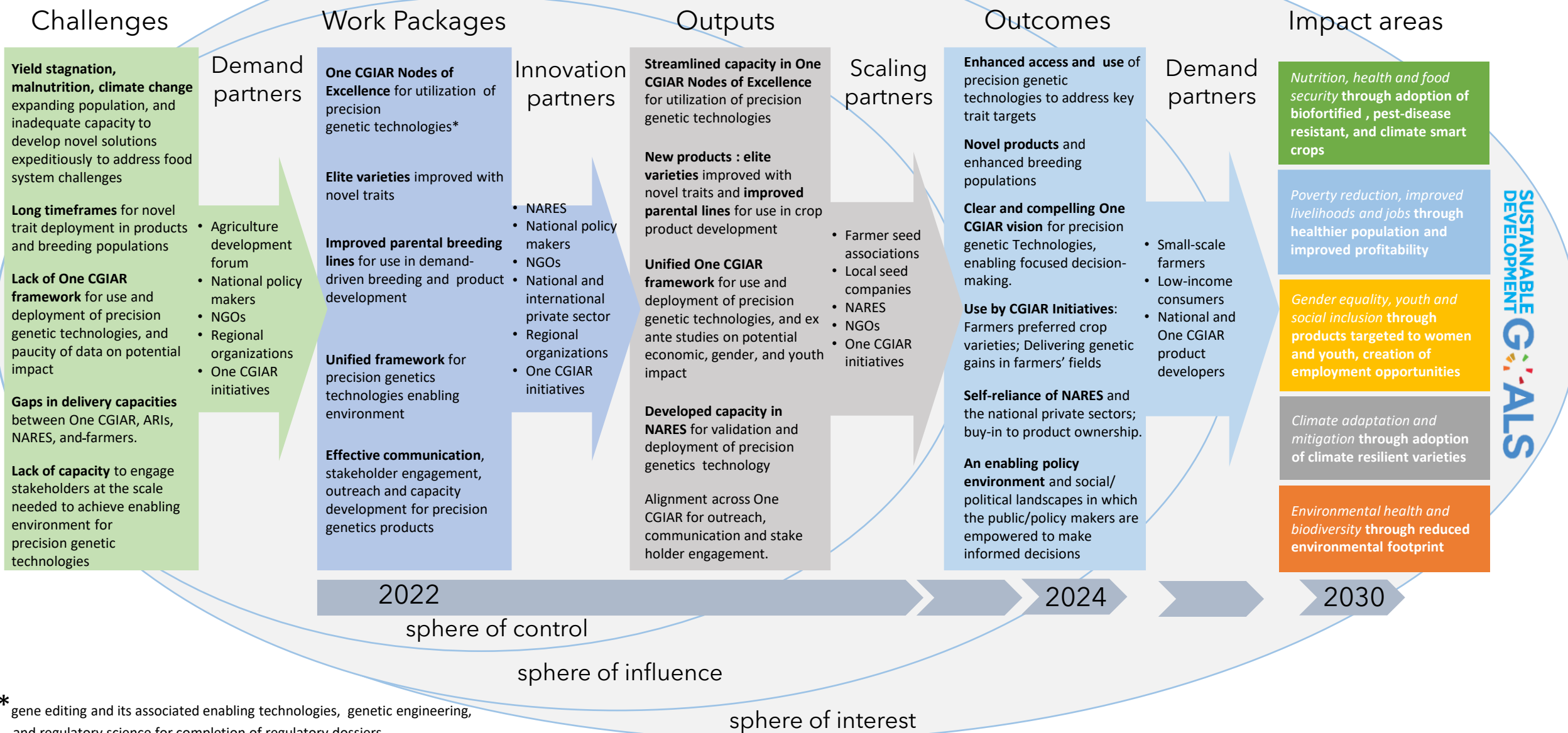
### Key Partners

<b>Demand</b>	Government	National agriculture research and extension services and other agencies from Ministries of Agriculture, Health, Environment, Finances, Science and technologies in target countries. ( <a href="https://bit.ly/3triuMI">https://bit.ly/3triuMI</a> )
	National NGO	Non-governmental organizations focused on science, women, youth, agriculture, environment, farmers, etc.
	Other	CGIAR initiatives: Accelerated Breeding: Meeting Farmers' Needs with Nutritious, Climate-Resilient Crops; SeEdQUAL: delivering genetic gains in farmers' fields
		Funders: BMGF, USAID, FCDO, 2BLADES, etc.
	Other Public Sector	AATF, ASARECA, CORAF, SEARCA, etc.
<b>Innovation</b>	Academic, Training and Research	Advanced research institutes (e.g., CSIRO, CIRAD, JIRCAS, IRD, DDPSC), universities (e.g., Michigan State University, Heinrich Heine University, University of Berkeley, University Cambridge and Oxford University) and national science and technology institutes. ( <a href="https://bit.ly/3triuMI">https://bit.ly/3triuMI</a> )
	International NGO	Helen Keller International; International Centre for Diarrheal Disease Research -Bangladesh: Cornell Alliance for Science; ISAAA; etc.
	National NGO	Biotechnology Coalition of the Philippines; Farming Future Bangladesh, Society of Indonesia for Agriculture Biotechnology (MASBIOPI); etc.
	Other	CGIAR initiatives: Conservation and use of genetic resources (Genebanks); Accelerated Breeding: Meeting Farmers' Needs with Nutritious, Climate-Resilient Crops; Enabling Traits, Tools and Technology Services for Genetic Gains; Market Intelligence for More Equitable and Impactful Genetic Innovation; SeEdQUAL: delivering genetic gains in farmers' fields; HarvestPlus; South Asia Biosafety Program; African Biosafety Network of Expertise; etc.
	Private Sector	Corteva Agriscience, Latin American Fund for Irrigated Rice (FLAR); etc.
<b>Scaling</b>	Government	Farmer cooperative seed organizations and other seed organizations, and national extension services in target countries.
	Other	CGIAR initiatives: Accelerated Breeding: Meeting Farmers' Needs with Nutritious, Climate-Resilient Crops; SeEdQUAL: delivering genetic gains in farmers' fields.
	Private Sector in Aid Recipient Country	Local seed companies, Farmers cooperatives. ( <a href="https://bit.ly/3triuMI">https://bit.ly/3triuMI</a> )



# Theory of change

## Accelerating crop improvement through precision genetic technologies



\* gene editing and its associated enabling technologies, genetic engineering, and regulatory science for completion of regulatory dossiers



## ActionNs for Innovative climate change Mitigation & Adaptation of Livestock Systems (ANIMALS)

Initiative Lead and Co-Lead	Primary CGIAR Action Area	Estimated 2022 - 2024 Budget
Polly Ericksen Jacob Arango	Resilient Agri-food Systems	\$30 - \$30 M

### Challenge

Low- and middle-income countries (LMICs) urgently need RLE livestock solutions to respond to climate change that won't threaten nutritional security, livelihoods and food systems, won't leave vulnerable people behind, and won't accelerate climate change through greater GHGe and threats to land, water and biodiversity. Strategic and well-targeted action research can provide answers to these tough choices and trade-offs as well as 'investable' solutions that attract policy attention and climate finance. Facing a climate emergency, research must provide proven adaptive measures that safeguard and capitalize on livestock benefits (<https://bit.ly/3sjOxwk>). Livestock are essential to the income and livelihoods of almost 930 million poor Africans and South Asians (<https://doi.org/10.1017/S1751731112001954>). Consuming animal source foods (ASF) has positive impacts on our cognitive development (<https://doi.org/10.1038/531S12a>) and growth (<https://doi.org/10.1093/advances/nmz018>). However, livestock production is highly vulnerable to rising temperatures, erratic precipitation and increasing extreme events (<https://doi.org/10.1038/nclimate2754>). About 994 billion USD in livestock value (~55% of total) are exposed to various climate hazards, especially climate variability (198 billion USD) and heat stress (130 billion USD) (<https://hdl.handle.net/10568/113289>).

Research must also provide innovations that mitigate livestock climate impacts. Livestock cause ~15% of human-induced GHG emissions (<https://bit.ly/3dMWTY3>) largely due to low feed efficiencies (<https://doi.org/10.1073/pnas.1308149110>), land use change (<https://doi.org/10.1038/s41586-020-03138-y>), land degradation (<https://www.ipcc.ch/srccl/>) and deforestation (<https://doi.org/10.1038/s41559-021-01417-z>). Nearly 50% of LMICs prioritize livestock-actions in their Nationally Determined Contributions (NDCs)--the national blueprints for climate action (<https://bit.ly/3myy06n>), and some are developing livestock-based Nationally Appropriate Mitigation Actions (NAMAs) (<https://hdl.handle.net/10568/56828>), but implementation lags. Governments need substantial technical support to access finance, implement programs and report mitigation achievements (<https://doi.org/10.1038/s43016-020-0042-9>). These challenges apply equally to the private sector where large-scale production changes landscapes and supply and demand shifts can provide major benefits and influence consumer behaviour.

Despite this urgency, research on climate-smart options for livestock in LMICs is scarce (<https://doi.org/10.1088/1748-9326/abc278>), so policy makers, investors and producers face gaps that limit their abilities to select policy and commercial leverage points, attract climate finance, measure progress and actually adapt or mitigate their activities to the climate emergency.

### Objective

ANIMALS aims to enable 300,000 producers (at least 40% women) in five countries to better prepare for and manage uncertain futures by adopting management practices that enhance their climate-related adaptive capacities (livestock assets) while ensuring household equity and reducing GHGe intensities. The initiative will also work with producers on adaptation initiatives and practices that restore degraded landscapes (100,000 hectares) while offsetting enteric methane emissions by 25 percent.

The initiative aims to stimulate inclusive and market-driven adaptation and mitigation pathways along ten value chains. It will promote ten interventions, new business models, and products that benefit producers, input suppliers, market actors, and consumers, help to adapt livestock value chains in five countries, and encourage private livestock enterprises to increase their commitments to sustainable production. These interventions will expand business opportunities, increase access to bundled climate information, insurance and credit services, and provide economic opportunities for women and youth in areas like fattening operations, feed and forage production, input markets and advisory services.

More broadly, the initiative aims to stimulate sustainable finance by providing evidence to five climate investors about how livestock production can be climate resilient, reduce climate emissions and be profitable. Five governments will use our tools to plan livestock climate interventions through policy and investment support from farm to landscape levels. Governments will also be supported in their national adaptation and mitigation reporting capacities to meet UNFCCC targets, helping to leverage more climate finance for the livestock sector.

### Theory of Change

Facing enormous exposure to climate hazards and contributing substantially to global greenhouse gas emissions (GHGe), the livestock sector urgently needs to adapt to climate change while reducing its impact on the global climate system. The ActionNs for Innovative climate change Mitigation & Adaptation of Livestock System (ANIMALS) initiative will partner with public and private actors to develop and deliver actionable innovations that measurably help producers, businesses, and governments adapt livestock agri-food systems (AFS) to climate change and reduce GHGe from livestock production. ANIMALS will contribute to sustainability and development goals across a range of livestock systems in low and middle income countries (LMICs).

By 2024, with the Sustainable Animal Productivity for Livelihoods, Nutrition and Gender inclusion - SAPLING and Building Systemic Resilience against Climate Variability and Extremes- ClimBeR IDTs, 300,000 producers will apply already-tested resilient and low emissions (RLE) technologies, practices, and climate risk management strategies across five countries. Leveraging NDC commitments and climate finance, governments and the private sector will employ initiative tools and business models to climate de-risk investments in at least 10 livestock value chains (with ASPIRE - building integrated agro-silvo-pastoral food systems resilient to climate change and other crises and ClimBeR). Across twenty landscapes, the initiative will provide evidence and systems for environmental restoration and reduced GHGe in livestock production (with Transforming food systems from net GHG sources to sinks IDT). Tailored decision support tools and robust data to assess interventions and trade-offs will influence government priorities in five countries.

By 2030, our farm, value chain, landscape and policy innovations will be widely used across fifteen countries (with Latin America & Caribbean and East & Southern Africa regional IDTs), reaching 2 million producers and attracting 200 M USD of investment into solutions that provide win-win-win social, environmental and economic benefits for people and the planet. Ten countries will use our tools to demonstrate progress on their UNFCCC mitigation and adaptation commitments.

## ActioNs for Innovative climate change Mitigation & Adaptation of Livestock Systems (ANIMALS)

### Highlights

**Thinking global, acting local**This will be the first initiative to simultaneously address climate change adaptation and mitigation in diverse livestock sectors across in the Global South under one umbrella. It creates a coherent global agenda that addresses pressing local climate concerns and accounts for South-South learning and pro-poor rural development.

**Climate finance for livestock**Climate investors have ignored tropical livestock production systems with critical livelihood and environmental implications. This initiative will demonstrate how livestock production can be an attractive and viable climate investment opportunity, unlocking and directing large amounts of climate finance toward livestock AFS.

**Accelerating commitments towards action**Our work will directly influence and boost commitment from large multinational meat and dairy companies for climate mitigation (e.g., net-zero emissions by 2050). The initiative will accelerate measurable progress reducing environmental hoofprints through identifying specific private and public entry points for actions.

**Making livestock count**Robust adaptation tracking protocols for livestock livelihoods will be implemented at scale, building on earlier pilots across East Africa. These are the first protocols developed specifically for different livestock production systems, including indicators that have been validated with both local producers and national governments.

**Partnerships for climate smart policy impact**Our initiative will develop multi-dimensional tools to evaluate policy and technology interventions' impact (household profitability, food security, GHGe, etc.) and identify trade-offs and scalable incentives. This will enhance national capacities and establish a coalition of public and private users of our outputs to develop social inclusive investment plans and strategies.

### Work Packages

	Scope of Work	3-year Outcomes
Farm-level technologies to adapt to climate change and reduce GHGe	WP1 will co-develop new technologies and scale out proven socially-inclusive and gender-equitable practices that adapt household livestock production to climate stresses such as temperature extremes and variable water availability, while quantifying and promoting practices that offer mitigation synergies from e.g. feed production or manure management.	150,000 livestock producing households will implement climate-smart technologies appropriate to their production system, improving their adaptation to climatic stresses while reducing GHGe intensities by 10% against Business as Usual. Within households, distribution of labour and benefits associated with climate smart technologies will be gender equitable.
Tailored climate risk management (CRM) services	WP2 will co-design and deploy digitally-enabled services that bundle climate information, risk transfer and credit strategies in livestock AFS. These public-private partnerships will build capacities to use the bundled services; the digital platforms will facilitate rapid scaling.	300,000 livestock (45% women and youth) producing households in 5 countries access climate information, insurance and credit products and services delivered through public-private partnerships, including national HydroMet services and local communities. Social and gender barriers to digital technologies will be identified and reduced to ensure that women and youth will access the information services.
Climate finance	WP3 will co-design and implement tools, business models and other market-based innovations that crowd-in climate finance that incentivizes adaptation and delivers verifiable GHGe reductions by livestock agri-food market system actors.	Climate finance investors commit 100 Million USD for climate-smart livestock interventions that reduce GHGe intensities and enhance climate risk management. Five private companies and meat processors commit to changing their business practices in order to reduce GHGe and manage climate risk.
Livestock landscape solutions	WP4 will identify and implement interventions that offset GHGe and land degradation through land use planning and governance, restoration, and avoided deforestation. It will assess the contribution of farm level livestock adaptation and mitigation interventions to sustainable landscapes.	Land managers implement measures (e.g., land use plans, tree planting scheme) that will increase landscape health (e.g., tree cover, soil health) of 100,000 ha through avoided deforestation and land restoration in both rangelands and forests. leading to both mitigation and adaptation benefits.
Tools for policy impact	WP5 will develop analytical tools and produce evidence to understand the sectoral political economy and enhance national capacities to plan, monitor and report progress toward adaptation and mitigation targets. These tools will also enable public and private sector decision makers to understand and act on trade-offs and synergies between socio-economic and environmental outcomes and incentives.	Policies, livestock master plans and climate change reporting systems (e.g., UNFCCC National Communications) in 5 countries include RLE livestock evidence and outputs from ANIMALS tools to prioritize and guide socially inclusive livestock and land management investments to achieve both adaptation and mitigation goals.

## ActionNs for Innovative climate change Mitigation & Adaptation of Livestock Systems (ANIMALS)

### Impact Area Contributions

<b>Nutrition, health &amp; food security</b>	RLE livestock AFS will safeguard affordable access to AFS by the poorest and most vulnerable people. ASF provide essential protein and micronutrients, critical during pregnancy and early childhood. Appropriate management of AFS can also help curb the spread of zoonotic diseases and foodborne illnesses.
<b>Poverty reduction, livelihoods &amp; jobs</b>	RLE livestock AFS will buffer the livelihoods of livestock-producing households against climate variability, enabling them to better manage risks and generate more reliable income from their livestock. More productive value chains will extend youth employment, address gender inequalities, expand economic opportunities for businesses and households.
<b>Gender equality, youth &amp; social inclusion</b>	RLE livestock AFS will promote and ensure more equitable participation of women in decision-making, widen ownership and control of productive assets, and expand economic and employment opportunities for women and youth.
<b>Climate adaptation &amp; greenhouse gas reduction</b>	RLE livestock AFS will equip producers with adapted solutions, practices, and capacities so they can deal with climate shocks and risks. Increased on-farm production efficiencies and sustainable land management will reduce GHGe. investments and national policy interventions will help countries meet emissions reduction commitments and adaptation goals.
<b>Environmental health &amp; biodiversity</b>	RLE livestock AFS will reduce GHGe that contribute to global warming. RLE livestock AFS will help restore soil and rangelands and reduce deforestation, promoting sustainable landscapes, maintaining and/or increasing biodiversity and providing ecosystem services. They will reduce deforestation by decreasing land pressure and by extension reduce a major driver of biodiversity loss.

### Impact on SDGs



### Regions

Global East and Southern Africa (ESA), Latin America and the Caribbean (LAC), South East Asia and the Pacific (SEA), West and Central Africa (WCA)

### Countries





## ActioNs for Innovative climate change Mitigation & Adaptation of Livestock Systems (ANIMALS)

### Innovations

Improved forage feeding systems that include grasses, legumes, forage shrubs and supplements improve animal nutrition across seasons. This increases animal productivity, improves household resilience in dry seasons and reduces or off-sets farm emissions.

A satellite-based agri-climate risk scoring and digital advisory system is used to compile targeted financial service bundles for livestock producers. The service bundles credit, agricultural advisories, and insurance for producers, enhances score reliability and reduces transaction costs for service providers, therefore enhancing sustainability and efficiency.

Inclusive traceability tools co-designed with meat packers, ranchers, and NGOs increase trust - and thus motivate investments - in livestock value chains. They are adapted to cover important climate-related attributes and to include smallholders, undocumented deforestation and ranch management practices.

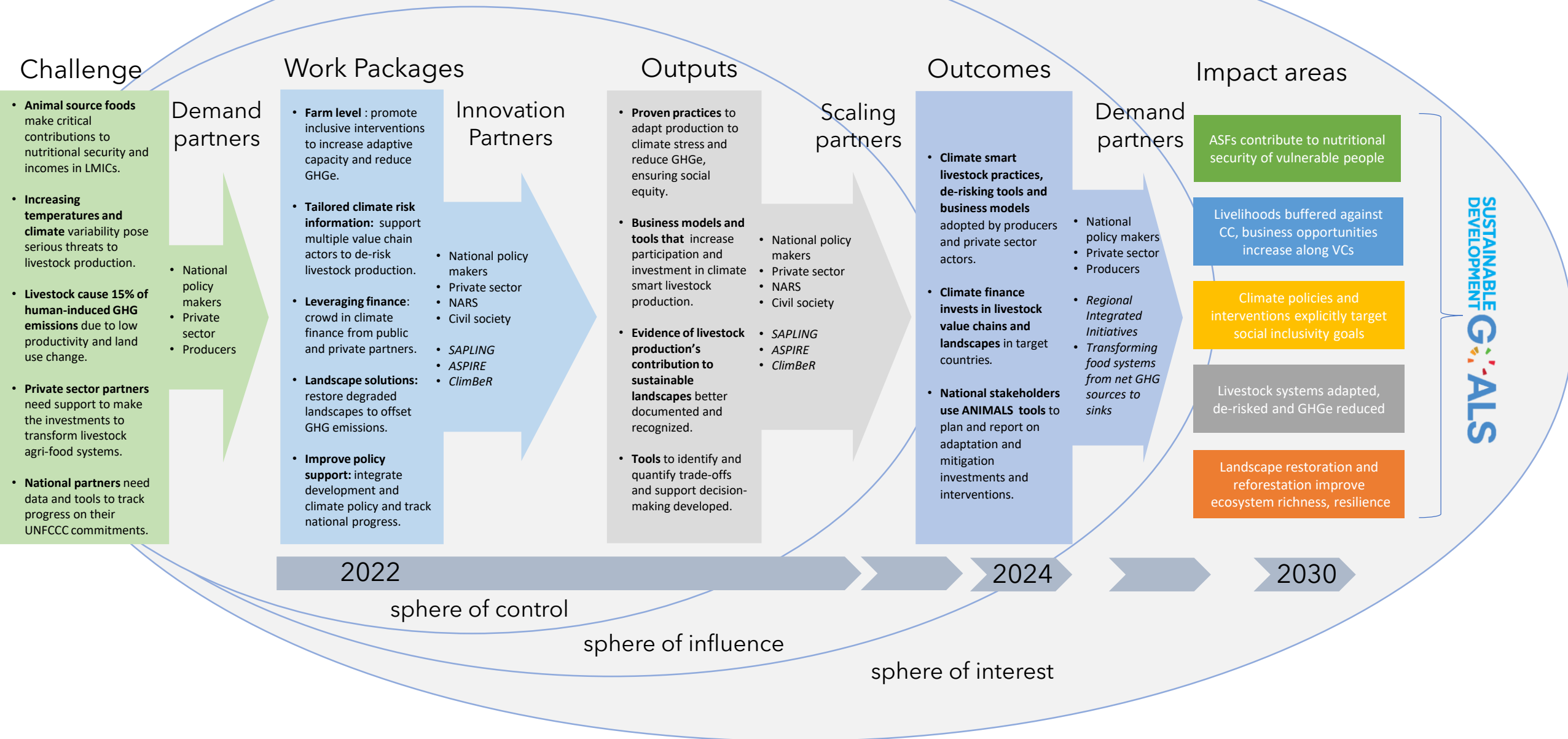
Agroecological zone and livestock-species guidelines for landscape restoration provide options that facilitate adaptation (e.g., appropriate feed and forage and shade tree species: silvo-pastoral systems) and sequester carbon. They guide national and programmatic climate change responses, while accounting for biodiversity, soil and water co-benefits from restoration and land management.

Ex-ante climate smart planning tools for the livestock sector incorporate socio-economic and environmental models to assess policies, incentives, and trade-offs in terms of their environmental, economic and social outcomes will help identify adaptation/mitigation synergies, trade-offs and leverage points to support better decision making.

### Key Partners

<b>Demand</b>	Government	Ministries of Agriculture and Environment of Kenya, Ethiopia, Uganda, Vietnam and Colombia demand our support to design, acquire funding and implement dairy and beef NAMAs and adjust NDCs respectively.
	Multilateral	Investors need assistance to prioritize and target climate smart investments in the livestock sector. We plan to intensify work with key partners such as Food and Agriculture Organization, the African Development Bank, the Inter-American Development Bank, and World Bank to guide their investments through support to business cases and tracking impact on key climate change targets.
	Other	Financial institutions are key to develop a climate finance strategy for this initiative and for up-scaling and sustain in time Climate-Smart solutions. The International Finance Corporation is keen to work with us to develop new business models along AFS systems. The Green Climate Fund and the NAMA Facility are currently evaluating proposals from our national partners for NAMA implementations in Africa and Latin America.
		Producer organizations are working to help their members make livestock production better adapted to climate change and they need information about practices and incentives for adoption. Youth climate change networks seek information about climate change and agriculture.
	Private Sector	National and multinational companies that produce and commercialize meat and dairy products for local and export markets. For example Minerva Foods has expressed interest to partner with us to achieve their sustainability plan, that includes traceability tools for zero deforestation beef.
<b>Innovation</b>	Academic, Training and Research	CIFOR-ICRAF, Wageningen University, IRI Columbia University, ETH, Aberystwyth University are examples of international research institutions and universities that provide upstream innovation ideas to ANIMALS. National universities are key innovation and capacity building partners, including Makerere University, University of Nairobi, Sokoine, National University of Colombia and Bahir Dar universities. Preference will be given to female students for thesis associated with ANIMALS.
		Kenya Agriculture and Livestock Research Organization (KALRO), NaLIRRI (Uganda), TALIRI (Tanzania) implement climate smart agriculture projects and are important co-developers of initiatives across geographies. National HydroMet (IDEAM-Colombia, NMA, Kenya Meteo) services are crucially important for the co-production of climate information services.
	International NGO	SNV, Send a Cow, Environment Alert are all NGOs with whom we collaborate to pilot and refine interventions with farmers across East Africa.
	Other	Colombian Federation of Cattle Ranchers (FEDEGAN) brings together, as affiliates, local livestock organizations linked to the national livestock industry and therefore are key providing information to develop and up-scaling best-suited Climate-Smart solutions at farm and landscape levels.
Private Sector	Almacenes Éxito (multinational beef retailer in South America) will work with us on selling certified deforestation-free beef through its channels, facilitating market-based climate action. VanDerSat is a leading global provider of daily satellite observed products with an aim to reduce food and water crises. Financial Access is a financial services firm for emerging markets.	
<b>Scaling</b>	Academic, Training and Research	Global Research Alliance on Agricultural Greenhouse Gases (GRA) is a key partner for ANIMALS for scaling technologies for GHG emissions intensity reduction and increasing carbon stored in soils at scale. Various actions (e.g., government relations, PhD students, collection/sharing local emission factors and activity data) channeled through the Livestock Research Group of the GRA will be crucial in this partnership.
	International NGO	ECLOF is an iNGO working to provide financial and other services to micro-entrepreneurs and smallholders. GANSO is a technical and financial assistance center, Climate Focus is a climate focused NGO and with both we will expand work on deforestation tracking and beef certification.
	Local Government	Ministries of Agriculture and Environment at national and local level are a key partner. For example in Kenya we work directly with county extension staff to provide training of trainers.
	Private Sector	ACRE (Agriculture and Climate Risk Enterprise) Africa links farmers to insurance products so they can confidently invest in their farms. Private insurance companies such as Oromia Insurance and Equity in East Africa are important for taking insurance to scale.
iCow and iShamba are digital application platforms that reach hundreds of thousands of farmers with information about farming innovations.		

# ActionN for Innovative climate change Mitigation & Adaptation of Livestock Systems (ANIMALS)





## ASPIRE - building integrated agrisilvopastoral food systems resilient to climate change and other crises

Initiative Lead and Co-Lead	Primary CGIAR Action Area	Estimated 2022 - 2024 Budget
Mounir Louhaichi Fiona Flintan	Resilient Agri-food Systems	\$30 - \$30 M

### Challenge

Over two billion people depend on the world's pastoral agrifood systems found mainly in rangelands covering approximately 54% of the world's terrestrial surface with 50% of the world's livestock (<https://bit.ly/2OJRDMn>, <https://bit.ly/3dXgJQB>, <https://bit.ly/3v0S4BJ>, <https://bit.ly/3thn7sq>, <https://bit.ly/3e0f78D>, <https://bit.ly/3tjgeH4>). These systems are experiencing intensifying impacts from climate change and other forces (<https://bit.ly/3sf8D14>, <https://bit.ly/3ab6WW5>), weakening their resilience (<https://bit.ly/3mJo3mQ>, <https://bit.ly/2Rp9byk>). Land degradation, productivity losses (<https://bit.ly/3g6cBR1>), conflicts, insecurities and displacement of populations (<https://bit.ly/3ab6WW5>, <https://bit.ly/32aieVU>) have resulted. A lack of appreciation and investment in pastoralism has meant not only weakened resilience, but also meant the full potential of these systems has never been realised.

There is a lack of knowledge and capacity to support a (re)building of this resilience (<https://bit.ly/3mICpE4>, <https://bit.ly/32b0aLD>) leading to governments and other stakeholders making decisions that fail to address root causes of resilience weakness whilst relying on increasing humanitarian aid (<https://bit.ly/3uOCSar>). Development interventions have been driven from outside communities, and the agency of pastoralists has not been fully tapped - particularly women and youth (<https://bit.ly/3df0IX6>, <https://bit.ly/3dehohp>, <https://bit.ly/3dZqY73>, <https://bit.ly/3ab3XwO>, <https://bit.ly/3e3ui0Y>, <https://bit.ly/3gh8Fge>).

The sustainability of pastoral agrifood systems is further challenged by significant need for land and resource restoration and rehabilitation which falls way behind those in such as forests (<https://bit.ly/3g6cBR1>, <https://bit.ly/3e5tkkE>, <https://bit.ly/3ac3pqp>, <https://bit.ly/32fKsyA>, <https://bit.ly/3ab6WW5>). Non-supportive policy and legislation further prioritize investments in other agrifood systems that lead to further marginalization, exclusion of pastoralists and other local stakeholders and can be a root cause of conflicts (<https://bit.ly/2Q18kDK>, <https://bit.ly/3di57Zj>, <https://bit.ly/32f3hSM>, <https://bit.ly/3dZ53Nf>, <https://bit.ly/32eMUW8>).

It is vital that pastoralists, agropastoralists and other stakeholders are given support to address these challenges, to strengthen pastoral agrifood systems as an integrated agroecological approach, linking new investments, research and innovations, working at different scales, transforming and intensifying sustainable production and providing environmental services locally and globally (<https://bit.ly/3uJEJxp>, <https://bit.ly/3a7Nuto>, <https://bit.ly/3g6cBR1>).

### Objective

ASPIRE's objective is to strengthen the resilience of pastoral agrifood systems to climate change and other crises, whilst optimising opportunities for the system to grow productively. This will be done in partnership with communities, development actors, and governments building capacity and optimizing opportunities for delivering impact at scale. It will be achieved through three interlinked specific objectives:

- i. To improve the security, health, productivity and capacities of people, land and livestock through strengthened land and resource management and governance and the better integration of livestock, crops and trees, women and youth empowerment including value chain development, and improved livestock health; facilitated through innovations and multi-stakeholder platforms, decision-making and digital tools co-constructed with end-users, identification of problems and potential scalable solutions across the targeted territories;
- ii. To improve understanding of what constitutes a resilient pastoral agrifood system, and how this resilience can be (re)built. This includes understanding and developing tools for risk management and early response to disasters and the development of e.g. resilience-building services, early warning systems, risk finance mechanisms, robust interdisciplinary model-based simulation/predictions of climate predictions, for more controlled risk exposure of pastoral agrifood systems and resilience-building;
- iii. To improve the political, financial, and institutional enabling environment at national, regional and global levels in order to better support agrisilvopastoralism: policy dialogues for knowledge generation, advocacy for more resilience-building investments in agrisilvopastoralism and rangelands, highlighting the role these can play in contributing to fulfilling national and global commitments on the SDGs, Land Degradation Neutrality, UN Food Systems Summit and others.

### Theory of Change

The resilience of pastoral agrifood systems to climate variability and crises has been weakened. Key drivers include a lack of investment in the pastoralist sector where livestock is central, supported by effective resource management and governance, well-tested livelihood diversification, productivity improvements and a more enabling environment. ASPIRE will (re)build the resilience of pastoral agrifood systems in five interlinked areas: i. land and natural resource management and governance; ii. empowerment of women and youth including through pastoral agrifood value chains; iii. improvements in livestock health and herd management; iv. improving understanding/functioning of resilient pastoral agrifood systems; and v. an improved enabling environment and partnership building. The Initiative will work in predominantly dry rangeland landscapes where pastoral agrifood systems are the norm.

Partnership is key to the success of this Initiative and to optimise impact-at-scale: ASPIRE is already cooperating with IFAD, FAO and government partners for codesign and implementation; ASPIRE will work closely with other OneCGIAR Initiatives ensuring complementarities and synergies; innovations will be developed with users building on previous CGIAR programs. Further, monitoring and evaluation, horizontal and vertical learning across stakeholders and scales will be continuous.

ASPIRE will result in pastoral agrifood systems being more resilient to climate and other crises and better positioned to grow productively. This will directly and positively impact on the food and nutrition security of communities. Value chain development will provide opportunities for improved incomes and empowerment of women and youth. Additional impacts include reduced population migrations, greater human security, reduced conflicts, and improved ecosystem services.

## ASPIRE - building integrated agrisilvopastoral food systems resilient to climate change and other crises

### Highlights

ASPIRE works from local to landscape (rangeland) levels, (re)building resilience of pastoral agrifood systems holistically and integratively, focusing on the collective in terms of society, economy, institutions, ecology, ensuring that the sum of the whole is greater than its parts.

ASPIRE will benefit from experience and relations already built in certain countries providing for a quick start-up. From this foundation, new partnerships, countries, expertise, innovations and research will be built. To optimise impact at scale, ASPIRE is already cooperating with IFAD, FAO and government partners for codesign and implementation.

ASPIRE will develop analytical frameworks and associated metrics in collaboration with research and development partners, generating evidence of what works (or not) and how to measure pastoral agrifood system resilience, responding to complex, varied and interwoven issues of physical, social, ecological, economic and institutional nature.

ASPIRE will promote knowledge and data exchange horizontally across regions, countries, landscapes and vertically between pastoralists/farmers, practitioners, others with national, regional, global actors developing initiatives and fulfilling commitments to such as LandDegradationNeutrality, BonnChallenge, GreatGreenWall, UN Food Systems Summit, UN Decade on Ecosystem Restoration, EU Green Deal and Food-to-Fork initiative.

ASPIRE works with other OneCGIAR Initiatives, including Climate-Smart Livestock (CSSLI), Building Systemic Resilience, Agroecology, Genebanks, Digital Technologies, and regional initiatives. Complementarities and cross-fertilisation between initiatives, sharing of tools, approaches and insights knowledge and expertise will be optimised. ASPIRE will provide local entry points and learning sites for many of these.

### Work Packages

	Scope of Work	3-year Outcomes
LAND AND NATURAL RESOURCE MANAGEMENT AND GOVERNANCE	Identifying knowledge gaps and undertaking research to (re)build more resilient systems, working with communities and other stakeholders. To include baseline-impact studies, context analysis, field trials, land/resource tenure and governance improvements, participatory planning, rangeland management, nutrient/waste cycling, water management, integration of trees, biodiversity conservation, ecosystem services, multistakeholder-platforms and innovation development	By 2024 40% of pastoralists in target areas will be adopting improved (more resilient) agrisilvopastoral processes and practices, including integrated management of livestock, crops and trees resulting in 20% increase in rangeland productivity, good resource governance, efficient use of resources, and boosting of conservation and ecosystem services
EMPOWERMENT OF WOMEN AND YOUTH INCLUDING THROUGH VALUE CHAIN DEVELOPMENT	Research and development of value chains benefiting from agrisilvopastoralism, particularly targeting women and youth leading to empowerment. Participatory value chain mapping and formal analysis conducted to identify and correct chain inefficiencies, while actors address challenges through innovation platforms and business incubation services, strengthening chains from producer to consumer	By 2024 there will be 30% increase in women and youth leading new pastoral agrifood system businesses contributing to empowerment of women and youth improving the capacity of these groups to access resources, control assets, and participate in decision-making
LIVESTOCK HEALTH AND HERD MANAGEMENT	Assessment of new and current livestock health issues, research on livestock health and disease, herd management, fodder, feed, animal breeding, reinforced by trainings and support to local livestock health services and development of knowledge products on One Health in agrisilvopastoralism for building resilience	By 2024 there will be a 10% increase in livestock health and better herd management, together with improved understandings of practices that address the health of people, animals and environment influenced by the One Health approach
IMPROVING UNDERSTANDING AND FUNCTIONING OF A RESILIENT PASTORAL AGRIFOOD SYSTEM	Development of tools, digital technologies, protocols to understand, measure and (re)build resilience of pastoral agrifood systems, foresight and simulation on climate predictions, risk management of drought, water and disasters, early warning systems etc. Engagement with the public and private sectors on resilience-building investments in agrisilvopastoralism	By 2024 at least one tool, technology or protocol to measure and build resilience of pastoral agrifood systems will be uptaken by users in each country. Local and national risk management of drought, water and disasters will be improved. At least one partnership with private sector for investment in pastoral agrifood systems established
ENABLING ENVIRONMENT AND PARTNERSHIP BUILDING	Policy engagement with national and regional stakeholders through co-design and implementation, multi-stakeholder platforms, rangeland restoration cost-benefit analysis, knowledge-data sharing and other. Partnerships with global actors, platforms, initiatives to raise awareness on importance and contribution of pastoral agrifood systems and need for investments, with improved access to and relevant information	By 2024 there will be at least one improved policy, legislation and/or institutional arrangements supporting agrisilvopastoralism in each country, supporting an improved enabling environment. At least two research in development partnerships will be established in each country, and two at global level. National and global rangelands data platforms established



**ASPIRE - building integrated agrisilvopastoral food systems resilient to climate change and other crises**

**Impact Area Contributions**

<b>Nutrition, health &amp; food security</b>	Improved pastoral agrifood systems coping better with climate change and other crises, reducing the number of people experiencing hunger. Food and nutritional security is improved by increased intake of animal-sourced foods, nutrient dense crops, vegetables, fruits and nuts, whilst also increasing the number of people with more healthy diets
<b>Poverty reduction, livelihoods &amp; jobs</b>	Equitable engagement of communities, particularly women and youth, in dynamic value chains reduces the numbers of people living in poverty, increases household income and leads to economic empowerment. This is synergistically improved when supported by stronger engagement of private actors and increased investments in agrisilvopastoralism
<b>Gender equality, youth &amp; social inclusion</b>	Focus on women and youth in the development of value chain also increases employment and entrepreneurial opportunities for youth in the sector, reduces migration and strengthens the rights of women to economic and other resources, proving a strong contribution to overall social inclusion and empowerment
<b>Climate adaptation &amp; greenhouse gas reduction</b>	Self-sustained and adaptive pastoral agrifood systems lead to pastoralists and others being more resilient to climate shocks. Investments in land improvements, restoration and rehabilitation improve carbon storage/sequestered of land at local level and contribute to Land Degradation Neutrality country commitments, including land cover and productivity
<b>Environmental health &amp; biodiversity</b>	Sustainable land and natural resource management approaches in agrisilvopastoralism increases animal and plant biodiversity, boosting conservation and ecosystem services, including through increased land cover and in particular tree coverage. Improvement in nutrients and water cycling, and in waste management improves use of consumptive water

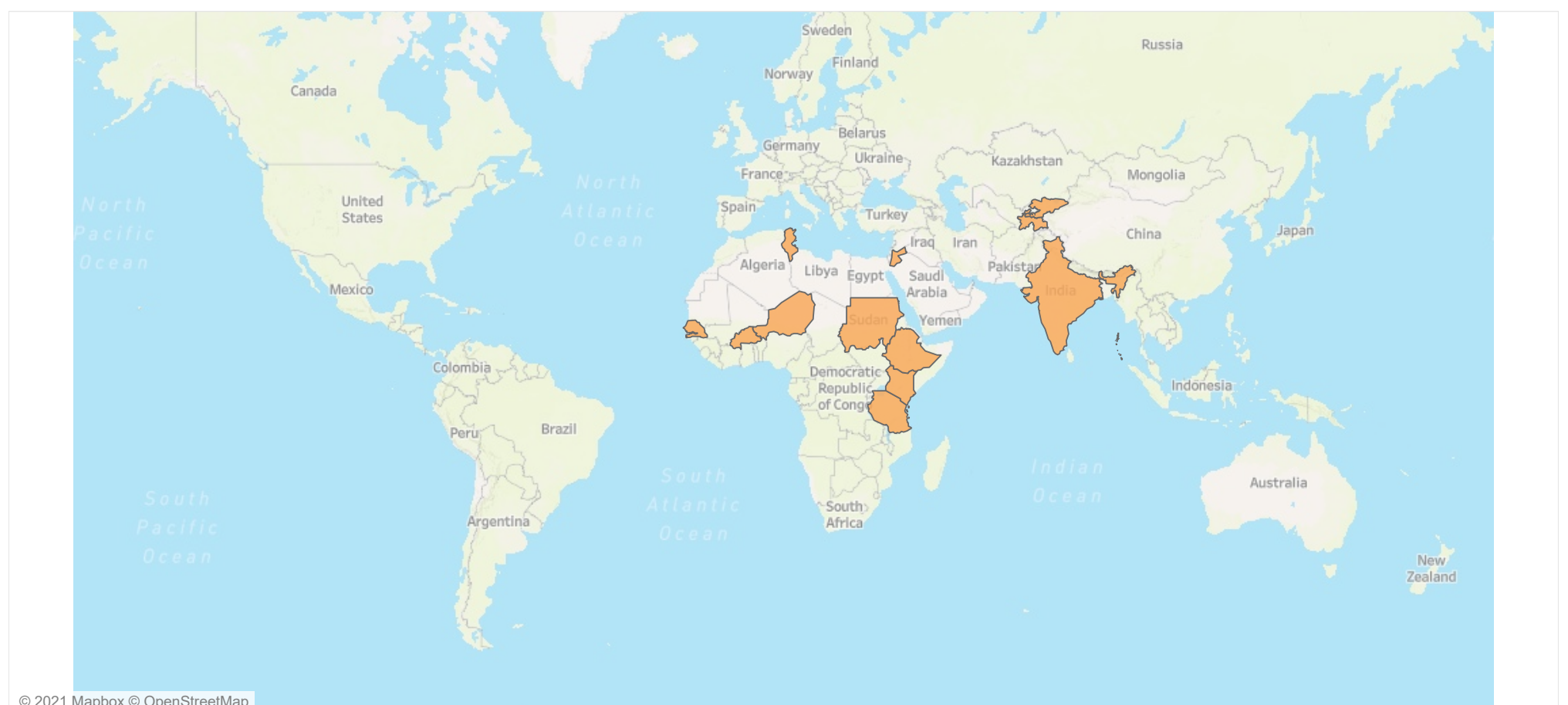
**Impact on SDGs**



**Regions**

Global Central and West Asia and North Africa (CWANA), East and Southern Africa (ESA), South Asia (SA), West and Central Africa (WCA)

**Countries**



## ASPIRE - building integrated agrisilvopastoral food systems resilient to climate change and other crises

### Innovations

- Scaling of Participatory Rangeland Management (PRM) a process supporting inclusive community mobilisation and capacity building for improved management and governance of rangelands, working through three stages - Investigation, Planning, Implementation. Activities include participatory mapping, baseline/monitoring system set-up, development of a rangeland management plan and agreement strengthening rights to resources.
- Expansion of the Sustainable Rangeland Management toolbox for addressing the root causes of agrisilvopastoral ecosystem degradation at local scale and in different contexts. This toolbox combines indigenous knowledge and science-based evidence for site-specific practical solutions e.g. silvopastoralism, planned grazing, water conservation, reseeded. Training materials including online will be developed.
- New transdisciplinary tool for measuring and monitoring system-level resilience of pastoral agrifood systems and rangelands, including possible optimal resilient or tipping points and/or thresholds. This tool and the process to develop it will influence/change thinking on resilience, its measurement and provision of support for resilience-building through interventions and investments.
- A Women Empowerment in Pastoralism Index (WEPI) building on and adapting the Women Empowerment in Livestock Index (WELI) measuring the impact of interventions on the empowerment of pastoral women (as part of a collective group)
- New tool(s), process(es), and protocol(s) for undertaking an evaluation of costs and benefits of rangeland degradation vis-à-vis rangeland restoration, with long and short-term scenarios. These will be tested and shared as a decision-making tool with intended users including communities, practitioners, researchers, government and investors. Results should have strong policy implications.

### Key Partners

<b>Demand</b>	Government	National Governments
	Multilateral	Global Environment Facility (GEF), European Union (EU), Swiss Agency for Development Cooperation (SDC), Federal Ministry for Economic Cooperation and Development (BMZ), Foreign Commonwealth & Development Office (FCDO) UK, USAID, Agence France de Developpement (AFD), Africa Development Bank (AfDB), Asia Development Bank (ADB), NDA (Netherlands Development Agency), etc
		International Fund for Agricultural Development (IFAD), Food and Agricultural Organization of the United Nations (FAO), World Bank (WB), United Nations Environment Programme (UNEP), International Union for Conservation of Nature (IUCN)
	Other	Pastoralists, agro-pastoralists and other local stakeholders
UN Decade on Ecosystem Restoration, UN Convention to Combat Desertification (UNCCD), Green Deal and Food-To-Fork initiatives of EU, UN Food Systems Summit Action Track 3, Great Green Wall, Bonn Challenge, UN Convention on Biological Diversity (UNCBD) and UN Conventions Framework Convention on Climate Change (UNFCCC)		
<b>Innovation</b>	Academic, Training and Research	National Agricultural Research Systems (NARS), Universidad de Extremadura (Spain), Utrecht University (Netherlands), International Centre of Insect Physiology and Ecology (ICIPE), French Agricultural Research Centre for International Development (CIRAD), Research Institute for Development (IRD), International Center for Research in Agroforestry (ICRAF), International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Overseas Development Institute (ODI), Institute for Development Studies (IDS)
	Multilateral	IFAD, FAO, UNEP, IUCN, German Cooperation for International Cooperation (GIZ), Netherlands Development Organisation (SNV)
	Other	Pastoralists, agro-pastoralists and other local stakeholders
		RAMONA (Rangeland Monitoring for Africa using Earth Observation), GMV Innovating Solutions-Spain, VIAMO
	Private Sector	Private companies, businesses and entrepreneurs e.g. Danone (international) or La Laiterie du Berger in Senegal
<b>Scaling</b>	Government	National Governments
	Multilateral	IFAD, FAO, WB, International Land Coalition (ILC), World Food Programme (WFP), IUCN
	Other	Pastoralists, agro-pastoralists, CBOs and other local stakeholders
	Other Public Sector	GEF, EU, SDC, BMZ, FCDO-UK, USAID, AFD, AfDB, ADB, NDA, etc.
	Partner Country based NGO	CAMP Alattoo Public Foundation (Kyrgyz Republic), World Wildlife Fund (WWF), Resource Conflict Institute (RECONCILE), Tanzania Natural Resource Forum (TNRF), Veterinaires sans Frontieres-International, Acting for Life, Réseau Billital Maroobé (RBM), Caritas Switzerland, etc.

# ASPIRE – building integrated agrisilvopastoral food systems resilient to climate change and other crises

## Challenges

- Pastoral agrifood systems are experiencing intensifying pressures from climate change and other factors, weakening their resilience and leading to reduced productivity, land degradation, tensions and conflicts over natural resources
- Lack of appreciation of and investment in pastoral agrifood systems including in land and natural resources restoration and rehabilitation
- Lack of knowledge and capacity to (re)build resilience
- There is a lack of climate responsive services and tools to support rebuilding of this resilience
- Women and youth are key agents of change, yet this agency has not been fully tapped
- Non-supportive policy and legislation further challenges the situation

## Work Packages

- Land and natural resource management and governance
- Empowerment of women and youth including through pastoral agrifood value chains
- Livestock health and herd management
- Improving understanding & functioning of resilient pastoral agrifood systems
- Enabling environment and partnership building

### Demand partners

- End beneficiaries
- National Governments
- Int. Dev. Agencies
- NGOs
- Private sector
- Global Platforms
- Donors

## Outputs

- Strengthened **research in development partnerships**
- Strengthened **land & NR security**, planning, and management
- More efficient **nutrient & water cycling**
- Improved **crops & rangelands** including integration of trees
- **Empowerment of women and youth** including through value chains
- Improved **livestock health** and herd management
- **Resilience-building tools, technologies and investments**
- **Policy** engagement including MSPs
- **Knowledge** products and data platforms
- Engagement and partnerships with **private investors**

### Innovation partners

- Governments
- National research organizations
- Research Institutes (NARS, universities & training centers)
- Int. Dev. Agencies
- NGOs
- Private sector
- Global Platforms

## Outcomes

- **Climate-resilient agrisilvopastoralism** adopted by pastoralists and agropastoralists
- **Women and youth leading new pastoral agrifood businesses** in collaboration with Levering gender and social equality
- **Increased livestock health and better herd management**, with improved understanding of **One Health**
- **Tools, technologies and protocols** to measure and build resilience of pastoral agrifood systems **developed**
- **Effective policy**, legislation and institutional arrangements supporting agrisilvopastoralism enabled.
- Improved **national and global partnerships**

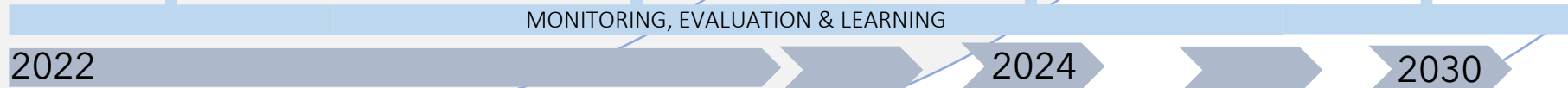
### Scaling partners

- End beneficiaries
- Governments
- Int. Dev. Agencies
- NGOs
- Global Platforms
- Public sector
- Donors
- UN agencies & programs

## 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

contributing to



sphere of control

sphere of influence

sphere of interest

In collaboration with the following One CGIAR Initiatives:

- ① ST-ClimBeR
- ② ST-Transformational agroecology
- ③ ST-Harnessing digital technologies
- ④ ST-Foresight
- ⑤ RAFS-Regional Integrated Initiatives
- ⑥ RAFS-ANIMALS
- ⑦ GI-Genebanks
- ⑧ RAFS-Sustainable Intensification...



## ClimBeR: Building Systemic Resilience against Climate Variability and Extremes

Initiative Lead and Co-Lead	Primary CGIAR Action Area	Estimated 2022 - 2024 Budget
Ana Maria Loboguerrero Jon Hellin	Systems Transformation	\$30 - \$30 M

### Challenge

The adverse impacts of climate variability and extremes on food, land, and water systems are well documented. The resulting loss of productive assets and human capital, coupled with the effect of uncertainty on investments in agricultural innovation, frustrates smallholders' efforts to improve their livelihoods in risk-prone environments. There are three main roadblocks to systemic transformation: (1) lack of a transdisciplinary and multi-systems' approach to address the complexity of building resilience against climate variability and extremes, (2) limited farmer empowerment and adaptive capacity, and (3) failure to scale demand-led CGIAR innovations quickly enough to trigger systemic transformation.

Climate-resilience systems rely on numerous autonomous decisions and investments at diverse time-scales. A systemic transformation approach is needed to unite partnerships (including non-state actors), innovative finance, knowledge, tools, and policies to enhance farmers' adaptive capacity and catalyze transformational change. The approach must work across diverse contexts, at greater speed and adopt a political-economy lens that addresses power imbalances and socio-cultural factors. To date, the incremental and piecemeal adoption of climate-resilience innovations has lagged behind the rapid shifts and tipping points in system productivity under climate variability and extremes. CGIAR and partners have developed good science and new technologies but, on their own, these have been insufficient to generate the required depth, pace and scale of change. The challenge is to deliver bundled market- and system-ready socio-technical innovation packages whereby millions of users are empowered at the scale and pace required to trigger systemic transformation and ensure that sustainable development is equitable and inclusive.

### Objective

The Initiative aims to build more climate-resilience systems, benefitting twenty million farmers by 2024, to withstand climate variability and extremes. It aims to achieve this by generating knowledge about climate-security as an imperative for climate-resilience, and transforming this into action by connecting knowledge, innovations and institutions to specific regional and national challenges. The objective is to deliver impact-at-scale for 20 million farmers by 2024.

Climate actions can focus on adapting to changes already underway, or future-proofing systems so that projected adverse impacts are mitigated. While there are strong synergies between these two approaches, ClimBeR will focus on adaptation, achieving its overarching objective through a three-pronged approach:

- (i) Co-developing climate-resilience innovation packages to enhance access to and use of technologies and practices that increase climate-resilience considering the inter-linked relation between climate, security and peace;
- (ii) Enhancing climate-informed knowledge-exchange and risk-management services, helping farmers to: access critical meteorological information they currently lack, identify and address probable future climate risks, and access risk-management services. By coupling climate-informed knowledge-exchange with risk-management interventions, such as crop insurance and social protection programs, ClimBeR will foster climate-resilience systems;
- (iii) Supporting policy and institutional reforms for transformational change, including those linked to the UN's Framework Convention on Climate Change and United Nations Security Council, and policy coherence across climate, food security, poverty, and peace, acknowledging the linkages across and between these dimensions and using a systemic lens.

ClimBeR builds on CGIAR achievements, comprehensive stakeholder-consultations (Two-Degree Initiative), and baseline studies that define an empirical approach to assess the relation between climate, peace and security.

### Theory of Change

Climate-resilience is critical to farmers' ability to respond to and recover from climate variability and extremes. It relies on adaptive capacity and transformation. Science and novel technologies alone are insufficient to drive rapid and broad systemic transformation. Transdisciplinary networks and enabling environments enhance farmers' capacity to utilize socio-technical innovations that drive transformation.

ClimBeR is CGIAR's leading venue for research and innovation around systemic resilience against climate variability and extremes. With a global focus, ClimBeR will deliver radical, scalable climate-resilience solutions through global public goods, initially focusing on six countries as test sites to tackle on the ground issues, coupled with regional scaling. Building on a decade of CCAFS research, ClimBeR will co-develop solutions with strategic partners (farmers, governments, National Agricultural Research Systems, commercial actors) and promote multi-scale governance including providing the right signals so that empowered farmers can enhance their resilience in the face of climate uncertainty.

Through: (a) co-developing climate-resilience innovation packages with the private sector; (b) enhancing climate-informed knowledge-exchange and risk-management services with partners in the development ecosystem; and (c) influencing national governments' policy and institutional 'tipping point' reforms, by 2024, digital-enabled bundled climate knowledge-exchange services developed by ClimBeR will be used by at least three digital service providers in each target country; ten programs of government, humanitarian and development institutions will utilize CGIAR climate science to steer US\$500 million investments; fourteen climate-resilience policy decisions will be founded on CGIAR science; and scaling-partners in each target country will be using ClimBeR's innovations to empower farmers' climate-resilience decision-making. As the overarching CGIAR initiative on climate-resilience, ClimBeR will work with Regional Integrated and other Initiatives to link global public-goods with robust impact pathways and strategic partnerships for greater grassroots impact.



## ClimBeR: Building Systemic Resilience against Climate Variability and Extremes

### Highlights

**Trans-disciplinarity.** Climate challenges are complex, uncertain and non-linear. Stakeholders may disagree about what causes the problems and what constitutes a 'solution', depending on their needs, knowledge, and aspirations. We, therefore, gather researchers, farmers, development-practitioners, and policymakers into action-oriented networks where 'research' and 'development' merge for robust, multi-level change.

**Partnerships.** In complex-situations, no single discipline has all the answers. ClimBeR brings together perspectives for solutions by combining biophysical and social-science researchers, worldwide, across disciplines. South-North and South-South partnerships will foster exchange of knowledge and experience, to help farmers and other stakeholders make autonomous, better-informed, climate-resilience decisions.

**Climate-security focus.** ClimBeR blends systemic risk modeling and foresight (e.g. climate-smart nutrition and integrated assessment frameworks), linked to the six focal countries' context-specific complexities. It builds on novel baseline studies defining an empirical approach to assessing the relation between climate, security and peace in these countries.

**Socio-technical innovation bundles.** ClimBeR bundles approaches and disciplines like interactive scenario-building, global systems science, big data, innovative use of climate and integrated assessment models, and innovative methods to understand societal climate risk responses. These novel combinations of innovations and tools will deliver radical solution packages for global impact.

**Inclusivity.** ClimBeR harnesses and expands the CGIAR's past critical mass of climate research, and enhances it by proposing a radically-transformative agenda that places systems thinking, and egalitarian and inclusive knowledge and action at its core, in line with the linked SDGs (see 10.3).

### Work Packages

	Scope of Work	3-year Outcomes
Reducing risk in production system-linked livelihoods and value chains at scale	Managing and reducing the impact of variable weather and extreme events, including through enhanced digital services. This action will focus on addressing the systemic impacts of increasingly severe and extreme events, while contributing to reducing climate-related risk to protect and enhance production system-linked livelihoods, value chains, food and nutrition security.	By 2024, digital-enabled bundled climate knowledge-exchange services developed by ClimBeR to de-risk livelihoods and value chains are being used by at least three digital service providers in each target country, hence, reducing losses due to climate variability and extremes.
Building production-system resilience through considering the inter-linked relation between climate, security and peace	Leveraging CGIAR's land, water, and food systems science to address the climate-security-peace nexus contributing to relevant policies, programming, and finance. Given the danger of climate risk as a 'threat multiplier' adversely impacting peace and security, this WP will stimulate a virtuous cycle between climate-resilience, and the climate-security-peace nexus.	By 2024, CGIAR Climate science informs ten development programs/policies of regional bodies, national governments, humanitarian and development institutions, steering US\$500 million of investments to build farmers' climate resilience.
Developing adaptation instruments to inform policy and institutional development	Developing instruments to support policy implementation; identifying gaps, models, and tradeoffs to stimulate policy coherence; exploring systems-thinking, including addressing risks of (synchronous) crop-failures; and influencing and shaping investments (e.g. building pipelines of bankable-projects) to unlock private and public finance.	By 2024, CGIAR climate science directly shapes fourteen national and/or regional policy decisions on climate resilience.
Promoting multi-scale governance to empower decision making by farmers and communities	The focus will be on institutional change and articulation in multi-scale governance, appropriate investment models, and information and data resources that actors can use in bottom-up processes to test the robustness of alternative technologies, livelihood trajectories, and investments under futures with dynamically changing climatic and hydrological uncertainties and unknowns.	By 2024, ClimBeR's scaling partners (see 12.3) in each of the six target countries are using ClimBeR's innovations to empower farmers to make decisions leading to increased resilience with a focus on increasing the agency of women, youth, and other marginalized groups.

## ClimBeR: Building Systemic Resilience against Climate Variability and Extremes

### Impact Area Contributions

<b>Nutrition, health &amp; food security</b>	By reducing the impact of variable weather and extreme events in vulnerable populations, our actions will increase the number of people in the six pilot countries and wider regions directly benefiting from CGIAR innovations that directly target improved food security and enhanced nutrition and health.
<b>Poverty reduction, livelihoods &amp; jobs</b>	ClimBeR will enable exiting poverty by enhancing farmers' livelihoods through overcoming risk as a barrier to adoption of socio-technical innovation bundles, access to credit, and development of value chains. The climate-security work will generate long-lasting co-benefits in terms of reducing poverty, improving livelihoods, and creating jobs.
<b>Gender equality, youth &amp; social inclusion</b>	The creation of gender-responsive digital services to reduce the impact of variable weather and extreme climate events will improve access to information for women and youth as well as for marginalized groups, thus increasing their agency. National-level action on systemic-risk will emphasize gender- and socially-inclusive scaling-mechanisms.
<b>Climate adaptation &amp; greenhouse gas reduction</b>	By 2030, ClimBeR will develop the enabling environment to support a cohort of drivers of climate-adaptation interventions, at the magnitude and speed necessary to achieve rapid and broad transformation. Thirteen policies and adaptation plans will show evidence of implementation via investments worth US\$900 million, reaching seven million beneficiaries.
<b>Environmental health &amp; biodiversity</b>	WP3 will advance nature-based solutions as economically viable climate-resilience options, resulting in improved land management and restoration of deforested land. Policy decisions will promote environmental health and biodiversity as a means to achieving climate-resilience.

### Impact on SDGs



### Regions

Global	Central and West Asia and North Africa (CWANA), East and Southern Africa (ESA), Latin America and the Caribbean (LAC), South East Asia and the Pacific (SEA), West and Central Africa (WCA)
--------	---

### Countries



## ClimBeR: Building Systemic Resilience against Climate Variability and Extremes

### Innovations

A Climate-Risk-Profiling-System that combines data sources and analytical approaches to identify key agricultural risks and risk mitigation solutions tailored to value-chain, geographical, and agro-ecological contexts. The system includes geospatial and other types of information (e.g. hazards, exposure, adaptation solutions, investment credit scoring) to inform policy-makers, investors, and development programming.

A financial-product, embedding within its structure an insurance-protection, which, when triggered, offsets loan payments due to the lender; combined with a digital Measurement, Reporting and Verification (MRV)-advisory-toolkit (to understand climate impacts for farmers, aggregate their data into an interoperable data wallet, and share it with stakeholders of their choosing).

A framework to increase food and nutrition security of the most vulnerable households living in climate-fragile areas, to establish a shock-responsive approach for eArly Warning to eARly action and early financE (AWARE) to strengthen the humanitarian-development-climate-security nexus. AWARE will be built on a cloud-environment using Artificial-Intelligence technologies.

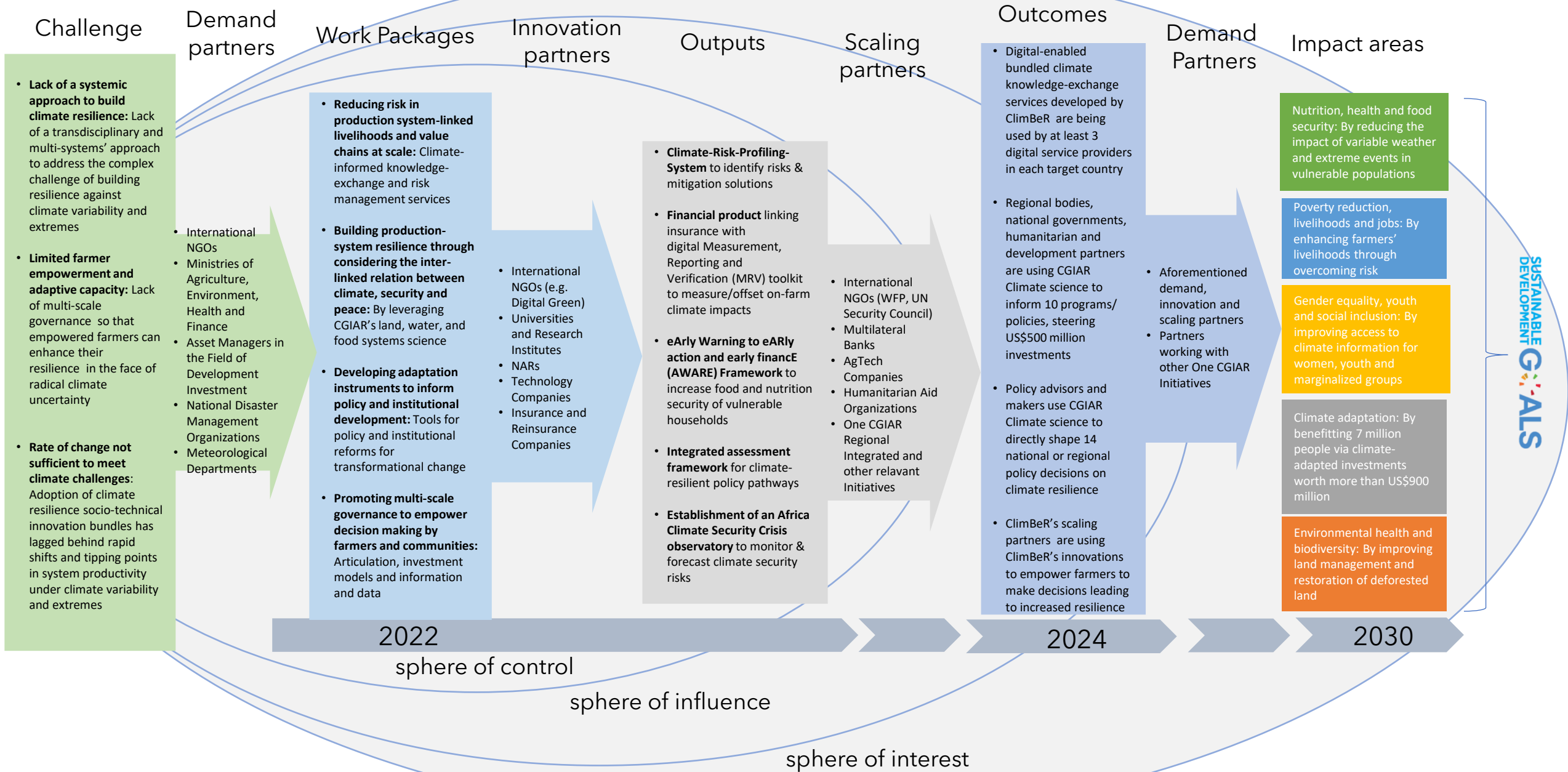
An integrated assessment framework to develop policy pathways that can enable and prime the environment for climate-resilience futures. By using participatory scenario workshops, task forces, and integration workshops we will be able to translate idealized modeling into real-world policy and vice-versa, to accomplish integration of climate-resilience measures into policies.

An 'Africa Climate Security Crisis' observatory that monitors, assesses and forecasts climate-security risks across the Sahel, North Africa, Eastern and Horn of Africa and Southern-Africa. This tool will go beyond predicting conflict in order to inform policy, programming and investments of national and international stakeholders along the humanitarian-development climate-security nexus.

### Key Partners

<b>Demand</b>	Government	Ministries of Agriculture, Environment, Health and Finance
	International NGO	United Nations Security Council
		World Food Program
	Other Public Sector	National Disaster Management Organizations and Meteorological Departments
	Private Sector	Asset managers in the field of development investments
<b>Innovation</b>	Academic, Training and Research	National Agricultural Research Systems
		Universities and Research Institutes
	International NGO	Digital Green
	Private Sector	Insurance and Reinsurance Companies
		Technology Companies
<b>Scaling</b>	International NGO	Humanitarian Aid Organizations
		United Nations Security Council
		World Food Program
	Multilateral	Multilateral Banks
	Private Sector	AgTech Companies

# ClimBeR: theory of change







## Conservation and Use of Genetic Resources (Genebanks)

Initiative Lead and Co-Lead	Primary CGIAR Action Area	Estimated 2022 - 2024 Budget
Mariana Yazbek Michael Abberton	Genetic Innovation	\$45 - \$50 M

### Challenge

An unprecedented rate of biodiversity loss is one of the defining global challenges of our times. Reduced biodiversity will undermine resilience of agricultural systems, threaten nutritional security, and put at risk the foundations of crop improvement. SDG 2.5 highlights the importance of maintaining genetic diversity of crops and their wild relatives, including through soundly managed genebanks, and ensuring access to that diversity and equitable benefit sharing, in accordance with international law (Scope and roles of the CGIAR genebanks: 2030 vision - <https://bit.ly/3sselGG>)

Interrelated with biodiversity loss, the changing climate is putting our increasingly homogeneous farming systems at risk of failure through extremes of abiotic stresses and continuously evolving pests and diseases. The difficulty in predicting trends in climate change, as well as socioeconomic trends, makes it essential to keep options open (How may food systems evolve: looking ahead in an uncertain world - <https://bit.ly/32jAoVpn>)

Global simplification of diets (and increasing reliance on decreasing diversity of plants) is contributing to the double burden of malnutrition. Meanwhile international disagreement concerning the governance of genetic resources and genomic information is exacerbating genetic resources nationalism as reflected in the reluctance of some countries to cooperate internationally exchanging genetic resources and related information., with negative impacts on AgR&D. These unresolved tensions are also contributing to unprecedented international scrutiny of CGIAR programs' compliance with international laws.

### Objective

While ensuring that annual germplasm requests are met in compliance with Plant Treaty and phytosanitary regulations, CGIAR aims to consolidate collections through strategically aligning processes, standards, and curation, deploying one data management system, and to have either reached or sustained performance targets for availability, safety duplication, documentation, and quality management.

By 2028, CGIAR aims to deploy strategic, cost-efficient methods for conserving (including cryobanking), testing and cleaning at least six priority cultivated crops or wild relatives, while ensuring that the international policy environment is increasingly supportive of CGIAR's work through active engagement in Plant Treaty, Convention on Biological Diversity and International Plant Protection Convention developments.

CGIAR crop curators will engage in cross-initiative teams to support researchers in meeting the needs laid out in product profiles through providing data, tools, and genetic resources, in so doing accelerating trait discovery as well as enriching data resources to increase the value of the collections. Curators will actively engage with increasing numbers of genebank users (>2000 external requests/yr.) from outside Genetic Innovation or CGIAR to support the appropriate use of the diversity available from CGIAR genebanks in underpinning efforts to adapt to climate change, increase nutrition and improve food security and livelihoods.

CGIAR will provide services and build capacity for more effective conservation and use of plant diversity in at least 50 medium or low-income countries by 2028. It will promote a "Greenpass" system, and access and benefit-sharing initiatives, to facilitate and increase international germplasm exchanges

### Theory of Change

The CGIAR Genebanks (hereafter Genebanks) will conserve, make available and promote use of agrobiodiversity, in compliance with international obligations, for current and future generations, directly responding to Sustainable Development Goal 2.5. It will actively curate global ex-situ collections of crops, crop wild relatives, forages, and trees to ensure their viability, health, and genetic integrity in a rational and effective system (Annex I). Researchers will expand utilization of fully characterized germplasm to identify novel sources of genetic variation and mine collections ("Accelerated Breeding: Meeting Farmers needs with Nutritious, Climate-Resilient Crops"). Breeders will use landraces and wild relatives as sources of novel alleles to increase precision and accelerate genetic gains for climate resilience, nutrition and processing traits ("Accelerating crop improvement through precision genetic technologies"). Genebanks, through providing trends in germplasm requests, will establish a feedback loop on priority crops and desirable traits with "Market Intelligence for More Equitable and Impactful Genetic Innovation". Diverse users' will draw on genetic diversity for landscape management ("ASPIRE - agri-silvo-pastoral food systems resilience"), and crop diversification ("SeEdQUAL: delivering genetic gains in farmers' fields " and ALL regional initiatives), will be met.

Genebanks and germplasm health units, in collaboration with "Plant Health and rapid response to protect Food and Livelihood Security", will develop more efficient methods for long-term conservation, disease-cleaning and testing, and deploy capacity development packages with international and national partners, on conservation, exchange, and use (Genebank Costs and Operations - <https://bit.ly/3aiKMkO>).

Stronger and more interactive partnerships with national genebanks and a wide range of germplasm requesters/users worldwide will enable the generation and use of genetic resources, tools, and information. New modalities of collaboration will strengthen joint collection and conservation with national partners expanding the scope and efficiency of the global system of plant genetic resources.

## Conservation and Use of Genetic Resources (Genebanks)

### Highlights

Genebanks conserve efficiently and effectively the largest and most widely used collections of crop diversity in the world. The initiative will mainstream strategic curation of crop collections through adoption of one data management system, unified quality management and phytosanitary systems, harmonized policy compliance, and streamlined services to expand use.

CGIAR has succeeded in cryopreserving potato and banana on a uniquely large scale. Genebanks will expand this success to other collections under CGIAR management and create specialist cryo conservation hubs to support national genebanks to secure their collections of vegetative propagated crops and potentially additional crops with recalcitrant seeds.

Genebanks facilitate the identification and use of genetic variation for crop improvement as part of cross-initiative teams responding to cultural demands, market intelligence and product profiles, and will ensure data on genebank collections is enriched through closer interaction with the user community and other stakeholders.

Genebanks contribute to development of new international policies and instruments (concerning Access to Benefit Sharing (ABS) and phytosanitary regulation) that support future availability and exchange of genetic resources and genomic information.

Genebanks underpin the global system of plant genetic resources conservation and use and, in partnership with the Crop Trust, deploys CGIAR's wide experience in international policy and technical skills to build capacity worldwide for more effective conservation and use of plant diversity in response to SDG 2.5 and its successor.

### Work Packages

Scope of Work		3-year Outcomes
Guarantee availability of diversity in perpetuity	Ensuring "In perpetuity" operations that are required to meet CGIAR's legal, moral, and technical obligations to maintain and make available designated collections under Article 15 of the Plant Treaty. Every actively curated accession in the collection must be adequately documented, viable, healthy, true-to-type and safety duplicated according to international standards	Breeding, research and development actors continuously make advances through utilizing Genebank material
Futureproofing collections & exchange	New innovations to improve future efficiency and effectiveness of genebanks and GHU operations under an enabling policy environment. Priorities include pioneering novel approaches to seed quality management, mainstreaming cryopreservation, piloting new conservation and phytosanitary diagnostic advances, and contributing to the development of new or revised international policies and instruments.	Global System of germplasm conservation and exchange is more efficient and cost effective through sharing information, technologies and capacity building.
Supporting breeding programs and increasing value and use of collections	Focuses on supporting the active participation of genebanks in MIPP-driven trait discovery and facilitating full use of the diversity options for application in measures to adapt to climate change and increase nutrition and food security through genotyping collections, improving data management and accessibility, and developing discovery-ready genetic resources.	Breeding, research and development actors continuously make advances through utilizing Genebank material
Strengthening the Global System	Maximizing synergies and coordination between Genebanks, GHUs and other actors in the global system, focusing on capacity strengthening and partnerships with NARES and NPPOs to co-develop tools, methods, standards, best practices, policies etc., culminating in enhanced sharing of responsibilities in support of SDG 2.5 and its successor.	Global System of germplasm conservation and exchange is more efficient and cost effective through sharing information, technologies and capacity building

## Conservation and Use of Genetic Resources (Genebanks)

### Impact Area Contributions

<b>Nutrition, health &amp; food security</b>	Agrobiodiversity available in genebanks includes nutritional traits and variation and resilient landraces to underpin farming system diversification and crop improvement in support of planetary and human health and nutritional and food security
<b>Poverty reduction, livelihoods &amp; jobs</b>	Agrobiodiversity available in genebanks includes specific crops and genotypes to underpin crop improvement, and farming system diversification in support of efforts to increase farmers' employment and income and hence reduce poverty and enhance livelihoods.
<b>Gender equality, youth &amp; social inclusion</b>	Needs of women, men and youth addressed by providing improved technologies (varieties with adaptive traits) that respond to their preferences (such as drudgery reduction, quality traits, and income generating traits) and by repatriating landraces that have been selected by women over time for particular preferred traits.
<b>Climate adaptation &amp; greenhouse gas reduction</b>	Genebanks are a rich source of adaptive traits and alleles in both landraces and wild relatives that can be made available through a range of tools and approaches in adaptive breeding, developing new stable varieties of globally important crops under new challenges from climate change.
<b>Environmental health &amp; biodiversity</b>	Agrobiodiversity conserved in genebanks and made available for use underpins efforts to reduce the loss of genetic variation at all levels and to safely restore and diversify agroecosystems, supporting the provision of environmental services as well as crop products.

### Impact on SDGs



### Regions

Global

### Countries



## Conservation and Use of Genetic Resources (Genebanks)

### Innovations

New methods of non-destructive viability testing, automated germination scoring, and a dormancy-germination toolbox developed to reduce use of resources for viability monitoring and better understand the longevity of seeds in genebank storage for use primarily by curators and genebank managers, and other workers in seed storage and delivery systems.

Reliable cryopreservation methods for vital crops where long-term conservation methodologies do not exist, to ensure the long-term availability of these crop collections, in base collections and safety back-up cryopreservation facilities for CG genebanks and the wider international Genebank community conserving clonal crops and recalcitrant seeds

Novel strategies to identify user-defined dynamic subsets combining information (Passport, phenotypic, environmental, genotypic) for prioritized adaptive traits (climate change, nutritional quality, gender- & social inclusion) to enhance allele mining, trait discovery, and subsequent evaluation of the defined subsets ensuring information backflow to finetune strategies for and in collaboration with breeders.

A "Greenpass" system with published common internal standards for phytosanitary certification of all imported and exported materials exchanged with CGIAR with the aim of achieving recognition of such standards by the International Plant Protection Convention (IPPC) to facilitate and accelerate safe germplasm exchange involving all CGIAR germplasm transactions.

A one-stop, centralized service/ helpdesk providing decision support tools, information, one-on-one feedback for OneCGIAR scientists to ensure compliance with Centers' obligations under Article 15 of the Plant Treaty, national access and benefit-sharing laws, and phytosanitary regulations

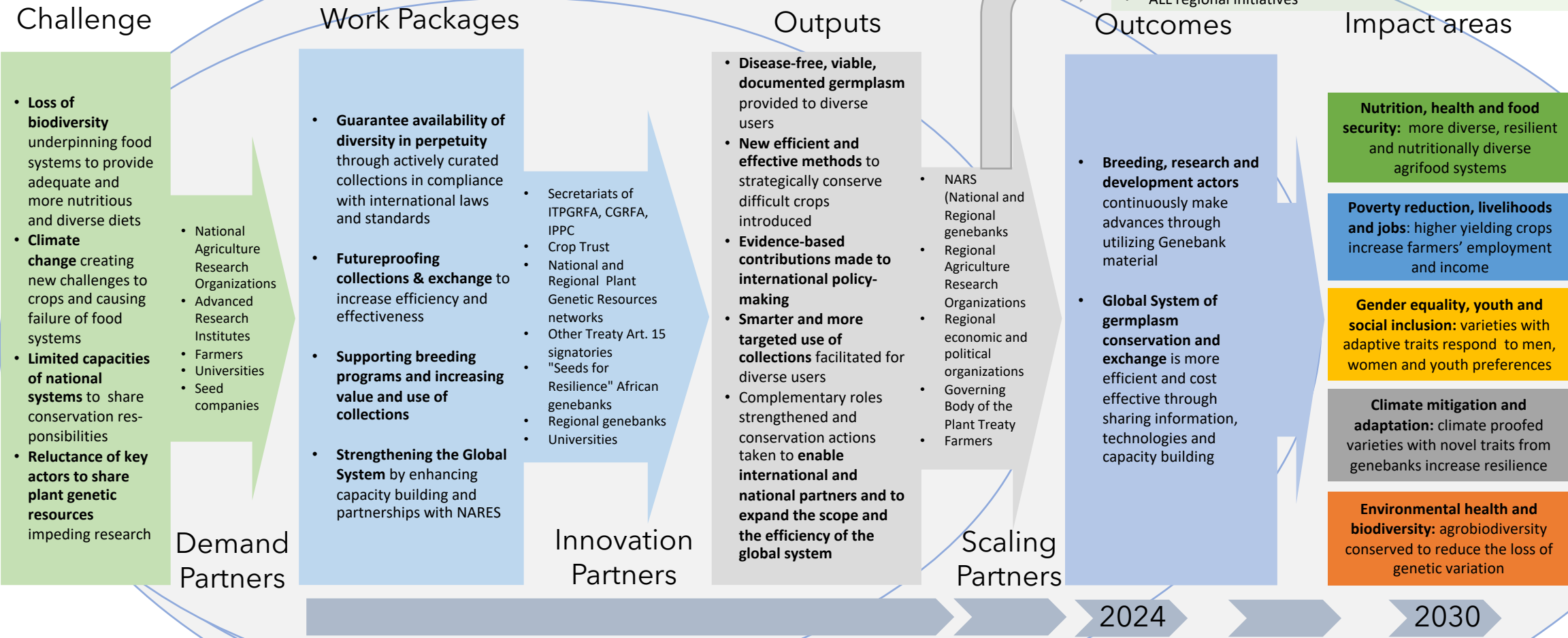
### Key Partners

<b>Demand</b>	Academic, Training and Research	Advanced Research Institutes
		Universities
	Government	National Agriculture Research Organizations
	Private Sector	Farmers
Small and large private sector companies		
<b>Innovation</b>	Academic, Training and Research	Aarhus University, Wageningen University, University of Reading, National universities in host countries
	International NGO	The International Seed Testing Association (ISTA), The International Society for Biological and Environmental Repositories (ISBER), The DivSeek International Network, International Seed Federation (ISF)
	Other	Other Treaty Article 15 signatories and international genebanks (World Vegetable Center, Centre for Pacific Crops and Trees (CePaCT), International Center for Biosaline Agriculture (ICBA), The Tropical Agricultural Research and Higher Education Center (CATIE)
		Secretariats of Plant Treaty, Commission on Genetic Resources for Food and Agriculture, International Plant Protection Convention, Crop Trust
Other Public Sector	National Genebanks and Research institutes: Kenya, Ethiopia, Zambia, Ghana, Nigeria ("Seeds for Resilience" partners); Brazilian Agricultural Research Corporation (EMBRAPA); South Korea Rural Development Administration; Centre for Genetic Resources, the Netherlands (CGN), Leibniz-Institute (IPK); United States Department of Agriculture (USDA)	
<b>Scaling</b>	International NGO	World Vegetable Center, International Center for Biosaline Agriculture
	Other	Governing Body of the Plant Treaty
	Other Public Sector	National genebanks and National Plant Protection organizations NPPOs
	Private Sector	Farmers
	Regional NGO	Regional Agriculture Research Organizations: West and Central African Council for Agricultural Research and Development (CORAF); Association of Agricultural Research Institutions in the Near East & North Africa (AARINENA); The Centre for Coordination of Agricultural Research and Development for Southern Africa (CCARDESA); Regional economic and political organizations (ECOWAS, SADC Southern African Development Community); Arab Organization for Agricultural Development (AOAD)



# Theory of change - Genebanks

- CGIAR Initiatives:
- Accelerated Breeding: Meeting Farmers needs with Nutritious, Climate-Resilient Crops
  - Accelerating crop improvement through precision genetic technologies
  - Market Intelligence for More Equitable and Impactful Genetic Innovation
  - ASPIRE - agri-silvo-pastoral food systems resilience
  - SeEdQUAL: delivering genetic gains in farmers' fields
  - Plant Health and rapid response to protect Food and Livelihood Security
  - ALL regional initiatives



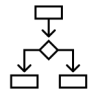
CONTRIBUTING TO  
**SUSTAINABLE DEVELOPMENT GOALS**

sphere of influence

sphere of interest



[Participatory process](#)



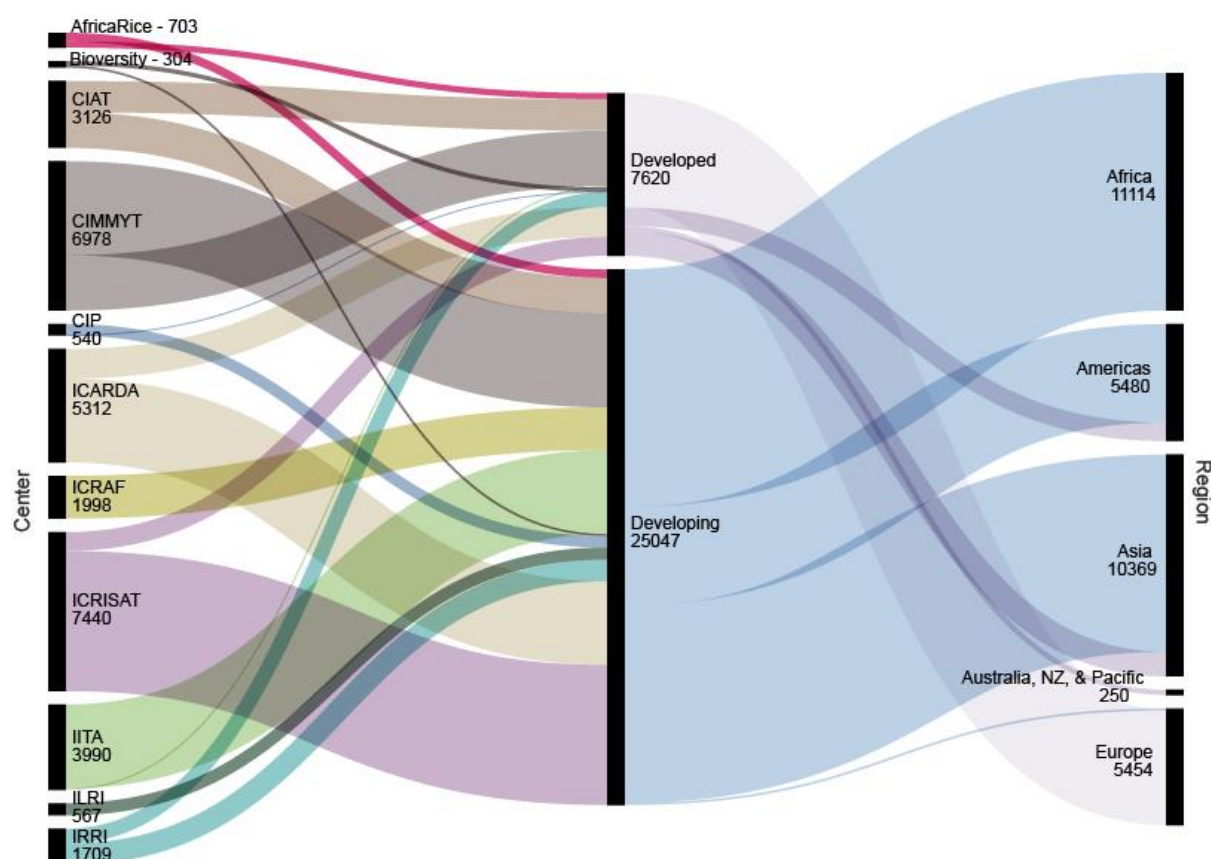
[Extended ToC](#)

## Annex I. Genebanks Initial design for the Investment Plan

Table 1. CGIAR genebanks and collections in 2020

Center	Location	Crops	Accession numbers	Conservation form
AfricaRice	Cote D'Ivoire	Rice	21,815	Seed
Alliance	Belgium	Banana	1,624	In vitro & cryo
	Colombia	Beans, tropical forages	58,668	Seed & field
		Cassava	5,779	In vitro & cryo
CIMMYT	Mexico	Maize, wheat	147,842	Seed & field
CIP	Peru	Andean roots & tubers, potato, sweetpotato	18,156	Seed, in vitro, field, cryo
ICARDA	Lebanon	Wild cereals, grain legumes, temperate forages	152,609	Seed
	Morocco	Cultivated wheat, barley, chickpea, lentil		Seed
ICRAF	Kenya & multiple countries	Tree species	14,919	Seed & field
ICRISAT	India <sup>1</sup>	Sorghum, pearl millet, small millets, chickpea, groundnut	129,034	Seed, field & in vitro
IITA	Nigeria	Cowpea, maize, Bambara groundnut & other legumes	25,359	Seed
		Banana, cassava, yams	9,415	In vitro, field & cryo
ILRI	Ethiopia	Tropical forages	18,662	Seed & field
IRRI	Philippines	Rice	132,140	Seed
<b>Grand total</b>			<b>736,210</b>	

Figure 2. Distribution of germplasm from CGIAR genebanks in 2020



<sup>1</sup> Not including collections in Niger, Kenya & Zimbabwe



## Enabling Tools, Technology, and Services for Genetic Gains

Initiative Lead and Co-Lead	Primary CGIAR Action Area	Estimated 2022 - 2024 Budget
Young Wha Lee Augusto Becerra Lopez-Lavalle	Genetic Innovation	\$20 - \$85 M

### Challenge

There is an acute demand for more productive and nutritious crops in the developing world, as agri-food systems are strained by climate change, rapidly increasing demographic pressure, and soil and natural resource degradation. Crop improvement can play a key role in addressing these challenges as breeding cycles can be drastically shortened (2-3 years for some commodity crops such as rice and wheat) with genetic gains markedly increased through deployment of new technologies and breeding schemes. We must transform our operational capabilities and organizational culture to take advantage of these modern advances.

Operational excellence is defined as the agile and cost-efficient deployment of effective technologies and practices into the breeding process. A proven path to operational excellence is the centralized coordination and specialization of functions, especially those that are crop agnostic and driven by key performance indicators (KPIs), enabling both cultural change in the organization as well as increased effectiveness and cost-efficiency.

Operational excellence in CGIAR and partner breeding programs is not uniformly adopted; some programs and components of programs lag behind current best practices. The result is poor penetrance, uneven uptake, and inefficient deployment of enabling technologies and methods into a fragmented landscape of independently operating programs and Centers, hindering breeding optimization and stifling genetic gains. Farmers then lack access to the best adapted, most nutritious varieties and crop productivity is reduced in farmer fields.

### Objective

This objective of this initiative is to define and provide access to best practices, enabling resources, and implementation support to increase the operational return on investment of breeding programs for their stakeholders. Through the supported and scaled implementation of tried and tested innovations breeding programs will deliver enhanced rates of genetic gains and varietal turnover per unit investment. The initiative will operate across commodities, enabling structured and formalized capacity exchange among scientists across CGIAR and partners, regardless of affiliation, to support the rapid validation and translation of innovations. The removal of siloes will promote and enhance cross-disciplinary exchange while securing critical mass within disciplines across the CGIAR-partner network. Dynamic and robust disciplinary groups will better enable innovation and implementation while enabling the recruitment and retention of excellence and fostering the next generation of leaders in crop improvement science and operations within OneCGIAR. The new working model emphasizes the coordination and deployment of quality core services, from global to local level, enabling more effective and efficient incorporation of new technologies and methods simultaneously in multiple crops and pipelines in the CGIAR-partner breeding network. Finally, the new operational model builds new connections between crop and Center based staff to create a sense of shared ownership among all participants of the data, decisions, and germplasm produced in the crop improvement process, fostering a culture of operational excellence and continuous improvement in the CGIAR-partner breeding programs.

### Theory of Change

This initiative aims to address barriers to modernization in CGIAR and NARS breeding programs due to uneven acquisition and inefficient deployment of tools, technologies and harmonized best practices and protocols. It will do so by (1) providing transparently costed core services to breeding programs under a new business model (2) establishing a research and innovation brokerage system for capacity exchange between programs and centers, aiming to connect CGIAR and NARS breeding programs with specialists regardless of crop or center affiliation to evaluate innovations and develop best practices (3) providing a sustainable operational infrastructure to institutionalize existing CtEH facility investments into germplasm delivery hubs that will minimize variation in germplasm development (4) establishing a trialing support service for CGIAR-NARS breeding networks that is centrally coordinated for harmonizing SOPs in trialing, facility management, and germplasm evaluation and operational performance monitoring. Enabling core services for quantitative genetics, genotyping, phenotyping, chemotyping, envirotyping, data management, data analysis and data mining are integral elements of this initiative. Building on the advances made by the Excellence in Breeding Platform (EiB) and CtEH facility investments, this initiative will create a new culture of equitable co-ownership of the crop improvement processes. The services provided in this initiative will act as a force multiplier in increasing the operational efficiency of breeding pipelines for both NARS and CGIAR programs and support all genetic innovation action area initiatives, particularly "Accelerated Breeding: Meeting Farmers' Needs with Nutritious, Climate-Resilient Crops".

## Enabling Tools, Technology, and Services for Genetic Gains

### Highlights

CGIAR-NARS breeding networks benefit from new centralized core services that provide access to high-quality data, analytics, and data management, helping to close the gap in adopting best practices in crop improvement.

CGIAR-NARS breeding networks benefit from a new capacity exchange system that connects researchers with specialized expertise into transient multi-disciplinary teams to support the breeding program's science and innovation needs. Programs can access the best technical support available regardless of crop, center, or partner affiliation, accelerating the translation and scaling of new technologies and discoveries into CGIAR-NARS breeding networks.

A new culture of operational excellence, enabled by co-ownership and engagement of all participants in the breeding process, results in bold, attainable, and effective breeding pipeline optimization, following a baseline established by Excellence in Breeding (EiB) for breeding modernization and Crop for Ending Hunger (CtEH) facility investments in regional germplasm hubs.

Harmonization of protocols, standardization of data, and integration of data types in the Enterprise Breeding System will speed the pace of insights and accelerate the translation and scaling of new technologies and discoveries into CGIAR-NARS breeding networks.

Democratizing access and capacity to take advantage of the core support services by NARS, who become core services customers as well as equal peers in jointly creating a CGIAR-NARS breeding network.

### Work Packages

	Scope of Work	3-year Outcomes
Core Data Services	Services will be provided under a new business model to support breeding programs with data generation (genotype and phenotype), operations costing, analyses and simulations, and integrated data management with the Enterprise Breeding System as a core connecting database. The services will support CGIAR-NARS breeding networks and NARS breeding programs. Early NARS adopters of services includes KALRO, NARO, and DRS.	Breeding programs routinely and rapidly capture data, perform high quality streamlined analyses, and deploy appropriate visualization tools to make effective, data-driven breeding decisions. Data use is extended to routinely generate metrics of program effectiveness and health, guiding investment decisions and the planning and execution of continuous improvement plans.
Research and Innovation Exchange System	A brokerage system will enable exchange of scientists across CGIAR and NARS regardless of affiliation to support the rapid validation and translation of innovations. The service enables interaction and synergies between specialties to create transient multidisciplinary teams as needed and establishes critical mass to attract the leaders in crop improvement science and operations to OneCGIAR.	Breeders leverage scientific innovation to enhance the efficiency and effectiveness of germplasm development. The continued definition and business case-based refinement of best practices together with access to enabling tools, services, and technical backstopping accelerates and scales the development, identification and implementation of high value innovations across CGIAR-NARS networks.
Germplasm Hubs	Hubs dedicated to the application of plant reproductive technologies are established. Breeders will be provided with ready-to-use seed, removing conversion quality, seed quality, or seed identity as a source of variation in field testing. This work package institutionalizes facility investments to create germplasm hubs at select CGIAR and NARS stations via CtEH funding, and will support "Accelerated Breeding: Meeting Farmers' Needs with Nutritious, Climate-Resilient Crops"	Breeding pipelines have increased efficiency and effectiveness of product delivery achieved through access to and use of germplasm hubs securing the generation of high quality, true to type source germplasm.
Trialing Support Services	A global trialing support service will enable CGIAR-NARS breeding networks in creating and managing TPE-aligned trials to global standards. The service will harmonize SOPs for trial management, facility management, and germplasm evaluation across regional trialing networks and monitor network performance in data generation and return, supporting "Accelerated Breeding: Meeting Farmers' Needs with Nutritious, Climate-Resilient Crops" and building on CtEH investments into NARS station improvements .	Breeders improve the efficiency and effectiveness of germplasm evaluation within their segmented pipelines through access to and use of harmonized, standardized, TPE-appropriate trialing support services.



## Enabling Tools, Technology, and Services for Genetic Gains

### Impact Area Contributions

<b>Nutrition, health &amp; food security</b>	This initiative will increase the efficiency of genetic gains by breeding programs to deliver more productive and nutrient-dense crops, thus contributing to improved regional nutritional and health status, especially for women and children, and resulting in a region wide reduction in the loss of disability-adjusted life years.
<b>Poverty reduction, livelihoods &amp; jobs</b>	Facilitating more efficient generation of highly productive, more resilient crop varieties will ensure that poor smallholders can increase production under the adversity of pest and disease pressure and climate change, thus mitigating the risk of crop losses and securing their investment.
<b>Gender equality, youth &amp; social inclusion</b>	Efficient generation of gender aware varieties will increase wealth and nutrition of disadvantaged communities. Capacity reorganization and career specialization in the CG-NARS network creates new work opportunities in the technology sector for more people, including women, youth and disadvantaged minorities.
<b>Climate adaptation &amp; greenhouse gas reduction</b>	Accelerated genetic gains will enable breeding programs to efficiently respond to climate change pressures, including resistance to pests and diseases exacerbated by changing conditions. Increased productivity under adverse conditions will ultimately contribute to feeding more people while reducing per capita resource utilization, including water and fuel consumption.
<b>Environmental health &amp; biodiversity</b>	Enabling higher productivity and crop resilience from improved genetics will limit the expansion of agricultural land in regions with high demographic pressure and dwindling natural resources. Higher responsiveness to nutrient applications will lead to healthier soils in the agricultural context and regarding waterway contamination.

### Impact on SDGs



### Regions

Global

### Countries



## Enabling Tools, Technology, and Services for Genetic Gains

### Innovations

A corporate and scientific program to develop fee for service models that enable global business units for the delivery of effective and cost-efficient crop improvement services.

Formal benchmarking of the services and operations in CGIAR against public and private peer organization for Genetic Innovations, to harmonize cost structures across the CGIAR and create a disciplined approach to spending.

A KPI tracking and reporting dashboard for Core Services and hub operations to enable these units to monitor themselves to achieve continuous improvement and operational excellence.

A KPI tracking and reporting dashboard for breeding programs to monitor adoption and use of new technologies and protocols for breeding scheme optimization.

A scientific exchange system that connects specialized experts across the CGIAR and partners in dynamically formed teams to support research and innovation efforts, providing breeding programs with the best technical expertise regardless of affiliation.

### Key Partners

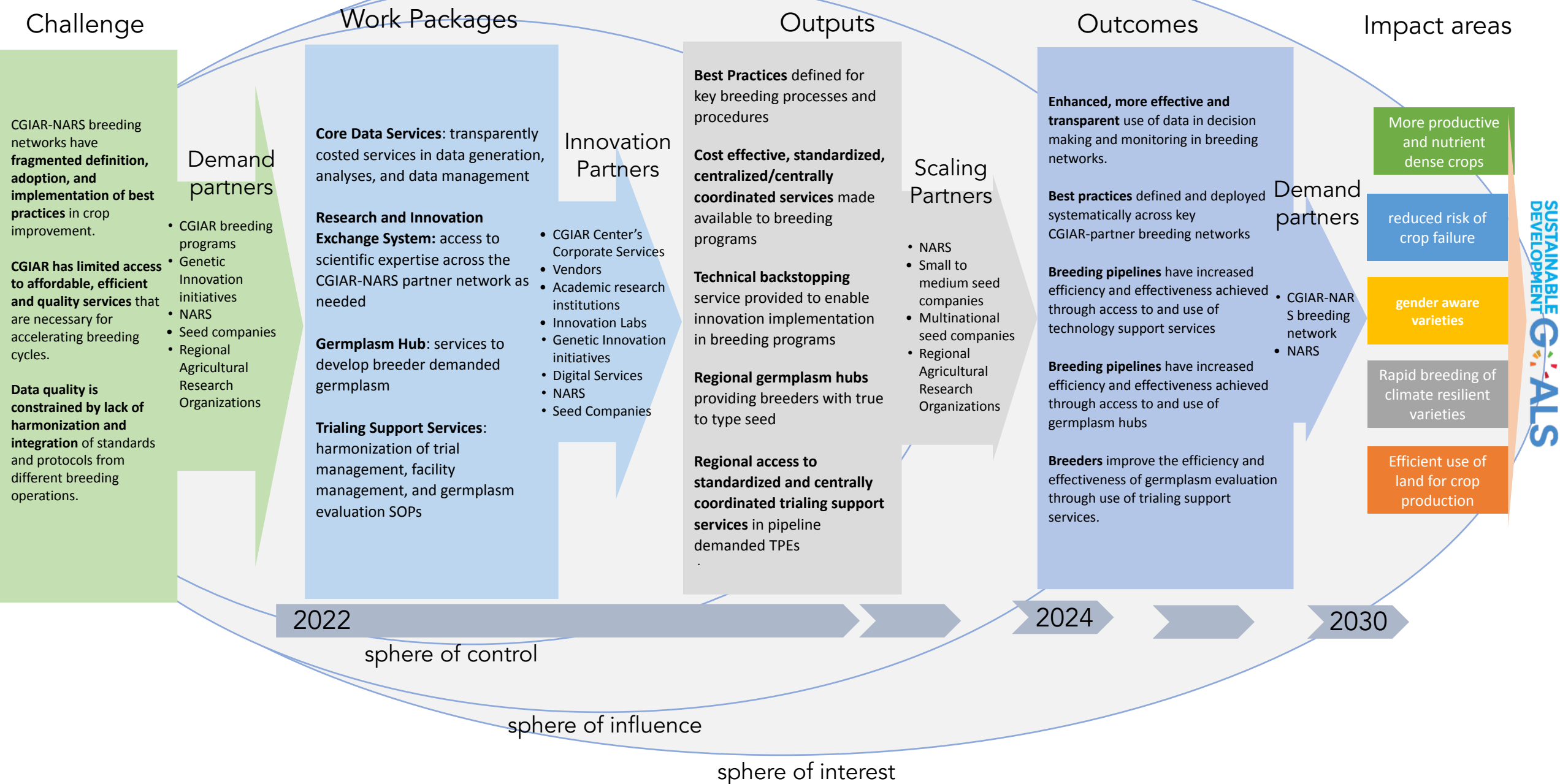
<b>Demand</b>	Government	KALRO in Kenya, NARO in Uganda, DRS in Zimbabwe, EIAR in Ethiopia, ISRA in Senegal, CSIR in Ghana, ICAR in India, Embrapa in Brazil
	Multilateral	Genetic Innovations action area initiatives: Accelerated Breeding: Meeting Farmers' Needs with Nutritious, Climate-Resilient Crops, Accelerating crop improvement through precision genetic technologies, Genetic Resources (Genebanks), Market Intelligence for More Equitable and Impactful Genetic Innovation, SeEdQUAL: delivering genetic gains in farmers' fields
	Other Public Sector	Regional Agricultural Research Organizations including World Bank supported Centers of Excellence (eg AGRA, CORAF, ASARECA, APPSA)
	Private Sector	Small and Medium Size Enterprise (SME) and Multinational Seed Companies in Target Regions (eg Kenya Seed Company, Zamseed, Ethiopian Seed Enterprise, East-West Seed, Bayer, Corteva, Syngenta, SeedCo).
<b>Innovation</b>	Academic, Training and Research	Sequencing: Arizona University Bioinformatics: Cornell, Cirad, Cambridge Biostatistics: University of Nebraska, Cornell, NCSU, University of Queensland Metabolomics: Royal Holloway Phenotyping: Vermont University, Cirad, CSIRO Data systems: Minnesota University (GEMS); BTI (Breedbase)
	Government	KALRO in Kenya, NARO in Uganda, DRS in Zimbabwe, EIAR in Ethiopia, ISRA in Senegal, CSIR in Ghana, ICAR in India, Embrapa in Brazil
	Multilateral	CGIAR action areas: Excellence in Agronomy, Meeting Farmers' Needs with Nutritious, Climate-Resilient Crops, Corporate Services, Digital Services USAID supported Innovation Labs
	Private Sector	Multinational crop science companies: Corteva Agriscience, BayerCrop Science, Syngenta  Vendors and contracting services: Intertek, DaRT, Corteva Agriscience Research as a Service, Amazon Web Services, VSNI, IBP, Hyphen, Keygene
<b>Scaling</b>	Government	KALRO in Kenya, NARO in Uganda, DRS in Zimbabwe, EIAR in Ethiopia, ISRA in Senegal, CSIR in Ghana, ICAR in India, Embrapa in Brazil
	Other Public Sector	Regional Agricultural Research Organizations including World Bank supported Centers of Excellence (eg AGRA, CORAF, ASARECA, APPSA)
	Private Sector	Small and Medium Size Enterprise (SME) and Multinational Seed Companies in Target Regions (eg Kenya Seed Company, Zamseed, Ethiopian Seed Enterprise, East-West Seed, Bayer, Corteva, Syngenta, SeedCo).



# Theory of change for the initiative

## Enabling Tools, Technology, and Services for Genetic Gains

This initiative will work synergistically with other initiatives in the Genetic Innovation action area, particularly *Accelerated Breeding: Meeting Farmers' Needs with Nutritious, Climate-Resilient Crops*





## Excellence in Agronomy- Solutions for Agricultural Transformation (EiA)

Initiative Lead and Co-Lead	Primary CGIAR Action Area	Estimated 2022 - 2024 Budget
Bernard Vanlauwe Madonna Casimero	Resilient Agri-food Systems	\$20 - \$85 M

### Challenge

Smallholder farming represents over 80% of the world's farms, mostly located in the Global South, and supplies 50% of the global food (<https://bit.ly/3tmuZsG>; <https://bit.ly/3mOoXOU>; <https://bit.ly/3e2hckB>). Smallholder farming is characterized by low and variable yields and profitability (<https://bit.ly/3gbA9nu>; <https://bit.ly/3gdbq2b>), from which 80% live in water-scarce areas, and reinforced by climate change, low resource use efficiencies and declining soil health, resulting in negative impacts on food/nutrition security, equitable livelihoods, and ecosystem health (<https://bit.ly/2Qp4P9Z>; <https://bit.ly/2OOyOaU>). Sound agronomy is key to achieving resilient agri-food systems but its uptake is hampered by technical and social constraints, confounded by ineffective scaling (<https://bit.ly/3uLADom>; <https://bit.ly/3gdyL3Y>). Genetic gain expression is also hindered by poor agronomy (<https://bit.ly/32gQdw7>).

Agronomy is perceived as being too site-specific for global research but this impression is outdated. Modern agronomy spans local relevance and impact at scale through advancements in diagnostics, data science, geospatial analytics, remote sensing, and understanding economic, social, and gender barriers. Predictive agronomy entails integrating crop, soil, nutrient, and water management in a spatially explicit framework to guide action towards sustainable intensification (<https://bit.ly/3gk2dVE>; <https://bit.ly/3mOrU1W>). Adaptive scaling models built via co-creation from scaling partners and enabled by innovation systems embedded in multi-actor partnerships will facilitate uptake of agronomic solutions at scale.

Research is needed to: (i) Develop reusable tools and approaches to prioritize best-fit agronomic solutions, leveraging existing and generating new data, tools, and analytics to maximize return on investment and minimize risk; (ii) Assess the climate adaptation/mitigation and sustainability impacts of agronomic solutions over space and time; (iii) Innovate to increase the efficiency and efficacy of agronomic research workflows; and (iv) optimize the Use Case models to deliver on scaling objectives.

### Objective

The vision of success of EiA is to deliver by 2030 higher and more stable yields through agronomic gain for millions of smallholder farming households in prioritized farming systems, with emphasis on women and young farmers for measurable impact on food/nutrition security, income, water use, soil health and climate resilience. Although there is no generally accepted definition, in this context, smallholder households are defined as those managing 5 ha or less, using mainly family labor, and achieving their livelihoods mainly from on-farm production. Agronomic gain is conceptualized around a set of Key Performance Indicators (KPIs) with anticipated improvement in terms of average crop yields and profitability, reduced yield variability, improved resource (nutrients, water, labour) use efficiency, and restored soil health.

The overarching objective is to deliver gender- and youth-responsive agronomic solutions to smallholder farmers via demand-driven Use Cases in prioritized regions, underpinned by large pools of actionable data and decision support tools. This primary goal will be achieved through (i) a CGIAR-wide alliance to diagnose and resolve the technical and social constraints hampering inclusive sustainable intensification of smallholder agriculture in a changing climate, thus valorizing the currently available expertise and assets of the CGIAR, as detailed in the recent Agronomy Program Assessment report (<https://bit.ly/3smVjkY>), (ii) the use of data-intensive and gender responsive agronomic solutions that are tailored to the diverse needs and circumstances of smallholder farmers, (iii) deep engagement with public and private sector research and scaling partners with inclusive impact pathways and co-ownership of innovations, and (iv) backstopping of key enabling actors in partner networks by targeted capacity development efforts.

### Theory of Change

Agronomy - the integrative science of cropping systems ecology and crop production - provides the foundation for productive, profitable, and sustainable agriculture under a changing climate. Nevertheless, the transformative potential of sound agronomy has not materialized across much of the Global South partly because research has often narrowly focused on technology development and not fully embraced the power of ex-ante priority setting, modern data systems and analytics, and end user targeting. Moreover, technological scaling has often been relegated to the end of the innovation process rather than incorporated as an essential design element, facilitating co-creation with partners.

Building on increasing demand for agronomy solutions and advances in science and technology, EiA 2030 will address these challenges and deliver agronomic gain at scale, while unlocking the gains in genetic potential from breeding. Taking advantage of progress made through the EiA Incubation Phase (2020-2022), this will be achieved by (i) prioritizing key farming systems and demand-driven entry points where needs are urgent and science-led progress within reach, (ii) leveraging data and novel tools to develop and validate inclusive agronomic solutions at scale, (iii) investing in innovation research to address complex problems, supported by non-CGIAR Advanced Research Institutes, and (iv) co-creating solutions with public and private sector demand partners through Use Cases, formulated around specific demand and innovation systems, and supported by National Agricultural Research Systems (NARS).

By focussing on scaling partners with substantial reach, EiA's agronomic solutions will improve crop productivity and livelihoods for millions of households (at least 40% female-headed) while enhancing resource use efficiencies, increasing climate resilience and reducing greenhouse gas emissions, and rehabilitating soil health. The ToC diagram (<https://bit.ly/3nt6Yhc>) refers to Initiatives EiA is planning to continue engaging with, including ST- Harnessing Digital Technologies for Timely Decision-Making across Food, Land, and Water Systems, ST- National Policies and Strategies for Food, Land and Water Systems Transformation, ST- Enabling gender and social equality through resilient and inclusive agri-food systems, ST- Transforming food systems from greenhouse gas sources to sinks (S2S), RAFS- Plant Health and Rapid Response to protect Food and Livelihood Security, RAFS- Sustainable Intensification of Mixed Farming Systems, GI- Enabling Traits, Tools and Technology Services for Genetic Gains, and RAFS-Regional Integrated Initiatives.

## Excellence in Agronomy- Solutions for Agricultural Transformation (EiA)

### Highlights

**Agenda setting:** Data-intensive prioritization logic and ex-ante impact assessment to identify opportunities for country-x-farming system combinations with high potential uptake of gender- and youth-responsive agronomic solutions, supported through a pipeline of agronomic product profiles, assembled over time and enriched through innovation research projects.

**Data and tools:** A coordinated approach to data compilation, interpretation and governance, backstopped by cutting-edge digital products and services, allowing for accurate predictive agronomic impacts and leading to more rapid and complete adoption of agronomic solutions, including integration of novel tools and approaches among national agricultural research partners.

**Monitoring, evaluation, and learning (MEL) and feedback:** Development of a real-time agronomic gain Key Performance Indicator (KPI) framework for strategic decision-making that prioritizes effective scaling and multi-disciplinary assessment of temporal and spatial levers of sustainability, inclusivity, and climate adaptation/mitigation (e.g., long-term observatories; panel studies; field, farm, community, and landscape-level assessments).

**Use Case model:** Building on the EiA Incubation Phase (Exhibit 1, <https://bit.ly/32hKq9p>), deployment of Use Cases, with their specific Theories of Change, formulated around demand from public and private scaling partners with large impact targets, and innovation systems, inclusive of service providers and NARS partners, and supported by innovation research.

**EiA Global and Regional:** Operationalization through EiA Global, hosting global functions, including prioritization, demand mapping, ex-ante analytics, data governance and tools, cultural change, and agronomic gain assessment, and connected EiA Regional components, aiming at keeping track of demand, co-creating agronomic solutions with private and public scaling partners, and providing 'One-Stop-Shop' services.

### Work Packages

	Scope of Work	3-year Outcomes
ORGANIZE	ORGANIZE hosts the functions related to internal organization and external partnerships. This work package (WP) organizes prioritization, demand mapping, and foresight, manages the other WPs through providing critical input on who to engage, what to innovate for, and how to support, leads strategic communication, and manages interactions with other Initiatives.	ORGANIZE: By 2024, 11 CGIAR Centers with agronomy expertise collectively decide on an agronomy at scale research portfolio, based on prioritization and partner demand, share data, tools, and learning, and cooperate to co-create agronomic solutions through at least 20 Use Cases, and monitor progress against agronomic gain KPIs.
TRANSFORM	TRANSFORM hosts core functions of EiA, including assembly of data and tools and their governance, following open and FAIR principles; application of existing analytics and turn-key solutions developed for specific Use Cases; supply of information on the climate impacts, inclusivity, and sustainability of agronomic solutions; and NARS capacity strengthening.	TRANSFORM: By 2024, all research and scaling partners engaged in EiA use available data, tools, and turnkey solutions to support the co-creation of locally relevant agronomic solutions, integrate climate-smart, inclusivity, and sustainability principles in such solutions, and generate primary data on their performance using common protocols.
INNOVATE	INNOVATE addresses key knowledge gaps and facilitates innovation in agronomy research with engagement from public and private sector partners and non-CGIAR ARIs, based on Use Case needs, requirements for the assessment of agronomic gain KPIs, or needs for increasing the efficiency, efficacy, gender- and youth-responsiveness, and cost-effectiveness of research workflows.	INNOVATE: By 2024, at least 5 non-CGIAR Advanced Research Institutes with complementary expertise in geo-nutrition, farming systems analytics, remote sensing, or other relevant research areas, and at least 10 NARS partners, cooperate with EiA through at least 10 innovation research projects and deliver results that are added to the TRANSFORM infrastructure.
DELIVER	DDELIVER hosts the co-creation, including development and technical and user experience validation, and deployment of gender- and youth-responsive agronomy solutions, inclusive of mechanization, to smallholder farmers via scaling partners through demand-driven Use Cases, formulated around inclusive innovation systems and operating within defined extension networks and farming systems.	DELIVER: By 2024, at least 20 public and private scaling partners integrate agronomic solutions in their respective initiatives, targeting at least 1 million farmers through extension agents or other social or technological information networks, and use common ME&L concepts to report the performance of these solutions against agronomic gain KPIs.

## Excellence in Agronomy- Solutions for Agricultural Transformation (EiA)

### Impact Area Contributions

<b>Nutrition, health &amp; food security</b>	Millions of smallholder farming households will adopt agronomic solutions that increase yields and yield quality of key staple crops, legumes, and perennial cash crops within prioritized farming systems by at least 50%, on average. The risk of underperformance of agronomic solutions will be reduced by at least 25%.
<b>Poverty reduction, livelihoods &amp; jobs</b>	Millions of smallholder farming households will adopt agronomic solutions that generate a 'living income'. Such living income will not only allow households to cross the poverty line but also invest in improving their overall livelihood status. Jobs will be created through service delivery initiatives.
<b>Gender equality, youth &amp; social inclusion</b>	At least 40% of smallholder farmers engaged will be female and several tens of thousands of young people will provide agronomic services to smallholder farmers, allowing both groups to exit poverty.
<b>Climate adaptation &amp; greenhouse gas reduction</b>	Millions of smallholder farming households will adopt agronomic solutions that reduce climate-related yield losses to an average 25% of target yields, while reducing product-based greenhouse gas emission intensities (ton CO <sub>2</sub> -equivalent) by at least 25%.
<b>Environmental health &amp; biodiversity</b>	Millions of farming households will adopt agronomic solutions that increase resource (nutrient, water, and/or labor) use efficiencies by at least 25%; millions of hectares of agricultural land will be converted to sustainable land use through the adoption of practices that surpass thresholds for soil properties below which soil degradation occurs.

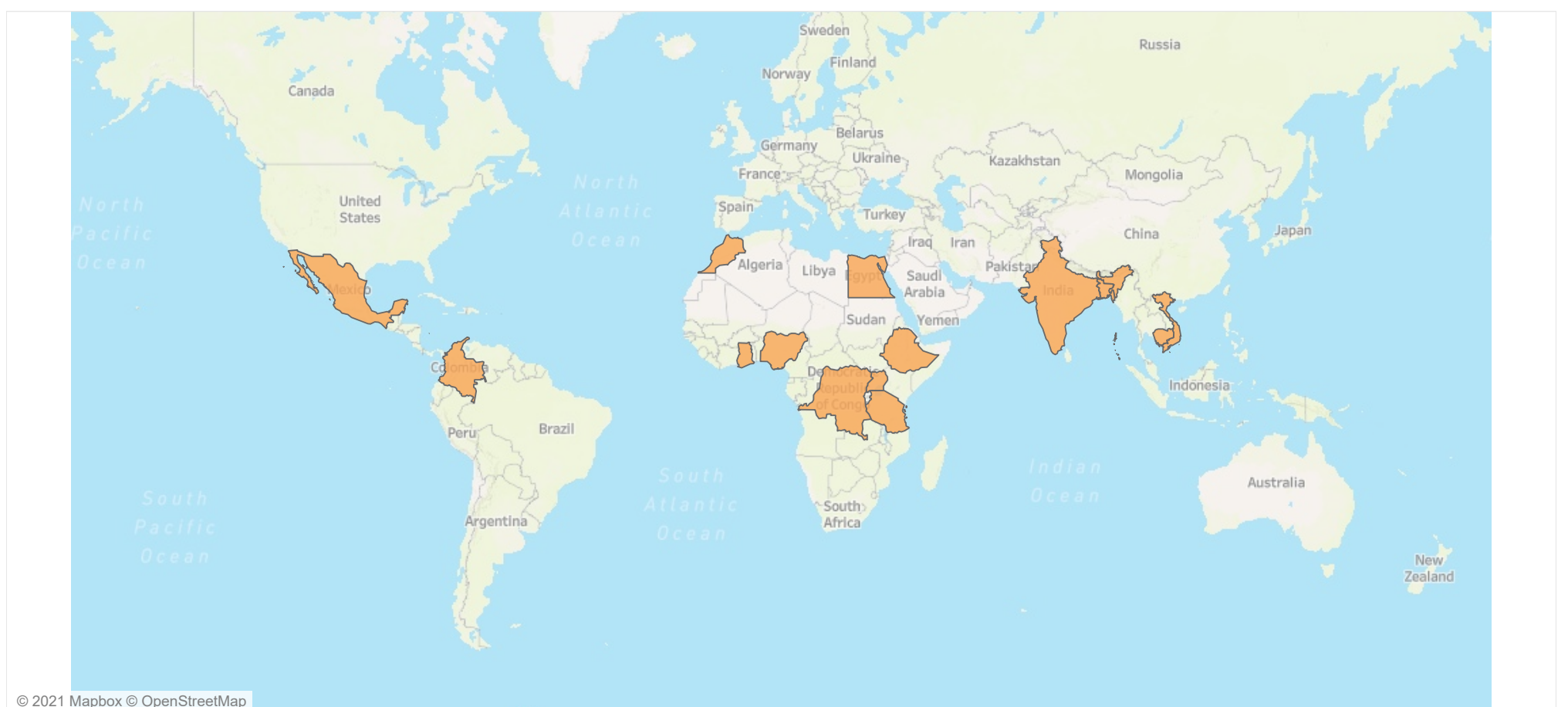
### Impact on SDGs



### Regions

Global	Central and West Asia and North Africa (CWANA), East and Southern Africa (ESA), Latin America and the Caribbean (LAC), South Asia (SA), South East Asia and the Pacific (SEA), West and Central Africa (WCA)
--------	--

### Countries





## Excellence in Agronomy- Solutions for Agricultural Transformation (EiA)

### Innovations

Gender- and youth-responsive digital agronomic decision support tools for bespoke nutrient management and associated agronomic practices to improve staple crop and legume productivity and profitability and resource use efficiency for integration in public and private extension networks through extension agents (e.g., Rice Crop Manager, Nutrient Expert, AKILIMO).

Real-time and digitally enabled feedback loops, aiming at collecting within-season feedback at scale on the technical and user experience-related performance of gender- and youth-responsive agronomic solutions, for assisting research partners in improving alignment of their content and presentation to end-user needs.

A coherent, common data infrastructure and governance framework that facilitates the use of consistent standards, workflows, approaches to enable open and FAIR data through born-FAIR data collection, workflows, and capacity enhancement and its efficient leveraging for analysis and visualization by CGIAR researchers and other stakeholders engaged in agronomy at scale.

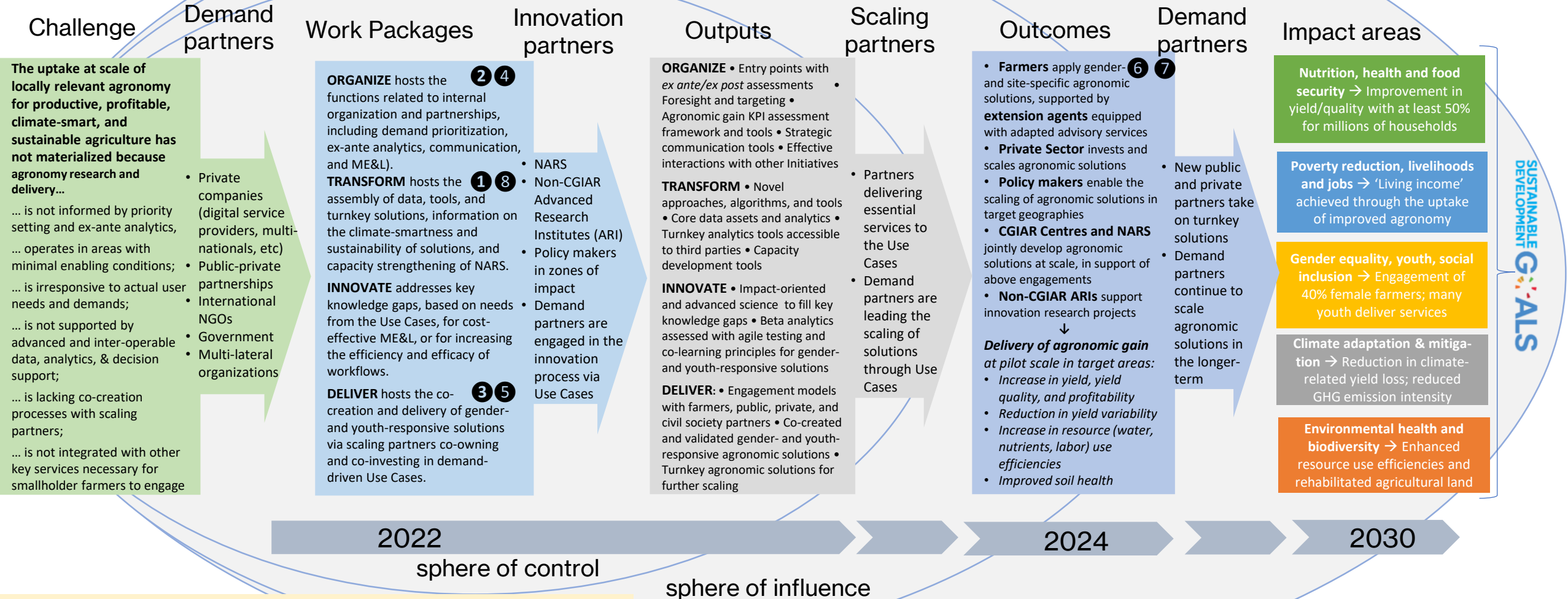
Water technologies to overcome physical and economic water scarcity in rainfed and irrigated agriculture through access (micro-irrigation technology), application (e.g. drip and partial root zone drying) and management (e.g. alternate wetting and drying for rice, 'IRWI App', advising on the water needs based on key crop, soil, and micro-irrigation system properties).

New and diversified cropping practices and systems that increase resource use efficiency, profitability, and on-farm diet diversity, reduce risk and green gas emissions, and enhance sustainability for smallholders, and that are scalable and readily adopted by facilitation through innovation systems and strategic partnerships at local, regional, and global scale.

### Key Partners

<b>Demand</b>	Government	Active for the Incubation Phase: Public extension services of Ethiopia, Egypt, Mexico, Colombia, and Peru
	International NGO	Active through the Incubation Phase: Digital Green, Sasakawa Africa Association; Discussions on-going with: Rainforest Alliance, The Nature Conservancy
	Multilateral	Discussions on-going with: AGRA, World Bank, African Development Bank, FAO
	Private Sector	Digital service providers (Business-to-Consumers or Business-to-Business): Active through the Incubation Phase: ARIFU, iSDA; Discussions on-going with: eProd, One Acre Fund, AgroCares, CropNuts Limited, ClimateEdge Multinationals: Active through the Incubation Phase: International Fertilizer Association, representing the fertilizer industry; Discussion on-going with: Bayer, OLAM
	Public Private Partnership	Active through the Incubation Phase: Direct Seeded Rice Consortium (DSRC); Convergence platform led by JEEViKA and Bahir Agricultural University, India
<b>Innovation</b>	Academic, Training and Research	Local and regional universities in the target countries
		National Agricultural Research Systems in the target countries; (sub)-regional organizations (e.g., FARA)
		Non-CGIAR International Institutes: African Plant Nutrition Institute, IFDC, ICIPE, ISRIC, Rothamsted Research
		Universities in the North: Cornell University, Michigan State University, University of Florida, Wageningen University and Research (WUR), Swedish Agricultural University (SLU), ETH-Zurich, CSIRO Australia, University of Queensland, CATIE
	Other	All demand partners (see section 12.1) will co-invest in improving the readiness of innovations to contribute to impact at scale
<b>Scaling</b>	Government	Public sector scaling partners interested in specific turnkey solutions, identified through new opportunities during the implementation of the first business cycle
	International NGO	Non-governmental scaling partners interested in specific turnkey solutions, identified through new opportunities during the implementation of the first business cycle
	Other	Any other partnership opportunities identified during the first business cycle that can take agronomy solutions to scale
		EiA will work based on demand from scaling partners so our scaling partners are our demand partners
Private Sector	Private sector scaling partners interested in specific turnkey solutions, identified through new opportunities during the implementation of the first business cycle	

# Excellence in Agronomy – Solutions for Agricultural Transformation (EiA) : theory of change



SUSTAINABLE DEVELOPMENT GOALS

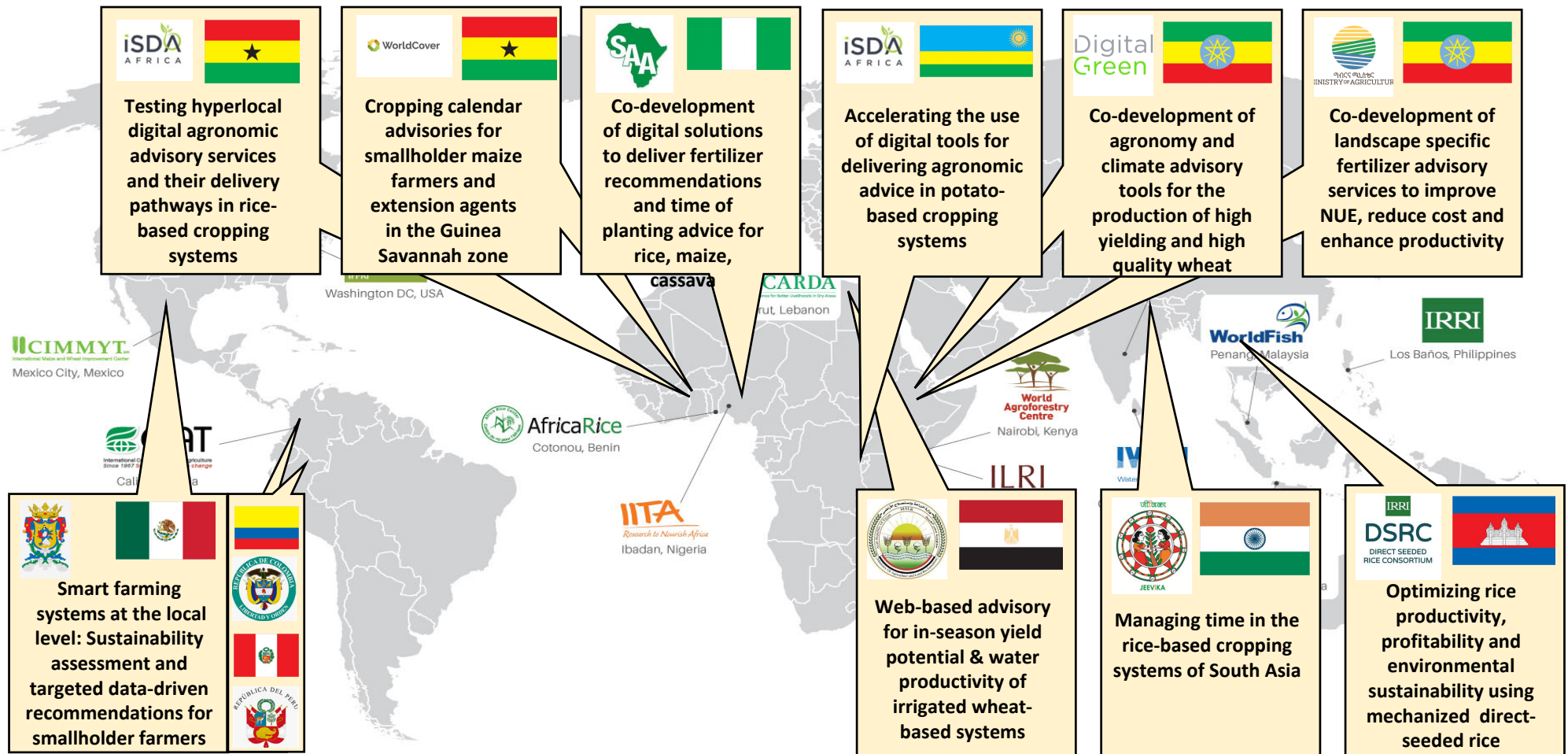
- In cooperation with the following One CGIAR Initiatives:**
- ① ST-Harnessing Digital Technologies...
  - ⑤ RAFS-Plant Health...
  - ② ST-National Policies and Strategies...
  - ⑥ RAFS-Sustainable Intensification...
  - ③ ST-Enabling Gender and Social Equality...
  - ⑦ RAFS-Regional Integrated Initiatives
  - ④ ST- Transforming Food Systems (S2S)...
  - ⑧ GI-Enabling Traits, Tools,...



# Exhibit 1: Use Cases active through the Excellence in Agronomy Incubation Phase (2020-2022)



**Summary description of the 10 Use Cases, currently active through the Incubation Phase of the Excellence in Agronomy Initiative.** Information is presented on the demand partner (top left), the target countries (top right), and the specific demand and cropping systems. The impact targets across the Use Cases are about 15 million households. Each Use Case is formulated around actual demand for agronomy solutions from a public or private scaling partner, facilitating a scaling network in specific target geographies, and a solution co-creation process, ultimately delivering turnkey solutions for scaling to other interest parties. *More information is available via [b.Vanlauwe@cqi-ar.org](mailto:b.Vanlauwe@cqi-ar.org).*





## Foresight and metrics to accelerate inclusive and sustainable agri-food system transformation

Initiative Lead and Co-Lead	Primary CGIAR Action Area	Estimated 2022 - 2024 Budget
Keith Wiebe Elisabetta Gotor	Systems Transformation	\$25 - \$30 M

### Challenge

Two generations ago, the challenge facing agriculture was daunting but clear: the world needed to rapidly increase staple food production to meet rising demand. That goal was met but new ones arose, and today the challenges facing food, land and water systems are more numerous and complex: over 700 million people still live in absolute poverty, millions of young people join the global workforce every year; at least 2 billion people are hungry, micronutrient-deficient, or overweight or obese; gender gaps persist; natural resources are under stress; and climate change compounds these challenges. Addressing them is a priority, but trade-offs are unavoidable, and the choices facing national governments and their development partners have become increasingly complicated. "Business as usual" is not an acceptable option, but what are better pathways to more inclusive and sustainable development, and what actions are needed to get there? Decision-makers at global and national levels have expressed their need for better evidence on the challenges they face, which courses of action should be undertaken, and which policies and investments might minimize trade-offs and achieve collective goals. What is the appropriate balance between self-reliance and global integration, or between immediate welfare gains and long-term sustainability? Are these goals competing or complementary? These difficult questions demonstrate the clear need for cross-cutting capacity to understand system-level interactions and outcomes. Innovative use of data, best-in-class analytics, and deep and ongoing dialogue with global and national stakeholders offer better insights into alternative transformation pathways that can inform choices and sharpen decision-making today.

### Objective

To provide the evidence and capacity needed to make the complex choices that shape the future of food-land-water systems, this initiative will improve and combine two foresight elements that are too often provided separately: rigorous analytics and close interaction with decision-makers. Systematic engagement, including annual forums with national governments, regional organizations and donor agencies, will help assess and articulate foresight needs, identify plausible and desired futures, create appropriate metrics, develop and apply fit-for-purpose interdisciplinary analytical tools, share results, and discuss implications for policies and investments that support inclusive, sustainable system transformation under uncertainty. The initiative will focus on systems-relevant indicators and processes over medium-to-longer-term time horizons, and capture interactions between socioeconomic and biophysical factors and between national, regional and global levels, recognizing the trade-offs and political economy considerations involved. The initiative will analyze six systems-level challenges (indicatively: risk and resilience under climate and other shocks; affordable healthy diets within planetary boundaries; inclusive agricultural transformation; transforming animal-source-food systems; transitioning to green economies; and enhancing system productivity), with a particular focus on poor populations in low-and-middle-income countries. Three challenges will be examined at global, regional and national scales, and three will focus on specific regions and countries. The intermediate objective is to show that better options than business-as-usual can address multiple complex challenges while minimizing trade-offs. The ultimate goal is to help decision-makers identify policy and investment options and socio-technical innovation bundles that lead towards inclusive and sustainable food-land-water systems, and associated improvements in nutrition, livelihoods, equity, climate resilience, and environmental quality.

### Theory of Change

Achieving sustainable and inclusive development at multiple scales requires a shared understanding of drivers, trade-offs and priorities across food, land, and water systems, and compelling evidence and effective partnerships to support coordinated planning and action. This initiative works interactively with demand, innovation and scaling partners to address key foresight information needs for strategic planning. The initiative harmonizes and strengthens foresight data, methods and analysis across and beyond One CGIAR and identifies opportunities and trade-offs associated with alternative strategic pathways and actions across geographies and medium-to-longer-term planning horizons under climate and other risks. The initiative develops and maintains systems-level data and metrics to track progress and guide analysis, action, and learning. Novel mechanisms of engagement and learning with global, regional and national partners co-creates a shared information base and understanding of viable pathways to desired futures and priority actions to achieve them. Targeted training materials and virtual learning platforms bring sophisticated foresight resources to these partners in more accessible ways, fostering transparency, buy-in and uptake. This ongoing process of analysis and engagement will generate a regular cycle of global, regional and country outlook and thematic reports. By building trusted partnerships, responding to information needs, and providing credible and compelling evidence, the initiative will foster stakeholder alignment and informed decision-making, contributing to more cost-effective policies and investments (both public and private) that accelerate progress towards key outcome metrics of sustainable and inclusive development while minimizing potential trade-offs. Given our global, regional and country focus and role in consolidating information from a wide range of sources, we will work closely with all Regional Integrated Initiatives (with particular focus in East and Southern Africa; West and Central Africa; Central and West Asia and North Africa; and South Asia) and with many of the Thematic Initiatives (including National Policies and Strategies for Food, Land and Water Systems Transformation; Market Intelligence for More Equitable and Impactful Genetic Innovation; SHiFT: Sustainable Healthy Diets through Food Systems Transformation; Harnessing Digital Technologies for Timely Decision-Making across Food, Land, and Water Systems; Transforming food systems from greenhouse gas sources to sinks (S2S); ClimBeR: Building Systemic Resilience against Climate Variability and Extremes; Rethinking Food Markets and Value Chains for Inclusion and Sustainability; Excellence in Agronomy- Solutions for Agricultural Transformation (EiA); NEXUS Gains: Realizing Multiple Benefits Across Water-Energy-Food-Forest-Biodiversity System; Transformational agroecology across food, land and water systems; ANIMALS - ActioNs for Innovative climate change Mitigation & Adaptation of Livestock Systems; Resilient Aquatic Foods for Healthy People and Planet; and others).

## Foresight and metrics to accelerate inclusive and sustainable agri-food system transformation

### Highlights

Consolidate, upgrade, and better utilize One CGIAR's strength in foresight analytics linked directly to in-country science on food, land and water systems, and establish a global center of excellence, in partnership with other experts, for research on the medium-to-longer-term drivers, trade-offs, and priorities of global, regional, and national agri-food systems.

Generate new systems-level data and metrics, linked to the Sustainable Development Goals, that capture important but not adequately quantified aspects of food-land-water systems to facilitate a more comprehensive approach to systems transformation, including tracking progress and informing strategic decision-making by national governments, donor agencies, private actors, and other stakeholders.

Establish a regular cycle of engagement and analytics, supporting co-creation of a shared evidence base on the constraints and drivers of food-land-water system transformation at global, regional, and national scales, including greater understanding of desired futures, uncertainty, trade-offs between alternative development pathways, and priorities for today's policies, investments, and research.

Provide targeted training materials and virtual learning platforms that make advanced foresight tools, data and insights more accessible and useful for a wider range of government, research, and development partners, particularly in regions facing the greatest challenges with the least capacity.

Provide cross-cutting capacity to aggregate and integrate interdisciplinary information and analytics from across One CGIAR and other partners, in order to explore system-level interactions and effects and inform decision-making by national, regional and global development partners.

### Work Packages

	Scope of Work	3-year Outcomes
Innovative engagement and learning	Co-develop evidence to inform analytical and learning priorities with national, regional and international development partners through systematic horizon scanning, needs discovery, articulation of desired outcomes, scenario development, review of results and implications, and learning from ex-post assessments, to inform strategic decisions on development pathways to achieve desired futures under uncertainty.	Global partners, national governments, private sector actors, and researchers are actively engaged in a regular series of discussions and share foresight analytics that enable the development of a common understanding of current and alternative inclusive and sustainable food-land-water system pathways and priorities across spatial and temporal scales.
Upgrading foresight tools and analyses	With other leading researchers around the world, deliver a step-change in the accessibility, relevance and rigor of foresight efforts through enhanced socioeconomic and biophysical analytics and other foresight approaches that capture and clarify the complex, inter-related processes, outcomes and trade-offs faced in achieving pathways to desired futures.	National governments, regional organizations and development partners use information generated by a regular cycle of foresight engagement, analysis and reporting, leading to better targeted and more efficient and cost-effective policy and investment decisions.
Systems-relevant data and metrics	Develop and provide open access to new and improved spatially referenced and interoperable data, metrics and interactive exploration tools designed to support improved foresight articulation, analysis and learning and to track systems transformation and performance in relation the One CGIAR impact areas and Sustainable Development Goals.	Decision makers, researchers and other partners have access to new system-level metrics that better capture the drivers and outcomes of inclusive and sustainable transformation and use these data to better diagnose challenges, set priorities, manage risks, and track progress.
Advancing foresight skills	Develop training materials and programs to enhance access to and use of foresight-related data, metrics, models and results by key engagement partners. Efforts will be focused on selected countries (to be identified in collaboration with the National Strategies and Regional Integrated Initiatives), building greater levels of self-reliance.	National, regional and global partners have access to innovative training and delivery platforms so that their knowledge, aptitude and skills with foresight tools, data, and analysis are enhanced and their engagement and strategic planning processes more effective.

**Foresight and metrics to accelerate inclusive and sustainable agri-food system transformation**

**Impact Area Contributions**

<b>Nutrition, health &amp; food security</b>	Contribute to achieving improved nutrition by providing national governments, regional organizations and funding agencies with credible and useful information on the impacts of changing demand, novel technologies, and alternative policy and investment strategies on nutrition-related outcomes, including diet costs and quality, under a range of climate and socioeconomic conditions.
<b>Poverty reduction, livelihoods &amp; jobs</b>	Contribute to creating more decent jobs in agri-food systems and helping people move out of poverty by identifying sustainable, inclusive development pathways that enable CGIAR technologies and innovations and national policies and investments to more effectively reach target populations, including smallholder farmers, the working poor, and vulnerable consumers.
<b>Gender equality, youth &amp; social inclusion</b>	Contribute to closing the gender gap, creating more and better livelihood opportunities for women and youth, and promoting inclusion of lagging regions and marginalized populations by analyzing the distributional implications of policy and investment options (including gender-intentional interventions), and identifying more equitable development pathways.
<b>Climate adaptation &amp; greenhouse gas reduction</b>	Help improve adaptation to climate change and extremes through improved quantification of climate impacts and options to address them, and help reduce greenhouse gas emissions and increase carbon sequestration in agri-food systems through improved analysis of costs and benefits of alternative technologies and of changes in poverty, employment and diets.
<b>Environmental health &amp; biodiversity</b>	Provide foresight analysis and data to help identify pathways that ensure that environmental sustainability is an outcome of food system transformation, recognizing that while food systems rely on the environment for inputs such as land, water, and genetic materials, agriculture is the biggest driver of environmental degradation.

**Impact on SDGs**



**Regions**

Global	Central and West Asia and North Africa (CWANA), East and Southern Africa (ESA), Latin America and the Caribbean (LAC), South Asia (SA), South East Asia and the Pacific (SEA), West and Central Africa (WCA)
--------	--

**Countries**





## Foresight and metrics to accelerate inclusive and sustainable agri-food system transformation

### Innovations

This initiative will design and implement a systematic process of engagement and learning, informing and supported by an annual cycle of reports on key food-land-water systems challenges, to meet the information needs of national governments, donor institutions, and other partners.

This initiative will consolidate, upgrade and improve access to a system of advanced foresight tools, including biophysical (e.g., land, water, crop, livestock, fish) and economic models (e.g., IMPACT, RIAPA), linked to specialized models of drivers (e.g., climate, energy, pests/diseases, demographics) and outcomes (e.g., poverty, jobs, gender).

This initiative will develop and improve access to data and metrics (e.g., agri-food system growth, jobs, resilience, inclusion, dietary quality, and TFP) to track system-wide performance and trade-offs and inform decision-making. New tools and a results database from ex-post evaluations will complement existing resources like ASTI and SPAM.

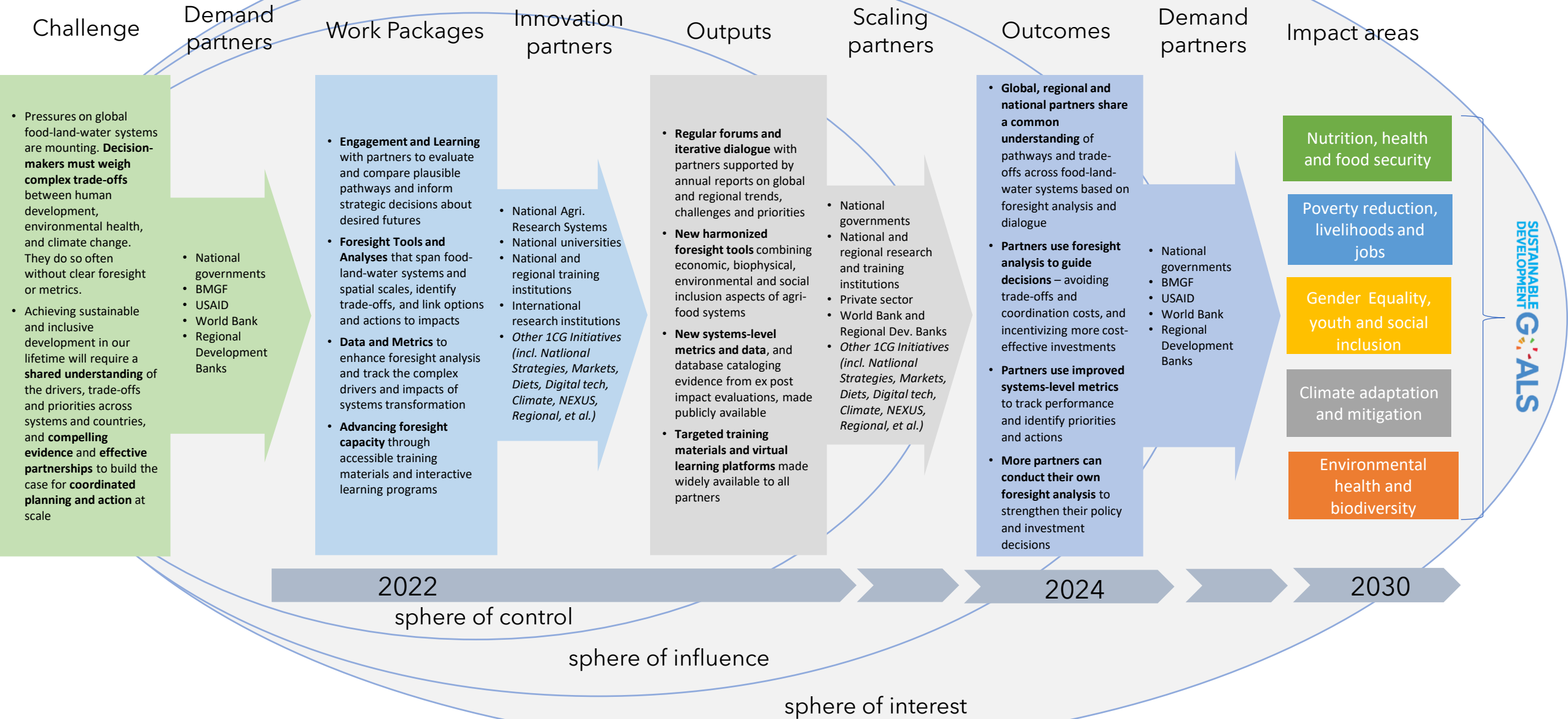
This initiative will focus on six challenges identified together with partners (indicatively: risk and resilience under climate and other shocks, affordable healthy diets within planetary boundaries, inclusive agricultural transformation, transforming animal-source-food systems, transitioning to green economies, and enhancing system productivity).

Targeted capacity-building materials and training programs will support enhanced data, tools, and engagement processes to improve understanding and ownership of foresight methods and results by partners, including analysts advising decision makers in national governments. Distance-learning courses will help train the next generation of foresight analysts in developing countries.

### Key Partners

<b>Demand</b>	Foundation	BMGF
	Government	National governments (tbd)
		USAID
	Multilateral	Regional Development Banks
World Bank		
<b>Innovation</b>	Academic, Training and Research	Agricultural Model Intercomparison and Improvement Project (AgMIP)
		International research institutions
		National Agricultural Research Systems
		National and regional training institutions
		National universities
<b>Scaling</b>	Academic, Training and Research	National and regional research and training institutions
	Government	National governments (tbd)
	Multilateral	Regional Development Banks
		World Bank
Private Sector in Aid Recipient Country	Private sector actors (e.g., farmer and business associations)	

# Foresight & Metrics to Accelerate Inclusive & Sustainable Agri-Food System Transformation: Theory of change







**From Fragility to Resilience in Central and West Asia and North Africa (F2R-CWANA):  
Transforming responses to drought and climate variability**

Initiative Lead and Co-Lead	Primary CGIAR Action Area	Estimated 2022 - 2024 Budget
Michael Baum Maha Al-Zubi	Resilient Agri-food Systems	\$30 - \$45 M

**Challenge**

Drought and climate variability are CWANA's primary climate hazards, exacerbating prevailing challenges in the world's most water-stressed and socially-fragile region. These compounding factors fuel a perpetual cycle of vulnerability, and inequality, worsened by 9 active armed conflicts (<https://bit.ly/3eHxHD3>). CWANA hosts over 40% of global IDPs (Internally Displaced People) (<https://bit.ly/3ajd3aG>) and 33% of refugees (<https://bit.ly/3x0wHSJ>). In Central Asia, youth unemployment propagates widespread labour migration (<https://bit.ly/3tpk814>). Increasing "feminization of agriculture" indicates new exposure levels for women comprising more than half the agricultural labour force (<https://bit.ly/2Qxvt0h>).

Rainfed systems constitute the main source of staple food and proteins, making rainfall variability a key concern. Irrigated systems - important for local nutritious foods, diversification and incomes - use more than 85% available freshwater resources in the region (<https://bit.ly/3dnzmxQ>; <https://bit.ly/3sijWiQ>). Increased inter-sectoral competition, including for aquatic food systems, demands that agricultural water consumption, productivity and quality be addressed urgently. Land degradation and salinization from poor water and soil management, compounded by erosion and overgrazing, amplify these challenges. The conditions lead to critical loss of CWANA's biodiversity across ecological zones.

Dependence on imports of cereals and exports of cash crops escalates concern about virtual water trade and water security. COVID-19 spotlights trade uncertainties and the need to ensure food and nutrition security, market access, and value addition. Producers, SMEs (small and medium enterprises) and value chain actors struggle to access resources to manage risks and are not adequately supported by policies and institutions.

Science and co-designed innovation bundles are required to address interconnected challenges and support evidence-based, inclusive decision-making to accelerate system resilience.

**Objective**

F2R-CWANA will co-develop, scale and implement solutions that reduce fragility and accelerate resilience to drought and climate variability across CWANA's agrifood systems, from farm to regional level. We build on strengths of existing innovation platforms, linking focus and geographies, and integrate solutions. By 2024, hundreds of thousands of stakeholders will adopt innovations that enhance production and marketing of staple and locally-important nutritious foods while restoring water resources, soil health and agrobiodiversity. From farm-to-fork, the Initiative promotes gender- and socially-inclusive governance and decision-making for common benefits and opportunities across value-chains, responding to market-demand and generating enhanced value-addition. This will improve livelihood security, raise incomes, reduce poverty among tens of thousands of value-chain actors, particularly women, youth, migrant/displaced and conflict-affected groups. F2R-CWANA will build integrated capacity at multiple scales to mitigate drivers of fragility and conflict particular to CWANA (climate, environment, social and economic), which propagate inequality, insecurity, and threaten systems resilience. At multiple levels, we will support broad stakeholder collaboration across value-chains and sectors to effectively manage risks and tradeoffs, improve policy and operational coherence, and build synergies.

In proposed countries, transition to more coherent policies promoting joint benefits across water management, energy, food production and growth will be supported. Knowledge, data exchange, engagement of partners in neighboring countries will enhance collaboration, accelerating environmental, social and economic resilience and empowering diverse populations facing physical and social risks unique to the region. We will first target low-intensity situations and intend to expand our remit into active conflict contexts (e.g. Iraq, Syria, Yemen).

**Theory of Change**

F2R-CWANA will transform fragile contexts and accelerate resilience to drought and climate variability among communities, businesses and countries in the region, thereby increasing livelihood security, promoting inclusion and cohesion, and reducing poverty. F2R-CWANA will intervene at strategic entry points from farm-to-fork, at basin, national and regional levels, in partnership with producers, agribusinesses, support services, investors, national agricultural research systems and decision-makers. To strengthen rainfed (WP1) and irrigated (WP2) agrifood systems, CGIAR, partners and target communities will co-create innovation bundles that incorporate technologies, capacities and incentives for inclusive, sustainable value chains and investments that are resilient to climate variations, and compounding economic, social, conflict and environmental risks that make CWANA especially fragile.

Across scales and sectors, F2R-CWANA will promote collaborative governance, evidence-based decision-making and inclusive investment (WP3) through policies and data platforms that de-risk and promote alignment, scaling and impact of WPs 1 and 2.

F2R-CWANA will support smallholders and other value chain actors to adopt innovations that increase productivity, and food and nutrition security under water-scarce conditions while generating incomes, promoting livelihood security and restoring freshwater resources, soils and agro-biodiversity. Data and knowledge exchange across sectors and geographies will accelerate scaling of integrated solutions to maximize resilience through synergies between water, energy, food and economic systems. CWANA's development challenges span from "stable" to "active conflict" situations. We will focus on a selection of countries representative of this context, where CGIAR is positioned to build on partnerships and local development priorities, thus validating and demonstrating impact pathways for additional countries.

## From Fragility to Resilience in Central and West Asia and North Africa (F2R-CWANA): Transforming responses to drought and climate variability

### Highlights

De-risk and diversify for security and growth: Champion integrated responses to risk across scales and value chains through scientific research, digitalization, cooperation and knowledge exchange on sustainable intensification, diversification and agro-ecology for enhanced income, land and water productivity, and nutritious diets, in turn strengthening governance across sectors and reducing fragility/conflict.

Advance a socially transformative agenda: Empower vulnerable populations - including women, youth, migrants/displaced and conflict-affected communities - across all work packages, activities and sectors, through collaborative solution-building, governance and investment, and by improving equitable access to resources, services and markets to promote sustainable green growth and resilience across scales.

Enhance production and employment under water scarcity: Co-deliver innovation packages adapted to context and enabling conditions, and build coalitions between key value chain actors to manage drought and create jobs with mechanized systems that can produce more staple and locally nutritious food, including plant and animal protein, utilizing dryland agrobiodiversity.

Provide enabling environments for sustainable water (re)use and circular economy: Co-develop inclusive policies, incentives and opportunities for actors within value chains to invest in and benefit from socio-technical innovation bundles that promote water productivity and use of non-conventional water sources, renewable energy and agro-ecological principles, simultaneously supporting integrated source-to-sea management.

Harness the energy of the private sector: Help investors reduce the risk of investment and promote business incubation networks that leverage and scale innovations for more inclusive and competitive value chains with a focus on small agribusinesses, smallholders, women, youth and other vulnerable groups.

### Work Packages

	Scope of Work	3-year Outcomes
Next Generation Rainfed Agrifood Systems: Socio-technical innovation bundling to support climate adaptation and value addition	Co-designing innovation bundles for investment and climate/water-smart value chains of staples (wheat), animal protein and nutritious crops under low and variable rainfall through: (1) efficient seed systems; (2) utilizing native dryland agrobiodiversity; (3) climate-smart agricultural practices for sustainable intensification; (4) digital information dissemination; (5) capacity for value addition and inclusion.	At least 100,000 smallholders, agribusinesses, and value chain actors, with focus on vulnerable groups (youth, migrants, conflict-affected), including 30% women, use innovations that increase productivity by 5-20% and maintain agrobiodiversity under limited and variable rainfall while generating market access and more stable incomes, and enhancing carbon sequestration.
Next Generation Irrigated Agrifood Systems: Socio-technical innovation bundling for non-conventional water and energy use	Co-designing innovation bundles for investment and sustainable provision of locally-important nutritious foods including fish, through: (1) water- and energy-efficient practices; (2) circular economy including use of non-conventional water; (3) digital innovation for precision agriculture and improved multi-scale management and productivity; (4) genetic innovations; (5) capacity for value addition and inclusion.	At least 100,000 smallholders, agribusinesses, and value chain actors, with focus on vulnerable groups (youth, migrants, conflict-affected), including 30% women, use innovations that help them better manage drought across irrigated systems to enhance land and water productivity by 5-20%, and market and employment opportunities, while restoring freshwater resources and agro-biodiversity.
Nexus for growth, inclusion and security: Strengthening governance and policy coherence to drive synergies and impact - and to mitigate conflict and fragility	Strengthening multi-level, cross-sectoral, collaborative governance systems through: (1) evidence-based inclusive policy and incentives; (2) co-designed decision-support tools for impact including water and food/nutrition management platforms; (3) multi-actor and sector partnerships and services, including SMEs, for maximized synergies and trade-off management, empowering populations confronted by interconnected risks, including fragility and conflict.	Stakeholders in four countries ranging from "stable" and fragile contexts, collaborate across sectors and geographies, and lead a transition to more coherent policies, governance and data platforms, promoting synergies between water management, energy, food production and economic growth at watershed and country levels to drive impact at scale.



### From Fragility to Resilience in Central and West Asia and North Africa (F2R-CWANA): Transforming responses to drought and climate variability

#### Impact Area Contributions

<b>Nutrition, health &amp; food security</b>	Adoption of innovations that increase food production stability and enable access to affordable safe and nutritious foods for millions of households and consumers in the CWANA region including contextually relevant protein and nutritious food such as legumes, cereals, vegetables, animal protein and fruit/nuts from across CWANA's agricultural production systems.
<b>Poverty reduction, livelihoods &amp; jobs</b>	By 2030, value chains will be more inclusive, benefiting millions of people across a broad representation of the population, both in "stable" and fragile situations. Innovations intended to enhance profitability and incomes will assist hundreds of thousands to exit poverty - with particular focus on women, youth migrant/displaced and conflict-affected groups.
<b>Gender equality, youth &amp; social inclusion</b>	In "stable" and fragile situations, contribute to empowerment of hundreds of thousands of women, youth, migrant/displaced and conflict-affected groups by strengthening their role in decision-making and enhancing their economic opportunities through more equitable access to financing, inputs, services, markets and jobs.
<b>Climate adaptation &amp; greenhouse gas reduction</b>	Millions of value chain actors benefitting from climate-adapted innovations making their livelihoods more resilient to drought and climate variability. Innovations include climate-smart varieties and practices, use of non-conventional water resources and renewable energy. A mitigation co-benefit will contribute to a reduction of CO2-eq emissions by 20% across the value chains.
<b>Environmental health &amp; biodiversity</b>	Contribute to improved management of hundreds of thousands of hectares of degraded land in CWANA. Consumptive water use in food production will be reduced through enhanced efficiency and (re)use of non-conventional water resources. Contribute to preservation of dryland agrobiodiversity and availability of plant genetic accessions.

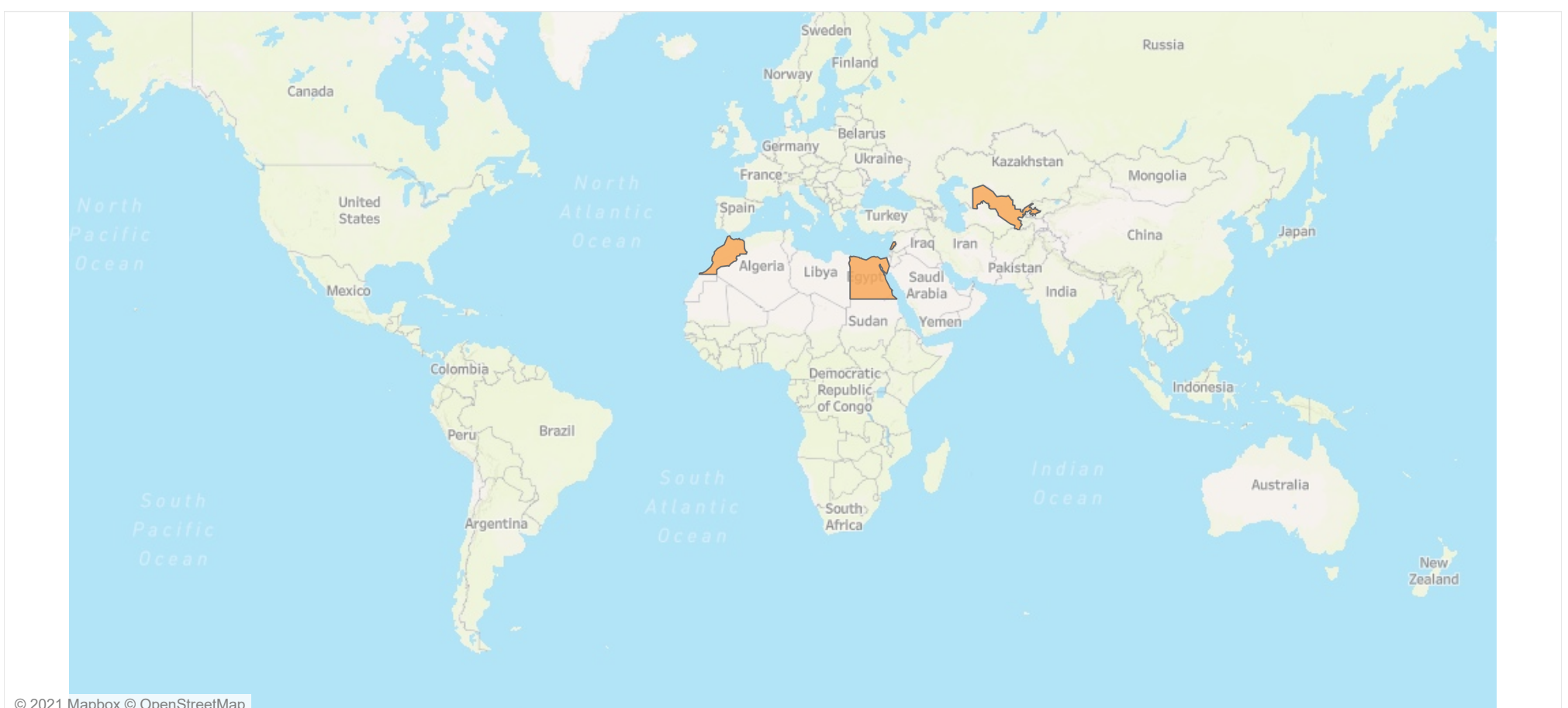
#### Impact on SDGs



#### Regions

Central and West Asia and North Africa (CWANA)

#### Countries



**From Fragility to Resilience in Central and West Asia and North Africa (F2R-CWANA):  
Transforming responses to drought and climate variability**

**Innovations**

Accelerating resilience in rainfed agrifood systems - scale out drought and temperature tolerant crop varieties, agronomic practices building on agroecological principles to support pollinators and soil/water management, supported by digital climate information services, policies and outreach for enhanced drought management to address drivers of fragility and displacement, particularly for agro-pastoralists.

Accelerating resilience in irrigated agrifood systems - produce contextually relevant, highly nutritious and equitably accessible food using less water, protecting resources, and mitigating competition and conflict, through integrating drought tolerant cropping systems with irrigation systems using recycled resources, low or green energy, aqua/hydroponics, agrivoltaics and digital services.

Accelerating resilience through integrated policy and governance - building from government commitments to greening and from foresight insight, support multi-ministerial, cross-sectoral planning and monitoring across food, land and water systems to manage tradeoffs and increase sustainability, including actions to de-risk drought impacts, support inclusion and cohesion, and reduce fragility and conflict.

Accelerating resilience through scaling/investment/employment - multi-actor engagement and strengthening of the financial ecosystem to provide incentives to entrepreneurs, development agents and other stakeholders across the farm-to-fork spectrum to invest in socio-technical innovations to support drought resilience in "stable" and also fragile and conflict-affected situations, while also tackling poverty.

Accelerating resilience through food/nutrition management platforms - linking across food value chains to connect locations of production to those of demand, bring markets closer to consumers to reduce waste, support nutritious local food consumption, bring stability to farmers and fishers, reduce carbon and water footprint, and tackle drought and fragility.

**Key Partners**

<b>Demand</b>	Government	Ministries of Agriculture, Water, Environment, Economy, Finance and Trade of Morocco, Egypt, Lebanon and Uzbekistan at the national and local levels
	Multilateral	Bilateral and multilateral agencies (e.g., United Nations (UN) programme agencies, regional development banks and funds, regional development cooperation organizations, regional commissions, bilateral donors)
	Partner Country based NGO	Agriculture cooperatives and councils, water user associations, consumer associations
	Private Sector	Impact investors, trade associations, transnational corporations in the food and beverage industry, organizations promoting environmental and social governance (ESG) standards
	Private Sector in Aid Recipient Country	Chambers of Commerce, members of the food and beverage industry, and organizations that support private sector incubation
<b>Innovation</b>	Academic, Training and Research	Innovation centers of international and local universities that link research to application in food, land, energy and water sectors
	Government	National Agricultural Research Systems (NARS), Academies of Science and Innovation Centers
	Partner Country based NGO	Farmer and consumer associations
	Private Sector in Aid Recipient Country	Water, energy and agricultural data and technology companies developing innovations
	Public Private Partnership	Innovation programmes supporting youth and women entrepreneurs, and SMEs
<b>Scaling</b>	Government	Extension services and policy development with Ministries of Energy, Water and Agriculture Policy development with Ministries Transportation, Labour, Trade and Finance Innovation centers
	Multilateral	UN programme agencies, regional development cooperation organizations, regional development banks and funds- which are supporting entrepreneurship, micro-financing, SMEs, financing schemes focusing on women, youth, fragile/at-risk communities, including migrants and displaced persons, to support innovation and funding
	Partner Country based NGO	Civil society organizations advocating for needs of youth, women, displaced persons and other vulnerable groups; agriculture councils
	Private Sector	Food and beverage processing, retail and trading industry; digital service providers/ information and communications technology (ICT); Chambers of Commerce
	Public Private Partnership	Regional Innovation Hub for Middle East and North Africa, and Central Asia that support scaling of existing innovations through technical assistance and grants and end-users and access to finance National programs supporting Public-Private-Partnerships (Countries or European Union (EU))



# From Fragility to Resilience in Central and West Asia and North Africa (F2R-CWANA): Theory of change

## Challenge

- **Drought and climate variability** exacerbate challenges in the world's most water-stressed and socially-fragile region, where conflict and migration are common development challenges
- **Migration flows are among the world's largest** and increasing "feminization of agriculture" reveals inclusion and equity challenges
- **Increased inter-sectoral competition** for water resources demands that agricultural water consumption, productivity and quality be addressed urgently
- **Land degradation, salinity and biodiversity loss** further amplify the challenges
- **Dependence on cereal imports** highlights the need to ensure food and nutrition security, while exports escalate concern about the virtual water trade balance
- **Producers, SMEs, and value chain actors** struggle to access resources to manage risks and are not adequately supported by policies and institutions

## Demand partners

- Governments
- Producers and food industry
- Consumer associations
- Cooperatives and councils
- Impact investors, trade associations
- Bilateral and multilateral agencies

## Work Packages

### Innovation partners

- **Next Generation Rainfed Agrifood Systems:** Socio-technical innovation bundling to support climate adaptation and value addition
- **Next Generation Irrigated Agrifood Systems:** Socio-technical innovation bundling for non-conventional water and energy use
- **Nexus for growth, inclusion and security:** Strengthening governance and policy coherence to drive synergies and impact, and to mitigate conflict and fragility

### Innovation partners

- NARS
- Innovation programs for youth/women entrepreneurs
- Farmer/consumer associations
- Data/tech companies
- University innovation centers

## Outputs

- **Co-designed innovation bundles for investment and climate/water-smart value chains under low and variable rainfall** through seed systems, agrobiodiversity, climate-smart agriculture, digital information, capacity for value addition and inclusion
- **Co-designed innovation bundles for investment and sustainable provision of nutritious foods** through water/energy efficiency, circular economy and use of non-conventional water, digital innovation and improved multi-scale management and productivity, genetic innovations, capacity for value addition and inclusion
- **Multi-level, cross-sectoral tradeoff and synergy management** through evidence-based policy advice, co-designed decision-support tools, multi-actor and sector partnerships and services – for stable and fragile contexts

## Scaling partners

- Governments (extension and policy)
- Innovation hubs and PPPs
- Civil society actors
- Regional and multilateral banks/agencies
- Food, retail and trading industry
- Digital service providers

## Outcomes

- Smallholders and other value chain actors **use innovations that increase productivity and maintain agrobiodiversity under limited and variable rainfall** while generating market access and stable incomes, and enhancing carbon sequestration
- Smallholders and other value chain actors **use innovations that help them better manage drought across irrigated systems** to enhance land and water productivity and market and employment opportunities, while restoring freshwater resources and agro-biodiversity
- In stable to fragile contexts, stakeholders **collaborate across sectors and lead a transition to more coherent policies, governance, and data platforms** promoting synergies between water, energy, food and economic growth to drive impact at scale

## Demand partners

- Governments
- Producers and food industry
- Consumer associations
- Cooperatives and councils
- Impact investors, trade associations
- Bilateral and multilateral agencies

## Impact areas

- Nutrition, health and food security:** improved access to affordable and nutritious food
- Poverty reduction, livelihoods and jobs:** more inclusive value chains, enhanced profitability and incomes
- Gender equality, youth and social inclusion:** empowerment of women, youth and vulnerable groups
- Climate adaptation and mitigation:** livelihoods more resilient to drought and climate variability
- Environmental health and biodiversity:** restoration of degraded land and reduced consumptive water use



sphere of control

sphere of influence

sphere of interest

Collaborate with the following thematic initiatives (and others as relevant), leveraging relevant innovation and partnerships, for impact in CWANA:

<i>NEXUS Gains</i>	<i>ASPIRE</i>	<i>Foresight</i>
<i>ClimBeR</i>	<i>Sustainable Intensification of</i>	<i>Accelerated Breeding</i>
<i>Transformational agroecology</i>	<i>Mixed Farming Systems</i>	<i>Rethinking Food Markets and</i>
<i>National policies and strategies</i>	<i>Excellence in Agronomy</i>	<i>Value Chains</i>
<i>HER+</i>	<i>Enabling traits, tools and</i>	<i>Nature-positive solutions</i>
<i>Harnessing digital technologies</i>	<i>technology services</i>	







## Harnessing Digital Technologies for Timely Decision-Making across Food, Land, and Water Systems

### Initiative Lead and Co-Lead

Jawoo Koo  
Carolyn Florey

### Primary CGIAR Action Area

Systems Transformation

### Estimated 2022 - 2024 Budget

\$30 - \$30 M

### Challenge

Our food system is unsustainable. Threatened by climate change, biodiversity loss and persisting inequalities, urgent actions are required to transform food-land-water systems. The COVID-19 pandemic has demonstrated the importance of digital infrastructure and skills for resilient food systems [<http://bit.ly/gfpr2021>]. This Initiative addresses three information-related challenges in the food-land-water systems using digital technologies. First, small-scale producers in the Global South are underserved by appropriate digital technologies. Less than 40% of small farms are covered by 3/4G mobile coverage [<https://bit.ly/3gfHFxA>], and only 13% of them in sub-Saharan Africa have ever accessed a digital service [<https://bit.ly/3spUms7>]. Enabling policies and investments are urgently needed, yet policymakers and investors do not always agree on priorities. Research is needed to assess the intersectoral values and develop business cases of investing in digital infrastructure, innovation ecosystems, and their catalytic impact for sustainable development. Second, food-land-water systems stakeholders lack timely and equitable access to data and information for identifying risks and manage them to promote resilient food systems and governance. More than 300 million small-scale producers do not have access to digital climate advisory services [<https://bit.ly/3azwv3p>]. Unmanaged risks hinder producers' adoption of technologies. Existing information may not be enough to manage emerging food systems risks from climate, pests, and markets [<https://bit.ly/3sUYhh3>]. Promising pilots exist, yet research is needed to benchmark solutions and develop strategies to localize and scale inclusively. Third, extension and digital advisory services need the technical capacity to utilize data and interpret research findings to synthesize actionable information. Existing knowledge is often outdated and difficult to apply in practice. The levels of digital literacy and skills across the Global South remain low [<https://bit.ly/3t0j9Do>], and technology access is gender-divided [<https://bit.ly/2OUiJk9>]. Research and capacity-strengthening support are needed to tailor advisory content and serve food-land-water systems stakeholders inclusively for their informed, effective risk management decisions.

### Objective

This Initiative aims to support inclusive agricultural transformation and sustainable food-land-water management by improving information systems and strengthening digital innovation ecosystems. Target areas will be selected where capacity and demand for digital innovations coincide with food-land-water system challenges. Target stakeholders include producers, digital extension, agribusiness, environment and conservation organizations, investors, and policymakers. In year 1, multi-stakeholder engagement and analyses on the digital technology landscape, information demand, prototype designing and evaluation, and gender inclusion will be undertaken in target areas. Initial use-cases will support local government agencies, crop and livestock insurance providers, and digital extension services to leverage cross-sectoral real-time data, ensuring gender inclusion and empowerment. In year 2, food-land-water system monitoring and modeling services will be co-developed in target areas and deployed to generate timely, actionable information for managing risks and natural resources. Architecture and policies for ensuring the inclusive collection and responsible management of data will be established. In year 3, information services will be jointly operated with local partners, with associated capacity strengthening programs on its use and maintenance. New information will be used as a basis for policies, business decisions, and advisory content. Stakeholders' technical capacity and digital literacy will strengthen, connected with regional and global innovators. Scaling partners will synthesize actionable information from research findings, supported by CGIAR scientists and automation tools. Leveraging economies of scale, their content will potentially reach ten times more gender-balanced stakeholders and nudge them to adopt sustainable and climate-smart practices, verifiable using the Geospatial Impact Evaluation approach [<https://bit.ly/2ZOPLq>]. At least ten datasets, services, and knowledge products will be publicly released annually.

### Theory of Change

This Initiative aims to contribute to accelerating the inclusive agricultural transformation and sustainable natural resource management by addressing systemic constraints in information flows across food-land-water systems. This Initiative will strengthen information systems and digital innovation ecosystems in target areas. Policymakers will be supported to enhance the efficiency of food-land-water systems by assessing trade-offs of investment and management options. Food systems stakeholders benefit from the localized food-land-water monitoring and modeling systems to detect risks early and adapt their businesses. Digital extension services will be strengthened to synthesize actionable advisory content and disseminate it equitably. Small-scale producers will receive tailored, timely information to inform day-to-day decision-making, manage climate and market risks, and contribute to the sustainability of society, environment, and biodiversity. Research-for-development communities will gain real-time insights on food-land-water systems dynamics, identifying opportunities for improvement. The latest technologies in artificial intelligence, remote sensing, and system dynamics modeling will be mobilized, aided by CGIAR's expertise in research, capacity building, inclusive user-centered design, and network of South-South public-private digital innovators. CGIAR will engage with more last-mile service delivery partners, who will benefit from high-quality research and the latest digital technologies while enabling CGIAR to amplify impact. CGIAR will safeguard stakeholder data privacy. Co-developed innovations will be institutionalized in in-country partner agencies for long-term sustainability and impact. Strengthened digital innovation ecosystems will contribute to spurring more innovations by local stakeholders, raising digital skills, exploring novel technologies for solving complex problems in food-land-water systems, and developing new business opportunities. These outcomes will collectively contribute to the digital transformation of food-land-water systems, where timely, actionable information is openly available to all stakeholders. In-region activities will coordinate with the Regionally Integrated Initiatives of "Securing the Asian Mega-Deltas against Sea-level Rise, Flooding, Salinization and Water Insecurity," "Transforming Agri-Food Systems in South Asia (TAFSSA)," "Ukama Ustawi (U2) Water Secure and Climate Resilient Agricultural Livelihoods in East and Southern Africa," "From Fragility to Resilience in Central and West Asia and North Africa (F2R-CWANA) : Transforming responses to drought and climate variability," "Resilient and Sustainable LAC Agri-food Systems: Driving Global Food Security, Inclusive Growth, and Reduced Out-migration," and "Market-driven, Resilient and Nutritious Agri-food Systems in the Humid zones of West and Central Africa (WCA)" to identify their existing digital technology capabilities in the region, leverage public-private partnerships, and co-design effective solutions to region-specific food-land-water systems challenges. This Initiative will also coordinate digital technology-related components of the Thematic Initiatives of "ClimBeR: Building Systemic Resilience against Climate Variability and Extremes," "Excellence in Agronomy – Solutions for Agricultural Transformation (EiA)," "NEXUS Gains: Realizing Multiple Benefits Across Water-Energy-Food-Forest-Biodiversity Systems," "National Policies and Strategies for Food, Land and Water Systems Transformation," "Foresight and Metrics to Accelerate Inclusive and Sustainable Agri-Food System Transformation," "HER+: Harnessing equality for resilience in the agri-food system," "Market Intelligence for More Equitable and Impactful Genetic Innovation," "Rethinking Food Markets and Value Chains for Inclusion and Sustainability," "ASPIRE – Building Integrated Agri-Silvo-Pastoral Food Systems Resilient to Climate Change and Other Crises," and "SeEdQUAL Delivering Genetic Gains in Farmers' Fields." Specifically, the modeling analyses' underlying data, scenarios, and assumptions will be compatible with the "Foresight and metrics to accelerate inclusive and sustainable agri-food system transformation" Initiative when the extents of spatial and temporal scales overlap.

## Harnessing Digital Technologies for Timely Decision-Making across Food, Land, and Water Systems

### Highlights

The Global South is poised to harness digital technologies to help achieve sustainable and inclusive development. This Initiative will facilitate a South-South digital innovation network by convening local innovators, CGIAR, regional food and agriculture Innovation Hubs, and global communities of practice with public-private partners to exchange knowledge and build capacity for information systems, governance, architecture, and interoperability.

Managing risks in food-land-water systems can be cost-effective using digital technologies, but this potential is unrealized in much of the Global South. This Initiative will strengthen the capability and utility of local information systems for stakeholders in target areas to early-detect food system risks and better manage them to promote the adoption of climate-smart practices and aim for a circular economy.

Concerns about the digital divide exist in food systems, between urban and rural, large and small enterprises, and male and female actors. The new Digital Inclusion and Empowerment Index in Food Systems will provide guiding principles, evaluative criteria, and case studies for digital farming service providers in both public and private sectors to adopt and promote inclusive and equitable food system outcomes.

Ground-truth data ensures the quality and relevance of machine learning-aided insights. Existing datasets fail to capture emerging risks of food-land-water systems under changing climate and landscapes. This Initiative will identify critical data gaps in target areas and equip collaborative networks to collect, share, and analyze data, maximizing efficiencies through improved interoperability and sampling frames.

Food producers need support to use the information to make informed decisions. This Initiative will strengthen digital farming services by connecting them with CGIAR scientists (or retirees [<https://bit.ly/3t1gUjc>]) and other experts to share knowledge and interpret research findings, user-centered designers to synthesize content, and communication channels (both digital and trusted agents) to ensure equitable dissemination and voice feedback.

### Work Packages

	Scope of Work	3-year Outcomes
Digital Innovation and Policy	Conducting participatory, user-centered analyses on the technology landscape, benchmarking of existing solutions, and priority-setting of policies and investment options to support policymakers and stakeholders to develop digital strategies to empower innovation ecosystems and accelerate inclusive transformation. Strategies will reflect multi-stakeholder development priorities and the local political economy. The Initiative will accompany strategy implementation and support evaluating impacts.	Policymakers governing target areas make inclusive policy and investments to support digital ecosystems, based on the Initiative-supported assessment showing the food systems-wide benefits of digital infrastructure and information systems. Small-scale producers will benefit from localized digital advisory services that meet their specific needs. Agribusinesses will benefit from new capabilities and market opportunities from digital innovations.
Digital Inclusion and Empowerment	Developing a suite of tools, guidelines, and indices to track digital inclusion and intersectional inequalities and present options for changes in the empowerment of women and other target groups to ensure that gender and intersectional inclusion underlie program development and implementation. The Index will be promoted to food systems stakeholders and other Initiatives to assess their digital inclusion outcomes and use them as adaptive management tools.	Digital innovators targeting food systems (e.g., digital extension, financing, and e-commerce providers) will design inclusive products, utilizing the Initiative-developed Digital Inclusion and Empowerment Index, and reach more users with customized services. Policymakers will assess the status of digital inclusion in the target area and strategize to address digital divides. Small-scale producers will benefit from tailored digital advisory services that meet their needs.
Food-Land-Water System Dynamics Modeling	Conducting simulation analysis of short-term food-land-water system dynamics in each target area, predicting changes in food production, land-use allocation, and water productivity, based on seasonal climate forecasts. Additional what-if scenarios of management and policy options will be simulated to assess their trade-offs that affect the market, livelihoods, sustainability, biodiversity, risk, and inclusion outcomes.	Partner agencies will institutionalize the co-developed modeling system and strengthen their analytical capacity to support food systems decision-makers to assess impacts and trade-offs from what-if scenarios concerning changes in climate, policy, and market conditions and use the information to manage risks, develop strategies, and formulate policy for inclusive investments and innovations.
Real-time Monitoring of Food-Land-Water System Risks	Developing food-land-water systems monitoring and intelligence services in each target area to provide timely and reliable information to stakeholders, based on satellite remote sensing and ground-truth data from multiple sources. Types of data, information products, and delivery methods will be defined in consultation with demand partners. Tools and services to support ground-truth data collection, responsible management, and sharing will be developed.	Partner agencies will utilize the co-developed food-land-water monitoring system to early-detect emerging food-land-water system risks and generate timely, localized information products and release through digital channels. Government agencies will improve efficiency through the digitalized workflow. Policymakers will assess their decision impacts faster, enabling them to implement targeted policies that promote sustainable and inclusive outcomes.
Empowering Extension and Digital Advisory Services	Providing technical support for extension, digital farming, and value-chain service providers to interpret research findings and synthesize actionable advisory content. Scaling partners' capacities for data analysis, visualization, and storytelling will be strengthened. Information delivery will be improved to reach food system stakeholders in a targeted and equitable way through extension, CGIAR experts, social networks, and digital channels.	Extension and digital advisory services will provide more timely, locally relevant, and inclusively designed content to food-land-water systems stakeholders. Early warning of potential disruptions (e.g., drought and flood forecasts) and advisory content will help producers prepare and manage the risks, invest in adopting climate-smart practices, leading to more productive and profitable farming and sustainably managed natural resources.

## Harnessing Digital Technologies for Timely Decision-Making across Food, Land, and Water Systems

### Impact Area Contributions

<b>Nutrition, health &amp; food security</b>	Timely, high-frequency monitoring of food-land-water systems and socioeconomic indicators, combined with multi-purpose ground-truth data and actionable advisory information, will enable food systems stakeholders to early-detect risks, make targeted interventions, and monitor the effects in real-time to ensure the continued supply of nutritious food and safe water for WASH and One Health.
<b>Poverty reduction, livelihoods &amp; jobs</b>	Strengthened digital ecosystems with timely, reliable food-land-water systems information will allow food systems stakeholders to manage risks, optimize business decisions, create market opportunities, increase income and profitability, and improve livelihoods. Digital extension services will strengthen to provide targeted, inclusive advisory information and scale to reach ten times more subscribers, creating more youth employment opportunities.
<b>Gender equality, youth &amp; social inclusion</b>	The Digital Inclusion and Empowerment Index will support digital innovators to design accessible tools and inclusive services that promote gender equality and social inclusion across food-land-water systems. Availability of open access ground-truth data will support local technology education programs to develop their own machine learning applications. Digital tools empower marginalized groups to voice concerns and influence governance.
<b>Climate adaptation &amp; greenhouse gas reduction</b>	Food-land-water system stakeholders will access short-term (sub-seasonal-to-seasonal) climate forecasts to better manage the risks, adopt climate-smart technologies and management practices, and improve their climate adaptive capacity. Policymakers will use intersectoral data and food-land-water systems status indicators to negotiate global climate agreements on the adaptation and mitigation planning.
<b>Environmental health &amp; biodiversity</b>	Timely information on the state of food-land-water systems and embedded biodiversity will help stakeholders assess their environmental impacts, such as infrastructure development (natural and built) impacts on surface water availability and deforestation, accounting for environmental costs. Publicizing this information will incentivize food system actors to adopt practices promoting environmental health and biodiversity.

### Impact on SDGs



### Regions

Central and West Asia and North Africa (CWANA), East and Southern Africa (ESA), Latin America and the Caribbean (LAC), South Asia (SA), South East Asia and the Pacific (SEA), West and Central Africa (WCA)

### Countries





## Harnessing Digital Technologies for Timely Decision-Making across Food, Land, and Water Systems

### Innovations

Digital Inclusion and Empowerment Index in Food Systems for policymakers, public and private digital service providers, and natural resource managers in target areas to assess the digital inclusivity of their policy and services across food-land-water systems and help develop empowerment strategies grounded in equitable access to technology and use, social inclusion, and user-centered design for digital services.

Monitoring and Modeling of Food-Land-Water Systems that estimate the production of livestock and crops, including fruit and vegetables, in target areas, complemented with information on market, processing, and consumption collected from crowdsourcing, digital transactions, and environmental sensing, verified using ground-truth data. System dynamics modeling allows users to simulate what-if scenarios of policy and management options.

Multi-purpose Ground-truth Data Collection and Sharing System that enables timely analytics and validations, including best-practice guidelines for data collection, sampling frames, interoperable metadata standards, and example codebase for building local technical capacity on machine learning while protecting privacy using a self-sovereign identity solution implemented on a secure, centralized repository.

Digital Advisory Content System for public and private digital extension services to (semi)automatically produce advisory content, supported by CGIAR's expertise to interpret real-time data and research findings, applied to respond to emerging food systems risks. Digital tools enable translations to local languages and real-time communications with users. Capacities raised for inclusive product design, data storytelling, and targeted delivery.

Digital Agrifood Solutions Benchmark that annually evaluates the scalability, productivity, profitability, environmental sustainability, and gender inclusion of food-land-water system digital advisory services, prominent in target areas. The benchmarking framework will accommodate different types of services and business models. Seals of Excellence will be awarded to the highest-performing solutions within each category.

### Key Partners

<b>Demand</b>	Academic, Training and Research	National Agricultural Research and Extension System (NARES), The Regional Network of Agricultural Policy Research Institutes (ReNAPRI)
	Foundation	The Bill and Melinda Gates Foundation, Radiant Earth Foundation
	Government	United States Agency for International Development (USAID), The United Kingdom Foreign, Commonwealth and Development Office (FCDO), Swiss Agency for Development and Cooperation (SDC)
	Local Government	Ministries of Agriculture, Finance, Information and Communication Technology, and Planning
	Multilateral	The World Bank, Food and Agriculture Organization (FAO)
<b>Innovation</b>	Academic, Training and Research	Wageningen University and Research, University of Twente/ITC, University of Florida, University of Maryland, Stanford University, The College of William and Mary, Cornell University, University of California - Davis, International Institute for Applied Systems Analysis (IIASA), National Agricultural Research and Extension System (NARES), International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), International Centre of Insect Physiology and Ecology (ICIPE), Commonwealth Scientific and Industrial Research Organisation (CSIRO), Griffith University - Australian Rivers Institute
	Multilateral	UN Women, Food and Agriculture Organization (FAO), International Telecommunications Union (ITU), World Food Programme (WFP), International Fund for Agricultural Development (IFAD), The World Bank
	Other	GSM Association (GSMA), World Economic Forum, Ag Gateway, Digital Impact Alliance (DIAL), Global Forum for Rural Advisory Services (GFRAS), Digital Agriculture Knowledge Hub, Climate and food security early warning services
	Private Sector	Google X - The Moonshot Company, Open Farm and Field Data Exchange (ODX), The Syngenta Group, Facebook, 60 Decibel, aWhere, Hewlett Packard Enterprise, Planet, Esri
	Private Sector in Aid Recipient Country	Digital farming and advisory service providers, Digital finance service providers, Crop and livestock insurance providers
<b>Scaling</b>	Academic, Training and Research	National Agricultural Research and Extension System (NARES)
	International NGO	One Acre Fund, Digital Green, Mercy Corps/AgriFin, Farm Radio International, Grow Asia, Alliance for a Green Revolution in Africa (AGRA)
	Local Government	Ministries of Agriculture, Finance, Information and Communication Technology, and Planning
	Other	National and international food security and climate early warning service providers
	Private Sector in Aid Recipient Country	Digital farming and advisory service providers, Digital finance service providers, Crop and livestock insurance providers

# Harnessing Digital Technologies for Timely Decision-Making across Food, Land, and Water Systems | *Theory of Change*



- Implementation with Regional Initiatives:**
- Asian Mega-Deltas
  - South Asia (TAFSSA)
  - East and Southern Africa
  - LAC Agri-food systems
  - From Fragility to Resilience in CWANA
  - West and Central Africa (WCA)

## Challenge

## Demand partners

## Work Packages

## Innovation partners

## Outputs

## Scaling partners

## Outcomes

## Demand partners

## Impact areas

- **Small-scale producers** are underserved by appropriate, inclusive digital technologies. Enabling policies, investments, research, and advocacy are needed.
- **Food-land-water system stakeholders** lack timely & equitable access to data and actionable information for decision-making.
- **Extension and digital advisory services** lack sufficient capacity/skills for data analysis, interpretation, and timely delivery.
- **Lack of contextualized, user-centered, inclusive data collection and analysis** further exacerbates the digital, gender, and data divides.

- **PRIVATE**  
Digital Farming, Digital Finance
- **MULTILATERAL**  
WB, FAO
- **LOCAL GOV'T**  
Min. Ag, Finance, ICT
- **GOVERNMENT**  
USAID, FCDO, SDC
- **RESEARCH**  
NARES, ReNAPRI

- Digital Innovation & Policy**  
Digital strategy development for innovation ecosystems & inclusive transformation
- Digital Inclusion & Empowerment**  
Suite of tools, guidelines, & indices for digital and intersectional inclusion
- Food-Land-Water System Dynamics Modeling**  
Demand-led simulation, what-if scenario analyses
- Real-time Monitoring of Food-Land-Water System**  
Monitoring & intelligence services to provide timely, reliable, information
- Empowering Extension & Digital Advisory Services**  
Capacity building for data interpretation, visualization, & synthesis

- **PRIVATE**  
Google X, ODX, Syngenta, Facebook, 60 dB, aWhere, HPE
- **MULTILATERAL**  
WB, FAO, UN Women, ITU, WFP, IFAD
- **RESEARCH**  
WUR, ITC, WM, IIASA, CSIRO, NARES, ICRISAT
- **OTHER**  
GSMA, WEF, DIAL, GFRAS, AgGateway, Radiant Earth

- Digital Agrifood Solutions Benchmark** with evaluation of digital advisory services, incl. diversity of services and business models
- Digital Inclusion & Empowerment in Food Systems Index** to assess digital inclusivity in policy and services
- Monitoring & Modeling of Food-Land-Water Systems** that estimates production, integrated with variety of data sources for simulations.
- Ground-truth Data Collection and Sharing System** that enables timely analytics and validations
- Digital Advisory Content System** to rapidly synthesize advisory content to leverage existing CGIAR expertise

- **PRIVATE**  
Digital Farming, Digital Finance
- **NGO**  
One Acre Fund, Digital Green, Mercy Corps/AgriFin, Farm Radio Int'l, Grow Asia, AGRA, Local NGOs
- **OTHER**  
Climate, food security early warning services

- Inclusive policy & investments** for enabling digital innovation ecosystems
- Inclusive products and datasets** for accessible, equitable digital products and increased business opportunities
- Strengthened analytical capacity** of partners to assess impacts and trade-offs of investment options
- Timely, localized, publicly-available information** for targeted decision-making, early detection of risks, adoption of climate-smart practices
- Actionable advisory content** for productive, profitable farming & sustainably managed natural resources.

- **PRIVATE**  
Digital Farming, Digital Finance
- **MULTILATERAL**  
WB, FAO
- **LOCAL GOV'T**  
Min. Ag, Finance, ICT
- **GOVERNMENT**  
USAID, FCDO, SDC
- **RESEARCH**  
NARES, ReNAPRI

- NUTRITION, HEALTH, FOOD SECURITY** enhanced by timely, actionable information, risk mgt., ensured supply of nutritious food and safe water
- POVERTY REDUCTION, LIVELIHOODS, JOBS** improved by strengthened digital innovation ecosystems, new market opportunity, digital advisory services reaching 10X subscribers
- GENDER EQUALITY, YOUTH, SOCIAL INCLUSION** improved by accessible tools & inclusive services, STEM education, communication channels
- CLIMATE ADAPTATION, MITIGATION** increased by sub-seasonal climate forecasts, risk management, adopting climate-smart technologies, resilient food-land-water systems
- ENVIRONMENTAL HEALTH, BIODIVERSITY** improved by monitoring food-land-water systems, allowing to assess environmental impacts and costs of development



2022

2024

2030

sphere of control

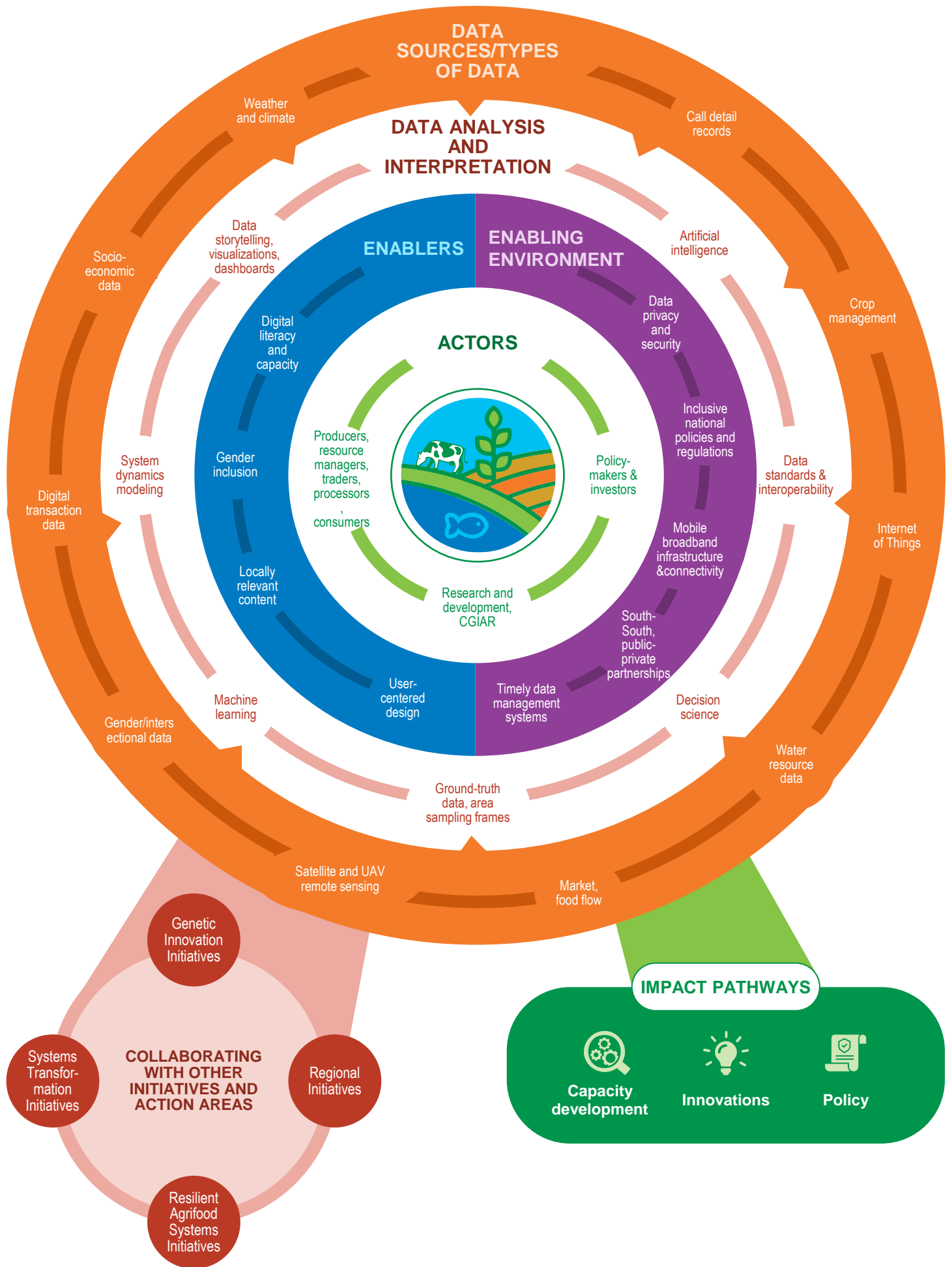
sphere of influence

sphere of interest

**In Collaboration with the following CGIAR Thematic Initiatives:**

- ClimBeR
- Excellence in Agronomy
- NEXUS Gains
- National Policies & Strategies
- Foresight & metrics
- HER+
- Market intelligence
- Rethinking Food Markets
- ASPIRE
- SeEdQUAL







## HER+: Harnessing equality for resilience in the agri-food system

### Initiative Lead and Co-Lead

Nicoline de Haan  
Daniel Gilligan

### Primary CGIAR Action Area

Systems Transformation

### Estimated 2022 - 2024 Budget

\$25 - \$30 M

### Challenge

Gender and social inequalities are deeply entrenched within our global AFS. Although women are critical agents in the AFS, comprising 43% of agricultural workers (<https://bittylink.com/egr>), the World Economic Forum estimates that it will take 135 years to close the gender gap (<https://bittylink.com/jkf>). The COVID-19 crisis has reversed gains in gender equality, while intensifying stresses of climate change disproportionately harm women (<https://bittylink.com/dfz>). For vulnerable and marginalized groups, social protection raises incomes but often lacks investments to strengthen linkages to the AFS. These structural forces disempower women and other social groups from accessing resources, technologies and services, and better and more supportive markets, policies, and governance institutions, and constrain their decision-making powers.

This is compounded by several challenges within AFS, where agricultural innovations are predominantly technical in form (<https://bittylink.com/juv>), mostly operationalized in isolation from other innovations or levers (<https://bittylink.com/asg>), and lack responsiveness to the needs of women and marginalized actors. Data structures informing policy are often gender-blind, resulting in large-scale investments that work for men and powerful actors (<https://bittylink.com/Ohb>). Digital innovations in food systems offer great potential, yet to date their pathways reflect and reinforce gender gaps (<https://bittylink.com/ad6>). Women's involvement in decent work, whereby they earn a stable, living wage and are free from harassment, is significantly constrained. And while promising, gender transformative strategies lack evidence on enabling women as innovators in production and in markets and lack focus to date on leveraging change beyond the household scale (<https://bittylink.com/kyf>).

### Objective

This Initiative aims to contribute to the CGIAR 2030 Research and Innovation Strategy through research that pinpoints effective strategies to achieve gender equality and social inclusion across the AFS. This requires interventions and outcomes that foster empowerment; lead to greater technology adoption and livelihood security by bundling socio-technical innovations; build resilience by leveraging large-scale social protection programs; and make governance and public investment inclusive, transparent and efficient. Its objective is to, with partners, support women, youth and marginalized groups to expand their voice and agency, acquire and control assets, adapt to climate change and shocks, and access better markets, financial and public services.

To achieve this objective, the Initiative will conduct research that identifies solutions and approaches to reduce barriers to gender and social equality in the AFS and measures their economic and social costs and benefits. The initiative will use mixed methods and causal impact evaluation, to provide evidence of cost-effective socio-technical innovations that overcome these barriers and prioritize agency, empowerment, resilience and improved governance for women, youth and marginalized groups.

The Initiative will work in countries in sub-Saharan Africa and South Asia where women, youth and marginalized groups are vulnerable to climate shocks as well as persistent poverty, inequality and social exclusion. The Initiative will collaborate with One CGIAR Initiatives for synergies, 'value for money,' and greater impact at scale. Ultimately, the Initiative's research will shape socio-technical innovations that contribute to increased gender equality and social inclusion, reaching at least 80 million people by 2030.

### Theory of Change

Much needed gender equality and social inclusion in agri-food systems (AFS) can only be achieved if the processes and improvements involved in AFS transformation are designed intentionally with women, youth, and marginalized groups at their center. This will empower people to become agents of change and reduce inefficiencies in agriculture.

This Initiative will bring intentionality to gender and social equality (GSE) in the AFS through impactful research that can be taken up and implemented by partners at scale. To do this, the Initiative will (1) co-develop (with NARES, private sector, development partners) a set of ambitious gender transformative approaches designed to work at multiple scales within AFS, (2) rigorously test bundles of socio-technical innovations to ensure relevance to demand partners, boosting CGIAR technology adoption by women, men and youth, (3) work with governments and development NGOs to test targeted social protection measures such as poverty graduation interventions alongside complementary investments to build resilience and reduce poverty, and (4) help Governments and communities strengthen gender and social equality in national and sub-national plans, policies, and community institutions designed to address climate change.

By 2030, the Initiative will have shaped, tested, and informed the selection of cost-effective mechanisms needed for achieving gender and social equality in the AFS. These will be scaled out by partners further down the R4D continuum to reach at least 80 million people, who will become agents of AFS transformation rather than passive end users, unlocking the multiple outcomes created by CGIAR socio-technical innovations.

The Initiative will collaborate closely with the following other Initiatives for synergies, 'value for money' and greater impact at scale: ClimBeR: Building Systemic Resilience against Climate Variability and Extremes; Resilient Cities through Sustainable Urban and Peri-urban Agrifood Systems; Harnessing digital technologies for timely decision-making across food, land, and water systems; Excellence in Agronomy; Protecting human health through a One Health approach; Rethinking food markets and value chains for inclusion and sustainability; Resilient Aquatic Foods for Healthy People and Planet; Plant Health and Rapid Response to protect Food and Livelihood Security; National Policies and Strategies for Food, Land and Water Systems Transformation; Food Systems Transformation for Sustainable Healthy Diets; Market Intelligence for More Equitable and Impactful Genetic Innovation; and SeEdQUAL delivering genetic gains in farmers' fields. This initiative will also work closely with the regional Initiatives as gender and social inclusion are very context specific.

## HER+: Harnessing equality for resilience in the agri-food system

### Highlights

**TRANSFORMATIVE change:** A research portfolio aimed at leading CGIAR in finding solutions for women, youth and marginalized groups to become equal partners, rather than passive end users, in the transformation toward healthier, more sustainable, more productive agri-food systems.

**CLIMATE CHANGE lens on solutions:** This Initiative will address climate change challenges compounding inequalities and exclusion by co-designing with women, youth and marginalized groups projects on voice, empowerment and governance opportunities to better manage water and natural resources, escape socio-ecological poverty traps and thrive despite climate change.

**A WHOLE-OF-SYSTEMS approach to gender equality and social inclusion:** This Initiative responds to complexity in the AFS by targeting, via its work packages, four interdependent levers-voice, empowerment, protection and governance-essential to enable women, youth and marginalized groups to benefit from CGIAR innovations and participate in AFS transformation.

**Rigorous evidence to inform SCALING:** Building on CGIAR's comparative advantage in research on gender (<https://bittylink.com/3qh>), social protection (<https://bittylink.com/yk1>) and governance (<https://bittylink.com/7gs>), this Initiative will co-design, test and rigorously evaluate relevant, context-specific strategies and innovations, with opportunities to collaborate with other CGIAR Initiatives and partners, to identify cost-effective approaches for scaling.

**Gender SYNERGIES:** This Initiative complements activities of the CGIAR GENDER Platform (<https://bittylink.com/qcs>). While the Platform focuses on synthesizing global gender research to deliver insights, identify and prioritize gaps, the Initiative focuses on producing strategic primary research, through designing and testing gender-transformative approaches, to improve effectiveness of scaling partners' interventions.

### Work Packages

	Scope of Work	3-year Outcomes
TRANSFORMATIONS for equity and empowerment	Leverage women's VOICE and AGENCY in AFS to identify entry points for greater gender equality; generate desired future scenarios with women, youth and marginalized groups for inclusive AFS trajectories; design and test gender transformative approaches at multiple scales to transform constraining norms and support women's agency as innovators in markets.	At least 10 national agencies, civil society networks, and other public and private actors have strengthened their planning, decision making, and investments by incorporating evidence-based practices, novel scenarios and bespoke gender transformative strategies to overcome structural barriers and enable women's voice and agency and greater social inclusion in AFS governance and markets.
Bundling innovations for EMPOWERMENT and accelerated impact	Operationalizing socio-technical innovations for EMPOWERMENT entails understanding why adoption of promising technologies is low. WP2 identifies which factors need to be considered to co-design and test context-specific bundles of social and technical innovations leading to equal uptake and benefits by women, men and youth in AFS.	At least 4 context-dependent, socio-technical innovation bundles designed and piloted with multiple stakeholders in Eastern Southern Africa and West Central Africa to achieve empowerment outcomes for women, youth and marginalized groups generate an evidence base for large-scale climate-resilient agricultural investments by CGIAR, other initiatives and development and scaling partners.
Leveraging social PROTECTION to build resilience and reduce inequality	Social PROTECTION is a powerful platform reaching billions of vulnerable people in rural areas. WP3 co-designs and tests strategies to leverage social protection and complementary interventions around agricultural livelihoods, human capital, psychosocial factors, and social change to inclusively address poverty and gender inequality, building resilience to climate change and other shocks.	At least 4 governments, UN agencies or non-government partners have modified designs of social protection and other poverty graduation programs to strengthen gender equity and social inclusion in nutrition, health, education, agricultural livelihoods, and psychosocial well-being.
Enabling inclusive GOVERNANCE	Inclusive GOVERNANCE and effective public service delivery better promote equity when the priorities of women, youth, and marginalized groups are heard and consulted. WP4 tests the effectiveness of different institutional arrangements, interventions, and policies in promoting inclusive and responsive governance and public investments, including those related to climate change and planetary health.	At least 3 governments in climate change-affected countries of sub-Saharan Africa and South Asia have increased the gender responsiveness of local or national-level plans and policies, including those related to climate action, to enable women and vulnerable groups to better influence policies and budgets, and ensure investments and services benefit them.

## HER+: Harnessing equality for resilience in the agri-food system

### Impact Area Contributions

<b>Nutrition, health &amp; food security</b>	Agri-food systems retrofitted for greater gender equality and social inclusion are expected to result in an improved ability of the AFS to provide healthy, nutrient-rich food (and enough of it) to meet the growing nutrition, health and food security demands of millions of men, women and children.
<b>Poverty reduction, livelihoods &amp; jobs</b>	Poverty graduation programs, women's entrepreneurship development in the agri-food systems and application of gender-responsive packages of technical and institutional innovations to enhance and stabilize productivity will contribute to creating new jobs, developing resilient livelihood portfolios and expanding economic opportunities for women and men in food systems.
<b>Gender equality, youth &amp; social inclusion</b>	Women, youth and other groups become proactive agents of agri-food systems transformation, benefiting from enhanced agency in policy dialogues, greater participation in the co-design of innovations and programs, and a better ability to demand, access and control use of services and technologies.
<b>Climate adaptation &amp; greenhouse gas reduction</b>	Enhanced agency and reduction of structural barriers enable women, youth and other vulnerable groups to participate more actively in, and influence, policy making processes, including on national climate adaptation plans (NAPs), the Global Stock Take for the next generation of Nationally Determined Contributions (NDCs), and National Biodiversity Strategies and Action Plans (NBSAPs).
<b>Environmental health &amp; biodiversity</b>	Implementation of tried-and-tested socio-technical innovation bundles, which include digital support, enhanced decision-making, participatory development, and application of context-specific strategies, is expected to have a positive impact on the status and management of natural resources (water, soil, nutrients and biodiversity) in target sites.

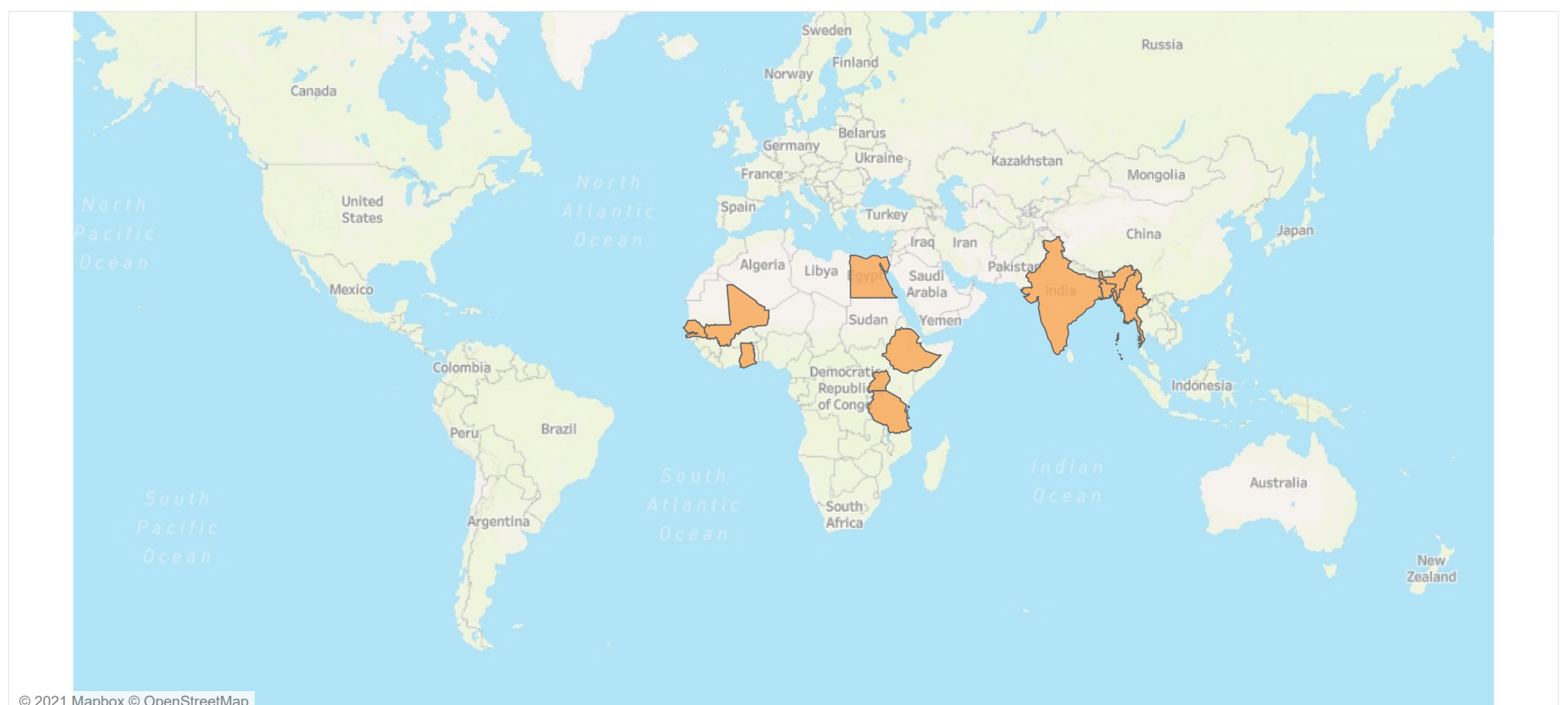
### Impact on SDGs



### Regions

Global Central and West Asia and North Africa (CWANA), East and Southern Africa (ESA), South Asia (SA), South East Asia and the Pacific (SEA), West and Central Africa (WCA)

### Countries





## HER+: Harnessing equality for resilience in the agri-food system

### Innovations

Gender transformative approaches databases that tackle constraining norms and power relations causing gender and other social inequalities at multiple scales. For use by government, non-governmental organizations, and private sector actors who aim to increase the voice and agency of women and socially excluded groups in pursuit of developing an inclusive AFS.

Decision support tool that outlines the necessary steps and processes to take when identifying the factors that limit empowerment and adoption of promising technologies when bundling socio-technical innovations. For use by other One CGIAR Initiatives and partners to increase uptake of and associated gender equality and empowerment outcomes from their core technologies.

Poverty graduation model interventions, combining social protection with interventions like poultry kits and training for women, men's engagement to support domestic work, and mental health support, designed to accelerate exiting poverty and empowerment for women and socially excluded groups in poor, fragile and climate change-affected areas in sub-Saharan Africa and South Asia.

A set of recommended institutional arrangements (national-level plans, transparent gender responsive governance tracking tools, guidelines for governance of natural resources, tools for engaging women in the policy process, effective service delivery modalities, etc) to make the enabling environment around agri-food systems transformation and climate resilience more gender-equitable and socially inclusive.

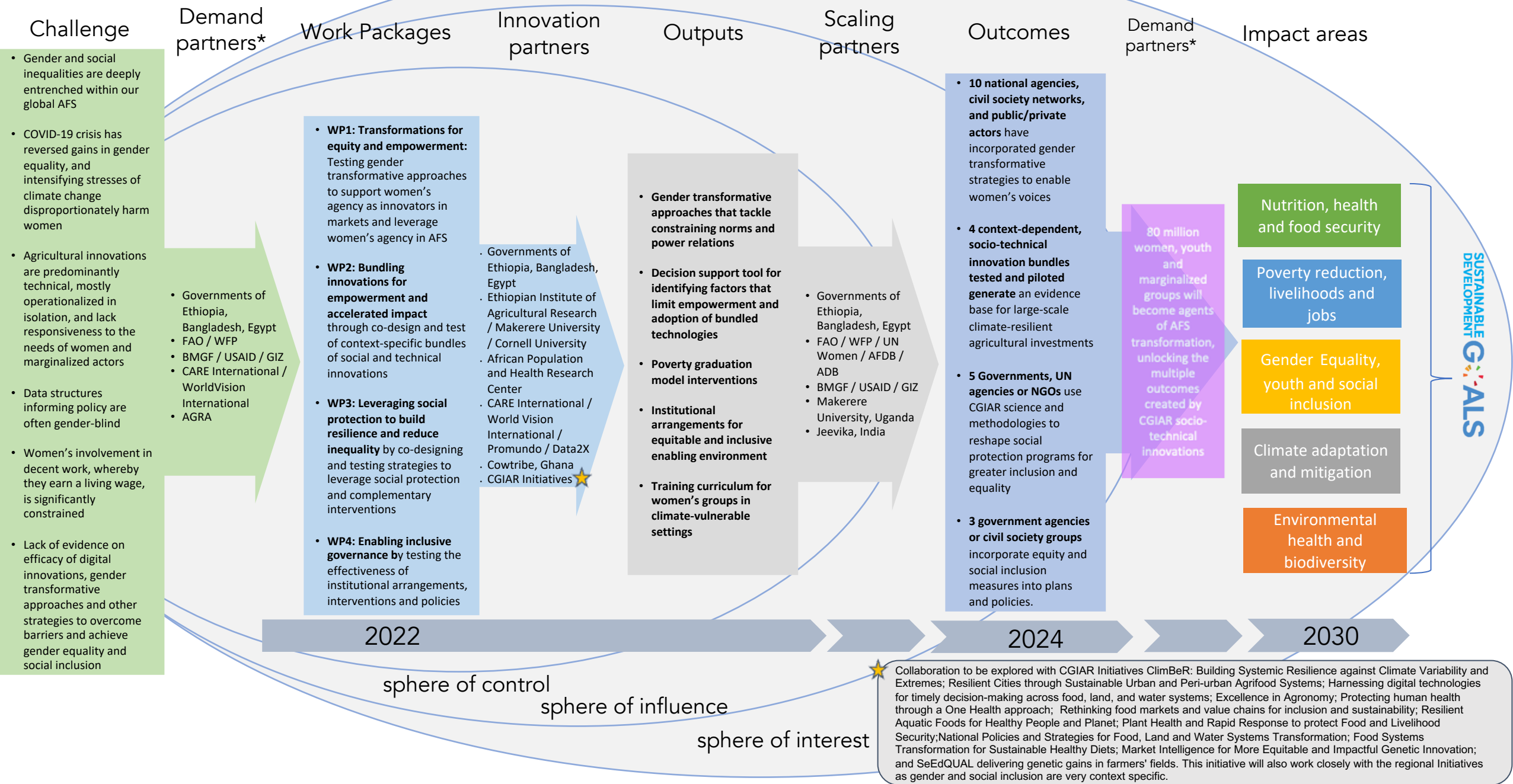
A training curriculum available for women's groups in climate-vulnerable settings to increase their understanding of public sector responsibilities and potential toeholds to influence government, and to build their capacity and sense of collective agency to bring about improved AFS policies and public services.

### Key Partners

<b>Demand</b>	Government	Government of Ethiopia / Government of Bangladesh / Government of Egypt
	International NGO	CARE International / WorldVision International
	Multilateral	Food and Agriculture Organization / World Food Program
	Other	Bill and Melinda Gates Foundation / USAID GIZ
	Regional NGO	Alliance for a Green Revolution in Africa (AGRA)
<b>Innovation</b>	Academic, Training and Research	Ethiopian Institute of Agricultural Research, Ethiopia/ Makerere University, Uganda / Cornell University, USA
	Government	Government of Ethiopia / Government of Bangladesh / Government of Egypt
	International NGO	CARE International / World Vision International / Promundo / Data2X
	Other	African Population and Health Research Center
	Private Sector	Cowtribe, Ghana
<b>Scaling</b>	Academic, Training and Research	Makerere University, Uganda
	Government	Government of Ethiopia / Government of Bangladesh / Government of Egypt (Ministry of Social Solidarity)
	Multilateral	Food and Agriculture Organization / World Food Program / UN Women / African Development Bank / Asian Development Bank
	Other	Bill and Melinda Gates Foundation / USAID / GIZ
		Jeevika, Self-help Group, Bihar, India



# Enabling gender and social equality through resilient and inclusive agri-food systems: theory of change





## Market Intelligence for More Equitable and Impactful Genetic Innovation

Initiative Lead and Co-Lead	Primary CGIAR Action Area	Estimated 2022 - 2024 Budget
Matty Demont Vivian Polar	Genetic Innovation	\$30 - \$30 M

### Challenge

Throughout the CGIAR, decisions on how to invest scarce resources in genetic innovation systems are predominantly supply-driven, out of touch with user demand and governed by multiple decision makers with little coordination or common framework. There is little reliable data or feedback loops on farmers' needs and on the larger factors that shape current and future needs and demand. Consequently, even with significant outcomes and impacts, these tend to fall below potential. Investments come at high opportunity costs with limited options to prioritize and miss opportunities to address gender equality and inclusion, climate change adaptation, and human health and nutrition goals. Moreover, social science teams and local partners (NARES) typically play a limited role in prioritization decisions related to product profiling and stage gate decision-making on product advancement and delivery or on product life cycle planning, prioritization and assessment. Recently, various other organizations have recognized the need for data-driven processes to guide work in genetic innovation systems, but efforts remain fragmented, and the coverage of crops and regions is patchy. Although CGIAR commodities are often grown in the same countries and affected by similar contextual factors, there is no unified approach to understanding current and future trends, with mostly fragmented and commodity specific studies. Genetic innovation systems lack shared digital infrastructure, institutional policies and standard operating procedures (SOPs) for mobilizing and empowering transdisciplinary teams within and across CGIAR and partners to address gender-intentional and socially inclusive processes of priority setting, product profiling, and stage gate decision-making on product advancement and delivery. The latter prevents donors, investors and research managers from making impact-maximizing investment decisions in genetic innovation.

### Objective

Maximize the impacts of investments in the Genetic Innovations action area by holistically gathering and analyzing women and men's demands, market opportunities, and the feasibility of producing and scaling crop varieties in local contexts. Insights from these analyses will inform discussions with breeding teams, resulting in agreed, prioritized efforts and increased accountability to timely deliver genetic gains in farmers' fields responding to the needs of consumers, farmers, and other value chain actors and considering climate change and the environment.

Specific objectives:

1. Design and implement institutional innovations that effectively and sustainably integrate transdisciplinary research on market intelligence (client demands and market opportunities), market segmentation, priority setting, product profiling, and stage gate decision-making across CGIAR-coordinated breeding networks.
2. Develop and implement a standardized process and templates for product profile development based on innovative behavioral research on preferences and demand from farmers and other value chain stakeholders, and the factors that shape varietal turnover that can inform future investments.
3. Design and implement approaches, methods, and tools to support socially inclusive data collection (across multiple dimensions) and analysis that responds to key information gaps across the five impact areas.
4. Establish a collaboration hub among CGIAR's Genetic Innovation initiatives, NARES, Innovation Labs (ILs) other international organizations, and the private sector to design and implement collaborative approaches to product profiling, and indicators to measure progress in transforming genetic innovation systems.
5. Deliver reliable, comparable and timely data on market segmentation and prioritization through an Investor Dashboard to inform researchers, research managers, and investors in prioritizing breeding and seed delivery efforts.

### Theory of Change

Plant breeding has the potential to inclusively benefit the nutrition, health, and livelihoods of farmers, value chain actors and consumers while minimizing climate and environmental footprints through continual development and uptake of varieties with improved value embodying strategically targeted traits. However, rates of varietal replacement have been low partly because products have not adequately met client needs due to supply-driven decision making in genetic innovation systems, resulting in high average varietal age, low turnover rates and suboptimal impacts. Addressing these impact gaps requires a better understanding and inclusion of "perceptions of improved value" of all clients along the value chain, especially women and marginalized groups. To improve adoption of CGIAR and partner products, a separate initiative is urgently needed that not only institutionalizes collaboration between social and biophysical scientists and nutritionists across CGIAR, partners and private sector through formal processes, but also empowers these transdisciplinary teams in market segmentation/prioritization and product profiling. To achieve this, the initiative will generate real-time, forward-looking market intelligence that supports breeding investment prioritization and product profiling. Innovative methods and tools will unravel constraints to varietal uptake, and will help build investment cases that improve productivity, nutrition, gender/social inclusion, livelihoods, climate change adaptation, and environmental preservation. Institutional standards for product profile design will be implemented in collaboration with other Genetic Innovation initiatives and action areas. An investor dashboard will increase transparency on potential social returns to investment in market segments, guiding decisions and attracting donor investment in genetic innovation. Through better stakeholder-inclusive and market-driven targeting of product profiles, this initiative will contribute to increasing varietal turnover, amplifying breeding and seed systems' impacts across the five impact areas.

## Market Intelligence for More Equitable and Impactful Genetic Innovation

### Highlights

Genetic innovation investments will be driven towards impact through real-time and forward-looking market intelligence to support decision making. Standards will be developed, data collected, and insights generated to inform market segmentation, priority setting, targeting, product design and seed systems to achieve impact by CGIAR and partners across five impact areas.

The effectiveness of market segmentation, targeting and prioritization of breeding investments will be increased by using a multi layered approach that incorporates the perceptions and demands of different stakeholders (women and men, institutions, climate and environment) along the value chain to direct the global genetic innovation system towards social and environmental impact.

The relevance of breeding product profiles for farmers and other users will be increased by developing and implementing new approaches, methods and tools that collect, analyze and integrate market intelligence on decisions and constraints for varietal uptake across multiple dimensions addressing major knowledge gaps on gender, social inclusion, environmental challenges, nutrition and seed systems governance.

The efficiency of market intelligence research to guide breeding investments will be increased by conducting global and regional, cross-commodity and within-commodity analyses of current and projected demand and its drivers and by eliminating the duplication of efforts by separate commodity teams in the same countries, overlapping context and regulatory environments.

Sustainable feedback loops with initiatives in the Genetic Innovations and Resilient Agrifood Systems action areas through institutional innovations will foster transdisciplinary dialogue and horizontal collaboration with key actors working in genebanks, breeding, seed systems, and cropping systems to inform prioritization of investments, definition and monitoring of progress indicators to track changes and impact.

### Work Packages

	Scope of Work	3-year Outcomes
Market intelligence	Design and implement market intelligence that characterizes current and future needs and perceptions of improved value across crops, varieties and traits in key regions. Approaches will consider priorities and needs of different actors (e.g., processors, seed businesses, consumers, women and men farmers) and potential mediating factors (e.g., policies, trade, technology, market structure, culture).	CGIAR GI initiatives and public and private sector partners collaboratively share, access and use a shared digital infrastructure for global and local market intelligence to build and prioritize investment cases, develop product profiles and address stage gate decision making.
Pipeline investment cases	Estimate the potential, current and future impact of breeding pipelines in targeted regions across multiple impact areas. Approaches will incorporate different types of data, perspectives (gender, nutrition, agronomy, economic, environmental) and analytical methods. An 'Investor Dashboard' will facilitate visualization of estimated impacts to support investment prioritization across crops and varieties.	Researchers, research managers and funders make more impactful resource allocation and investment decisions by using the pipeline investment cases and the investor dashboard produced by this initiative. Increased availability of information and transparent, holistic analyses on high-impact opportunities attract increased investments in under-invested and new-opportunity market segments.
Product profile design and prioritization	Define and implement prioritization processes which give voice to different stakeholders (e.g., NARES, private sector, breeding and social science teams) to refine existing product profiles, propose potentially new future-focused product profiles, and prioritize investments in product profiles at the regional level in response to current and future demand/needs and potential impacts.	Transdisciplinary teams of social and biophysical scientists and nutritionists across CGIAR and partners are empowered, develop, validate and prioritize product profiles for current and novel market segments. GI initiatives are empowered to achieve increased impacts through market intelligence-driven, transdisciplinarily-developed product profiles.
Accelerate varietal turnover	Conduct rigorous research on how women and men farmers/consumers take variety/product replacement/substitution decisions and identify factors that drive adoption and consumption of new varieties/products. Harness and test drivers that can accelerate varietal turnover and incorporate findings into regional and commodity-specific strategies with key stakeholders (private sector, NGOs, governments, donors).	Key stakeholders (private sector, NGOs, governments, donors) adopt approaches that harness drivers of adoption to accelerate varietal turnover across regional and seed systems contexts to advance regional and commodity-specific strategies.
Outreach and scaling within and beyond CGIAR	Establish a collaboration hub across GI initiatives and partners to (i) develop and implement institutional policies and SOPs for catalyzing inclusive decision making in breeding networks; (ii) develop alternative pathways to scaling, including digital platforms and incentive mechanisms for collaboration; and (iii) rigorously assess impacts on nutrition, poverty, productivity/profitability, gender equity and climate/environmental footprint.	CGIAR, NARES and other partners increase the impact of investments in breeding and other genetic innovations individually, by institutionalizing policies and procedures, and collectively, by participating in networks that design products by holistically analyzing knowledge and requirements of clients, share market intelligence, and monitor impacts.

## Market Intelligence for More Equitable and Impactful Genetic Innovation

### Impact Area Contributions

<b>Nutrition, health &amp; food security</b>	Intelligence on the triple burden of malnutrition, dietary recommendations and consumer preferences and demand elicitation will build investment cases for breeding and seed delivery, ultimately leading to farmer adoption of healthier crops and traits that improve nutrition and health and facilitate crop diversification.
<b>Poverty reduction, livelihoods &amp; jobs</b>	Breadth and depth of poverty will inform the weighting of market segments and prioritization of investment among crops and areas, and define the optimal mix of productivity-enhancing, loss and risk-reducing and value-adding product and byproduct traits that increase farmers' and consumers' livelihoods and contribute to job and income generation in food systems.
<b>Gender equality, youth &amp; social inclusion</b>	Gender, youth and social group-disaggregated market intelligence from all five impact areas will be embodied into crop prioritization and gender-intentional product profiles that contribute to increased gender equality, a fair balance labor-benefit for women and social inclusion of stakeholders along the value chain from producers to consumers.
<b>Climate adaptation &amp; greenhouse gas reduction</b>	Forward-looking information on climate change will build investment cases for breeding and seed delivery, ultimately leading to farmer adoption of more resilient, neglected crops and varieties with traits that render crops more resilient to climate extremes and climate-induced pest and diseases, and contribute to climate change mitigation.
<b>Environmental health &amp; biodiversity</b>	Forward-looking information on trends related to biotic stresses will set product profile targets for biotic stress resistance traits that reduce reliance on chemicals, reduce water use and environmental footprint and preserve in-field biodiversity. Market intelligence on value of heritage crops can assist cropping systems scientists, genebanks and farmers in valuing and preserving biodiversity.

### Impact on SDGs



### Regions

Global

### Countries





## Market Intelligence for More Equitable and Impactful Genetic Innovation

### Innovations

Genetic Innovation for Impact (G×I): a learning alliance of CGIAR GI initiatives, NARES and other public and private sector partners that conduct research and builds capacity for institutionalizing and empowering transdisciplinary teams through gender-intentional processes of prioritization, product profiling, and stage gate decision-making for maximizing impacts across the five impact areas.

Global digital platform for standardizing, crowdsourcing and sharing transdisciplinary market intelligence to assist CGIAR and partners in identifying intelligence gaps to set market research priorities, target market segments, building pipeline investment cases, and developing product profiles.

Behavioral research and digital tools that involve farmers, consumers and other value chain stakeholders in product profiling embodying (i) consumers' preferences and nutritional needs and farmers' livelihood needs; (ii) gender and social inclusiveness; (iii) food and by-product market trends; (iv) biotic and abiotic stressors, (v) climate change resilience and mitigation, and (vi) environmental health benefits.  
<https://www.cgiar.org/news-events/news/irri-transforms-rice-breeding-processes-market-oriented-product-profiling/>

Investor Dashboard: a global online digital tool to assist researchers, research managers and investors to visualize potential returns to investment across crop species, market segments, pipelines, product profiles and impact areas. The innovation will build on existing resources and innovations to increase their scalability.

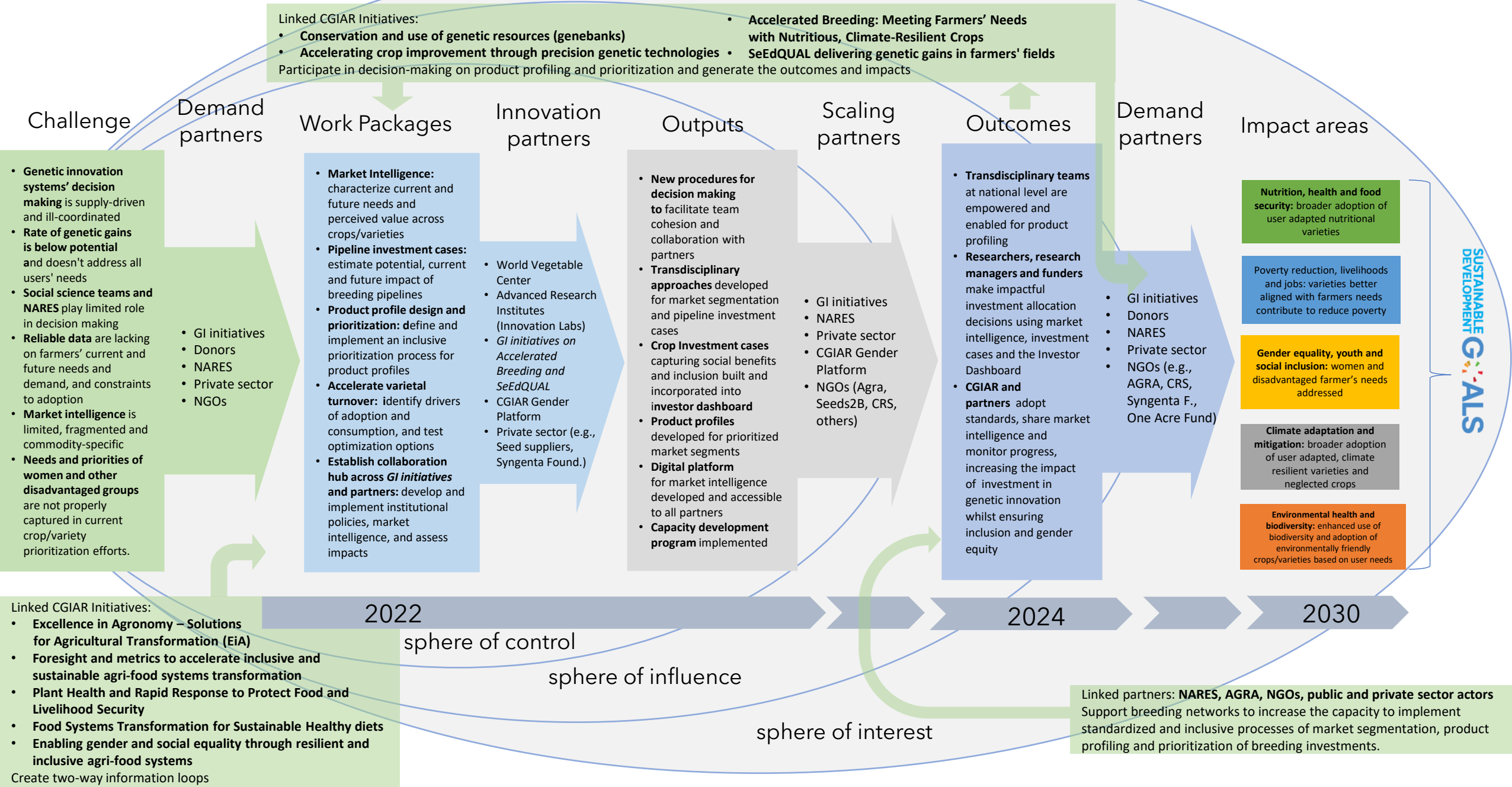
Gender-responsive tools and methods: a toolkit that guides transdisciplinary teams to work collaboratively to systematically include gender analysis information in market segmentation, targeting, crop prioritization and product profiling, scaled to support the G×I learning alliance. The tool will be adapted for an analysis of needs and preferences from youth and other intersectional groups.  
<https://www.cgiar.org/innovations/g-tools-for-gender-responsive-breeding/>

### Key Partners

<b>Demand</b>	Academic, Training and Research	GI initiatives: Conservation and use of genetic resources (Genebanks); Accelerated Breeding: Meeting Farmers' Needs with Nutritious, Climate-Resilient Crops; Accelerating crop improvement through precision genetic technologies; SeEdQUAL delivering genetic gains in farmers' fields
		NARES
	Other	Donors (BMGF, USAID, Germany, ACIAR, UK, African Export-Import Bank, ADB, AfDB)
	Private Sector	Private sector (farmer, consumer and food value chain stakeholder organizations, seed sector, e.g., ACRE Africa, and insurance brokers)
	Regional NGO	NGOs (e.g., One Acre Fund, Precision Agricultural Development, CRS, AGRA, Syngenta Foundation for Sustainable Agriculture)
<b>Innovation</b>	Academic, Training and Research	Advanced Research Institutes (e.g., universities) and big programs (e.g., Innovation Labs)
		CGIAR GENDER Platform for co-developing inclusive SOPs and gender research
		GI initiatives: Accelerated Breeding: Meeting Farmers' Needs with Nutritious, Climate-Resilient Crops; SeEdQUAL delivering genetic gains in farmers' fields
		World Vegetable Center
	Private Sector	Private sector (e.g., seed suppliers, Syngenta, etc.)
<b>Scaling</b>	Academic, Training and Research	CGIAR GENDER Platform
		GI initiatives: Accelerated Breeding: Meeting Farmers' Needs with Nutritious, Climate-Resilient Crops; Accelerating crop improvement through precision genetic technologies; SeEdQUAL delivering genetic gains in farmers' fields
		NARES
	Private Sector	Private sector (e.g., seed trade associations, agribusiness, food industry, etc.)
	Regional NGO	NGOs, like AGRA, Seeds2B and CRS that work in seed systems



# Market Intelligence for More Equitable and Impactful Genetic Innovation





## Market-driven, Resilient and Nutritious Agri-food Systems in the Humid zones of West and Central Africa (WCA)

### Initiative Lead and Co-Lead

Jan Helsen  
Regina Kapinga

### Primary CGIAR Action Area

Resilient Agri-food Systems

### Estimated 2022 - 2024 Budget

\$30 - \$45 M

### Challenge

Approximately 552 million people live in WCA, the majority in rural areas, but with some of the highest rates of urbanization in the world (>4% annually). Economic activity in 2020 contracted by 2.1%, due to a weaker external environment and measures to contain the COVID-19 pandemic. Agriculture and food are crucial sources of livelihood, providing 30-50% of GDP and income and livelihoods for 70-80% of the population. Economic growth, food security, nutrition and environmental health are challenged by rapid population growth, high unemployment, and the climate crisis. Human and environmental health issues are increasing due to pollution of water and soils, industrial and urban waste, as well as unhealthy and ultra-processed foods. Agriculture is dominated by smallholder farms reliant on rain-fed production and natural soil fertility maintenance. Rapid land degradation, disruptive forces of climate change, increasing invasive pest, changing disease patterns, ailing markets, poor infrastructure, non-supportive policies, limited access to quality seeds of resilient and nutritious varieties, and high post-harvest losses exert negative impacts on food systems. Limited opportunities for youth and women; and increasing conflicts (including terrorism and violent disputes between animal herders and farmers) restrict achieving the enormous agricultural transformation potential of the region. With 75% of the population under the age of 35, the region has one of the youngest populations in the world. In rural areas, young people are mostly landless, marginally employed, and suffer from poor working conditions and exploitation. The recent COVID-19 pandemic has slowed any progress being made in agriculture and related sectors.

### Objective

This initiative aims to build more resilient, climate-smart, nutritious, gender equitable and viable food production system in three humid agro-ecologies of WCA through development and scaling of novel and inclusive production and post-harvest technologies, participatory decision-making and planning, and informed governance systems. Incorporating innovations from other One CGIAR efforts, it will:

- Promote and facilitate adoption, through innovative scaling, of improved and climate-smart farming practices to increase sustained production of nutritious food crops and animal products;
- Increase skills of value chain actors in appropriate production of quality seed and crops, post-harvest handling, and consumption practices that support food and nutrition security while minimizing environmental damage;
- Support balanced food baskets by promoting increased diversity of household production systems;
- Harness community action to implement large-scale climate-smart practices and reduce vulnerability to climate change by ensuring that farmers, other value chain actors and governments have digital access to and use timely climate information and personalized agronomic practices for improved decision making;
- Improve youth engagement in agribusinesses and women and youth empowerment to ensure increased control on resources by women and other marginalized groups, and job creation, notably for the youth;
- Develop sustainable, productive, diversified and resilient food production landscapes with minimal impact on water, land and nature through informed participatory, gender-balanced and inclusive planning and implementation; and
- Conduct research on scaling readiness and processes, deploying experimental analyses, citizen science and consultative monitoring platforms, to guide scaling efforts and generate evidence that stimulates complementary investments into the Initiative.

### Theory of Change

The entry point will be to create effective public-private sector partnerships and increase private sector-led market opportunities for smallholder farmers as pull factors for innovation, adoption and impact creation. Multi-stakeholder platforms will provide timely feedback and adjustment mechanisms and inclusive agri-food business models will enable beneficiaries to adopt improved practices and access markets. Market demand, participatory gender-differentiated needs and opportunity assessment will underpin the co-design of gender-transformative innovations with beneficiaries considering local conditions and know-how. Scaling readiness assessment of innovation "packages" will be based on state-of-the-art knowledge, enabling productive environments under progressive climate change, and economic efficiency using experimental and observational evaluations. Successful innovations will be out-scaled through opportunities identified during project design. Out-scaling tools like demand creation campaigns, field demonstrations, spatial and climate analyses, machine learning, and citizen science will be used to map out and reach hotspots for change and scaling domains to guide investments towards increased success rates and higher value for money. This will tailor the interventions and increase innovation adoption. The adoption of climate-smart and digital technologies, climate information systems, planning at the landscape level, and innovative gender-responsive, youth-prioritized business models will lead to outcomes that positively affect youth and women livelihoods, smallholder productivity, climate risk awareness and preparedness and consumption of more diversified nutritious food. Through large-scale adoption, beneficiaries will sustainably improve their food and nutrition security, access agriculture-related jobs, generate wealth, move towards gender equality and adapt to climate change while protecting environmental health and biodiversity, thus contributing to 2030 Sustainable Development Goals.

## Market-driven, Resilient and Nutritious Agri-food Systems in the Humid zones of West and Central Africa (WCA)

### Highlights

The initiative will stimulate and match the demand for diverse nutritious and healthy food (including roots, tubers, plantain, rice, maize, vegetables, fish) based on local intensified, diversified, economically viable, healthier and safer food production systems supported by sustainable seed systems, climate-smart management practices, and market integration.

The initiative will, jointly with existing providers, improve and complement digital services for small-scale farmers, value chain actors and governments for informed decision making through data analysis and information and provide climate and agronomic advice, early-warning, pest management, relevant commodity price data, access to finance and near real-time deforestation monitoring.

The initiative will create healthy and sustainable food production landscapes minimizing the impact of agriculture on land, water and other environmental resources. It will improve food safety and human, animal and environmental health through inclusive governance of the landscapes and participatory circular economy approaches for sustainable agricultural and postharvest practices.

Through strong public-private partnerships and innovative financing, the initiative will develop, test, and scale effective input and output market linkages, access to finance, and post-harvest innovations that generate income-earning opportunities, with a focus on empowering youth and women; concurrently contributing to poverty reduction and less wasteful and healthier food systems.

The initiative will deploy the Scaling-Readiness approach and participatory multi-stakeholder platforms for effective, inclusive and gender-responsive scaling within and across landscapes. Advanced foresight, mixed-method monitoring, evaluation learning and accountability (MELA) tools will be used to generate evidence for learning and communicating success stories and methods to a range of stakeholders.

### Work Packages

	Scope of Work	3-year Outcomes
Sustainable Intensification and Diversification for Nutritious and Resilient Food Production through Sustainable Seed and Management Systems	Pursue demand-creation to promote nutritious foods; co-design cost-effective diverse sustainable food production systems to assure food and nutrition security; develop business models in sustainable seed system development; promote integrated management practices for water, soil fertility, pest and disease; and test and disseminate gender-transformative approaches to diversified and intensified farming systems.	At least 80,000 smallholder households have accessed and 20% use at least 5 improved climate resilient nutrient-dense crop varieties and adopted at least 6 good agricultural practices, with at least a 20% increase in the women's empowerment in agriculture index (WEAI) and a 30% increase in household dietary diversity scores.
Informed Digital Agriculture for Climate Resilience - Managing Climate Risks and Accessing Services	Build resilience and reduce climatic risks in smallholder systems by scaling inclusive climate-smart agricultural practices and technologies bundled with accessible and gender-targeted digital climate / agricultural / nutrition advice, finance and agronomic inputs, building on and complementing public and private sector schemes/partners to reach millions of farmers and value chain actors.	Building on existing platforms and schemes farmers (5 Million), value chain actors (50) and governments (5) will use improved timely climate information and early warning systems for improved decision making, which contribute to managing food and climate security risk, adapting to climate change and decreased deforestation rates, and improved resilience of male and female farmers..
Sustainable and Inclusive Landscape Management for a Healthy Environment and Safe Food	Develop sustainable landscape management plans and inclusive governance of agro-ecologies through community-engaged participatory approaches targeting soil health, water resources and waste management. Validate one-health approaches; pursue gender equity in resource access; investigate circular economy chains for waste-reuse; promote use of sustainable agronomic practices for minimized negative impact at landscape level.	At least 100 rural communities develop informed and inclusive land and water development plans to diversify income from agriculture sustainably based on one-health approach principles, increase production from agriculture, livestock/aquaculture, create rural jobs, stability, resilience and inclusivity, and hold dialogues to address gender inequalities concerning resource access and management structures.
Youth and Women Entrepreneurship Models in Food Value Chains	Catalyze gender-responsive youth entrepreneurship and job creation that: uses digital support tools to produce healthy value added food products; reduces post-harvest losses and increases efficient processing and storage; strengthens SMEs by linking entrepreneurs to credit and insurance services; and builds capacities in business acumen for youth and women.	At least 20,000 youth and 15,000 women are engaged in value-added activities related to agriculture. Of these, at least 50% have access to credit and credit worthiness of youth-led businesses provides employment and technical services to communities, resulting in increasing income by 50%. Post-harvest losses are reduced by 20%.
Innovation in Scaling Design, Implementation and Monitoring, Evaluation Learning and Accountability (MELA) Tools and Processes	Integrate and validate gender-transformative scaling readiness in program implementation; roll-out integrated public-private sector partnerships (PPPs) and local extension services for scale and impact; leverage financial services; deploy spatial analyses and advanced foresight and impact assessment to guide investments; use MELA tools and platform feedback to refine innovations and improve impact.	At least 10 efficient tools and methods are adopted for mapping and monitoring scaling domains for technologies to guide development of smart investments. Remote sensing, machine learning, spatial analyses, citizen science, consumer preference, advanced impact assessment and MELA tools are deployed to map scaling domains and aid monitoring and evaluation.



## Market-driven, Resilient and Nutritious Agri-food Systems in the Humid zones of West and Central Africa (WCA)

### Impact Area Contributions

<b>Nutrition, health &amp; food security</b>	Year-round enhanced diet quality, improved environmental safety, and sustained productivity on WCA smallholder farms through uptake of diverse, more heat tolerant, shorter duration nutritious crops/varieties and appropriate integration of small livestock/fish into selected production systems alongside investment in improved soil, water and knowledge management, and post-harvest storage and processing techniques.
<b>Poverty reduction, livelihoods &amp; jobs</b>	Increasing demand for nutritious foods and locally-sourced livestock/fish feed ingredients will create a market pull for nutritious products and their by-products, creating opportunities for value addition through economically-viable businesses along the value chains. Investment in gender-responsive youth skill development, and a better enabling environment will contribute toward long-term poverty reduction.
<b>Gender equality, youth &amp; social inclusion</b>	Building of more equitable agri-food systems will be achieved through 1) participatory planning of land and water resources to enable inclusive community access to resources for crop, livestock, and fish production; 2) gender-transformative community dialogues focused on empowering women and marginalized groups; 3) youth and women capacitation with agribusiness/production skills.
<b>Climate adaptation &amp; greenhouse gas reduction</b>	Investment in the 4 Rs to ensure transformed food systems are climate adapted due to 1) REROUTING by scaling climate-smart agriculture practices; 2) de-RISKING by providing timely digital climate, biorisk (pest and disease) and agronomic information, 3) REALIGNING by leveraging sustainable finance for smallholders and 4) REDUCING rates of deforestation.
<b>Environmental health &amp; biodiversity</b>	Sustainable use for land and water resources and minimizing the impact of agriculture is achieved through inclusive planning of resources for productive and non-productive uses, including nature and other non-monetized ecosystem services, avoidance of unnecessary land clearing by raising productivity of cultivated land, and investigating potential of underutilized forest products.

### Impact on SDGs



### Regions

West and Central Africa (WCA)

### Countries



## Market-driven, Resilient and Nutritious Agri-food Systems in the Humid zones of West and Central Africa (WCA)

### Innovations

Evidence for proposed set of technologies for smallholder production system, including underutilized and/or traditional but nutritious crops, in different agro-ecologies that are designed and evaluated not only by commodity yields (outputs), but by production per hectare of key nutrients, soil health indicators, estimates of water use efficiency and economic value.

One stop digital climate and agricultural advisory services for building resilience and reducing risk along the value chain on financial and marketing services, crop and practice choices, and biorisks tailored to the local conditions and expected weather climate, and deforestation monitoring.

A documented participatory toolset for creating inclusive landscapes. The toolset combines validated participatory tools and approaches to create climate-resilient water and land sources and plans that are owned, implemented and controlled by rural communities to sustainably develop and manage resources for increased and diversified agricultural production and income.

A scalable version (including new financing mechanisms) of the mind-set changing Start Them Early Program (STEP) piloted in WCA which integrates agribusiness studies into secondary schools through course work and experimental learning, stimulating youth and increasing their capacities to exploit employment opportunities in agriculture.

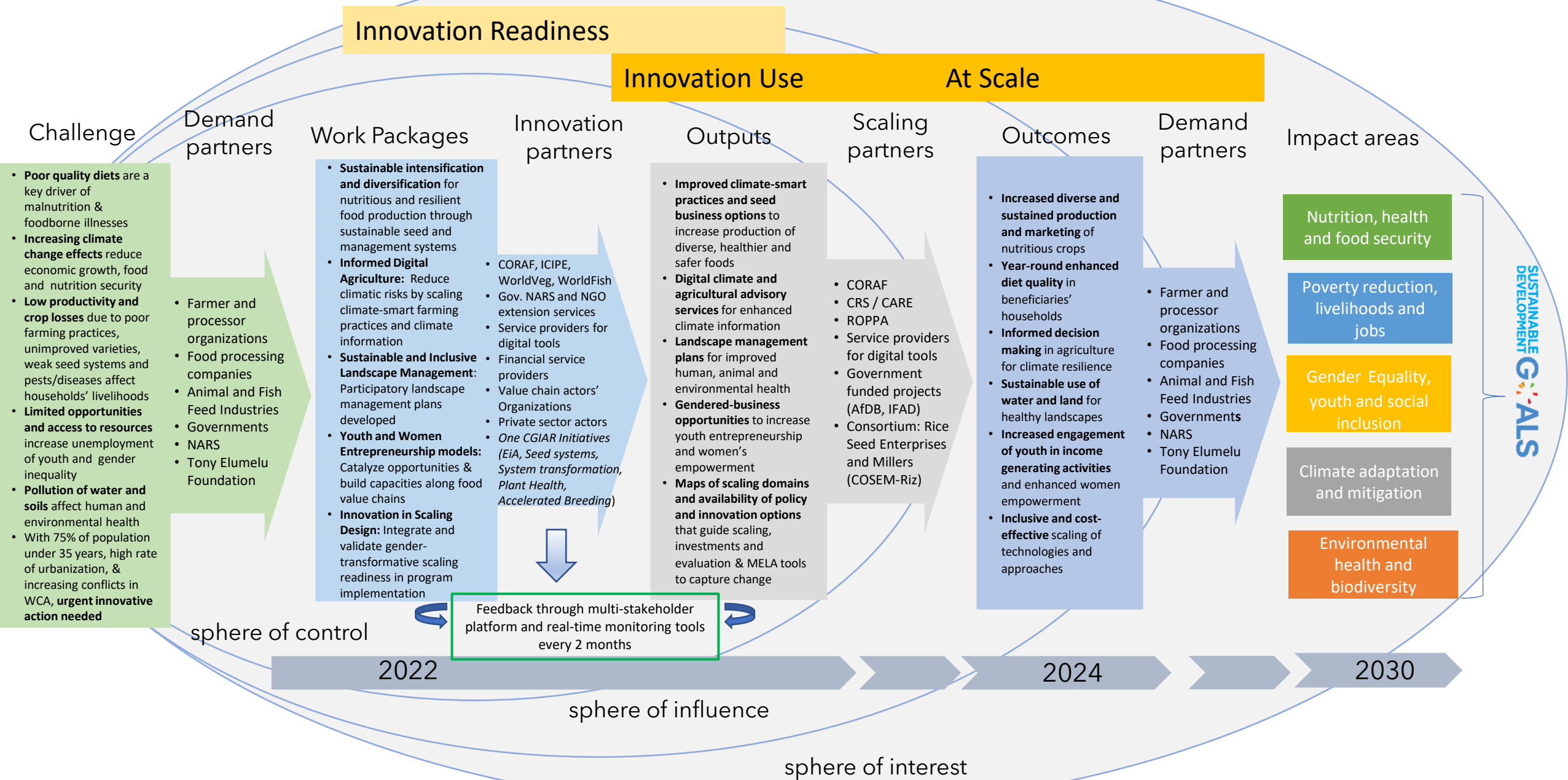
Novel spatial technologies based on machine learning and citizen science for 1) mapping scaling domains that guide investments, 2) informed decision-making processes, and 3) cost-effective Monitoring, Evaluation, Learning and Accountability (MELA), the latter combined with virtual feedback sessions with stakeholders.

### Key Partners

<b>Demand</b>	Foundation	Tony Elumelu Foundation (Private foundation in Nigeria supporting short-term youth entrepreneurship training for African youth)
	Government	Government Ministries (esp. agriculture, health, and environment) (The objectives of the project are directly supporting key government programmes from the local development point of view which is in line with the spirit of central government priorities).
		National Agricultural Research and Extension Systems in the target countries
Private Sector	Animal and Fish Feed Industries (The high cost of concentrates is driving interest in diversification of feed sources)	
	Farmer and processor organizations; food processing companies (Agricultural technologies and innovations (T&Is) have been a primary factor contributing to increases in farm productivity and production for economic growth in developing countries, therefore the end-users of T&Is as key demand partners in this project are farmer and processor organizations as well as food processing companies.)	
<b>Innovation</b>	Academic, Training and Research	CORAF (CORAF is an international association of national agricultural research systems in 23 West and Central African countries with the mandate to increase the use of appropriate technologies and innovations in the region.)
		International Centre of Insect Physiology and Ecology (ICIPE) (ICIPE works in a holistic and integrated approach through a 4-H paradigm comprising "Human, Animal, Plant and Environmental Health", with the aim of improving the overall health of communities in tropical Africa, by addressing the interlinked problems of pests and disease vectors, environmental degradation and climate. This approach will expand towards the concept of One Health by integrating key components.)
		World Vegetable Center (World Vegetable Center has a basket of technologies and innovations on vegetables if scaled up in the region will improve the nutrition of the population including women and youth.)
	Private Sector	Financial services for agriculture (Several initiatives either carried by national, private and donor funded institutions in target countries are currently implemented to improve access to credit and insurance to smallholder farmers. Identified finance institutions in each country will be fostered to be part of the multi-stakeholder partnership set down with innovation platforms to facilitate their interaction with farmers whom most of the time are not aware of their existence and the type and quality of services they can offer.)
Service providers (e.g. GODAN for digital tools; ESOKO for agricultural prices) (Service providers including the private agro-dealers, digital solutions providers, climate information providers, credit and insurance providers are part of the multi-stakeholders' platform for technologies and innovations upscaling and adoption for improved food and nutrition security)		
<b>Scaling</b>	Academic, Training and Research	CORAF (The partnership with CORAF will bring to the consortium an adding value in scaling. CORAF and its constituencies namely the national agricultural research systems in 23 West and Central African countries have the mandate to increase the use of appropriate technologies and innovations in the region)
	Government	Government Programs funded by IFAD, World Bank, African Development Bank Technologies for African Agricultural Transformation (TAAT) programme, etc. (Linking to these separately funded development initiatives in the same target areas will enable additional beneficiary households to be reached, and enhance interaction with government partners)
	International NGO	CARE and/or Catholic Relief Services (Example of an international NGO that engages in agriculture and nutrition projects and would be the type of organization that would take the innovation packages to scale)
	Partner Country based NGO	Réseau des Organisations Paysannes et de Producteurs de l'Afrique de l'Ouest (ROPPA) (ROPPA is an initiative of West African farmers' and agricultural producers' organizations. It brings together 13 national member farmers' organizations (Benin, Burkina Faso, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Senegal, Sierra Leone, Togo) and farmers' organizations.)
	Private Sector	Consortium of Rice Seed Enterprises and Millers (COSEM-Riz) (COSEM-Riz through its agri-business model in rice value chain will promote the deployment of quality rice seed of high yielding and stress tolerant improved and climate smart-rice and other crop varieties within and across countries in the region.)



# West and Central Africa – Regional Integrated Initiatives (WCA – RII): theory of change





## National Policies and Strategies for Food, Land and Water Systems Transformation

Initiative Lead and Co-Lead	Primary CGIAR Action Area	Estimated 2022 - 2024 Budget
Jemimah Njuki Alan Nicol	Systems Transformation	\$25 - \$30 M

### Challenge

Despite improved economic growth in many low- and middle-income countries over the past decade, major inequalities persist. Rapid urbanization, migration, pockets of conflict, and other demographic and social challenges are likely to exacerbate these inequalities. By 2050, half of the population of Africa will be living in urban areas requiring special attention to the urban and peri-urban poor within national policies and strategies. In the absence of "Ministries of Food Systems", government actions towards the SDGs, and better integration of food, land and water systems, remains fragmented and uncoordinated. The need to make these systems more productive, resilient and responsive to growing demand has never been greater. Approximately 3 billion people cannot afford a healthy diet, and more than 3 billion suffer one or more manifestations of poor nutrition. It is likely that food systems are already operating beyond some planetary boundaries, exerting increasing pressures on land and water systems. Transformations will require benefit optimization while managing complex trade-offs. Without coherent evidence-driven policy and planning, and amidst substantially growing risks and uncertainties, future policy on food, land and water systems transformation could result in poor investments, ineffective national programming, and growing inequalities. This initiative brings together a more unified science system, working with governments, the private sector, and funding organizations to champion and strengthen capacity for more collaborative, evidence-based and coordinated policy development and implementation that transforms food, land and water systems at (sub)national, regional and international scales.

### Objective

This initiative will support prioritization of investments that transform food, land and water systems at the national level to achieve greater gender equality, inclusion, food and nutrition security, healthy diets, poverty reduction, and climate resilience. Working with country-led coalitions of government policy-makers, the private sector, funders and civil society organizations, we will develop new tools and adapt and apply a range of existing 1CGIAR tools to national and sub-national policies and investments, developing transformative strategies and plans that lead to more sustainable and equitable outcomes and provide investment entry points for funders, the private sector and others. Working with country-led coalitions and multi-sector coordination units we will co-design transformative programs, policies, and strategies that crowd-in multiple sources of funding and support implementation and analysis using political economy tools. This will facilitate integration of 1CGIAR innovations across initiatives, and support evaluation of program investments against poverty, food and nutrition security, equality, and climate resilience targets. We will also work at the science-policy interface with other 1CGIAR initiatives ensuring their work has policy synergy and that innovations are investment- and scale-ready to feed into national policies and investment plans. We will build think tank policy capacity, equipping a new generation of policy entrepreneurs in at least 20 next-generation policy institutes and will work with partners, including regional partners, to develop monitoring, knowledge management and accountability tools for food, land and water systems transformation.

### Theory of Change

This Initiative provides new, and adapts existing, policy tools and platforms to transform food, land and water systems in ways that deliver equitable and sustained food and nutrition security, healthy diets, poverty reduction, gender equality and climate adaptation. It does this through four work packages implemented with coalitions of actors in at least 8 countries: 1) Strategic Planning analyzes existing policies and co-identifies policy goals and objectives with potential for transformation, while minimizing negative trade-offs using a range of economic, value chain and social modelling tools; 2) Investment Prioritization identifies policies and strategies that are cost-effective in achieving policy goals and multiple outcomes; it also guides governments, funders and the private sector on where and how to make investments that have greatest potential to deliver equitable and sustainable food, land and water system transformation, including working across 1CGIAR Initiatives to ensure coherence and synergy in policies and investment-ready, scalable innovations; 3) Intervention Implementation works with public, private, and civil society actors, translating investment plans into national and sub-national implementation programs, using impact evaluation and political economy tools to identify bottlenecks and key drivers of change; it also builds policy think tank capacity to better support governments; 4) Learning and Feedback creates a policy innovation exchange across countries and regions, building knowledge management tools and establishing a Community of Policy Practice (CoPP) to deliver future transformative policies, as well as improving the policy impact/transformation relationship using CGIAR tools to deliver multiple food, land and water systems transformations in support of least 50 million people.

## National Policies and Strategies for Food, Land and Water Systems Transformation

### Highlights

Coalitions of policy actors across sectors (governments, donors, private sector, civil society, and policy researchers) at national and sub-national levels use emerging research evidence and tools from various 1CGIAR initiatives to develop policies and strategies that steer transformation towards more equitable and sustainable food, land, and water systems.

Co-developed evidence-based investment plans and scenarios across food, land and water systems, that crowd-in public and private resources (up to \$10 billion), and optimize impacts on inclusion and poverty, help manage trade-offs and identify optimal returns on potential investments (including from 1CGIAR innovations).

New capabilities in modelling tools, impact evaluation and political economy analysis enable countries to use evidence for more inclusive policy formulation, prioritization and implementation, as well as manage trade-offs that lead to more sustainable food, land and water systems for the benefit of the most vulnerable sections of society.

We will strengthen up to 20 next-generation public policy institutions to deliver on future policy development, knowledge management and transformation strategies through 2030 and beyond, including establishing specific skills in using tools for priority setting, evaluation, impact methods and social engagement, with a particular focus on strengthening processes of policy inclusion.

Rigorous impact evaluation and political economy tools support implementation and adaptation of policies and strategies including methods for addressing inclusion and distributional justice from investments, strengthening future models of private-public partnership and ensuring a continued focus on food and nutrition security, healthy diets, poverty reduction, gender equality and inclusion.

### Work Packages

	Scope of Work	3-year Outcomes
Strategic Planning: Co-design policies and strategies for growth and rural transformation	Analyze current policies and bottlenecks to implementation and develop, adapt and use a range of data and tools from 1CGIAR (e.g. the Foresight Initiative) and partners to support country polices and plans that drive food and nutrition security, gender equality, decent jobs, climate resilience, and sustainable transformations in food, land and water systems across 8 countries.	At least 8 countries have priority policies and strategies, or make policy and strategy changes to food, land, and water systems transformations using 1CGIAR tools and evidence, that deliver equitable outcomes for food, nutrition and water security, job creation, environmental sustainability, and gender and inclusion.
Investment Prioritization: Supporting the implementation of public and private investments	Work with a coalition of actors (government, private sector, funders, civil society and other 1CGIAR initiatives) to translate policies and investment plans into priority targeted and co-designed large public, private and donor-funded investments and programs to deliver food, land and water systems transformations and inclusive multiple impacts.	At least 8 country governments have formed coalitions of the private sector, civil society, and donors, and translated their policies and strategies into investment plans and programs with clear budgets and implementation, knowledge management and accountability plans that incorporate investment-ready 1CGIAR technological, policy and institutional innovations.
Intervention Implementation: Next generation research analysis and policy capacity	Using impact evaluation, political economy tools and institutional analysis we will bolster impact, accountability and transparency through leading-edge research co-produced with public, private, and civil society partners. We will strengthen next-generation policy think tank capacity using novel tools and approaches (including linkage to the Digital Initiative) to deliver robust and politically-feasible policy innovations.	Governments work with 1 CGIAR researchers and 20 next-generation policy think tanks and institutes, using evaluation and political economy tools to track the impacts of government and other investment programs and to address policy implementation bottlenecks to ensure policies and strategies lead to more transformational and equitable outcomes.
Learning and Feedback: Building a Community of Policy Practice (CoPP) that strengthens impacts and supports a range of initiatives	Develop innovative communications and advocacy mechanisms with partner organizations, forming wider strategic alliances and working with countries and regional organizations to foster cross-country and regional learning, public policy dialogue, capacity development and mainstreaming of policy analysis, impact assessment and accountability tools.	Evidence based policy analysis tools, knowledge management tools and lessons learnt from across countries and regions are mainstreamed in country planning and investment priority-setting as well as being reflected in regional organizations setting targets and supporting governments to invest in them.

## National Policies and Strategies for Food, Land and Water Systems Transformation

### Impact Area Contributions

<b>Nutrition, health &amp; food security</b>	At least 50 million people benefit from better food and water security because of policies and strategies that integrate 1CGIAR innovations, research, and evidence in their prioritization, targeting and implementation.
<b>Poverty reduction, livelihoods &amp; jobs</b>	At least 10 million women and youth, and marginalized groups, benefit through increased and more inclusive investments under large government, private sector, and donor-funded programs. The initiative will contribute to employment generation and improved efficiency beyond the farm, across food, land and water systems.
<b>Gender equality, youth &amp; social inclusion</b>	At least 10 million youth and women, as well as marginalized groups, benefit and are empowered through better returns from shared food, land and water systems as a result of strategies and programs designed and implemented with explicit attention to equity and inclusion.
<b>Climate adaptation &amp; greenhouse gas reduction</b>	Climate impacts, especially on the poorest and most marginalized, are minimized through activities and policies that are less fragmented and from reduced trade-offs leading to improvements in climate adaptation and resilience responses, as well as contributing to net carbon capture and retention in agri-food systems.
<b>Environmental health &amp; biodiversity</b>	Governments better manage environmental trade-offs and achieve food, land and water system transformations that succeed in strengthening environmental health and biodiversity in terrestrial and aquatic ecosystems under pressure from economic and demographic growth.

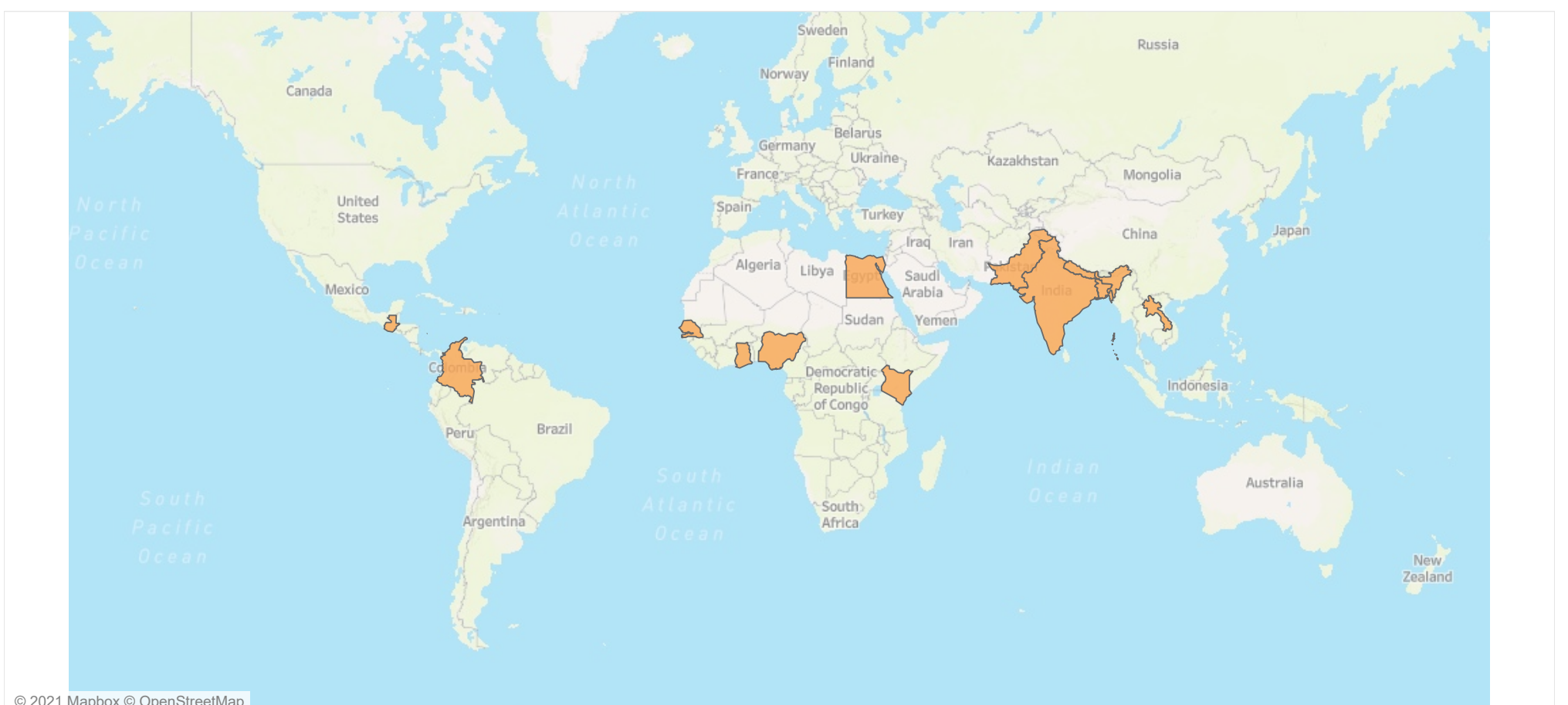
### Impact on SDGs



### Regions

Central and West Asia and North Africa (CWANA), East and Southern Africa (ESA), Latin America and the Caribbean (LAC), South Asia (SA), South East Asia and the Pacific (SEA), West and Central Africa (WCA)

### Countries





## National Policies and Strategies for Food, Land and Water Systems Transformation

### Innovations

A coalitions-based approach to country-led food, land and water systems transformation: Composed of champions from key ministries, policy advisors, academia, the private sector, media, and civil society this ensures that research-based advice translates into viable investments and measurable improvements in people's lives, attributable to 1 CGIAR at the country level.

Accessible tools, including digital tools, for country-led policy and investment prioritization, and capacity to use these: A suite of economy-wide and food, land and water systems-specific investment prioritization tools that are open access and easy to use at country level.

Methodological innovations in supporting and monitoring policy implementation: An integrated package of policy and implementation tools, including knowledge management tools, that can identify intended and unintended consequences, provide learning and fine-tuning of implementation processes, as well as communication of successes and, where necessary, enable adaptation.

Cross-country policy exchange: This will accelerate the production and compilation of, and access to, reliable data that is crucial for decision making through a policy exchange that promotes evidence-based and more inclusive policy making and accountability between countries and regions.

Supporting innovations in investment programming: Working with public and private sector actors, strengthen policy environments for innovations and scaling of investments through identification of priority investment pathways for different actors, including private sector crowd-in, to transform technological, institutional and policy interventions into investment-ready ideas.

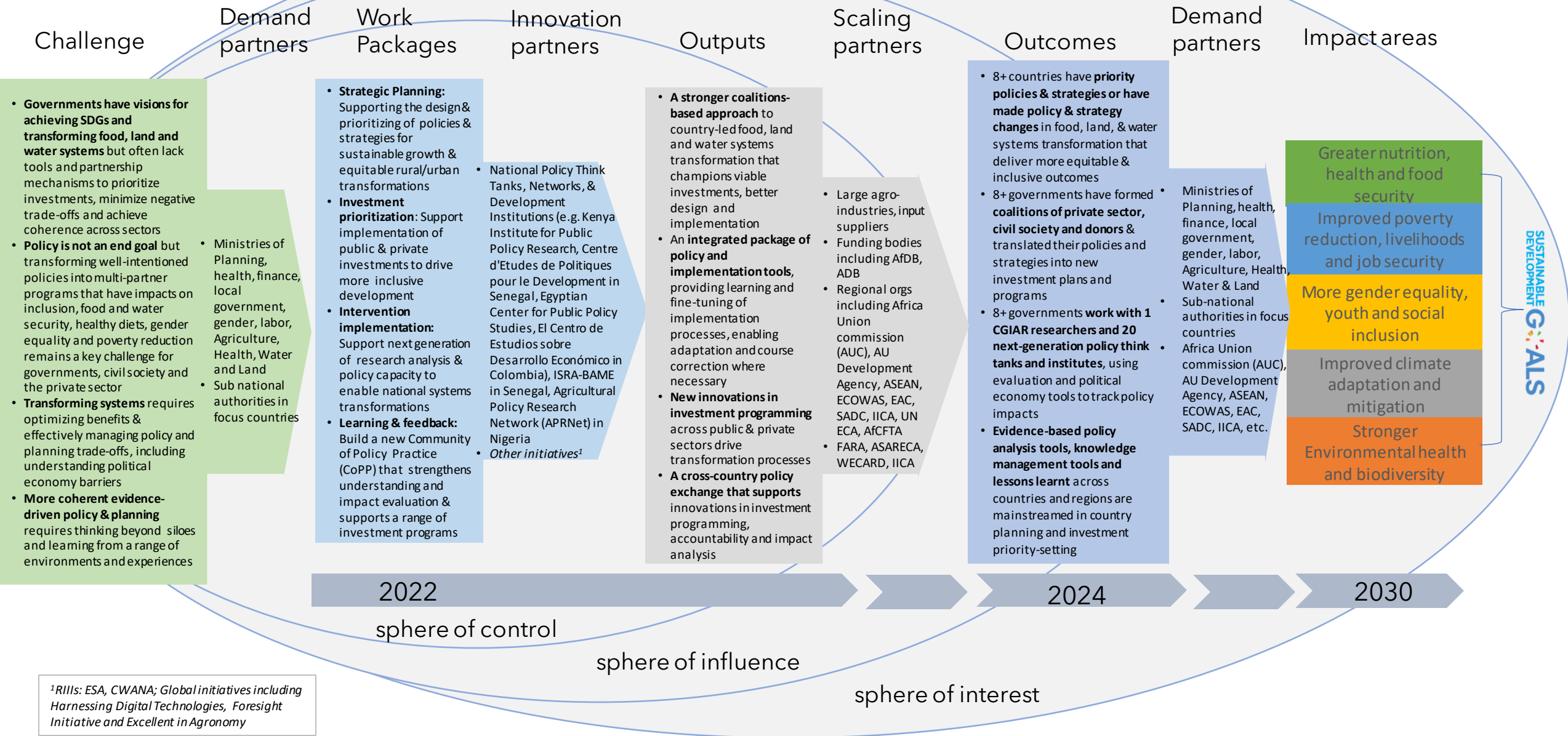
### Key Partners

<b>Demand</b>	Academic, Training and Research	FARA, ASARECA, WECARD, IICA
	Government	Ministries of Planning, Health, Finance, Local Government, Gender, Labor, Agriculture, Water and Land, and Sub-National Authorities in focus countries
	Multilateral	Africa Union commission (AUC), AU Development Agency, ASEAN, ECOWAS, EAC, SADC, IICA, UN ECA
	Other	Bilateral and multi-lateral funders
	Private Sector	Private sector companies and financial institutions
<b>Innovation</b>	Academic, Training and Research	Akademiya 2063, Alliance for a Green Revolution in Africa, Africa Economic Research Consortium, Regional Network of Agricultural Policy Research Institutes (ReNAPRI)
		National Policy Think Tanks, Networks, and Development Institutions in focus countries - e.g. Kenya Institute for Public Policy Research, Centre d'Etudes de Politiques pour le Development in Senegal, Egyptian Center for Public Policy Studies, El Centro de Estudios sobre Desarrollo Económico in Colombia, ISRA-BAME in Senegal, and the Agricultural Policy Research Network (APRNet) in Nigeria
		Overseas Development Institute, Universities including those in the Global North
	Other	Other 1CGIAR Initiatives (including Digital Tools, Foresight, Regional Integrated Initiatives)
	Other Public Sector	National agriculture, land and water research organizations in focus countries
<b>Scaling</b>	Academic, Training and Research	FARA, ASARECA, WECARD, IICA
	Government	Ministries of Planning, Health, Finance, Local Government, Gender, Labor, Agriculture, Health Water and Land at national and sub-national levels in focus countries
	Multilateral	Africa Union commission (AUC), AU Development Agency, ASEAN, ECOWAS, EAC, SADC, IICA, UN ECA, AfCFTA
	Other	Bilateral and multi-lateral funders
	Private Sector	Private sector companies and financial institutions including AfDB, ADB, IADB



# National Policies and Strategies for Food, Land and Water Systems Transformation

# Theory of change



<sup>1</sup>RHIs: ESA, CWANA; Global initiatives including Harnessing Digital Technologies, Foresight Initiative and Excellent in Agronomy



## Nature-Positive Solutions: Enhancing productivity and resilience, while safeguarding the environment, and promoting inclusive growth within communities

Initiative Lead and Co-Lead	Primary CGIAR Action Area	Estimated 2022 - 2024 Budget
Carlo Fadda Josiane Nikiema	Resilient Agri-food Systems	\$25 - \$30 M

### Challenge

Agroecosystems are the planet's largest existing ecosystem. They use 70% of freshwater resources, drive 80% of deforestation, and are responsible for major biodiversity losses and land degradation. Agriculture generally exploits nature beyond planetary boundaries, resulting in waste-generation, deforestation, water pollution, ecosystem destruction and biodiversity loss. One reason for this is that rural development and environmental policies have tended to be unconnected and incentives for boosting productivity are largely detrimental to adoption of NPS.

Now, with unprecedented job losses and increased social inequality triggered by COVID-19, the world has reached a critical point. We must find a way to shift those negative incentives, so that our food, land and water systems generate jobs, sufficient, diverse and safe food, while safeguarding planetary health.

Over half of global GDP (US\$ 44 trillion) depends on nature. Every dollar spent on nature restoration generates a Return on Investment of US\$9. Stimulus packages based on nature-positive solutions (NPS) can halt ecosystem destruction, tap into 395 million new NPS-driven jobs (<https://bit.ly/3soPd3F>), and unlock US\$ 4.5 trillion/year in new business opportunities (<https://bit.ly/3nrBLLz>) by 2030.

Evidence from traditional knowledge and modern science demonstrates how smart interventions can help to maintain or enhance natural resources in production systems. But scientific evidence alone isn't enough if political will is lacking. The challenge lies in working at multiple levels from households to communities, through to country policies and international legislation, to co-generate science-based solutions, and supportive policies, which accommodate the interests of all stakeholders, including those often under-represented, like women and youth.

### Objective

This Initiative will reshape food production systems in selected countries to meet food demands of growing populations by adopting agro-ecological principles including stewarding biodiversity, and improving soil and water management within integrated NPS. This will boost critical ecosystem services, and enhance social and economic benefits including equality.

Specific objectives:

1. Co-design a decision-support platform which helps users to select proven NPS, trialed and adapted to their local contexts, and integrating their needs. Users will be producers, natural-resource stewards, NGOs, conservation communities, private-sector actors, NARES, and local governments in five countries.
2. Validate the decision-support platform as a tool which achieves multiple benefits and minimizes tradeoffs for communities and their natural environments, through implementing NPS with ~eight communities in biodiversity-rich areas, benefitting ~100,000 people as co-designers/end-users
3. Analyze the local political economy and identify social-inclusion/agency barriers to NPS adoption, to shape more-inclusive enabling environments (policy, finance) to incentivize adoption by rural communities of NPS and embed NPS in 5 countries. Net valuations and accounting (US\$ and ecosystem co-benefits) of BFA assets (soil, water, forests) will inform public and private investment planning
4. Help private sector and government shape financially-viable business models and blended, market-responsive, socially-inclusive investment plans around NPS, using a demand-driven approach and capitalizing on CGIAR evidence and innovation around climate financing, payment for ecosystem services, and tradeoff evaluations.
5. Document learning while raising awareness and building capacity of key stakeholder to support wider adoption, globally, nationally and locally of NPS, based on sound monitoring (including locally relevant indicators), evaluation and novel learning mechanisms.

### Theory of Change

Nature-positive production (<https://bit.ly/3nr52WN>) is one critical pathway to sustainable food systems (<https://bittylink.com/9dy>). This Initiative will, in five countries and eight communities, work with stakeholders, representing agriculture, economy, environment and natural resource management, to address:

\*Tackling the root causes (e.g. economic, political) of environmental degradation from agricultural production

\*Enhancing provision of ecosystem services using (soil, agricultural and natural) biodiversity and water to increase productivity and resilience while safeguarding nature and promoting inclusive growth.

Pairing with the nature-conservation community, the Initiative will co-develop integrated nature-positive solution (NPS) packages for more resilient, biodiverse, productive food systems. We will work with rural communities, private-sector, policymakers, and natural-resource stewards to upscale NPS by improving enabling environments and identifying suitable incentives for uptake.

2024 outcomes include: (1) rural communities (especially women and youth) in five countries using decision-making toolkits to implement NPS; (2) communities, businesses and conservationists rigor-testing NPS approaches in ~eight communities in areas of significant biodiversity interest; (3) national and local policymakers using Initiative-generated evidence to reshape enabling legislation around NPS uptake and address blockages to their broader adoption; (4) innovative public and private investment structures incentivizing NPS; and (5) communities, natural resource stewards, and NARES demonstrating new capacity to implement NPS.

With scale-out to five other countries, via partnering Regional Initiatives, by 2030 the Initiative will achieve: 30% increased food, land, and water productivity; 20% rise in income from NPS-focused value chains; reversal in soil degradation and a 50% increase in systems biodiversity, directly benefiting ~10 million people.

The Initiative will collaborate closely with (1) the (ST) Transformational agroecology across food, land and water systems Initiative, specifically on the scaling up of policy and governance mechanisms at national/landscape level essential to creating a strong enabling environment for the sustainability of NPS, (2) the (RAFS) Sustainable Intensification of Mixed Farming Systems Initiative, specifically on reducing environmental footprints and improving AFS livelihoods derived from NPS, (3) the (ST) Food Systems Transformation for Sustainable Healthy Diets Initiative, specifically on refining that Initiative's trade off scenario analysis with criteria based on balancing food production and environmental protection objectives, (4) the (ST) Enabling gender and social equality through resilient and inclusive agri-food systems Initiative, specifically on designing gender intentional mechanisms to solicit and account for the meaningful participation of women, youth, and marginalized groups (including indigenous peoples) in the communities, (5) the (ST) Transforming food systems from greenhouse gas sources to sinks Initiative, specifically on linking conservation and protected natural area objectives with that Initiative's efforts to create or protect the natural carbon sinks associated with food production and (6) Conservation and use of genetic resources (genebanks) to access useful genetic material for using in the communities. Further, finding from the initiative will also be adopted beyond rural areas through collaboration with e.g. the (ST) Resilient Cities through Sustainable Urban and Peri-urban Agrifood Systems.

## Nature-Positive Solutions: Enhancing productivity and resilience, while safeguarding the environment, and promoting inclusive growth within communities

### Highlights

Forging complementarity-strong partnerships. Agriculture is often considered an enemy of nature. This initiative explores ways to pull in the same direction by forging new partnerships between CGIAR and the biodiversity conservation community to leverage complementary capacities for development impacts and work towards CBD post-2020-biodiversity targets, Food-System Summit deliberations, and International\_Treaty\_for\_Plant\_Genetic\_Resources\_for\_Food\_and\_Agriculture.

Evidence-based policy - Regenerative practices, BFA stewardship, agro-waste recycling, and closed-water cycles reduce waste and environmental pressures. We generate evidence on where, how and for whom NPS work best and how to increase win-win synergies where natural resources are enhanced, and use evidences to influencing the agendas of political stakeholders.

Reversing biodiversity loss driven by current food systems, through a strategy including food species (from farm to fork), community forest management and agroforestry. Biodiversity for food and agriculture (BFA) and nature-positive production are indispensable to simultaneously achieving multiple SDGs. (see 10.3), according to FAO (<https://bit.ly/3nr52WN> ) and UNFSS (<https://bit.ly/3eH3t33>).

Nature for inclusive growth - The initiative will boost social inclusion via inclusive policy tracks, participatory piloting in selected environments, and co-designing NPS innovation packages. Women, youth, and marginalized farmers will be targeted to benefit from enhanced agricultural productivity, and engage in markets which value nature-related benefits and waste-based outputs.

Innovative blended finance and business opportunities -The initiative will explore and co-design gender- and age-responsive novel business and income models, such as Payment for Environmental Services, benefit-sharing arrangements, certifications, to incentivize nature conservation and enhancement in addition to more diversified value chains, opening markets to new sets of diverse products.

### Work Packages

	Scope of Work	3-year Outcomes
Decision support to spur NPS investment and uptake	Creating decision-making toolkits using both local knowledge and contexts and international experiences, through: literature review, impact assessment, cost/benefit and valuation assessment, co-design of NPS plans in selected communities based on biodiversity assessment (natural and wild, including animals and fishes), soil degradation, water availability and quality.	Rural communities (including women and youth) and producers in five countries use a co-designed, inclusive, and context-specific decision-making toolkit to execute NPS in primary production systems.
Co-implementation of economically-viable community level NPS	Working with communities to test NPS (e.g. biodiversity, agroforestry and forest management; seed systems; integrated soil fertility management, including through soil biodiversity ; water management), digital tools for monitoring and evaluation (including locally-relevant indicators), through the creation of a multi-stakeholder innovation platform that will negotiate and transparently discuss the trade-offs.	Farmers, private business, and conservationists rigor-test NPS approaches in ~eight communities in environments of significant biodiversity interest, including around protected areas, leading to positive socio-economic and ecosystem-derived agrobiodiversity, soil, water, and income-equity benefits for ≥100,000 people, including vulnerable women, young people, and marginalized groups.
Policy dialogue to support the creation of an enabling environment for NPS adoption at community level	Designing inclusive demand-driven policies, integrating into national strategy plans for climate change, water and land management, and biodiversity; Analyzing the political economy to devise reliable strategies to support scaling-up of NPS by providing incentives to local communities to adopt these practices and improving communities' agency to contribute to such policies.	Policymakers in 5 countries will have received policy briefs, participated in 30 workshops and trainings, and actively engaged in relation to developing policies more supportive of NPS, and leading to more transparent, inclusive and empowering governance.
Innovative blended gender- and age-responsive financing and business models to support scaling-out of NPS solutions	Investment plans, including transparent and sustainable value-chain development, public-payment schemes recognizing local communities' roles in maintaining public goods; agro-waste recycling business models providing soil management inputs; use of energy sources to lessen women's drudgery; animal/fish feed, and public-private partnerships supporting green investment, e.g. using green deal approaches.	Public and private investment structures incentivize NPS uptake, with significant new investment in NPS in five countries by end 2024 and three ecosystem payment schemes near launch stage. Better understanding of direct and indirect benefits and costs associated with the NPS, who pays and who benefits, are identified and documented.
Development of capacity, and Monitoring, Evaluation, Accountability and Learning (MEAL) to fill gaps in NPS solutions and sustain wider adoption	Knowledge sharing, trainings, publications, cross pollination/collaboration within the CGIAR Initiatives. Building on training needs identified in WP1, sound training programs will be developed for various stakeholders and specifically targeting women and youth (incl. curriculum development). Sound and participatory MEAL frameworks designed and implemented.	Community member representatives, natural resource stewards, and NARES increase their capacity to implement NPS. Participatory MEAL frameworks and monitoring tools are in place and adopted in five countries.



**Nature-Positive Solutions: Enhancing productivity and resilience, while safeguarding the environment, and promoting inclusive growth within communities**

**Impact Area Contributions**

<b>Nutrition, health &amp; food security</b>	Using more agrobiodiversity in production systems will include greater promotion of vegetables, fruits, nuts, fishes and animal products leading to better diets. In 10 countries, at least 10 million women, men, and children benefit from improved nutrition, health, and food security outcomes deriving from CGIAR-led NPS innovation packages.
<b>Poverty reduction, livelihoods &amp; jobs</b>	Poverty reduction, livelihoods and jobs created by new NPS-focused business activities, value chains, and public/private investment assist 6 million women, men and youth to exit poverty. Overall, we aim at diversifying the economy, making it more circular, supporting the creation of local SMEs and providing options for green investments.
<b>Gender equality, youth &amp; social inclusion</b>	≥6 million women and youth are empowered to become agents of NPS-based innovation, along with end users, by involving them (≥65% representation) in all stages, from co-design of NPS community trials, scaling out and up, and including their voices in assessment of demand and supply dynamics of NPS investment.
<b>Climate adaptation &amp; greenhouse gas reduction</b>	Enhanced climate adaptation and greenhouse gas (GHG) reduction in the form of contribution to 10 national-level plans (Nationally-determined contributions (NDCs), national adaptation programs (NAPs), etc.) with evidence of implementation of NPS measures, \$1 billion (est.) of climate-adaptation NPS investments, and a 10% reduction in CO2 equivalent emissions.
<b>Environmental health &amp; biodiversity</b>	Improved environmental health and biodiversity across degraded land brought under sustainable management (e.g. zero deforestation, agroforestry, natural corridors, restoration of ecosystem services), 30% increase in water productivity, 40% plant accessions available and safely duplicated in genebanks. Agrobiodiversity increases by 40% and biodiversity by 50% in selected locations.

**Impact on SDGs**



**Regions**

Global	Central and West Asia and North Africa (CWANA), East and Southern Africa (ESA), Latin America and the Caribbean (LAC), South Asia (SA), South East Asia and the Pacific (SEA), West and Central Africa (WCA)
--------	--

**Countries**



**Nature-Positive Solutions: Enhancing productivity and resilience, while safeguarding the environment, and promoting inclusive growth within communities**

**Innovations**

BFA packages addressing knowledge gaps related to agrobiodiversity (crops, varieties, forage, tree, agroforestry, fish and livestock) together with research and local communities for its characterization. It will use crowdsourcing to disseminate winning technologies and will build community-based seed/planting-material producers to ensure access this material as well as to improve management.

On-farm plot demonstrations co-implemented with citizen scientists (producers) to test packages of circular soil management and improvement technologies (e.g. biochar and compost), particularly focusing on the largely unknown interaction of below ground and above ground biodiversity to improve fertility and productivity.

Packages of water management NPS aimed at improved water storage (e.g. small reservoirs, managed aquifer recharge), monitoring water use, increasing water productivity and reducing climate-related risks (e.g., digital tools for early warning and drudgery reduction). We will use ecosystem valuation tools to estimate incentives for NPS adoption.

Decision-support toolkits co-designed with local communities, that enable communities and policymakers to identify the NPS appropriate to their specific context and the enabling environment mechanisms required to support adoption at scale. The Initiative will seek out early-adopters to adapt NPS identified through the toolkit, thus improving their scalability.

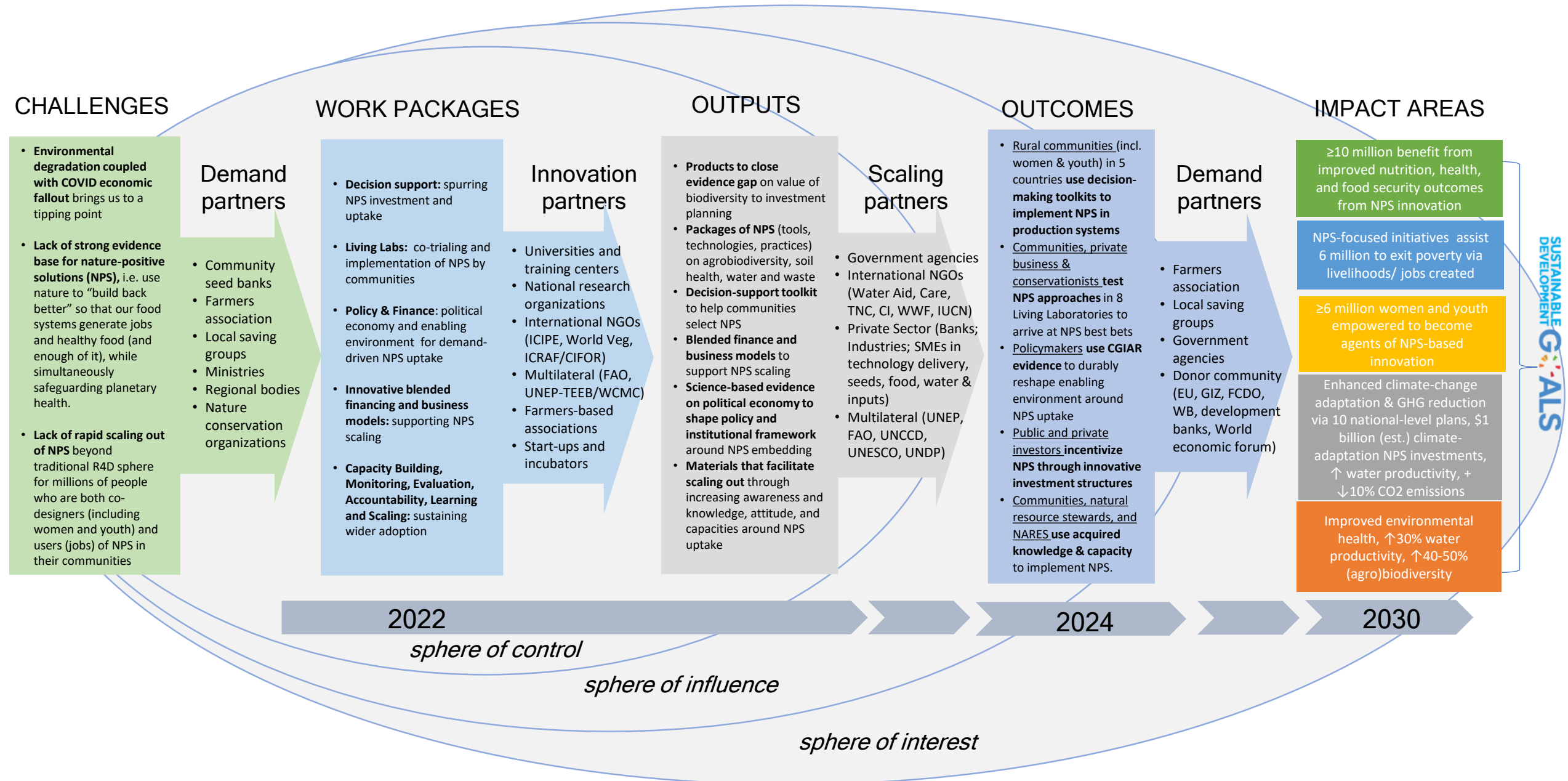
A set of community-based, safe agro-waste recycling business solutions, building on business models and pre-feasibility guidelines for safe resource recovery from municipal waste and fecal sludge developed by the CGIAR, which can be implemented by young entrepreneurs or via public-private partnerships.

**Key Partners**

<b>Demand</b>	Government	Ministry of agriculture, Ministry of environment, ministry of education, ministry of water, local governments
	International NGO	Nature conservation organizations (TNC, CI, WWF, IUCN)
	Multilateral	Regional bodies, e.g. African Union
	Other	Donor community, e.g. EU, GIZ, FCDO, WB, regional development banks, World economic forum
	Partner Country based NGO	Community seed banks, farmers association, indigenous groups, local saving groups, local conservation groups
<b>Innovation</b>	Academic, Training and Research	Universities, National research organizations, training centers
	International NGO	ICIPE, World Veg, ICRAF/CIFOR
	Multilateral	UNEP-TEEB, UNEP-WCMC, FAO
	National NGO	Farmers-based associations
	Private Sector	Start-ups and incubators
<b>Scaling</b>	Government	Extension agencies, local and national governments (sectorial ministries)
	International NGO	Water Aid, Oxfam, Care, TNC, CI, WWF, IUCN, One acre fund
	Multilateral	UNEP, FAO, UNCCD, UNESCO, UNDP
	Other	Donor community, E.G. EU, GIZ, FCDO, WB, regional development banks, World economic forum
	Private Sector	Rural (savings and loans) banks; Traditional Agri-food industries; SME for technology delivery, seeds, food, water and inputs; finance investors; World economic Forum, Global Alliance for Future of Food



# Nature-Positive Solutions: how to enhance productivity and resilience, while safeguarding the environment, and promoting inclusive growth within communities: *theory of change*



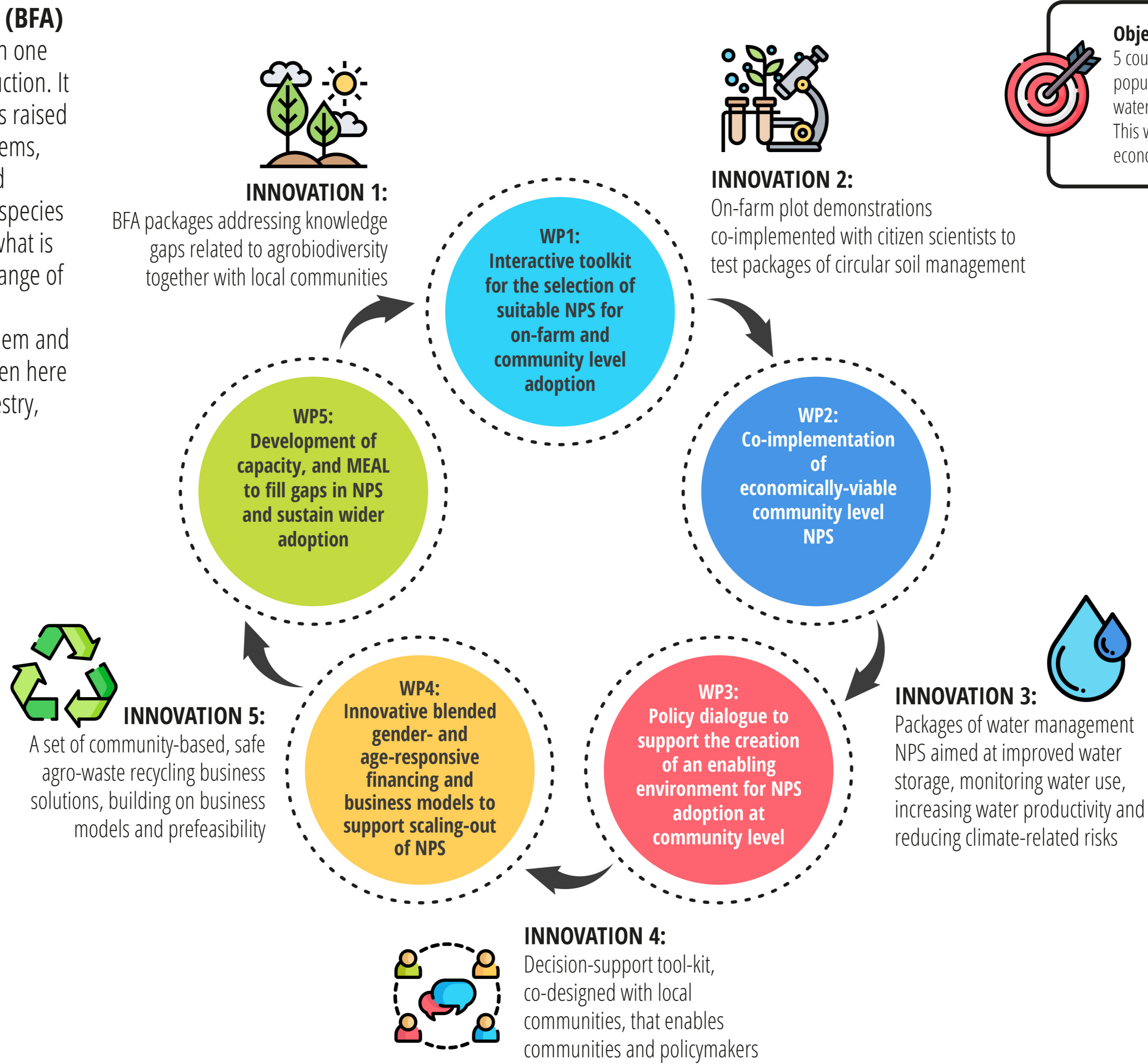


# Biodiversity for Food and Agriculture (BFA)

is the subset of biodiversity that contributes in one way or another to agriculture and food production. It includes the domesticated plants and animals raised in crop, livestock, forest and aquaculture systems, harvested forest and aquatic species, the wild relatives of domesticated species, other wild species harvested for food and other products, and what is known as “associated biodiversity”, the vast range of organisms that live in and around food and agricultural production systems, sustaining them and contributing to their output. Agriculture is taken here to include crop and livestock production, forestry, fisheries and aquaculture (FAO, 2019).<sup>1</sup>

## Definition of nature positive agriculture:

A nature-positive production aims to build food systems that globally meet the fundamental human right to healthy food while operating within planetary boundaries that limit the natural resources available for a sustainable exploitation



**Objective:** This Initiative will reshape food production systems in 5 countries and 8 communities to meet food demands of growing populations, by stewarding biodiversity, and improving soil and water management as the pillars of integrated NPS. This will boost critical ecosystem services, and enhance social and economic benefits and including equality.

## Highlights

- 1** Forging complementarity-strong partnerships
- 2** Evidence-based policy
- 3** Reversing biodiversity loss driven by current food system
- 4** Nature for inclusive growth
- 5** Innovative blended finance and business opportunities

## Countries

The project will be implemented in 5 countries and scaled out to 5+ countries selected among: Burkina Faso, Nigeria, Kenya, Ethiopia, Sri Lanka, Nepal, India, Peru, Lao DR, Vietnam, Colombia, Uzbekistan and Tajikistan.

<sup>1</sup> FAO (2019). <http://www.fao.org/3/CA3129EN/ca3129en.pdf>





## NEXUS Gains: Realizing Multiple Benefits Across Water-Energy-Food-Forest-Biodiversity Systems

Initiative Lead and Co-Lead	Primary CGIAR Action Area	Estimated 2022 - 2024 Budget
Dr. Stefan Uhlenbrook Dr. Claudia Ringler	Systems Transformation	\$25 - \$30 M

### Challenge

Water, land, energy, forests and biodiversity are critical to rural livelihoods and food and nutrition security, and are strongly interconnected. Water availability [<https://bit.ly/3gdohl5>] and ecosystem health [<https://bit.ly/3dknooF>] directly affect food security and nutrition through multiple pathways. Similarly, lack of clean energy access leads to degradation of upper watersheds, forests and biodiversity, and soil erosion and water siltation downstream impacting important infrastructure [<https://bit.ly/2R2x8eK>], lowering agricultural productivity and limiting rural agro-processing [<https://bit.ly/32jKmpW>]. All these systems are under extreme stress from climate change and other mutually reinforcing human-induced pressures. Planetary boundaries are exceeded [<https://bit.ly/3mTS57E>] and social foundations eroded [<https://bit.ly/3mUDMPZ>] in many low- and-middle-income countries and related impacts are accelerating. These challenges are particularly pronounced in South Asia's breadbasket basins, where unsustainable (ground)water abstraction, climate change, deforestation and biodiversity loss, and poor policies put 8% of the world's food production at risk, with potentially devastating impacts on wellbeing, health and peace for more than 2 billion people. Similarly, glacial retreat, changing hydrological and ecological regimes, unsustainable water withdrawals and fossil fuel reliance, aggravated by transboundary water conflicts, profoundly impact Central Asia's future. East Africa's rapidly growing population faces increasing food insecurity from climate change and low productivity, lack of irrigation and energy access. However, investors do not know where or how best to retain forests and biodiversity, and support sustainable irrigation, clean energy and agro-processing needs [<https://bit.ly/32fVkfR>]. Similarly, investments in water remain disconnected from policy goals of healthy diets [<https://bit.ly/3aeKhYT>]. National/regional institutions fail to account for the integrated nature of these systems or the cross-sectoral feedbacks, including tradeoffs and synergies. And women, girls, and other vulnerable groups face the greatest adverse consequences from poorly developed water, energy and food systems and ecosystem degradation.

### Objective

NEXUS Gains will realize gains across water-energy-food-forests-biodiversity (WEFFB) systems in three selected regions by co-generating a series of outputs via four work packages and a cross-cutting capacity development program. All work packages build on previous work by CGIAR and partners and all will focus on strengthening the benefits of marginalized groups, including youth and women. Specifically, NEXUS Gains will:

- 1) Co-develop and scale at least six WEFFB nexus innovations focused on increased resource use efficiency and strengthened ecosystem functions with regional and local partners using foresight tools and tradeoff analyses in focal basins.
- 2) Develop the evidence and approaches for improved water productivity across scales (farm to watershed to basin) using a systems approach that considers all water users, i.e., agriculture, industry, energy, domestic sector (incl. WASH), forests and biodiversity in two focal basins.
- 3) Energize food systems equitably and sustainably (water, ecosystems) with at least four innovations, such as solar systems for women farmers and entrepreneurs, small hydropower generation, bioenergy, and solar-supported agro-processing and storage, in close collaboration with private energy and other WEFFB actors.
- 4) Strengthen governance across WEFFB systems, including groundwater and basin/landscape management at regional and national government levels across key ministries/departments, including at least five social learning, citizen-science, or multi-stakeholder platform mechanisms.

To ensure that these objectives and outputs lead to desired outcomes at scale, NEXUS Gains will support a capacity development program and build on deep partnerships that will unlock inclusive cross-sectoral gains in these interconnected systems and directly support investments.

### Theory of Change

NEXUS Gains will foster integrated management of water, energy, food, land, biodiversity and forests, for inclusive, sustainable development in transboundary river basins in a climate crisis.

To achieve this, NEXUS Gains will 1) co-develop prioritized, scalable water-energy-food-forest-biodiversity (WEFFB) nexus innovations using foresight tools and tradeoff analyses; 2) co-generate the evidence and approaches to significantly improve water productivity across scales (farm to watershed to basin) and sectors using a systems lens; and 3) energize food systems sustainably (water, ecosystems) and inclusively with private sector actors. These work packages will be anchored by 4) research on strengthening cross-sectoral, multi-stakeholder governance at community, national and regional levels. Capacity-building on WEFFB nexus approaches, deep partnerships, interdisciplinary biophysical and social science methods, and strengthening inclusion will help to improve food security and nutrition, climate action, water security, environmental health, and inclusion, and increase rural growth. NEXUS Gains will thus reduce costs of tradeoffs and strengthen cross-sectoral synergies, with benefits for food (SDG2), water (SDG6), energy (SDG7), climate action (SDG13) and ecosystems (SDG14), as well as other interdependent SDG targets.

River basins will be the main frame of analysis, intersected with political boundaries that introduce geopolitical challenges. The initiative will work with the initiatives Harnessing Digital Technologies and Foresight Analyses; and key outcomes will be achieved at national levels considering - regional interlinkages - by engaging with the Regional integrated initiatives, National strategies and policies, Agroecology, and the One Health initiatives.

Focal areas in phase 1 are the Eastern Nile, where accelerated water and clean energy access and watershed rehabilitation will support agricultural productivity, food security, job creation and economic growth and reduce conflict; and the Indus, Ganges and Aral Sea basins, where NEXUS Gains will increase resource use efficiency, strengthen ecosystem functions and support governance and sustainable development. Phase 2 will add the entire Nile, Brahmaputra and the Zambezi basins.

## NEXUS Gains: Realizing Multiple Benefits Across Water-Energy-Food-Forest-Biodiversity Systems

### Highlights

NEXUS Gains aims to meet the demand for more integrated solutions-ranging across South Asian governments' request to reduce land and water resource depletion while improving food security and nutrition; Central Asia's need to reduce conflict over shared resources; and East Africa's urgent need to expand WEFFB securities more sustainably and equitably.

NEXUS Gains works at scale considering food systems as part of a larger set of interdependent systems, allowing us to develop innovations outside the traditional focus on agriculture alone to alleviate growing systemic stresses for human and planetary health; building on two decades of learnings from CGIAR water [<https://bit.ly/2PY89t3>], land and ecosystem [<https://bit.ly/3e3kiEV>] programs.

NEXUS Gains will develop the evidence, tools, capacity and support partnerships for boosting water productivity and tangible, more inclusive access to clean energy for sustainable food systems for human wellbeing and planetary health, with a particular focus on benefits for rural women. This includes innovations in solar systems, small hydropower, bioenergy, postharvest loss reduction and agro-processing.

NEXUS Gains will strengthen local ownership, strive to overcome disciplinary and administrative silos, and support inclusive, polycentric governance systems by strengthening existing platforms and other institutions and introducing WEFFB nexus thinking and approaches - fundamental steps for sustainable rural livelihoods and green growth.

NEXUS Gains will build deep partnerships and develop capacity through 1) a cross-sectoral leadership program for professionals to design, implement and scale integrated innovations, 2) curriculum development and mentoring of junior researchers, and 3) online training modules to support design and implementation of WEFFB nexus innovations.

### Work Packages

	Scope of Work	3-year Outcomes
Co-developing and scaling WEFFB nexus innovations using foresight tools and tradeoff analyses	Identifying and scaling of WEFFB nexus innovations through evidence-based assessment, foresight analyses and prioritization processes that consider cross-sectoral tradeoffs. Potential innovations include new mechanisms to scale integrated forestry/landscape management, land restoration, wastewater reuse, and integrated water storage solutions. Innovation grants and novel ideas for green recovery from COVID-19 will broaden partnership and grow impact.	Co-developing and scaling WEFFB nexus innovations using foresight tools and tradeoff analyses: WEFFB actors increase water, energy, and food and nutrition security and environmental sustainability (i.e., forest, biodiversity) through scaling prioritized innovations in focal regions based on NEXUS Gains data, tools, institutions, and innovations.
Boosting water productivity across scale	Reducing food insecurity and strengthening food systems in water scarce regions through more productive uses of available water at system level. Opportunities will be identified across scales (farm, watershed, basin) and sectors; and foresight analyses of alternative WEFFB Nexus Futures will be co-developed, integrating the latest Earth system data.	Boosting water productivity across scales: WEFFB actors (e.g., public sector, private sector, farmers, NGOs, investors, IOs, academia) in focal basins are enabled to significantly improve water productivity across scales.
Energizing food systems sustainably (water, ecosystems) and inclusively	Developing scalable business and finance models for accelerated, inclusive, sustainable access to energy for food systems, and generating evidence to strengthen environmental (water and ecosystem sustainability) and economic benefits for vulnerable groups. Innovations include solar systems for women farmers and entrepreneurs, micro-hydropower, and incentives for inclusive bioenergy and sustainable agro-forestry systems.	Energizing food systems and building water and ecosystem security sustainably and inclusively: WEFFB actors use scalable business models to accelerate rural energy access for more sustainable and equitable food systems in at least three target basins. Business models consider environmental, economic, and social impacts and support marginalized groups, including rural women and youth.
Strengthening multi-stakeholder WEFFB nexus governance	Supporting collective action for more inclusive and sustainable WEFFB nexus systems. Innovations considered include practical guidelines for cross-sectoral multi-stakeholder platforms at various scales, social learning interventions for improved (ground)water governance, science-policy dialogues and guidelines for transboundary WEFFB nexus management.	Strengthening multi-stakeholder WEFFB nexus governance: Policymakers and communities are enabled to develop more inclusive WEFFB nexus institutions through knowledge products, practical learning tools and guidelines, and science-policy dialogues.
Developing capacity to support WEFFB nexus co-design and implementation	Developing capacity (cross-cutting work package) through 1) a cross-sectoral leadership program for professionals to lead on-the-ground WEFFB nexus policy innovations and implementation and/or to become scaling accelerators, 2) curriculum development and research support for junior researchers (graduate students, post-docs), and 3) online training modules to support design and implementation of WEFFB nexus innovations.	Capacity development for NEXUS analysis, co-design and implementation (cross-cutting activity): A wide range of WEFFB actors from public and private sectors, NGOs, investors, IOs and academia have increased capacity to identify, assess and act on WEFFB nexus tradeoffs and synergies and to lead implementation.

## NEXUS Gains: Realizing Multiple Benefits Across Water-Energy-Food-Forest-Biodiversity Systems

### Impact Area Contributions

<b>Nutrition, health &amp; food security</b>	30 million (~2% of focal basin populations) will access sustainable healthy diets via 1) lower prices/higher incomes from irrigated (horticultural) crops, and 2) renewable energy supporting perishables and reducing postharvest losses; currently 85% in sub-Saharan Africa and 76% in South Asia [ <a href="https://bit.ly/3aeM67Y">https://bit.ly/3aeM67Y</a> ] cannot afford healthy diets. Infectious diseases [ <a href="https://bit.ly/3uOeMMY">https://bit.ly/3uOeMMY</a> ] will be reduced through improved water supply.
<b>Poverty reduction, livelihoods &amp; jobs</b>	Rural poverty of ~5 million farm households reduced and labor absorbed in agro-processing and irrigated farms through 1) expanded horticultural crop irrigation, higher dry-season incomes and employment, and 2) increased rural energy access generating rural incomes and jobs (est. 500,000 new jobs estimated in horticulture and irrigation in Ethiopia [ <a href="https://bit.ly/3gcqPjI">https://bit.ly/3gcqPjI</a> ] alone).
<b>Gender equality, youth &amp; social inclusion</b>	Approximately 2 million youth and 2 million rural women access irrigation and energy benefit streams. Reduction in women's time-burden to collect water [ <a href="https://bit.ly/3do1bX7">https://bit.ly/3do1bX7</a> ] through 1) improved water access, 2) reduced water competition, and 3) improved energy access, supporting wellbeing; and new jobs for youth in renewable energy and agro-processing.
<b>Climate adaptation &amp; greenhouse gas reduction</b>	Reduced fossil energy intensity in South and Central Asian agriculture and increased access to renewable energy [ <a href="https://bit.ly/3e9yOL8">https://bit.ly/3e9yOL8</a> ] in East Africa will reduce GHG emissions of agricultural output by 5% over baseline. Climate-smart WEFFB nexus innovations will reach 5 million farm households, increasing adaptive capacity. WEFFB nexus planning will stimulate investments of at least US\$5 billion.
<b>Environmental health &amp; biodiversity</b>	Strengthened ecosystem functions and greater resource use efficiency through scaling WEFFB nexus innovations will support resource conservation (water, biodiversity, forests) and land restoration and reduce water pollution. We project a 10% improvement over business-as-usual trajectories in biodiversity, consumptive water use and deforestation in the focal basins.

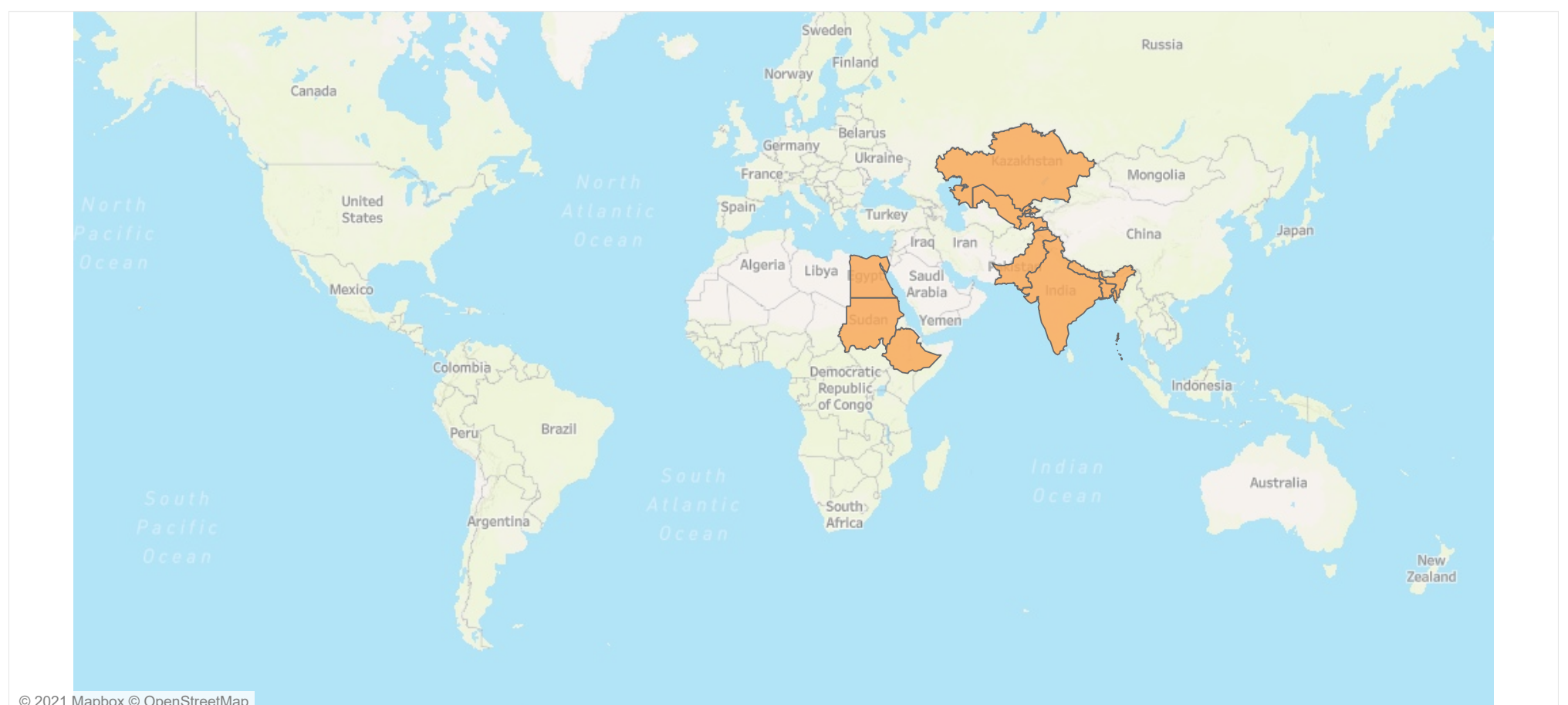
### Impact on SDGs



### Regions

Central and West Asia and North Africa (CWANA), East and Southern Africa (ESA), South Asia (SA)

### Countries





## NEXUS Gains: Realizing Multiple Benefits Across Water-Energy-Food-Forest-Biodiversity Systems

### Innovations

Inclusive business models [<https://bit.ly/3e5cfHI>] for sustainable, inclusive rural energy use in agrifood systems can unlock billions of dollars in value [<https://bit.ly/3wZbWa8>] from enhanced agriculture and rural growth and strengthen outcomes for women and youth. They include solar systems for women farmers and entrepreneurs, small hydropower and bioenergy systems and will support irrigation, households, storage and agro-processing [<https://bit.ly/3awwddB>].

Policy- and decisionmaking to significantly enhance water productivity will be supported through comprehensive tradeoff/synergy analyses of several (bundeled) interventions, inter alia, land use, scaling of irrigation (technology, behaviour), agronomic practices, wastewater reuse, economic instruments, etc.

Establish effective cross-sectoral multi-stakeholder platforms by building on existing dialogue initiatives [<https://bit.ly/3agcGO9>] to support participatory planning, implementation and monitoring of cross-sectoral strategies that include women, youth and other marginalized or vulnerable groups in the focal regions to leverage integrated WEFFB systems, conserve resources and support inclusive socio-economic development.

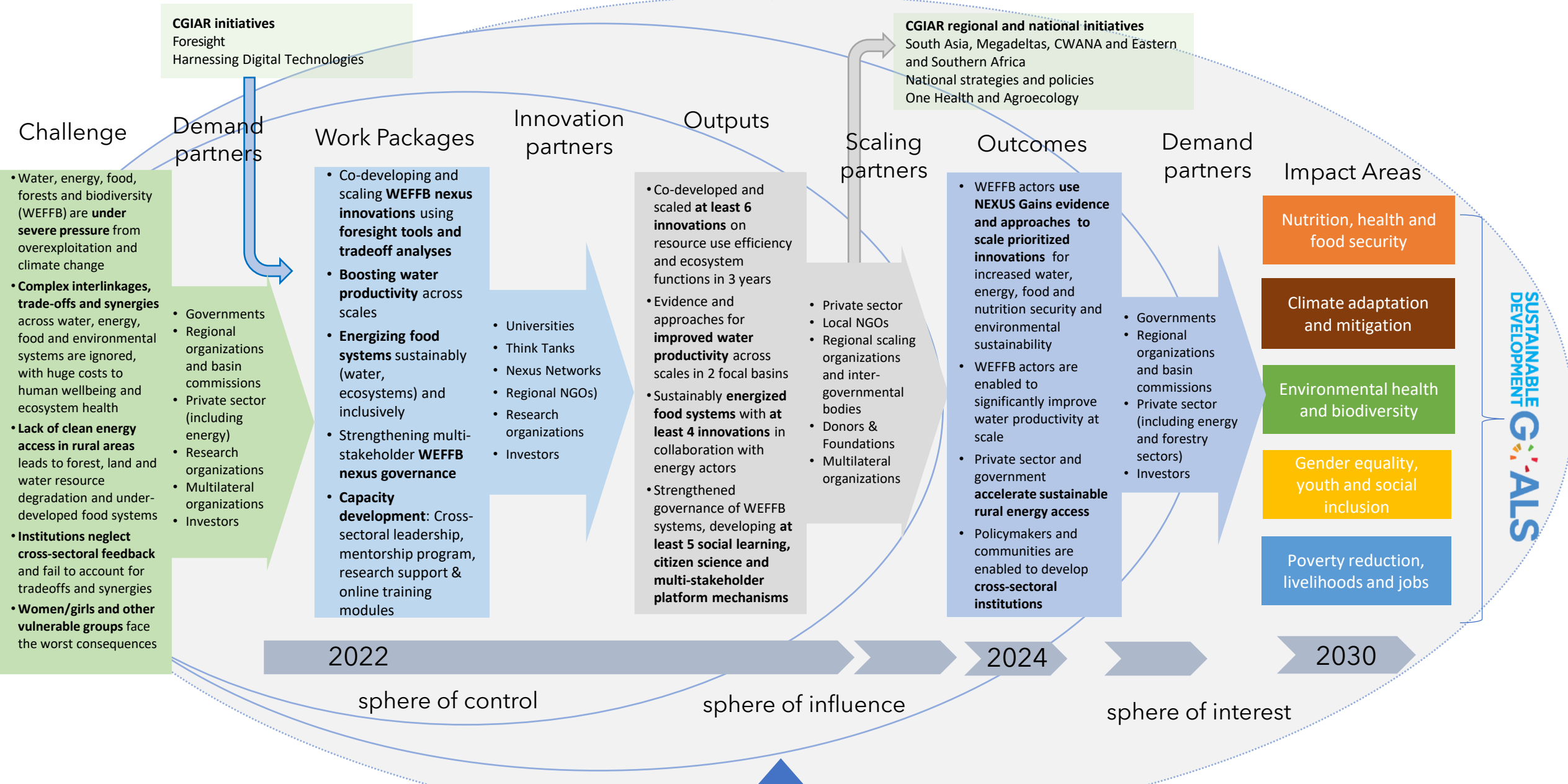
Integrated water storage solutions build resilience and support WEFFB security while promoting ecosystem health and considering climate change and growing water storage gaps [<https://bit.ly/3e4lJmp>]. Planners and basin managers will recognize storage as a service and tools will enable them to smartly combine nature-based (e.g., groundwater, wetlands, soil water, forests) and engineering solutions.

A groundwater governance toolbox scaled by policymakers and communities will help address growing competition, degradation, and depletion of resources in hotspot basins. Tools will include behavioral change interventions [<https://bit.ly/3dnKU48>] through experiential games, citizen science for monitoring [<https://bit.ly/3tmZD4V>], and learning exchanges via ICT at community levels focusing on strengthening women's agency.

### Key Partners

<b>Demand</b>	Academic, Training and Research	Bangladesh Center for Advanced Studies (BCAS), Indian Council of Agricultural Research (ICAR), Pakistan Council of Research in Water Resources (PCRWR), Scientific-Research Institutes of Water Problems and Water Economy of Central Asian States
	Government	Governments (national and state level) of Bangladesh, India, Pakistan, Central Asian states, Egypt, Ethiopia, and Sudan (water, agriculture, energy, and environment ministries)
	Multilateral	World Bank, FAO, AfDB, ADB, Africa Union
	Other	Nile Basin Initiative (NBI) and Eastern Nile Technical Regional Office (ENTRO)
	Private Sector	Water and Energy for Food Hubs [ <a href="https://bit.ly/3dmnQTG">https://bit.ly/3dmnQTG</a> ], Power for All Agriculture Campaign [ <a href="https://bit.ly/3tofhxc">https://bit.ly/3tofhxc</a> ], energy investors, etc.
<b>Innovation</b>	Academic, Training and Research	Universities of Bahir Dar, Addis Ababa and Khartoum, University of Central Asia, Council on Energy, Environment, and Water (CEEW) India, IHE Delft (Netherlands), SLU (Sweden), Australian National University (ANU)
	Government	Indian Council of Agricultural Research (ICAR), Indian Council of Forestry Research & Education (ICFRE), Institute of Hydrology, IIT, (all India)
	International NGO	ICIMOD, World Vegetable Center, Regional Environmental Centre for Central Asia (CAREC), Global Resilience Alliance
	Other	International Innovation Center for the Aral Sea Basin, Sustainable Development Policy Institute (SDPI), Pakistan, WEF Africa Nexus Network, FE2W Network, Sustainable Water Futures, Future Dams
	Private Sector	Futurepump, Hydrosolutions
<b>Scaling</b>	Local Government	State Governments in the Indus, Ganges and Nile basins
	Other	FES, FH, World Vision, GIZ, SDC, Tata Trust, Agha Khan Foundation, Global Green Growth Institute, Global Resilience Alliance, Donors & Funders, etc.
	Other Public Sector	AMCOW, AGRA, AUC
		International Fund to Save the Aral Sea
Private Sector	Power for All, Power Africa, Powering Agriculture, CLARO Energy Pvt. Limited	

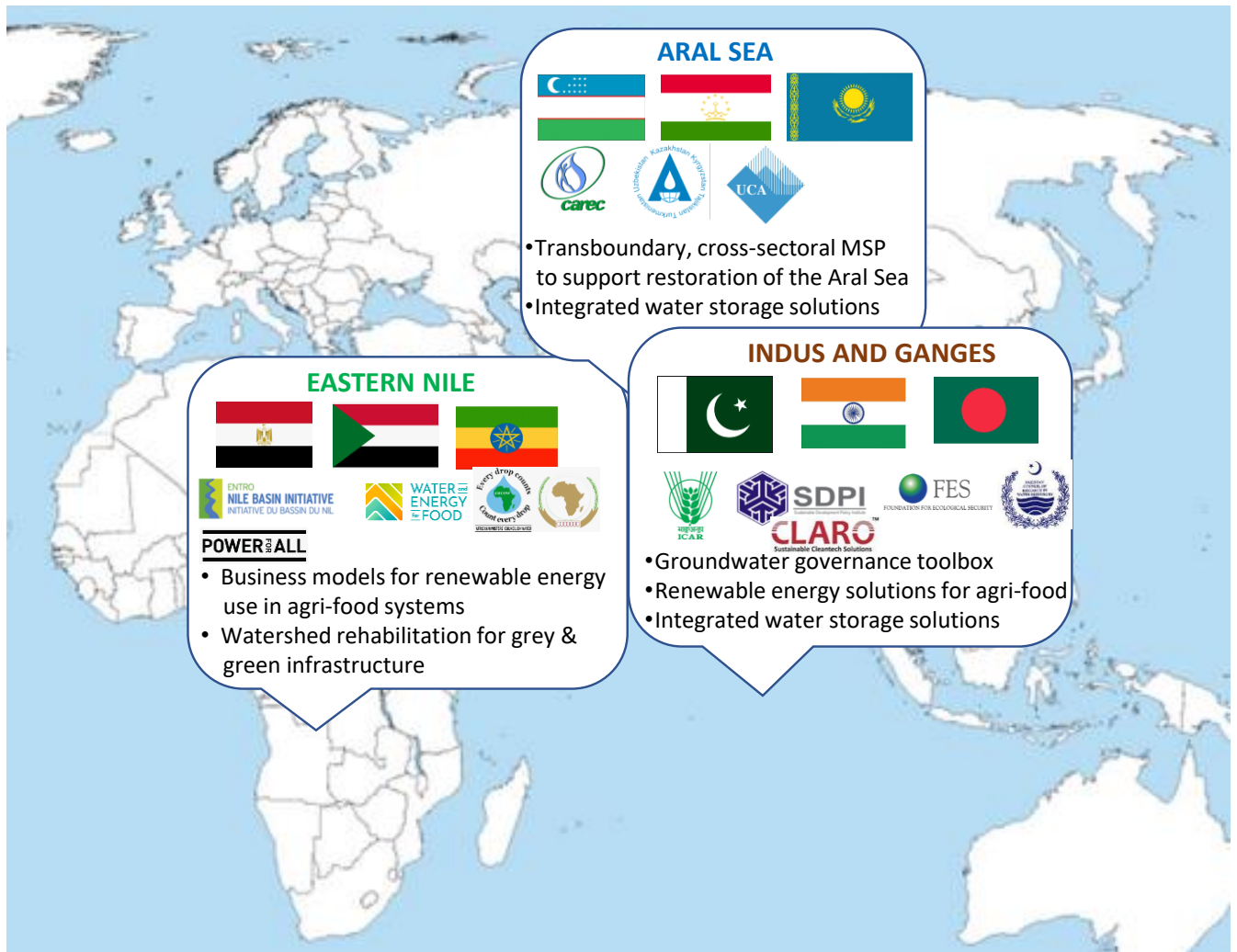
# Theory of change: NEXUS Gains



SUSTAINABLE DEVELOPMENT GOALS

**Objective:** NEXUS Gains will foster integrated management of water, energy, food, land, biodiversity and forests for inclusive, sustainable development in transboundary river basins in a climate crisis.

**Exhibit 1: NEXUS Gains Regions, Selected Partners and Innovations**



Note: The list of partners and innovations is indicative only.



## Plant Health and Rapid Response to Protect Food and Livelihood Security

Initiative Lead and Co-Lead	Primary CGIAR Action Area	Estimated 2022 - 2024 Budget
Prasanna Boddupalli Monica Carvajal Yepes	Resilient Agri-food Systems	\$30 - \$30 M

### Challenge

Effective plant health management is critical for improving the productivity, sustainability and resilience of agri-food systems. Yet, smallholder farmers, especially in LMICs, continue to struggle against pest and disease incursions/outbreaks. Each year, plant diseases and pests cost the global economy US\$220 billion. Recent analyses showed that the highest losses due to pests and diseases are associated with food-deficit regions with fast-growing populations. Moreover, mycotoxin contamination of crop produce above permissible limits is significantly impacting food safety, public health and trade. Besides air-borne, seed-borne and insect-vector channels, increasing trade and travel coupled with weak phytosanitary systems are accelerating the global spread of devastating pests and diseases. The situation is exacerbated by the effects of changing climate, driving the emergence of new threats. The burden of all this falls disproportionately on women and poorly resourced communities. Diagnostic capacity, global-scale surveillance data and risk forecasting for major pests/diseases are still lacking, alongside rapid response and management systems. Inadequate knowledge and/or access to integrated and climate-smart control options is often leaving smallholders and marginalized communities unprepared or poorly equipped to respond to the biotic threats. Environmental effects of toxic pesticides, mycotoxin exposure, and acute unintentional pesticide poisoning are of major concerns globally. Despite its scientifically sound principles, integrated disease and pest management continues to have low adoption rates worldwide due to various reasons, including critical gaps in access to affordable technologies, especially to women and disadvantaged groups, and underinvestment in promotion and uptake of available plant health interventions.

[References for the Challenge Statement: <https://bit.ly/2Q0G1p9>]

### Objective

The core purpose of this initiative is to protect agriculture-based economies of LMICs in Africa, Asia and Latin America from devastating pest and disease incursions/outbreaks, by leveraging/building viable networks across an array of national, regional and global institutions. The focus will be on high-impact and/or high-risk pests and diseases causing major food security shocks and severe economic impacts in the LMICs.

Together with innovation partners, the initiative will co-develop comprehensive research-for-development (R4D) approaches and analytical frameworks to identify, characterize, predict and manage plant health threats. Harnessing synergies with other thematic initiatives, this initiative will adopt robust and ecologically sustainable approaches to mitigate the effects of existing/emerging pests and diseases, and co-deploy integrated crop protection innovations in 20 target countries in the LMICs. By 2024, those frameworks and approaches will become routinely implemented by at least 10 national plant protection organizations (NPPOs) across the target LMICs in Africa, Asia and Latin America.

The specific objectives of the initiative will be: 1) Enabling critical R4D for rapid and accurate identification, characterization and assessment of plant health risks through coordinated and strengthened surveillance and diagnostics networks in LMICs; 2) Developing, validating and deploying conventional and novel integrated disease and pest management packages for mitigating the impacts of plant health threats (both existing and emerging) in the target regions through public-private partnerships; and 3) Bringing gender-responsive and socially inclusive plant health innovations to scale through novel partnerships, effective communications and outreach, and capacity development of local institutions.

### Theory of Change

The Initiative aims to enable targeted LMICs in Africa, Asia and Latin America to respond effectively to the plant health threats, thereby protecting food security and livelihoods of smallholders and communities, especially in the face of climate change. It will implement components of the Global Surveillance System including laboratory diagnostic network, data management and risk assessment modeling, by leveraging CGIAR's network of plant health units together with the infrastructure and expertise of external partners (e.g., NPPOs/RPPOs, FAO-IPPC, etc.) (WP1). It will improve and integrate data management systems, epidemiological modelling and risk assessment analysis (WP2) to recommend sampling/surveillance efforts (WP1), and prioritize high-risk threats and target areas for co-developing and deploying gender-responsive, eco-friendly crop protection innovations through integrated disease and pest management (IDPM) packages (WP3), and mycotoxin risk assessment and management (WP4). The initiative will implement effective approaches for gender-responsive and socially inclusive scaling of plant health solutions, monitoring, evaluation and learning (MEL), and socio-economic impact assessment (WP5).

Strategic partnerships with key demand, innovation and scaling partners, including Governments, NARES, NPPOs/RPPOs, advanced research institutions, private sector, and local communities, and strong synergies with relevant OneCGIAR initiatives\* will contribute to the initiative's outcomes and impacts. Through research-based analysis and recommendations, and leveraging and strengthening the capacities of local institutions, the initiative will lead to greater preparedness and effective response by national governments in 20 target LMIC countries to plant health threats. By 2030, the initiative's outcomes will benefit at least 150 million smallholders and disadvantaged groups in target geographies, enhancing resilience, productivity and sustainability of agri-food systems.

\*GI: Market intelligence for more equitable and impactful genetic innovation; Genebanks; Farmer-preferred crop varieties; Delivering genetic gains in farmers' fields; RAFS: Excellence-in-Agronomy; Regional Integrated Initiatives; ST: Harnessing digital technologies; Leveraging gender and social equality, etc.



## Plant Health and Rapid Response to Protect Food and Livelihood Security

### Highlights

The initiative will develop and validate robust and versatile tools/protocols for cost-effective pest/disease diagnostics and surveillance, quarantine monitoring, high-throughput and efficient disease and pest phenotyping assays to aid resistance breeding programs, and seed health testing. Connecting diagnostics laboratories in LMICs to globally coordinated networks will ensure capacity strengthening and application of new tools and protocols.

The initiative will focus on bringing technological, institutional and structural transformations (e.g., IDPM packages, intensive public-private partnerships for scaling etc.) to enhance the effectiveness and impacts of crop protection systems.

Harnessing the synergies with several OneCGIAR initiatives and expertise of innovation and scaling partners (both public and private), the initiative will co-develop eco-friendly and climate-smart IDPM innovations, and deploy these using gender-responsive and socially inclusive scaling approaches in the target LMICs.

Together with innovation partners, the initiative will further develop tools for pest/disease risk assessment and prioritization, and will facilitate local-to-global and global-to-local exchange of diagnostics and pest occurrence data. This will contribute to enhanced preparedness and rapid response to existing and emerging pests/diseases and minimize transboundary spread.

The initiative will develop, test and deploy context-specific, gender-relevant scaling methods for innovation delivery to end-users. Frameworks will be established for effectively identifying and alleviating bottlenecks to scaling, improving stakeholder capacity development, and assessing the socio-economic impact of crop protection interventions.

### Work Packages

	Scope of Work	3-year Outcomes
BRIDGING KNOWLEDGE GAPS AND NETWORKS: PLANT HEALTH THREAT IDENTIFICATION AND CHARACTERIZATION	Strengthening global phytosanitary systems by leveraging CGIAR and external partners' (e.g., FAO/RPPOs/NPPOs) diagnostic and field detection networks; Enabling partners for effective diagnostics, surveillance, monitoring and characterization of pests/diseases for rapid response; Research to bridge knowledge-gaps (e.g., climate-induced changes on pest/disease spectrum); high-throughput field-based pest/disease phenotyping assays; use of novel ICTs.	National plant diagnostic laboratories in 20 target LMICs are well-connected to regional/global diagnostic networks, and are capable of predicting, detecting, and managing existing and emerging pests/diseases, and prevent their transboundary spread.
GUIDING PREPAREDNESS AND RAPID RESPONSE: DATA MANAGEMENT AND RISK ASSESSMENT	Harness CGIAR and external partners' (e.g., FAO) capacities to improve and integrate plant health databases; Together with innovation partners, develop/validate/ update epidemiological models for guiding sampling/surveillance efforts by partners (WP1), identifying high-risk threats and target areas for implementing IDPM packages (WP3), and developing innovative tools/processes for reducing mycotoxin contamination (WP4).	Stakeholders, including policymakers, in the target LMICs access plant health databases and risk assessment analyses for taking informed decisions on strategies to mitigate the impacts of at least five devastating transboundary pests/diseases in target geographies.
INTEGRATED DISEASE AND PEST MANAGEMENT SOLUTIONS FOR THREAT MITIGATION	Integrated disease and pest management (IDPM) packages tailored to gender needs, agroecological and farmers' socio-economic contexts, and deployed against prioritized plant health threats in target geographies; Strategic R4D on mechanisms underlying host-pathogen/pest interactions for developing innovative solutions (in partnership with GI Initiatives)	Increased yield stability and reduced food security shocks due to containment of pest- and disease-induced crop losses at farmer- and landscape-levels, through deployment of gender-responsive and climate-smart IDPM packages against six prioritized plant health threats.
TOOLS AND PROCESSES FOR PROTECTING FOOD CHAINS FROM MYCOTOXIN CONTAMINATION	Innovative pre- and post-harvest mycotoxin management tools/processes developed, and deployed through national and regional scaling partners in targeted LMICs; Prediction models based on climate, agricultural and food safety information; Interdisciplinary communications campaigns and monitoring tools on food safety and nutrition.	Mycotoxin contamination significantly reduced in at least two major crop value chains in three target countries in Africa, resulting in more safe and healthy diets, and increased market access.
METHODS FOR INCLUSIVE AND EQUITABLE SCALING OF PLANT HEALTH INNOVATIONS TO ACHIEVE IMPACTS	Developing interdisciplinary approaches for sustainable, socially inclusive, and gender-equitable scaling of plant health innovations (from WP1-WP4) by national/regional (public and private sector) partners for benefiting women, youth and marginalized communities; Understanding and alleviating household/community constraints in adopting IDPM; Causal impact evaluation and evidence-based policy recommendations.	Gender-responsive and socially inclusive scaling of plant health innovations adopted in at least 10 target LMICs across Africa, Asia and Latin America, and socio-economic impact assessment undertaken for at least four major pests and diseases.



## Plant Health and Rapid Response to Protect Food and Livelihood Security

### Impact Area Contributions

<b>Nutrition, health &amp; food security</b>	Reduced risks to human health due to increased deployment of eco-friendly solutions (e.g., biological control, pest/disease-resistant varieties, etc.) in place of toxic pesticides. More safer diets through lowered incidence of mycotoxin contamination along the food chain. Improved food security due to increased protection of crop yields, and yield stability.
<b>Poverty reduction, livelihoods &amp; jobs</b>	Improved livelihoods of smallholders due to increased yield stability and containment of pest- and disease-induced crop and food losses at the field- and landscape-levels.
<b>Gender equality, youth &amp; social inclusion</b>	Increased access to and benefits from plant health innovations by women and vulnerable social groups. Inclusive approaches (e.g., participatory surveillance, monitoring and rapid response) foster co-ownership and resilience of farming communities. Increased youth involvement in developing innovative plant health solutions (e.g., digital surveillance and monitoring tools/technologies).
<b>Climate adaptation &amp; greenhouse gas reduction</b>	Improved capacity of development partners (e.g., NPPOs/NARES/NGOs/Private sector) in sub-Saharan Africa, Asia and Latin America to predict climate-induced changes in pest and disease spectrum and intensity, and to prepare/respond with effective management options.
<b>Environmental health &amp; biodiversity</b>	Reduction in use of toxic pesticides and associated safety hazards, including pesticide residues in the environment, due to IDPM deployment. Protection of natural biodiversity and ecologies from devastating invasive pests/pathogens and toxic pesticides. Effective use of microbial or insect biodiversity as biocontrol agents by local partners to protect crops.

### Impact on SDGs



### Regions

Global East and Southern Africa (ESA), Latin America and the Caribbean (LAC), South Asia (SA), South East Asia and the Pacific (SEA), West and Central Africa (WCA)

### Countries



## Plant Health and Rapid Response to Protect Food and Livelihood Security

### Innovations

A diagnostics and surveillance toolbox (including low-cost and robust assays, and genomics & bioinformatics-based tools for pest/disease diagnosis and diversity assessment, and ICT tools for real-time data collection and crowdsourcing) developed and deployed to NPPOs, public/private agencies and farming communities in LMICs to effectively survey, monitor and manage pests/diseases.

Interoperable databases/repositories, risk assessment models, and evidence-based guidance frameworks co-developed with demand and innovation partners, for supporting Governments/NPPOs/FAO, prioritizing biosecurity measures and rapid response to high-risk pests/diseases, including surveillance, sampling and field detection (WP1), and recommending target sites for deploying IDPM packages (WP3).

Eco-friendly and sustainable integrated pest and disease management packages, including resistant varieties, biological control, environmentally safer pesticides and agro-ecological approaches, developed, validated and deployed against major plant health threats (existing and emerging) in target LMICs.

Robust, sensitive and affordable mycotoxin diagnostic tools/protocols, coupled with improved risk assessment tools and integrated management solutions, developed for use in the target LMICs.

Gender-responsive and socially inclusive approaches for plant health management, including capacity development of local and regional institutions for preparedness, diagnostics, and rapid response, and evidence-based policy recommendations for scaling innovations through effective public-private partnerships.

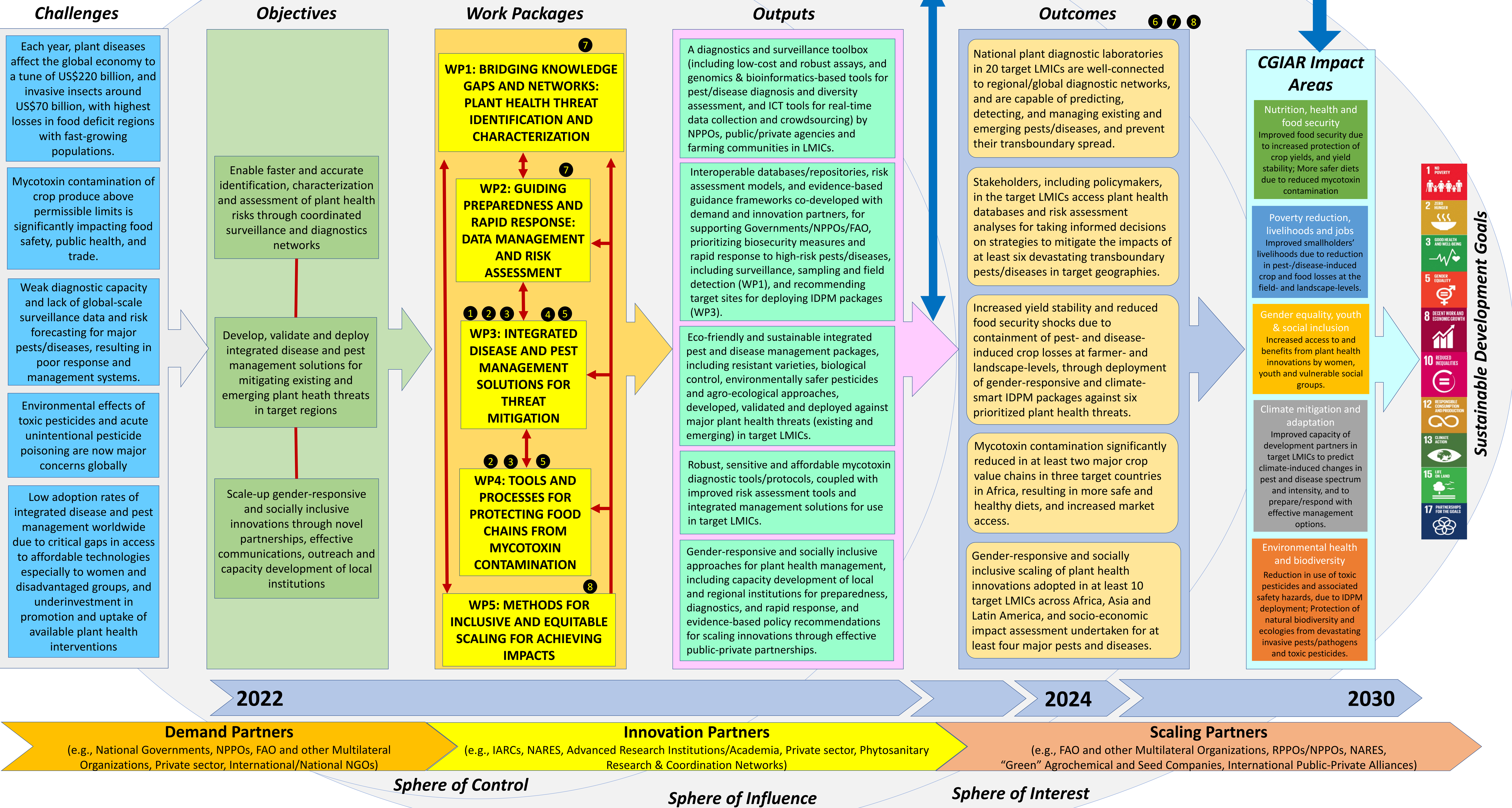
### Key Partners

<b>Demand</b>	Government	Ministries of Agriculture, Environment, Food, and Planning Commissions in the target LMICs in Africa, Asia and Latin America; African Union; The Australian Centre for International Agricultural Research (ACIAR).
		National Plant Protection Organizations: e.g., KEPHIS-Kenya, Nigerian Agricultural Quarantine Services, Plant Protection and Regulatory Services Directorate, Directorate of Plant Protection, Quarantine and Storage, India, ICA-Colombia, SENASA-Peru, Agrocalidad-Ecuador, etc.
	International NGO	Examples: African Forum for Agricultural Advisory Services (AFAAS), FLAR (Latin America), Catholic Relief Services, etc.
	Multilateral	International/Regional Agricultural Development Bodies/Organizations: e.g., FAO, ECOWAS, CORAF, SADC, COMESA, ASEAN, SAARC, IAPSC, PACA, CARDESA, PACA, etc.
	Private Sector	Examples: International Seed Federation, African Seed Trade Association, Asia-Pacific Seed Association, HarvestFields Industries, KOPPERT Biologicals, A to Z Textiles Ltd., BAMTAARE, etc.
<b>Innovation</b>	Academic, Training and Research	Advanced Research Institutions / Universities: USDA-ARS, CSIRO-Australia, Aarhus University, PennState, Kansas State University, University of Florida, CAAS, ICAR, University of Warwick, University of Bristol, Plant Health Institute-Montpellier, University of Twente, University of Cambridge, JIC, Cornell University, JIC, Rothamsted Research, Keele University, University of Missouri, Colorado State University, Ohio State University, The Sainsbury Laboratory, Wageningen University, EMBL-EBI (European Bioinformatics institute), Washington State University, etc.
		International Agricultural Research Centers (IARCs): e.g., icipe, CABI, USAID CETC Innovation Lab, CIRAD, IRD, JIRCAS, ICRISAT, WorldVeg etc.
		National Agricultural Research and Extension (NARES) Organizations: e.g., KALRO, NARO, TARI, RAB, ICAR, BARI, INIA, INIAP, AGROSAVIA, etc.
	Multilateral	Phytosanitary research & coordination networks: AU-IAPSC, FAW R4D International Consortium, Euphresco, Crop Trust, BBTD Alliance, CGIAR GHU network, NPDN-USA, etc.
	Private Sector	Examples: Corteva, Syngenta, Bayer, Plantix, UPL, Biobest, Koppert, Russell IPM, ElephantVert, BCRL, UPL, etc.
<b>Scaling</b>	Government	National Agricultural Research & Extension System (NARES): e.g., KALRO-Kenya, NARO-Uganda, EIAR-Ethiopia, ICAR-India, BARI-Bangladesh, NRCRI-Nigeria, CRI-Ghana, IER-Mali, TARI-Tanzania, ZARI-Zambia, RAB-Rwanda, CAAS-China, etc.
		Regional/National Plant Protection Organizations (RPPOs/NPPOs): Inter-African Phytosanitary Commission (IAPSC), Asia and Pacific Plant Protection Commission (APPPC), Comunidad Andina (CAN), North American Plant Protection (NAPPO), KEPHIS-Kenya, Plant Health Services-Tanzania, NAQS-Nigeria, ICA-Colombia, Inter-American Institute for Cooperation on Agriculture (IICA), SENESA-Peru, etc.
	Multilateral	UN/Conventions: e.g., FAO, IPPC, ASARECA, CORAF, CCARDESA, SADC, COMESA, ECOWAS, etc.
	Private Sector	'Green' agrochemical and seed companies: e.g., Syngenta, Corteva, Bayer, Biobest, Koppert, Russell IPM, ElephantVert, FCI-Africa, etc.
	Public Private Partnership	International Alliances: e.g., PABRA (Africa), FAW R4D International Consortium, TAAT, etc.



# Theory of Change – Plant Health and Rapid Response to Protect Food and Livelihood Security

- Linkages and Synergies with CGIAR Initiatives**
- 1 GI: Market intelligence for more impactful genetic innovations
  - 2 GI: Market-preferred crop varieties
  - 3 GI: Delivering genetic gains in farmers' fields
  - 4 GI: Conservation and use of genetic resources
  - 5 RAFS: Excellence-in-Agronomy
  - 6 RAFS: Regional Integrated Initiatives
  - 7 ST: Harnessing digital technologies
  - 8 ST: Leveraging gender and social equality







## Protecting human health through a One Health approach

Initiative Lead and Co-Lead	Primary CGIAR Action Area	Estimated 2022 - 2024 Budget
Hung Nguyen-Viet Vivian Hoffmann	Resilient Agri-food Systems	\$30 - \$30 M

### Challenge

COVID-19 is the sixth zoonotic pandemic since 1980. The frequency and severity of these events is increasing as people encroach on wildlife habitats and livestock and fish production systems intensify. Animal production systems are reservoirs of zoonotic pathogens, which are responsible for 60% of human communicable disease cases (<https://bit.ly/3u1H7PZ>). Two thirds of global antimicrobial use (AMU), the key driver of AMR, is in livestock production. AMR causes 700,000 deaths annually and is projected to kill 10 million each year by 2050 (<https://bit.ly/3dn3Ksu>). Trade of animals and animal-source foods at increasing scales multiplies the magnitude of health and economic risks (<https://bit.ly/3g9xYRv>). Livestock generate 85% of global animal fecal waste (<https://bit.ly/3uXd3Ft>), leading to environmental degradation and human exposure to waterborne pathogens. Foodborne disease takes a toll comparable to that of tuberculosis, malaria, and HIV/AIDS, but receives a small fraction of the investment from international donors (<https://bit.ly/3tkulq0>, <https://bit.ly/3xt00xn>, <https://bit.ly/3sW3iFX>).

Solving these challenges requires both overcoming institutional barriers to cross-sectoral collaboration and stronger evidence on the importance and cost-effectiveness of incorporating One Health principles into management of food systems. Through implementation research conducted in partnership with national governments, we will develop structures for and build experience in cross-sectoral integration. Research conducted through this initiative will improve zoonotic disease surveillance and shed light on behavioral barriers to adoption of practices for the management of zoonotic disease, AMR, and food safety risks. By demonstrating the added value of One Health interventions, we will make the case for national governments and development partners to scale up investment. This initiative will demonstrate how food systems can be redesigned based on One Health principles along the entire value chain to benefit human, animal and environmental health. Research on disease ecology, particularly at interfaces of contact among wildlife, livestock, and people, will be the primary focus of work on emerging zoonoses. For endemic zoonoses, interventions that strengthen animal health services, including ICT-based diagnostic and disease reporting systems for small-scale farmers, will be evaluated for impact on disease prevalence and cost-effectiveness. New evidence on the contribution of livestock and aquaculture to microbial and antimicrobial pollution in water, and on incentives for farmers to reduce such pollution, will be generated and fed into watershed management planning processes.

Building on previous CGIAR work that quantified the burden of food-borne disease and evaluated strategies to improve food safety in informal and traditional markets, this initiative will strengthen the focus on government action to develop, implement, and scale standards that are achievable for small-scale informal sector value chain actors and enforceable by regulatory bodies. To reduce farm-level AMU and AMR in livestock and aquaculture, we will test interventions that enable farmers to improve herd and fish health via improved nutrition, vaccination, biosecurity, and diagnosis to guide treatment. Concurrently, we will work with governments to improve antimicrobial stewardship and better understand and manage informal or illegal antimicrobial supply, and gaps in policies for AMU in fish and livestock systems.

We estimate that between 4.3 to 41 million cases of disease could be averted annually through these efforts.

### Objective

This initiative will demonstrate how food systems can be redesigned based on One Health principles along the entire value chain to benefit human, animal and environmental health. Research on disease ecology, particularly at interfaces of contact among livestock, livestock, and people, will be the primary focus of work on emerging zoonoses, while threats to human health through food safety and antimicrobial resistance will be tackled along value chains. For endemic zoonoses, interventions that strengthen animal health services, including ICT-based diagnostic and disease reporting systems for small-scale farmers, will be evaluated for impact on disease prevalence and cost-effectiveness. New evidence on the contribution of livestock and aquaculture to microbial and antimicrobial pollution in water, and on incentives for farmers to reduce such pollution, will be generated and fed into watershed management planning processes.

Building on previous CGIAR work that quantified the burden of food-borne disease and evaluated strategies to improve food safety in informal and traditional markets, this initiative will strengthen the capacity of governments to develop, implement, and scale standards and incentives that are achievable for small-scale informal sector value chain actors and enforceable by regulatory bodies. To reduce farm-level AMU and AMR in livestock and aquaculture, we will test interventions that enable farmers to improve herd and fish health via improved nutrition, vaccination, biosecurity, and diagnosis to guide treatment. Concurrently, we will work with governments to improve antimicrobial stewardship and better understand and manage informal or illegal antimicrobial supply, and gaps in policies for AMU in fish and livestock systems.

### Theory of Change

The One Health approach recognizes the interconnections between the health of people, animals, and their shared environment. This initiative will generate evidence and develop tools enabling the redesign of food systems based on One Health principles, with a focus on reducing human disease risks by a) enabling timely detection and control of zoonotic pathogens including those with pandemic potential, b) adapting and scaling strategies to prevent foodborne disease, and c) pre-empting antimicrobial resistance (AMR) in land-water-food systems. Impacts of food systems on environmental health, human nutrition, and animal health outcomes will be tracked, and collaborations with initiatives focused on these outcomes will be undertaken.

Holistic risk assessment tools and interventions to mitigate transmission risks will be developed and tested primarily in two contexts: 1) intensifying fish and livestock production systems, where biosecurity and animal health practices fail to match increased transmission opportunities, 2) informal and traditional food systems, which provide the majority of fresh foods in low and middle-income countries (LMICs) but lack appropriate food safety management tools and incentives.

Results will be achieved through interdisciplinary projects that:

- 1) generate evidence, collaboratively with stakeholders, to enable risk-based prioritization of geographies, pathogens, AMR genes, and exposure pathways, for surveillance, risk mitigation, incentivization of stakeholders, and regulatory enforcement.
- 2) evaluate, with scaling partners, impacts of technologies, tools, and approaches to identify and control zoonoses and AMR, and improve food safety and water quality.
- 3) integrate innovations into government partners' policies and programs and disseminate knowledge for further scaling.

Collaborating initiatives: Sustainable Animal Productivity for Livelihoods, Nutrition and Gender inclusion (SAPLING), Resilient Cities through Sustainable Urban and Peri-urban Agrifood Systems, SHiFT: Sustainable Healthy Diets through Food Systems Transformation, NEXUS Gains: Realizing Multiple Benefits Across Water-Energy-Food-Forest-Biodiversity Systems, Harnessing Digital Technologies for Timely Decision-Making across Food, Land, and Water Systems, Foresight and metrics to accelerate inclusive and sustainable agri-food system transformation.

## Protecting human health through a One Health approach

### Highlights

We will leverage CGIAR's unique decades-long experience working with food system actors in LMICs, and relationships with national governments, to conduct cross-sectoral intervention-based research involving experts in animal and human health, epidemiology, food safety, AMR, economics, and water management.

Socio-economic, gender, and cultural factors will be incorporated into risk models, which will make use of innovative data sources and interdisciplinary approaches, including behavioral modeling, crowd-sourced data on animal and human disease syndromes, drone or satellite imagery of wildlife-livestock interfaces, and machine learning.

ICT-based systems will be developed and tested to build capacity and provide incentives throughout the food system, by expanding access to and improving affordability of veterinary services, disseminating information to improve manure and wastewater management, and monitoring performance of government personnel to improve service delivery.

Analysis of the fate and transport of microbiological and antimicrobial pollutants via water flow pathways (surface water and groundwater) will support basin-wide One Health assessment and management. Relationships with water management authorities will be leveraged to build this work into ongoing planning processes, ensuring relevance and use.

Building on the CGIAR's previous work co-designing national One Health strategies, we will demonstrate to government partners the feasibility and effectiveness of coordination across sectors through implementation-based research on surveillance, veterinary service provision, and regulatory monitoring and enforcement, while also strengthening public sector capacity.

### Work Packages

	Scope of Work	3-year Outcomes
Emerging and neglected zoonoses	Pre-empt emergence and spread of zoonoses with epidemic and pandemic potential at the interface of wildlife, livestock, and people, including in bushmeat value chains, through surveillance, identification of high-risk behaviors and geographies, and epidemiological-behavioral modeling; reduce incidence of zoonotic pathogens associated with poverty.	Evidence, co-generated with stakeholders and integrated into prioritization processes, on: how interactions between wildlife, livestock and people, including through land use change, lead to emergence of new zoonoses and persistence of endemic zoonoses; effects of intensification of production and trade on zoonotic disease transmission; and management of these risks.
Food safety	Reduce the burden of foodborne disease with a focus on animal-source and other perishable foods, including in informal and traditional food systems, through simple technologies and non-punitive governance approaches implemented along food value chains from production to consumption.	Reduction in foodborne disease in at least two primarily informal and traditional food value chains through improved practices of value chain actors due to a combination of capacity building, incentives and non-punitive enforcement. Interventions will be developed, implemented and evaluated in coordination with national governments.
AMR	Reduce selection and spread of AMR from livestock, fish and crop production systems through reduced and better-targeted AMU, surveillance of AMU and AMR in animals and animal-source foods, improved manure management, and a better understanding of the environment as a reservoir for AMR.	Reduced irrational AMU and reduced prevalence of AMR in animal source foods through improved herd and fish health in at least one country; reduced environmental contamination of AM residues and AMR genes through improved on-farm waste management practices. Greater knowledge of the role of wildlife and environmental reservoirs of AMR.
Environment	Improve land use and water management for the reduction of health risks, with a focus on pollution from agriculture and aquaculture, including zoonotic pathogens and antimicrobial residues and genes, and high-risk wildlife-livestock-human interfaces.	Evidence on microbiological water pollution from livestock or aquaculture, and the role of water as a conduit and reservoir of AM residues and AMR genes, informs management planning for at least one major watershed.
Economics, governance, and behavior	Test effects of capacity building, incentives, and monitoring on behavior of value chain actors and government personnel providing support or oversight for relevant sectors, with attention to the influence of gender on constraints, motivations, and capacities through randomized evaluations. Model economic impacts of epidemics and control measures.	Interventions based on One Health principles, and designed to reflect the constraints and incentives of small- and medium- scale food system actors, are evaluated for cost-effectiveness, and results are communicated to governments and international donors to inform future investments.



## Protecting human health through a One Health approach

### Impact Area Contributions

<b>Nutrition, health &amp; food security</b>	By reducing the prevalence of foodborne diseases, zoonoses, and infections resistant to antimicrobials, we will directly improve human health. The majority of foodborne diseases are diarrheal; reducing the diarrheal disease burden will improve key nutrition outcomes including stunting and wasting. Access to safe food is a component of food security.
<b>Poverty reduction, livelihoods &amp; jobs</b>	The poor are disproportionately exposed to zoonoses, foodborne disease and AMR. Access to treatment and the costs of treatment are major obstacles for the poor; many forgo treatment and suffer more serious illness. Inability to work and treatment costs can result in significant and lasting economic hardship for the poor.
<b>Gender equality, youth &amp; social inclusion</b>	Women and youth often care for livestock; their involvement in surveillance of zoonoses and uptake of disease mitigation measures are critical for effectiveness. Women are primarily responsible for preparing food and so are key actors in food safety. Reducing illness reduces the burden on women of caring for the sick.
<b>Climate adaptation &amp; greenhouse gas reduction</b>	Benefits of improved manure management through composting and use of bio-digestors, include reduced greenhouse gas emissions, reduced deforestation, and improved plant health and crop yields through higher quality organic fertilizers, in addition to reduced environmental contamination with pathogens, antimicrobial residues, and AMR genes.
<b>Environmental health &amp; biodiversity</b>	Threats to environmental health and biodiversity, such as human encroachment on and fragmentation of wildlife habitats, and replacement of indigenous wildlife with animals evolved to co-exist with people, are risk factors for the emergence of new zoonoses. Strategies for prevention of such emergence thus also benefit environmental health and biodiversity.

### Impact on SDGs



### Regions

Global

### Countries



## Protecting human health through a One Health approach

### Innovations

Mapping of zoonotic disease emergence risk based on crowd-sourced data on disease syndromes and treatment outcomes, meteorological and high-resolution environmental data from drone and satellite imagery, and use of machine learning approaches, taking into account human behaviour, helps governments and international organizations identify and manage high-risk wildlife-livestock-human interfaces.

Regulatory delivery approach that builds on CGIAR success supporting value chain actors to improve food safety in informal and traditional markets through training and certification by adding non-punitive requirements for corrective action and provision of infrastructure including water.

Behavioral nudges, incentives and technologies that are cost-effective and proven to reduce farm-level AMU and AMR, e.g., mobile apps to raise awareness and increase knowledge about AMU and AMR, promotion of non-antibiotic alternatives and implementation of manure management practices.

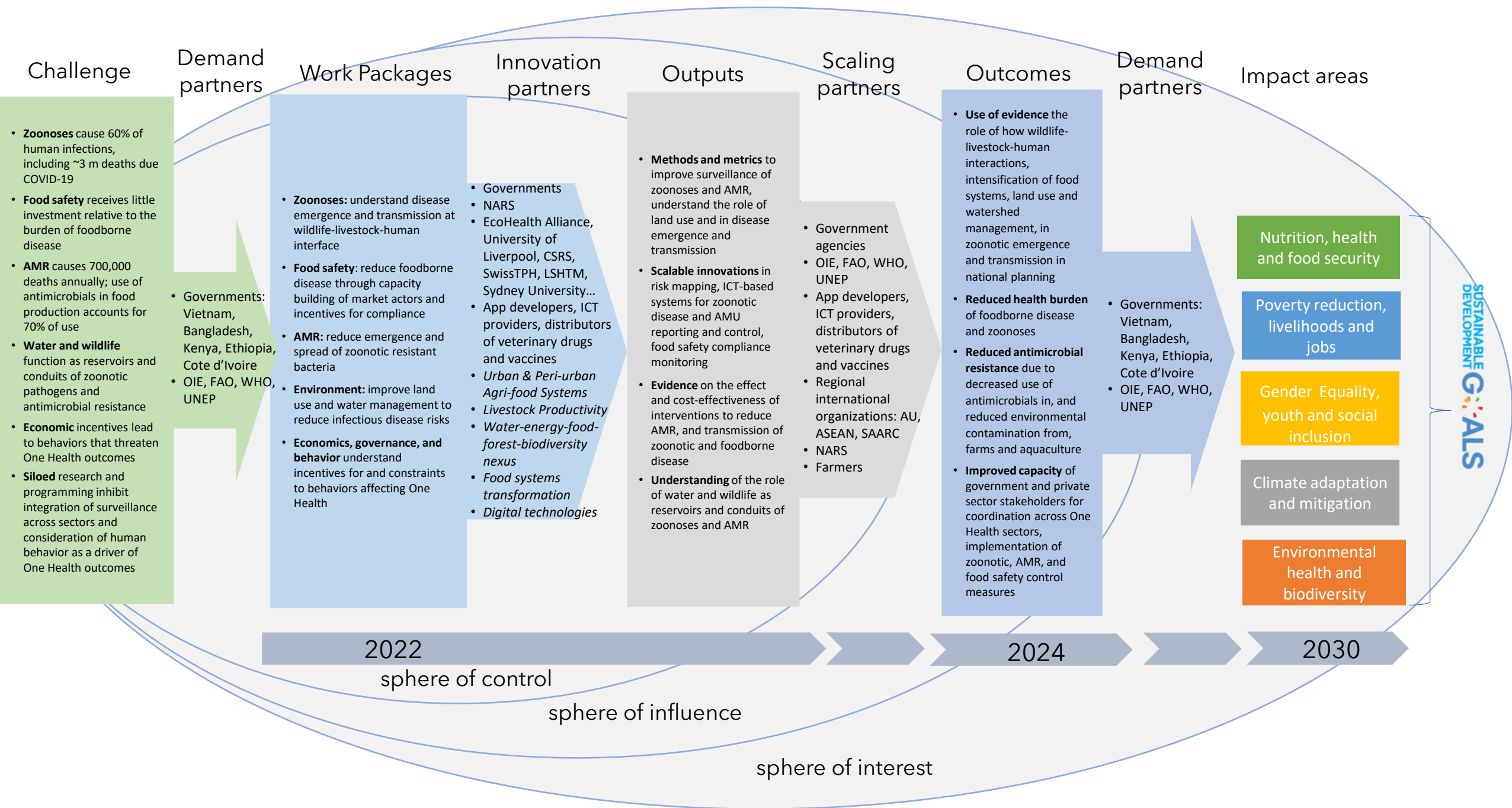
Hydrological modeling of the fate and transport of microbiological and antimicrobial pollutants via water flow pathways (surface water and groundwater) to support basin-wide One Health assessment and management.

Performance management and accountability systems for public servants responsible for implementing surveillance and enforcement of antimicrobial use and food safety regulations leading to improved service delivery and preventing potential abuse of power.

### Key Partners

<b>Demand</b>	Government	Government of Bangladesh
		Government of Ethiopia
		Government of Kenya
		Government of Vietnam
	Multilateral	OIE, FAO, WHO, UNEP
<b>Innovation</b>	Academic, Training and Research	International research institutions, including: EcoHealth Alliance, University of Liverpool, CSRS, Swiss TPH, LSHTM, University of Sydney, University of Melbourne
		Universities in focus countries
	Other Public Sector	NARS
	Partner Country based NGO	Farmer organizations
	Private Sector in Aid Recipient Country	App developers, ICT providers, distributors of veterinary drugs and vaccines
<b>Scaling</b>	Government	Governments of all focus countries
	Multilateral	OIE, FAO, WHO, UNEP
		Regional international organizations, for example AU, ASEAN, SAARC
	Other Public Sector	NARS
	Private Sector in Aid Recipient Country	App developers, ICT providers, distributors of veterinary drugs and vaccines

# Protecting human health through a One Health approach: theory of change (revised)





## Resilient and sustainable LAC agri-food systems: Driving global food security, inclusive growth, and reduced out-migration

Initiative Lead and Co-Lead	Primary CGIAR Action Area	Estimated 2022 - 2024 Budget
Deissy Martínez Barón Bram Govaerts	Resilient Agri-food Systems	\$30 - \$45 M

### Challenge

LAC holds the planet's largest reserve of arable soils, 30% of renewable water, 46% of tropical forests and 30% of biodiversity, making a massive contribution to global food supply and other planetary ecosystem services([bit.ly/3wZ5u2T](https://bit.ly/3wZ5u2T)). Climate change and natural disasters, exacerbated by COVID-19, have eroded CAC economic and food security, destabilizing communities and triggering exports of people instead of food. In 2010, intraregional immigrants reached 63% of all LAC migrants (28.5 million) ([bit.ly/3mLBhj4](https://bit.ly/3mLBhj4)). Further breakdown of LAC's most vulnerable agri-food systems will push millions globally into food insecurity, unleash unprecedented migration, especially of young people, and jeopardize achieving the SDGs of 'zero hunger', 'reduced poverty', and 'life on land'.

LAC's resource-intensive agricultural production model has reduced agri-food system resilience and increased conflicts with its global environmental function. Agricultural expansion and intensification, and urbanization have degraded over 20% of LAC forests and farmlands, with negative effects on productivity, carbon storage, and biodiversity, especially in the Andes. 69% of GHG emissions come from land-use changes([bit.ly/3goZHOj](https://bit.ly/3goZHOj)).

Regional food production depends on smallholders, who produce 60% of food([bit.ly/3mVmEcX](https://bit.ly/3mVmEcX)). Their livelihoods are threatened as 31% of LAC cropland is becoming less suited to changing climates([bit.ly/3goZHOj](https://bit.ly/3goZHOj)). Farmers lack access to training, improved technologies, and remunerative markets. High uncertainty due to climate variability discourages new investments in agriculture. Agricultural value chains fail to incentivize resource efficiency, agricultural diversification, and inclusivity. Simultaneously, unhealthy diets are causing obesity and malnutrition. Socio-economic disparities are more pronounced for women and indigenous peoples, whose participation in agri-food system innovations is hindered by deep-seated inequalities.

### Objective

The overarching objective is to increase the resilience, sustainability and competitiveness of LAC agri-food systems so that they are better equipped to meet urgent food security needs, reduce climate threats, stabilize conflict-vulnerable communities, and reduce out-migration. This embraces the specific objectives of:

1. Establishing participatory, inclusive R4D innovation hubs in 8 countries. These will pilot, finetune, and scale a suite of climate-resilient, sustainable, nutrition-sensitive production strategies in diverse LAC agroecological zones, that will bring 500,000 ha of land under sustainable management by 2024. Primary focus will be in five CAC countries (El Salvador, Guatemala, Haiti, Honduras, Nicaragua), and specific work packages will be implemented in Mexico and Andean countries (Colombia, Peru) using existing capacities and high potential for achieving outcomes at scale with reduced investment costs.
2. Strengthening the agency, skills, and capacity of extension systems in 5 countries to support farmers, including women and youth. This will allow adopting improved technologies (for nutrition, climate resilience, and yield), low-emissions strategies, and water/soil/biodiversity management best practices emerging from the participatory R4D innovation hubs across diverse agroecological zones.
3. Extension systems in 5 countries are equipped with better on-farm technologies, digital agro-climatic advisory tools and traceability mechanisms to support farmers and agricultural small/medium-sized enterprises (agri-SMEs) to better integrated risk management, enhanced value creation, access to finance and remunerative agricultural product offtake.
4. Assisting 3 LAC countries to use CGIAR research findings to shape and/or implement multi-sector, inclusive, transformative agri-food sector policies and robust Nationally Determined Contributions (NDC) and National Adaptation Plans (NAPs).

### Theory of Change

The Initiative will strengthen LAC agri-food systems' resilience, sustainability and competitiveness, enabling them to better meet food security needs, reduce climate threats, stabilize conflict-vulnerable communities, and reduce out-migration through CGIAR strong regional/national networks. Initiative's public-private-social partnerships will be underpinned by financial investment, research-for-development networks (R4D), and transformative policies linking climate security to food systems management. These partnerships will drive piloting and scaling co-developed, socially-inclusive, and socio-technical innovations. Initiative's innovations will increase agri-food system competitiveness, foster more climate-resilient value chains, and de-risk targeted food security systems (maize/beans, rice/cattle) and commercial crops (coffee/cocoa). Our approach harnesses and creates: a) new data, tools, and de-risking mechanisms; b) multi-stakeholder policy engagement; and c) participatory inclusive R4D innovation hubs, primarily in areas of extreme climate vulnerability, low agricultural productivity, out-migration, and instability across Central America and the Caribbean (CAC), and simultaneously in Mexico and Andean countries-where UN and other development agencies will facilitate broader scaling and multiplication-as vehicles to: (i) co-develop, with producer organizations, tools for climate-resilient, sustainable, and nutrition-sensitive food systems; ii) work with national research and extension systems and youth-networks to close the digital gap on agro-advisory services; and iii) co-develop, with civil society, public- and private-sector actors, strategies for low-emission agroecosystems and value chains.

By 2024, these changes will: i) support stabilization of LAC international food prices (as the world's largest net-food-exporting region); ii) enhance conserving globally-important carbon sinks and biodiversity hotspots; and iii) build the foundations for resilient, inclusive agri-food systems to stabilize conflict-vulnerable communities and reduce out-migration from Central America. The Initiative builds on existing efforts (MasAgro, Andean Initiative, EiA, CCAFS) and on the Two-Degree-Initiative consultations.

Synergies with eight Initiatives: Building systemic resilience to climate variability and extremes; Transforming food systems from net carbon sources to sinks; Food systems transformation for healthy, safe, and affordable diets; Excellence in Agronomy; Climate-smart livestock; Agroecology across food, land, and water systems; National strategies and policies for driving transformation; and Levering gender & social equality in agri-food systems.



## Resilient and sustainable LAC agri-food systems: Driving global food security, inclusive growth, and reduced out-migration

### Highlights

Strengthening LAC's dual role. LAC is the world's largest net food-exporting region, and a vital resource for planetary wellbeing, an (agro)biodiversity hotspot with one-quarter of the world's forests. This initiative protects these global assets by restoring broken food systems in destabilized communities that face out-migration, conflict, and environmental degradation.

Collaborative learning for rapid and demand-driven innovation. The initiative combines the power of proven existing R4D networks (CCAFS/Alliance/CIMMYT/CIP/IFPRI/HarvestPlus), for co-generation of value-creating innovations that increase competitiveness and de-risk food security and commercial crops. They enable rapid cross-learning to occur between the initial CAC countries, Mexico and Andean countries.

Innovation at the center of transformation. Innovation goes beyond technical solutions and needs a change in mindset. By bringing together public, private, and civil society actors (including indigenous people), with their different knowledge, goals and expertise, supported by data, we will create spaces for novel, concerted, inclusive and tailored actions.

Digital transformation to stabilize local and global agri-food systems. CGIAR's climate services work has reached over 350,000 LAC farmers (<https://bit.ly/32eWZCn>) demonstrating that using agro-climatic information for planning and decision-making results in crop-loss reduction, and enhanced yields, climate resilience and resource-efficiency, leading to increased agricultural incomes and nutrition security.

Sustainable agro-ecosystems for diversified, healthy diets. Resilient, competitive agri-food systems require strong, diverse linkages between social, economic and environmental dimensions. Joint efforts towards achieving sustainable, low-emission agroecosystems will enhance soil health, water availability and biodiversity management, critical for enabling shifts to diverse, sustainable, healthy diets.

### Work Packages

	Scope of Work	3-year Outcomes
Climate-resilient, sustainable, and nutrition-sensitive local and regional food systems	<ul style="list-style-type: none"> <li>●Adoption pathways for high-yielding, stress-tolerant, nutritious crop varieties.</li> <li>●Science-based management to optimize productivity of land, water, labor, biodiversity, and finance in integrated livestock-cropping systems and agroforestry.</li> <li>●Capacity-building and technological innovations, tailored to women and youth, targeting small/medium farms where returns to innovation are high while enabling shifts to healthy diets..</li> </ul>	<p>≥3 producers associations increased their knowledge and capacities to facilitate the adoption of improved technologies (with increased nutritional quality, yield, and climate resilience) by farmers.</p> <p>≥3 countries strengthened their policies to facilitate enhanced entrepreneurship in agri-services, value addition, and local marketing, contributing to climate-resilient, sustainable, nutrition-sensitive local/regional agri-food systems.</p>
Gender-sensitive digital tools for de-risking agriculture, increasing climate resilience and underpin actionable knowledge creation in mixed farming systems.	<ul style="list-style-type: none"> <li>●Fine-tuning and scaling agro-climatic information and digital advisory services to support improved farm and risk management and agricultural investment and planning.</li> <li>●Evidence generation and scaling agronomic options that promote climate resilience, and GHG emission reduction.</li> <li>●Multiple-source information and knowledge for equitable, rapidly evolving, and actionable knowledge generation and management for innovation and transformational change considering unresolved practical and relational barriers (<a href="https://bitly.com/3goZHOj">https://bitly.com/3goZHOj</a>).</li> </ul>	<p>Extension systems in 5 countries are equipped with better on-farm technologies and digital agro-climatic advisory tools, to support farmers with integrated risk management strategies, facilitate value creation, and remunerative offtake of agricultural products.</p> <p>≥3 high-capacity agri-SME partners deliver agricultural services, adopt traceability mechanisms, and facilitate financial investments.</p>
Sustainable and low emissions agroecosystems, landscapes and value chains	<ul style="list-style-type: none"> <li>●Sustainability and emission-reduction indicators to track contributions to national and regional climate, poverty, mitigation and biodiversity goals.</li> <li>●Digitally-enabled research-based tools supporting water and nutrient use efficiency, reduced pest/disease, and restored soils, ecosystem services, and biodiversity.</li> <li>●Science and market-based solutions for climate change mitigation in local and export value chains.</li> </ul>	<p>Producers associations/extensionists of ≥5 countries are capable to support farmers to increase water- and nutrient-use efficiency, conserve biodiversity, reduce pests/diseases, and restore soils using research-based tools.</p> <p>Agri-food actors in ≥3 countries implement low-emission strategies, reducing GHG emissions and increasing productivity by 10%, also tracking contributions to national/regional climate, poverty, and biodiversity goals using sustainability indicators.</p>
Hubs for agri-food innovation and scaling across countries for networking, knowledge exchange and co-creation.	<ul style="list-style-type: none"> <li>●Innovation hubs with physical infrastructure, including research platforms, modules, extension and impact areas that engage men, women, youth, and socially excluded groups in collaborative improvement of their productivity, income, nutrition, equity, and agency within agrifood systems(<a href="https://bitly.com/3goZHOj">https://bitly.com/3goZHOj</a>).</li> <li>●Hub-based partnership with researchers, input suppliers, extension agents, traders, and processors to co-create knowledge and solutions and to foster technical, social, and institutional change.</li> </ul>	<p>Participatory and inclusive R4D innovation hubs are established in 8 countries with agrifood actors, enabling fine-tuning, adoption, and scaling of climate-resilient/sustainable/nutrition-sensitive production strategies in diverse agroecological zones.</p> <p>Producers associations, extension services and value chain actors in 3 countries facilitate the adoption of validated strategies by farmers in 500.000has enhancing short/long-term system productivity and profitability.</p>
Policies and institutions for climate-resilient, competitive and low-emission agri-food systems	<ul style="list-style-type: none"> <li>●Supporting LAC countries to effectively deliver on NDCs/NAPs including gender-transformative approaches.</li> <li>●Evidence-generation on regional climate security and migration through the interaction of socio-economic, climatic, socio-political drivers and their impact on regional and global security(Jarvis et al., 2021).</li> <li>●Development of research-based decision-making tools for promoting climate-resilient and low emissions agrifood systems and policies.</li> </ul>	<p>Governments in 3 countries use OneCGIAR research to develop and implement transformative agri-food sector policies and robust gender-responsive NDCs/NAPs. Regional bodies develop policy instruments to facilitate coordinated investment by agri-food system stakeholders and shifts in government policy to better support climate resilience, competitive agri-food systems, and reduced out-migration.</p>

**Resilient and sustainable LAC agri-food systems: Driving global food security, inclusive growth, and reduced out-migration**

**Impact Area Contributions**

<b>Nutrition, health &amp; food security</b>	A triple burden of malnutrition, exacerbated by climate variability, threatens LAC health and stability, especially in Central America. This initiative will contribute to improving nutrition, health, and food security through collaborative, socio-technical innovation for climate-resilient, sustainable, and nutrition-sensitive local agri-food systems and stabilized contributions to global food security.
<b>Poverty reduction, livelihoods &amp; jobs</b>	Yield and productivity gaps, climate variability, and fragmented local agri-food systems drive food insecurity, poverty, and out-migration from Central America. This initiative enables new and increased agriculture-related incomes through enhanced digital capacity and agri-entrepreneurship that promote remunerative value chains, local economies, stability, and community resilience.
<b>Gender equality, youth &amp; social inclusion</b>	Socio-economic disparities restrict participation in agri-food system innovation and income generation. This initiative expands capacity for women, youth, indigenous groups, and ethnic minorities to take leadership roles in farm-level production, and natural-resource management, household nutrition, and agricultural value chains (local marketing; value-added food processing) through tailored capacity development programs.
<b>Climate adaptation &amp; greenhouse gas reduction</b>	Climate change exacerbates regional socio-economic and political problems, through low productivity, crop losses, lack of tools/mechanisms for local planning and decision-making, and increasing GHG emissions due to land-use changes. This initiative will facilitate cross-scale climate adaptation, thus de-risking agri-food systems, making them more competitive, and providing science-based GHG-intensity reduction solutions.
<b>Environmental health &amp; biodiversity</b>	Degradation of 20% of LAC forests and farmlands, with negative effects on productivity, carbon storage, and biodiversity, erodes the sustainability, competitiveness, and global environmental contribution of the region's agri-food systems. This initiative will promote adoption of climate-, water-, and nutrient-smart practices for enhancing multifunctional landscapes and enabling integrated crop-tree-livestock systems.

**Impact on SDGs**



**Regions**

Latin America and the Caribbean (LAC)

**Countries**



## Resilient and sustainable LAC agri-food systems: Driving global food security, inclusive growth, and reduced out-migration

### Innovations

Indicators and tools for assessing food systems in terms of nutritional, food safety, resilience, and inclusivity outcomes and trade-offs to guide enhanced agri-food systems policy development and implementation at national and subnational scales, that provide characteristics and drivers of consumers and producers' food environments, agri-food dynamics and climate-smart technological options.

Digitally-enabled agro-climate and e-extension system for local to national agri-food systems actors that engages existing extension services and hub networks to deliver advice, training and create knowledge, on how to respond to climate variability, sustainably increase productivity, sustainably diversify production, and participate in remunerative and traceable value chains.

Scalable traceability system for private sector, including agri-food SMEs, that supports them in delivering food security and environmental outcomes, while measuring and increasing agri-food system efficiency to reinforce competitiveness of local producers and overcome growing consumers' concerns in food safety and friendly environment goods.

Agri-food Innovation System (AIS) for agrifood system actors that enable value creation through participatory and context-specific testing and validation of climate-resilient, low-emission and nutrition-sensitive agricultural practices and technologies to provide options suitable for diverse farming households, agro-ecologies and value chains, and bring novel ways to facilitate innovation adoption and diffusion.

Civil society-public-private partnerships that leverage technological, institutional, and socio-economic analysis and modeling to co-develop tactical plans for agri-food systems transformation, including compliance with NDCs/NAPs and gender-transformative approaches. This will lead to active involvement of civil society in public-private partnerships to promote collective behavioral changes that positively impact agri-food systems.

### Key Partners

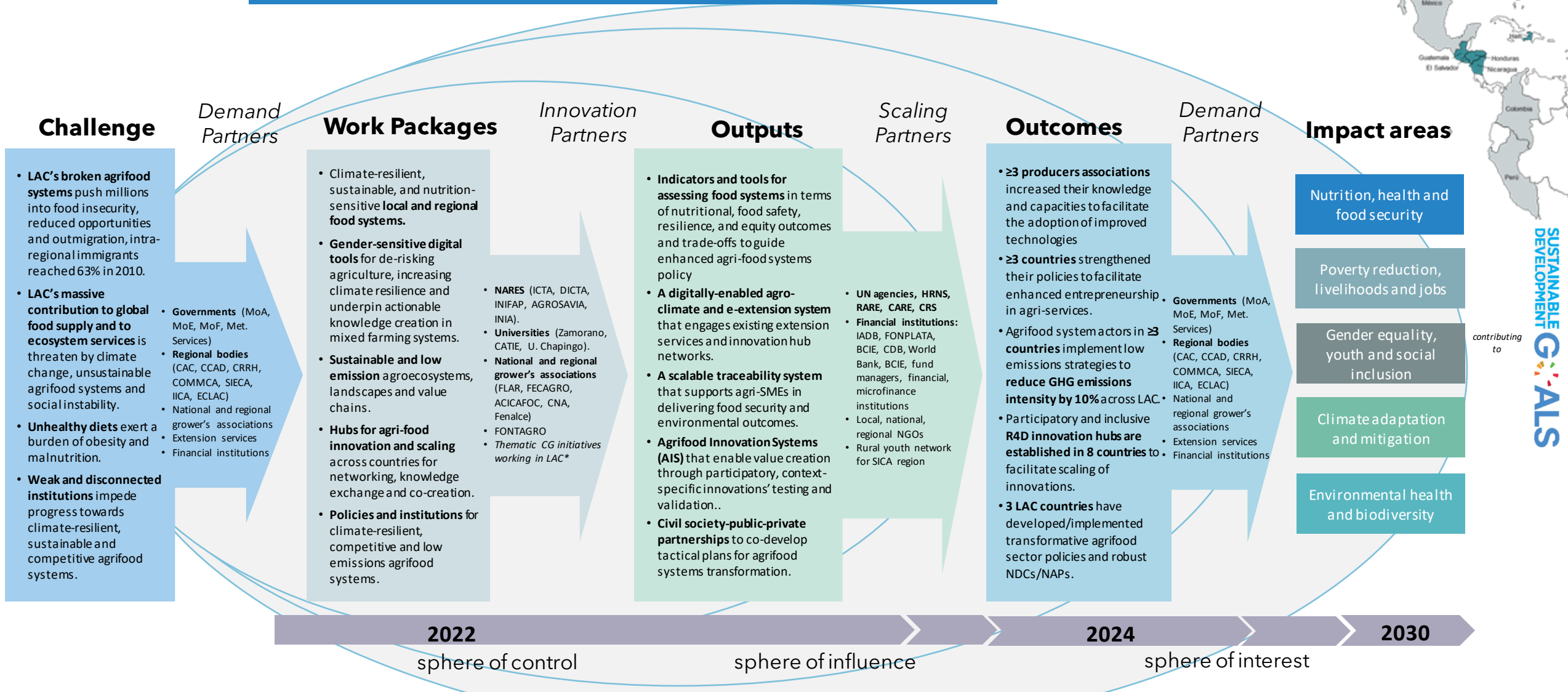
<b>Demand</b>	Government	Ministries of Agriculture, Environment and Finance, Food Security Agencies, Meteorological Services, NARES
	Multilateral	Regional government bodies: CAC, CCAD, CRRH, COMMCA, SIECA, IICA, ECLAC.
	Other	National and regional grower's associations (e.g. FLAR, FECAGRO, ACICAFOC, CNA, Fenalce)
	Private Sector	Consumer organizations, industry groups, food companies, trade associations.
<b>Innovation</b>	Academic, Training and Research	NARES (ICTA, DICTA, INTA, CENTA, INIFAP, AGROSAVIA, INIA)
		Universities (e.g. Zamorano, CATIE, University San Carlos of Guatemala, University of Chapingo)
	Multilateral	FONTAGRO
	Private Sector	National and regional grower's associations (e.g. FLAR, FECAGRO, ACICAFOC, CNA, Fenalce)
<b>Scaling</b>	International NGO	FAO, WFP, other UN agencies, HRNS, RARE, CARE, CRS
	Other	Rural youth network for Central America and Dominican Republic
	Private Sector	Financial institutions: IADB, FONPLATA, BCIE, CDB, World Bank, BCIE, fund managers, financial, microfinance institutions.
		National and regional grower's association, consumer organizations, industry groups, trade associations.
	Regional NGO	Local, national, regional NGOs (e.g. ASORECH, CASM, TNC, Conservation International)

# Theory of change

## Resilient and sustainable LAC agri-food systems: Driving global food security, inclusive growth, and reduced out-migration

### Geographies:

- 5 focus countries: Guatemala, Honduras, El Salvador, Nicaragua, Haiti.
- 3 satellite countries: Mexico, Colombia and Peru.



\*Synergies with thematic initiatives to achieve intended outcomes: \*Building systemic resilience to climate variability and extremes; \*Transforming food systems from net carbon sources to sinks; \*Food systems transformation for healthy diets; \*Excellence in Agronomy; \*Climate-smart livestock (3); \*Agroecology across food, land, and water systems; \*National strategies and policies for driving transformation; Levering gender & social equality in agrifood systems.



# Resilient and sustainable LAC agri-food systems:

Driving global food security, inclusive growth, and reduced out-migration

## WHAT

To increase **resilience, sustainability and competitiveness of LAC agrifood systems** to meet urgent **food security** needs, reduce **climate threats**, stabilize **conflict-vulnerable** communities, and staunch the flow of **out-migration**.

## WHY

**30%** of the world's **arable soils**

**46%** of world's **tropical forests**.

**63%** of **immigrants** were **intra-regional** in 2010

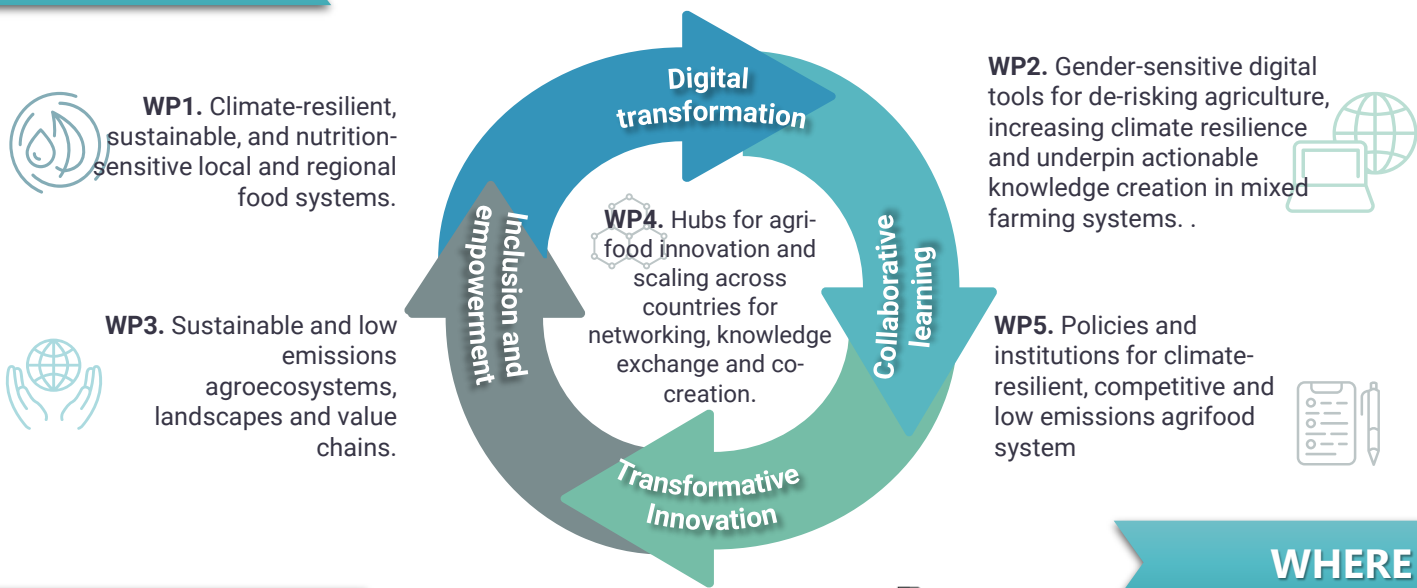
**25%** of world's **forests**.

**30%** of the planet's **renewable water reserves** and world's **biodiversity**.

**60%** of **food** is produced by **smallholder farmers**

## HOW

*Demand-driven approach through civil society-public-private partnerships*



## OUTCOMES by 2024

**8** R4D Hubs for agri-food innovation and scaling

**≥3** Producers associations increased their knowledge and capacities to facilitate adoption of smart technologies (climate/water/soils/carbon) and increase of ag-related income

**≥3** countries strengthened their policies to facilitate enhanced entrepreneurship in agri-services, value addition, and local marketing.

**≥3** high-capacity agri-SME partners deliver agricultural services, adopt traceability mechanisms, and facilitate financial investments.

Extension systems in **5** countries are equipped with better on-farm technologies and digital agro-climatic advisory tools, to support farmers

**10%** of GHG emissions intensity reduction and productivity increase in agrifood systems





## Resilient Aquatic Foods for Healthy People and Planet

### Initiative Lead and Co-Lead

Edward Allison  
Sonali Senaratna Sellamuttu

### Primary CGIAR Action Area

Resilient Agri-food Systems

### Estimated 2022 - 2024 Budget

\$30 - \$30 M

### Challenge

Aquatic foods (animals and plants grown or harvested from water for food or feed) provide micronutrient-rich foods for 3.3 billion people and support livelihoods of over 120 million (WorldFish, 2020, <https://bit.ly/3spSyPX>). However, access to food for low-income consumers and food and income for the majority (>90%) small-scale actors in wild-caught aquatic food systems (AqFS) is threatened by inadequate management and competing demands for aquatic foods by wealthier consumers. Climate change impacts AqFS productivity, viability and resilience (Barange et al. 2018, <https://bit.ly/3tjQ2fk>). Aquatic animal diseases threaten production, and treating them can cause antimicrobial resistance that threatens human health (Cabello et al. 2013, <https://bit.ly/3mPmtzZ>). Reducing loss, waste and environmental impacts are imperatives throughout AqFS.

Productivity, biodiversity and carbon-sequestering functions of aquatic ecosystems are threatened by competing water demands, pollution, infrastructure development, land use change, and competition for space and resources (Vorosmarty et al. 2010, <https://go.nature.com/2RvOv7Q>; Cohen et al. 2019, <https://bit.ly/2Qpdc5s>). AqFS-dependent communities risk being excluded from these food environments, traditionally managed as commons (Cohen et al., 2019; Joffre et al., 2017, <https://bit.ly/2QrN61F>).

Investment in novel cell or plant-based seafoods and aquaculture feeds (e.g. microalgae) is concentrated in the Global North, while 'aquatic superfoods' (seaweeds, shellfish) have yet to reach their full potential, and traditionally diverse, local 'food environments' are threatened by low-quality food imports (Sievert et al. 2019, <https://bit.ly/3gjW5gf>).

Underinvestment in breeding aquatic animals for improved growth, feed conversion efficiency, climate resilience and disease resistance constrains environmental performance and productivity, particularly for smaller-scale farmers (FAO 2019, <https://bit.ly/3x0erZO>).

Inadequate data and management systems hinder effective governance and marginalize AqFS within wider food system policy discourses (Bennett et al, 2021, <https://bit.ly/3uVu42>). This limits investments required to realize AqFS contributions to the UN Sustainable Development Goals.

### Objective

Aquatic foods are rich in highly bioavailable forms of essential vitamins and minerals and are major sources of omega-3 and vitamin B12 (Thilsted et al. 2016, <https://bit.ly/3x2qjtY>). AqFS provide business opportunities for tens of millions but are also harvested from aquatic commons by millions of landless and marginalized people. Our overall objective by 2030 is to ensure that the projected 160 million diverse AqFS actors and their dependents in our 11 target countries improve their access to income and nutrition from aquatic foods, and that our contributions to sustainably manage aquatic foodscapes and growing aquaculture will prevent up to 500 million people from becoming malnourished (Golden et al 2016, <https://go.nature.com/2Q0ENKy>).

Our initiative aims to accelerate transition towards an aquatic food system that is regenerative rather than extractive, so that by 2024, in our 11 target countries, 30% of AqFS production will come from the sustainable and efficient use of biodiverse inland freshwater systems and coastal wild and farm production environments. These AqFS will evidence improvement in social equity, climate-preparedness, and micronutrient yields. They will offer desirable employment for youth, and contribute to a 10 % increase in per capita aquatic food consumption for the 3.6 billion fish-consuming people in our target countries. We will achieve this by building on previous CGIAR research that has generated innovations in governance models, partnership modalities, technologies and knowledge services. Our initiative will scale up these innovations and apply our co-created knowledge base to influence policy and market behaviour in the AqFS and the broader food system.

### Theory of Change

Our theory of change is that aquatic foods could deliver more to human nutrition, livelihoods and environmentally sustainable agrifood systems if research-for-development investments were made in natural resource management and delivery and uptake of innovations throughout aquatic foods value chains. We propose a program of partnership-based research and innovation to help accelerate on-going sustainability transition in the aquatic food system.

Five work packages comprising bundled socio-technical innovations will deliver benefits to all five OneCGIAR impact areas. Decision-support tools, innovation-system relationships and production technologies to improve access to wild and farmed aquatic food production in inland freshwater systems and coastal waters (WP1, 2), together with genomic tools selecting for improved farmed fish growth and resilience (WP4), will help close fish supply-demand gaps, lower prices, and improve access to nutritious aquatic foods, while also creating jobs for women, men and youth. Moreover, well-managed food-producing wetlands and coastal waters are carbon sinks and aquatic farmed foods can be carbon-efficient. Innovation hubs will co-design, pilot and accelerate uptake of nutritious and climate-smart foods and aquaculture feeds, reduce loss and waste in value chains and support traditionally diverse local diets (WP3). Knowledge platforms will allow all partners to learn, anticipate change, and make better investment decisions in aquatic food futures (WP5).

The socio-technical innovation bundles in each WP will include gender-transformative approaches and be combined, in a given location, depending on diagnosed need and opportunity. We will also work in partnership with other synergistic regional and thematic initiatives to amplify outcomes and impact, including: Protecting human health through a One Health approach; Her+: Harnessing equality for resilience in the agri-food system; Resilient cities through sustainable urban and peri-urban agrifood systems; Transforming food systems from greenhouse gas sources to sinks (S2S); and the Securing the Asian Mega-Deltas against sea-level rise, flooding, salinization and water insecurity initiative.

## Resilient Aquatic Foods for Healthy People and Planet

### Highlights

Managing water for aquatic foods. Here we promote a participatory, inclusive landscape planning approach, focusing on habitat protection, connectivity and fish-friendly infrastructure, to get more food from water and ensure fair access. We will stimulate inter-sectoral collaboration to increase water productivity, carbon sequestration, biodiversity conservation, employment and nutrition from natural wetlands, irrigated rice and gray/green infrastructure.

Partnering for peopled seas. AqFS actors are being squeezed out of coastal zones by competing ocean uses. Building on relationships with fisherfolk associations, we will partner with 'ocean citizen action groups' to supply on-demand research to uphold their economic, social and cultural rights to traditional food-producing spaces and ocean-based livelihoods.

AquaLabs in four countries will incubate, pilot and accelerate uptake of novel nutritious, climate-smart aquatic foods and aquaculture feeds; improve processing to reduce waste and loss; market-test new products; and/or help revive traditional diets. We will co-design, co-pilot and scale with diverse AqFS actors, including women, youth and Indigenous Peoples.

AquaGenetics. Accelerating the creation and adoption of better-performing strains of main cultured fish (tilapias, carps, African Catfish), that meet users' needs, through novel institutional dissemination arrangements: improving productivity, profitability and environmental performance of fish farms, while building disease and climate-change resilient farming systems and reducing fish supply-demand gaps.

AquaData. Redesign fisheries and aquaculture sector data around a food systems approach, via an interactive AqFS knowledge platform for OneCGIAR and partners to: fill data gaps; identify priority threats and opportunities; model AqFS futures; conduct intersectional political economy analysis; evaluate policy proposals and provide AqFS actors with access to robust information.

### Work Packages

	Scope of Work	3-year Outcomes
Aquatic Foodscapes: Managing Aquatic Food Systems (AqFS) within Environmental Boundaries and Changing Climates	Co-design with AqFS partners, integrated packages for management and investment in AqFS with improved environmental and climate performance, by applying at scale, piloted innovations (e.g., integrated rice-fish farming, aquatic food production in water infrastructure and climate-smart fisheries management), to incentivize sustainable water and land use for resilient, nutrition-sensitive AqFS.	Guidelines on managing aquatic foods in multi-functional land/waterspaces rolled out in 2 countries in Asia (Cambodia and Myanmar) and two countries in Africa (Zambia and Ghana) by 2024
Partnering for Peopled Seas.	Building on extensive engagement in participatory resource management, gender transformative approaches and community development models, we will reformulate our partnerships with fisherfolk to deliver locally-demanded, co-created technical, socio-political and legal research that supports traditional access rights and management systems, and enables fisherfolk to prosper in the accelerating 'blue economy'	Transformed existing partnerships with 15 coastal communities to provide on-demand research in Odisha (India), Timor Leste and Solomon Islands serving food producers' autonomous efforts to sustainably govern aquatic resources and pursue new opportunities in the 'blue economy'.
AquaLabs: Innovation Hubs for Aquatic Food Systems (AqFS)	Where local aquatic food producers, actors involved in value addition and financing along the food value chain and consumers come together to design, pilot and accelerate socio-technical innovation bundles in AqFS. Ensuring food produced/consumed is culturally and contextually appropriate and ecologically sustainable providing economic opportunities and affordable, nutritious, micronutrient-rich diets locally.	Established four aquatic food system hubs in Solomon Islands, Bangladesh, Nigeria, Kenya or Zambia to identify, evaluate and scale socio-technical innovations around AqFS waste and loss recovery, novel aquatic foods and feeds and to promote diverse, nutritious, safe, affordable diets.
AquaGenetics: Accelerating the development and delivery of improved fish strains	Applying genomic innovations will accelerate improved performance of tilapia, carp and catfish to meet users' needs, delivered by novel institutional arrangements (including public-private partnerships), and gender- and youth-responsive management tools and extension services to make fish farming systems more productive, profitable and inclusive, increasing livelihood security and affordable fish for all.	Tilapia and carp strains (at least two) with improved performance demonstrate increased efficiency/resilience, productivity and profitability in the farming systems in Africa and Asia to which they were supplied together with management practices that address yield gaps and the novel institutional partnerships that demonstrate increased scale of supply to farmers.
AquaData: in support of an enabling policy environment for aquatic food systems to thrive	Models, impact evaluations, sector-focused political economy analysis and a novel set of aquatic food-system indicators that deliver the empirical and conceptual analysis required to support inclusive decision-making and representation in critical policy arenas: blue economy, water resource governance, gender equity and youth employment; food system transformation; planetary health	Improved AqFS data availability and access, including missing data on demographics of AqFS actors, role of aquatic foods in diets and life-cycle analysis of AqFS

## Resilient Aquatic Foods for Healthy People and Planet

### Impact Area Contributions

<b>Nutrition, health &amp; food security</b>	AqFs transformation to sustainability increases availability and consumption of safe and nutritious AqFs for 3,6 billion people (50% women) and leads to reduce micronutrient deficiencies in 11 countries in Africa and Asia especially for women, children and other vulnerable groups
<b>Poverty reduction, livelihoods &amp; jobs</b>	70 million small-scale producers and fishers (50% women) increase and stabilize their income and 15 million inclusive and sustainable jobs and resilient livelihoods opportunities are created in the aquatic food systems
<b>Gender equality, youth &amp; social inclusion</b>	Applying a gender transformative and intersectional approach leads to improved gender equality, youth and social inclusion: 40 million women, youth and other vulnerable groups are empowered through AqFS.
<b>Climate adaptation &amp; greenhouse gas reduction</b>	The adoption of improved and more sustainable production and management practices for AqFS leads to a 20% decrease in CO2 emissions and a 10% increase in water- and nutrient-use efficiency in 11 countries in Africa and Asia
<b>Environmental health &amp; biodiversity</b>	The adoption of improved and more sustainable production and management practices for AqFs leads to restoration of 5 million hectares of degraded multifunctional land and water systems in 11 countries in Asia and Africa

### Impact on SDGs



### Regions

Global East and Southern Africa (ESA), South Asia (SA), South East Asia and the Pacific (SEA), West and Central Africa (WCA)

### Countries





## Resilient Aquatic Foods for Healthy People and Planet

### Innovations

Decision support tools (models, institutional mechanisms, maps and guidelines) to co-design and co-manage with AaFS actors, targeted investments in multifunctional land/waterscapes. Providing data-backed gains for improved water and land management (e.g., integrated rice-fish farming, fish in irrigation infrastructure and climate-smart fisheries management) to increase productivity, profitability and development outcomes.

Decolonized relationships between OneCGIAR and coastal communities, delivering on-demand research combining local and scientific knowledge to inform AqFS actors' efforts to build thriving coastal communities and to steward safe, productive spaces for food production amid 'squeeze' from coastal urbanization, exclusionary marine conservation and an accelerating ocean economy.

Hubs for AqFS actors to evaluate and scale local innovations in: i) novel species culture, new food products and aquaculture feeds; ii) reducing waste along value chains; and iii) reviving nutritious traditional diets. Hubs are gender and youth-inclusive, foster peer-to-peer learning and stimulate local innovations through public-private-research partnerships

Tilapia and carp strains (at least two) with improved performance through application of latest breeding technologies and social science research, that demonstrate increased efficiency/resilience and meet users' needs, delivered to farming systems in Africa and Asia via novel institutional partnerships, together with management practices that address identified yield gaps.

Comprehensive publicly-available data systems that: enable timely response to inquiries from land/water/AqFS actors and stakeholders; ensure aquatic foods are properly integrated into wider food systems analysis in OneCGIAR; support gendered and intersectional analysis; and are disseminated through a bi-annual 'state of aquatic food systems' report.

### Key Partners

<b>Demand</b>	Other	High Level Panel for a Sustainable Ocean Economy (14 Heads of State)
		Mekong River Commission
		Orissa Traditional Fish Workers Union
	Private Sector	Catfish Farmers Association of Nigeria
	Regional NGO	African Women Fish Processors and Traders Network
<b>Innovation</b>	Academic, Training and Research	Bangladesh Fisheries Research Institute (BFRI)
		Roslin Institute, Division of Genetics and Genomics, U.K.
	Multilateral	Global Strategic Framework in support of the implementation of the Voluntary Guidelines for Securing Sustainable Small-scale Fisheries in the context of food security and poverty eradication, UN Food and Agriculture Organization
	Other	OKRONUS Resource Management and Development Trust, Malaita Province, Solomon Islands
	Private Sector	Premium Aquaculture Limited
<b>Scaling</b>	Government	Royal Government of Cambodia Ministry of Water Resources and Meteorology (MOWRAM)
	International NGO	International Union for the Conservation of Nature
	Multilateral	African Development Bank
		UN Food and Agriculture Organization (Fisheries and Water Resources Divisions)
	Private Sector	Skreeting Africa

# Resilient Aquatic Food Systems for Healthy People and Planet Theory of change

## Impact areas

**Nutrition, health and food security:** Increase availability and consumption of safe and nutritious AqFs for 3.6 billion people including women and children; micronutrient deficiencies reduced.

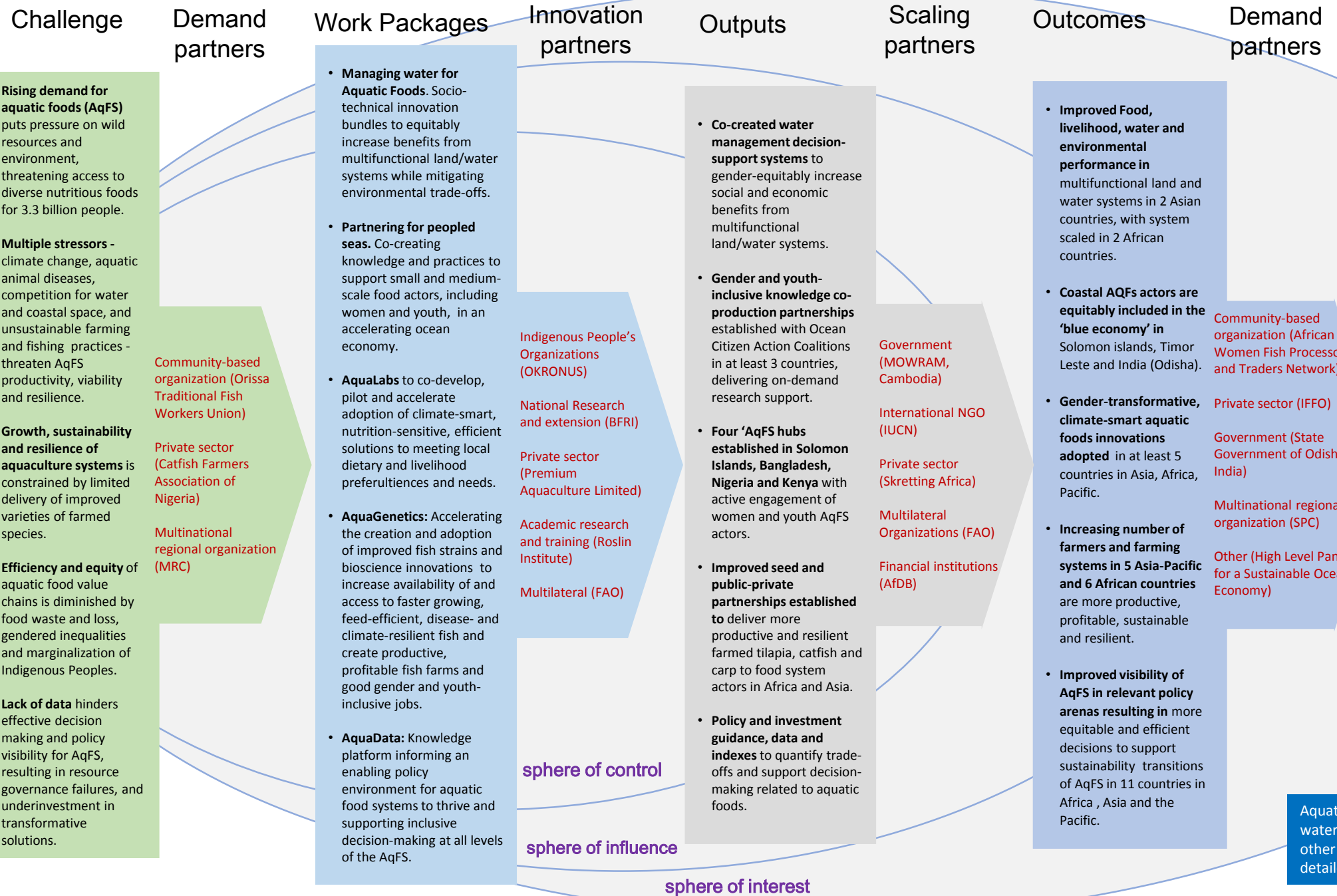
**Poverty reduction, livelihoods and jobs:** 70 million small-scale producers and fishers (50% women) increase and stabilize their income and 15 million new jobs and livelihoods opportunities created.

**Gender equality, youth and social inclusion:** 40 million women, youth and other vulnerable groups empowered through AqFs.

**Climate adaptation and mitigation:** 20% decrease in AqFS CO<sub>2</sub> emissions and 10% increase in water- and nutrient-use efficiency in 11 countries in Africa and Asia.

**Environmental health and biodiversity:** 5 million hectares of degraded multifunctional land and water systems are restored in 11 countries in Asia and Africa.

Aquatic Food Systems span land, water and food systems. Links to other OneCGIAR Initiatives are detailed in the text.

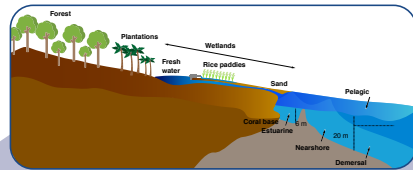


**Research question:**  
How can this initiative help get diverse, nutrient-rich and sustainable aquatic foods to nutritionally vulnerable consumers?



**Objectives**

By 2030, 160 million diverse Aquatic Food Systems actors and their dependents in our 11 target countries improve their access to income and nutrition from aquatic foods, and 500 million aquatic food consumers are prevented from becoming malnourished, through sustainable Aquatic Food Systems.



**Managing water for aquatic foods (WP1)**  
to increase water productivity and keep people and food integral to managed land-water interfaces

**Partnering for peopled seas (WP2)**  
To put research under the control of small-scale fishers who are fighting to keep their place in a fast-growing ocean economy

**Gender inclusion:**

- Reach
- Benefit
- Empower
- Transform

**AquaGenetics (WP4)**  
Bringing benefits of bioscience innovations to close supply-gaps, improve feed-efficiency, and put disease- and climate-resilient fish in farmers' hands

**AquaLabs (WP3)**  
where farmers, fishers, traders, entrepreneurs and researchers meet to co-create the aquatic foods future

**AquaData (WP5)**  
to inform an enabling policy environment for aquatic food systems

**Key Definitions**

**Aquatic Foods:** Animals, plants and microorganisms that are farmed in and harvested from water, as well as cell- and plant-based foods emerging from new technologies



**Resilience:** A resilient aquatic food system is one that continues to deliver diverse nutritious food at affordable prices to those who need it, despite shocks and perturbations and under a range of future market and climatic conditions.

**Differentiators**

1. Aquatic food systems include both plants and animals, are diverse and nutrient rich, with some affordable to all and others of value as 'cash crops'
2. Potential to contribute to transformative increase in the global availability of micronutrient-rich foods.
3. Diverse new Partnerships – e.g., with fisher community associations, 'ocean citizen action groups' and the private sector.
4. Indigenous Peoples are important stewards and consumes of aquatic foods
5. Pacific Region is included



THE BIG FACTS ON **AQUATIC FOODS**

Aquatic foods less well-known than their terrestrial counterparts but are diverse, nutritious, often sustainable and have growth potential. Here is some key information that supports the case for investing in sustaining and increasing their contributions to a transformed global food system.

**Nutrition, health and food security**

**3.3 billion**  
Number of people getting **20%** of their **animal protein** from eating aquatic foods.

**17%**  
Percentage of all **animal protein** consumed globally that comes from **aquatic foods**.

**2 billion**  
Number of people suffering the **triple burden of malnutrition** who can benefit from the life-changing option of consuming **nutrient-rich** aquatic foods.

**1000 days**  
Aquatic foods are dense in **micronutrients**, which are essential to cognitive development in the first **1000 days of a child's life**.

**Climate adaptation and mitigation**

**70%**  
Percentage of the planet that is covered by the **ocean**, which houses **80% of all life on earth** while **sequestering carbon** and providing **half of the world's oxygen**.

Production of aquatic foods has a **much lower carbon footprint** and **far fewer biodiversity impacts** compared to production of crops and livestock.

**Poverty reduction, livelihoods and jobs**

**50%**  
Percentage of the total global catch from **small-scale fisheries**.

**800 million**  
Number of people around the world who depend on **small-scale fisheries** and **aquaculture** for their livelihoods.

**60 million**  
Number of people engaged in the primary sector of **fisheries** and **aquaculture** in 2018.

**Gender equality, youth and social inclusion**

**1 in every 2**  
Workers in the primary and secondary sectors of fisheries and aquaculture who are **women**.

They are crucial to aquatic food systems, providing **labor, innovative ideas** and **entrepreneurship**.

**90%**  
Percentage of all **small-scale fishers** living in low- and middle-income countries in the Global South.

**Environmental health and biodiversity**

**Over 3000 species**  
of aquatic food plants and animals are harvested from the wild and **over 600 are cultivated**.

Growing food in surface waters provides **incentive to maintain water quality**, which benefits aquatic ecology.

**78%**  
Percentage of **fishstocks** currently within **biologically sustainable** levels, compared to 90% in 1990.

**\$ 22.5 billion**  
The **annual loss of discarded fish** alone.

**35%** of the global harvest from fisheries and aquaculture is **lost or wasted and could be recovered**.



## Resilient Cities through Sustainable Urban and Peri-urban Agrifood Systems

Initiative Lead and Co-Lead	Primary CGIAR Action Area	Estimated 2022 - 2024 Budget
Simon Heck Silvia Alonso	Resilient Agri-food Systems	\$25 - \$30 M

### Challenge

By 2050, more than 2 in 3 people on the planet will live in an urban environment, including over 5.5bn in LMICs. The agrifood sector is central to the complex set of challenges arising from this global demographic transition; including: Feeding and nourishing expanding, largely poor, urban populations; reducing risks for human and environmental health from unsustainable food production, inefficient marketing and unhealthy consumption; securing economic opportunities for the urban poor including women and youth; and strengthening the resilience of urban societies in the face of climate change and increasing inequalities. The COVID-19 pandemic further highlighted the urgency of research and innovation support to strengthen food system resilience in urban environments. Securing a future for productive, green and livable cities with healthy populations is a global priority; countries in CGIAR target regions are struggling to keep pace with the implications of rapid urbanization, especially in an agrifood sector slow to respond, and are demanding technically sound, equitable and scalable solutions.

Agrifood systems need to transform to meet these challenges. Within the urban and peri-urban environment, key research and innovation tasks include sustainable intensification of production systems and more equitable and efficient marketing systems for nutritious foods including vegetables, livestock products and fish; reducing the ecosystem footprint of these systems amidst degradation of urban and peri-urban environments through improved technologies and better planning and management practices; improving food environment and consumer choice for healthier diets; and strengthening governance and policies to enable continued innovation and sustainable agrifood sector growth .

### Objective

This Initiative will increase the resilience of rapidly expanding cities by strengthening UPU agrifood systems within wider City Regions. Working initially in six countries and then in at least ten by 2030, the Initiative will generate new knowledge, connect technologies to demand, co-develop and disseminate models and adaptive strategies for businesses and guidelines for public sector planning, and engage with governance processes to achieve the following objectives:

1. Sustainable intensification of UPU vegetable, livestock and fish production and reduction of their ecosystem footprint through improved technologies, safety practices and cleaner production sites to increase incomes of at least 2 million small-scale producers by 2030.
2. Vibrant, equitable, safe and sustainable UPU food market systems using improved technologies, business models, and decent work guidelines to generate economic opportunities and employment for at least 4 million women and youth in food production, trade, retail, processing, and service sectors by 2030.
3. Improved environmental and human health in UPU food production, marketing and consumption through improved risk assessment and risk mitigation, improved food safety, and better circular waste management to reduce health risks for at least 10 million people by 2030.
4. Improved food environments, consumer choices and women's empowerment to improve diet quality among at least 10 million low-income UPU consumers (especially women and youth) by 2030.
5. Inclusive governance to enable UPU agrifood sector growth using up-to-date evidence, broadly based accountability, and strong participation by diverse stakeholder groups in planning, implementation and evaluation processes in at least 10 countries by 2030.

### Theory of Change

Responding to demand for research and innovation, the Initiative will support a vibrant, largely informal urban and peri-urban (UPU) agrifood sector to help improve production systems for nutritious foods, equity in markets, environmental and human health, resource recovery from waste, food environments and consumer behaviors, and governance and policies. Stakeholders and partners will work with CGIAR scientists to co-develop UPU agrifood system typologies, technology portfolios, adaptive business development strategies, and programming and policy guidelines - pulling together research within and outside CGIAR into an integrated approach targeted at the specific needs and opportunities in UPU environments. The Initiative will synthesize evidence from this research into UPU Agrifood Systems Profiles and engage formal and informal governance mechanisms to co-convene multistakeholder platforms to develop UPU Agrifood Action Plans for sustainable growth based on this evidence. In the first 3-year phase, the Initiative will operate in six countries with rapid urban growth and documented demand for research and innovation. Involving diverse urban stakeholder groups in the research process, the Initiative will enable local authorities, local enterprises, and civil society to apply better technologies, business practices, program approaches and planning guidelines. Beyond 2024, these private and public investments can improve nutrition and health of 10 million low-income UPU consumers and create decent jobs and income opportunities for 2.5 million women and 1.5 million youth. The initiative will partner with well-established global city networks to foster learning and policy dialogue at large scale and support the broader transformation of UPU agrifood systems across the Global South.

We will pursue collaborations with the following proposed initiatives:

RAFS: One Health, Nature-positive Solutions, SAPLING, Resilient Aquatic Foods

GI: Accelerated Breeding (vegetables), SeEdQUAL (vegetables)

ST: SHiFT, HER+, Food Markets & Value Chains, National Policies & Strategies

RIs: South Asia, Southeast Asia, West & Central Africa, East & Southern Africa, Latin America & Caribbean



## Resilient Cities through Sustainable Urban and Peri-urban Agrifood Systems

### Highlights

Cities are crucibles of creative informal enterprise among women, men and youth, particularly in the agrifood sector. This Initiative will harness the innovation capacity of the informal sector, incl. through Agrifood Innovation Hubs, and provide research and technology support to create significant and inclusive growth in decent urban employment. <http://bit.ly/3tracWB>

Resilient, food secure cities depend on exchange with rural food production zones and rural society. This Initiative will take a City Region Food Systems research perspective to generate evidence for integrated urban-regional planning and investments that can generate opportunities and secure healthy sustainable diets along the rural-urban continuum. <http://bit.ly/3tracCR>

The future belongs to green and livable cities, and this future becomes more likely through local businesses and public-private partnerships pursuing opportunities for turning waste into value. This Initiative will support access to technologies and design business and financing models for circular water and nutrient reuse systems and cleaner environments. <http://bit.ly/3tracRR>

Food safety is a major concern in high density environments, jeopardizing people's health and nutrition, requiring public investment in control, and limiting market access for producers and traders. By developing and deploying novel approaches to risk mitigation in UPU settings, the Initiative will deliver health, nutrition and economic benefits. <http://bit.ly/3tracFS>

Cities are connected to each other globally including across the Global South; their connectivity offers tremendous opportunities for learning and accelerated progress at scale. This Initiative will engage with city-to-city networks and their development partners to promote inclusive and sustainable agrifood system growth as a pillar of resilient cities globally. <http://bit.ly/3tracNW>

### Work Packages

	Scope of Work	3-year Outcomes
Enabling sustainable UPU production of vegetable, livestock and fish	Sustainable intensification of small-scale vegetable, livestock and fish production to increase UPU availability and affordability of these foods whilst reducing ecosystem footprint. Increased use of improved varieties/breeds, quality seed, organic alternatives to agrochemicals, and safe practice guidelines. Supported by improved land and water use planning and monitoring. <a href="http://bit.ly/3tracUPA">http://bit.ly/3tracUPA</a>	Small-scale producers in UPU zones access and utilize improved technologies and management toolkits and guidelines for safer, more sustainable and more efficient vegetable, livestock and fish production. Reduced use of agrochemicals and increased availability of diverse, nutritious foods from less polluted UPU environments.
Catalyzing equitable and transformative UPU food markets and supply chains	Select/adapt technologies, develop business models and strengthen capacities of Micro, Small, and Medium Enterprises (MSMEs) in food markets and supply chains to expand decent employment and income opportunities, especially for women and youth. Targeting poor people's diets and reducing food waste, innovations will include storage, processing and retailing strategies.	Local MSMEs in food processing, marketing and agrifood service sectors access and apply adaptive business development strategies, improved technologies, 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 UPU consumers.
Mitigating UPU agrifood system footprint on human and environmental health	Technological, regulatory, institutional and educational advances to reduce the burden of water- and food borne diseases, manage zoonosis risks and turn urban waste burden into business opportunities for resource and cost recovery for agriculture. The Initiative will foster demand for innovation and connect stakeholders to technology and institutional change options.	Public-private partnerships in UPU settings adopt incentive-based 'Resource Recovery and Reuse' business models to improve waste management and sanitation. National and city governments promote locally relevant and evidence-based risk management strategies for food system-related health risks including water- and food-borne and zoonotic diseases.
Transforming UPU food environments and consumer behavior to improve diet quality and nutrition	Selection, adaption and testing of technological, programming and policy options for improving food environments, food choices and nutrition knowledge in collaboration with consumer initiatives and supply/demand side stakeholders, incl. schools and women's groups. Evidence generated will inform design of country-specific toolkits for UPU food system programming, policies and investments at scale.	Governments and their partners apply evidence-based UPU food environment and consumption strategies and tools, including approaches to increase women's decision-making power and technological and programmatic innovations that improve diet quality and nutritional status. This results in improved access, affordability and consumption of nutritious foods.
Strengthening UPU agrifood governance and innovation hubs	As an integrative and enabling WP: Policy and institutional analysis, adapting metrics and data tools to the vibrant UPU environment, synthesis of evidence across WPs to develop 'UPU Agrifood Systems Profiles' in each country. Co-convening multi-stakeholder UPU and City Region platforms and co-designing Agrifood Innovation Hubs targeted at young entrepreneurs.	Governments and stakeholders from private sector and civil society co-develop UPU Agrifood Action Plans based on evidence from the initiative's research. Improved research and monitoring tools are available for planning and accountability. Agrifood Innovation Hubs will be designed to support young entrepreneurs via entrepreneurial projects generating start-up agrifood enterprises.

## Resilient Cities through Sustainable Urban and Peri-urban Agrifood Systems

### Impact Area Contributions

<b>Nutrition, health &amp; food security</b>	Through increased availability and affordability of - and demand for - vegetables, livestock and fish in UPU markets: 10 million low-income consumers with improved dietary quality. Through improved UPU risk mitigation from public and private sector investments: 10 million people at reduced risk from water- and food borne and zoonotic diseases
<b>Poverty reduction, livelihoods &amp; jobs</b>	Viable MSMEs in the UPU agrifood sector utilizing improved technologies and business plans will result in: 3 million people having increased income 2 million new or upgraded jobs applying decent work guidelines
<b>Gender equality, youth &amp; social inclusion</b>	The Initiative will further strengthen the stake of women and youth in the UPU agrifood sector and prioritize them in technology and business innovations, benefitting: 2.5 million women having increased income in UPU agrifood sector 1.5 million youth entering employment or starting MSMEs supported by Agrifood Innovation Hubs
<b>Climate adaptation &amp; greenhouse gas reduction</b>	The Initiative will generate evidence on climate adaptation needs and mitigation opportunities in the agrifood sector to help cities address their specific climate threats and contribute to global targets, including: 7 million mt CO2 equivalent saved from reduced UPU food waste and losses
<b>Environmental health &amp; biodiversity</b>	Evidence-based planning and investments will prioritize improved environmental health both by reducing the ecosystem footprint of UPU food production and processing, and by creating productive green spaces in cities. This will result in: 7 million ha are under improved productive use, supported by UPU Agrifood Action Plans

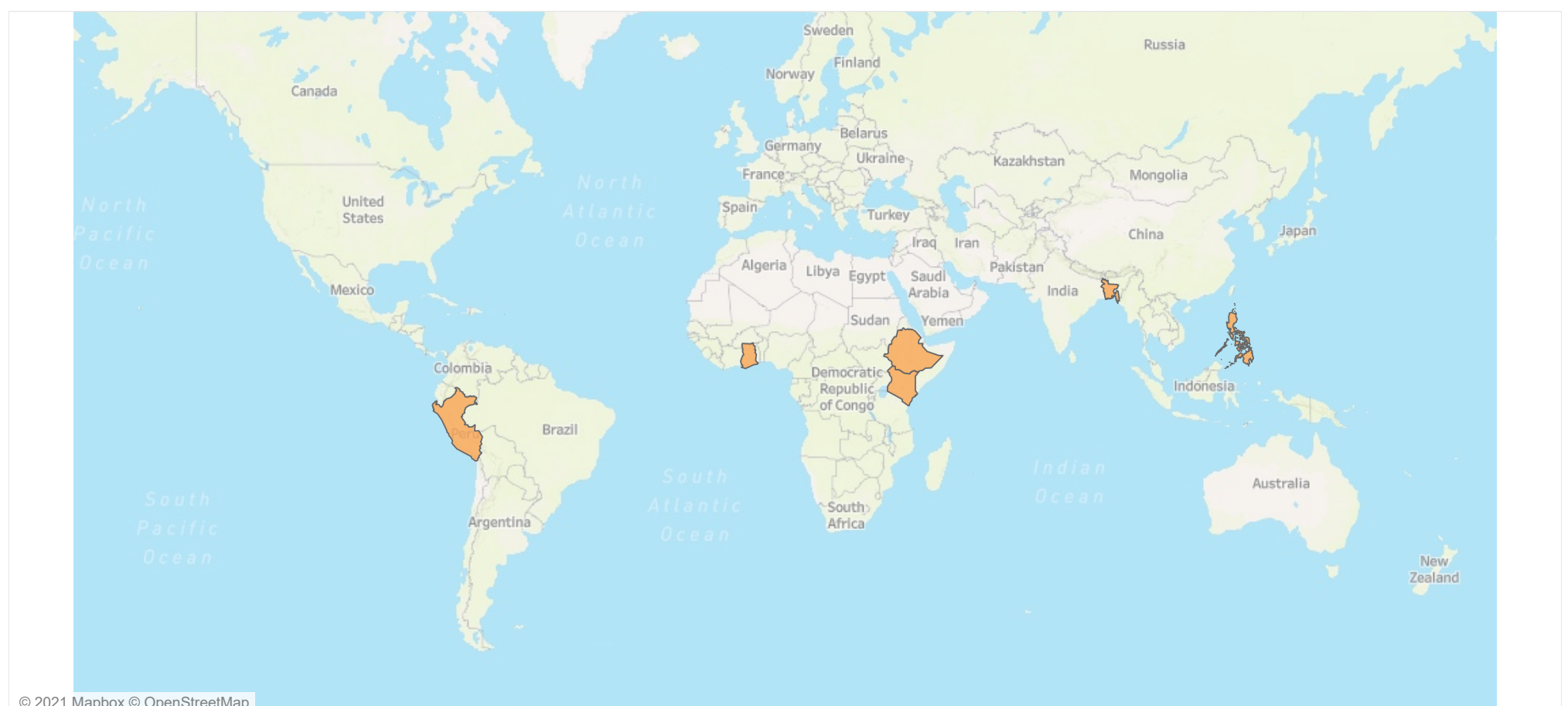
### Impact on SDGs



### Regions

Global East and Southern Africa (ESA), Latin America and the Caribbean (LAC), South Asia (SA), South East Asia and the Pacific (SEA), West and Central Africa (WCA)

### Countries



## Resilient Cities through Sustainable Urban and Peri-urban Agrifood Systems

### Innovations

Toolkits for sustainable intensification of vegetable production in UPU environments, including counter-season production technologies, rapid testing methods for contaminants, seed and seedlings of traditional nutritious vegetables, cost-effective alternatives to agrochemicals, low-cost options for resource-poor households, and guidelines for public policy support and promotional campaigns.

Business models and accompanying technologies for turning urban food waste challenges into incentives for public-private partnerships and investments in resource recovery for the benefit of UPU food systems and the environment; building on results from the Water, Land and Ecosystems (WLE) CRP.

Integrated demand-supply approach to stimulate private and public sector investments in reducing water- and food-borne diseases in UPU environments, leveraging consumer demand to incentivize technology adoption, business development and regulatory and policy support.

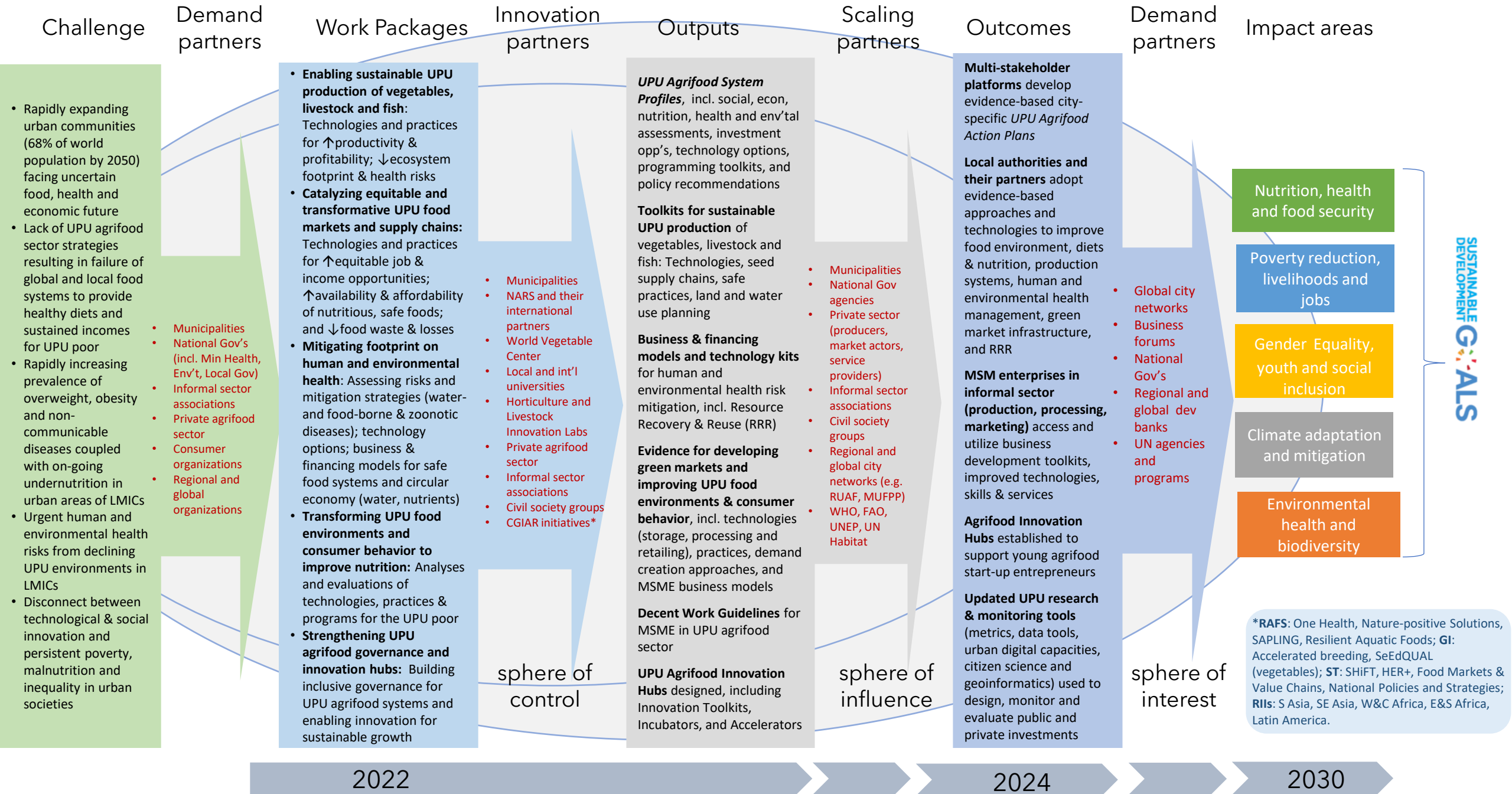
Typology profiling tools and toolkits to understand and improve UPU food environments and consumer behavior. This includes novel scalable technologies to improve diets and dietary assessments and evidence-based programs to foster accessibility and affordability of - and consumer demand for - healthy diets.

Agrifood Innovation Hubs that leverage best practices in human-centered design and agile development to build self-sustained ventures addressing food systems challenges. Hubs bundle innovation toolkits that ensure demand-driven design; innovation incubators that validate the solution's desirability, feasibility and viability; and innovation accelerators that build ventures around validated solutions.

### Key Partners

<b>Demand</b>	Government	Government Ministries (incl. Health, Environment, Local Government)
	Local Government	Municipalities in six countries
	National NGO	Consumer advocacy and rights groups
		Informal urban labor organizations
Private Sector in Aid Recipient Country	Local agrifood enterprises	
<b>Innovation</b>	Academic, Training and Research	Local universities in six countries and international research partners (incl. Institute for Sustainable Futures, UC Davis, U Florida, U London, Wageningen U, ETH Zurich, ZEF Bonn, USAID Innovation Labs for Horticulture and Livestock)
		NARS/NARES in six countries
		World Vegetable Center
	Local Government	Public waste management authorities in participating municipalities
	Private Sector	Innovators in UPU agriculture and food technologies and input supply chains in six countries
<b>Scaling</b>	Multilateral	International city networks and supporting agencies (including RUAF-Global Partnership on Sustainable Urban Agriculture and Food Systems, Milan Urban Food Policy Pact, Hungry Cities Partnership)
		UN agencies and programs, including FAO-Green Cities Initiative, UN Habitat Urban Resilience Hub, UNEP, WHO, UNU
	National NGO	Citizen Innovation Labs, consumer interest groups and civil society groups in six countries
	Other	Development banks (World Bank, Asian Development Bank, African Development Bank) and capital investors

# Resilient Cities: Theory of change







## Rethinking Food Markets and Value Chains for Inclusion and Sustainability

### Initiative Lead and Co-Lead

Rob Vos  
Jenny Wiegel

### Primary CGIAR Action Area

Systems Transformation

### Estimated 2022 - 2024 Budget

\$30 - \$30 M

### Challenge

The food sector constitutes about one fifth of the global economy and is the world's largest source of income and employment, but - owing to market failures and weak value-chain integration - has been unable to provide decent livelihoods and food security for hundreds of millions, while degrading the environment by overusing resources. These challenges remain despite great progress in recent decades in reducing poverty and food insecurity, driven in good part by agricultural productivity growth and modernization of food supply chains. Poverty disproportionately affects rural populations, whose livelihoods depend largely on agri-food-related economic activity. Women comprise almost half of the agricultural workforce and many run small-scale farm and non-farm businesses. More than half of developing-country working youth are employed in the agri-food sector. Both women and youth face greater barriers in access to resources. Market concentration, urbanization, and requirements to meet production, sanitary, dietary, and environmental standards of modern food value chains impede market participation for hundreds of millions of small-scale producers in developing countries, whose livelihoods are constrained by poor access to market information, finance, insurance, roads, storage, logistics, and digital services. On the demand side, both rural and urban poor are harmed by policy and market failures that limit their access to affordable nutritious foods. Growing food markets, associated with urbanization and changing dietary patterns, and use of digital technology in delivery systems provide opportunities to change market dynamics and reorient policies to foster inclusive domestic and global value chain integration, create many decent jobs, and provide affordable nutritious food to a growing population, while substantially reducing the food sector's environmental footprint.

### Objective

The Initiative aims to contribute to the One CGIAR Research Strategy objectives of ending hunger and enabling affordable access to nutrition-adequate diets for all, reducing rural poverty, and offering equitable livelihood opportunities for women and young people, while addressing the climate crisis. This Initiative will pursue these objectives by providing the necessary knowledge base to influence policy and market behavior to foster process innovations for efficient value-chain integration for fairer income sharing, greater job creation, and adoption of sustainable practices.

The Initiative will deliver on this promise by influencing policies and behaviors of national governments and international organizations, as well as key players among agri-food producer and trader organizations, private businesses, and financial institutions. Together with these scaling partners, the initiative will provide evidence on the effectiveness and scalability of piloted bundles of interventions in at least 6 value-chain contexts to show how improved market information and infrastructure, greater competitiveness, better targeted incentive schemes, digital innovation, inclusive finance and agribusiness models, skills and entrepreneurship development, and product innovation can help build better integrated and more inclusive local, regional, and global agri-food systems.

By endowing foodsystem actors with global, national, and market-specific evidence and insight on the potential for scaling and long-term sustainability of interventions, the Initiative aims to influence decision-making for the creation of inclusive value chains and contribute to lifting at least 10 million people out of poverty and creating 15 million remunerative employment opportunities for women and youth while reducing ecological footprints of supported food value chains by 25%.

### Theory of Change

o The initiative aims to induce change in market behaviors and policies to achieve inclusive value-added sharing, large-scale remunerative job creation, food security, and adoption of sustainable production and distribution practices along food value chains.

o This initiative contributes to this overall objective by generating evidence on the potential for piloted and scaled-up interventions and investments to address market inefficiencies and policy and institutional shortcomings that stand in the way of inclusive and sustainable food value chain development. The interventions and investments to be tested and scaled will focus on innovations in production processes, value-chain organization, market institutions, and policy processes. Bundles of production and process innovations will be tested for effectiveness, scalability, and relevance to foster adoption of interventions that inclusively link small-scale farms and food businesses to rural and urban domestic, regional, and global markets. Innovations include, inter alia, the application of green and digital technologies in supply chain processes, inclusive agri-business models, infrastructural improvements, innovative forms of inclusive finance and insurance, improved production and handling practices, and setting of appropriate food quality and sustainability standards. In choosing innovations for research focus, emphasis will be placed on facilitating empowerment and benefit-sharing by smallholders and small- and medium-size enterprise (SME) entrepreneurs and workers, especially for women and youth.

o Scaling will be achieved by actively engaging innovation and scaling partners from governments, producer organizations, private businesses, financial institutions, and development agencies. Market and food systemwide analyses of trade-offs and policy reforms (including repurposing of present agricultural support measures) will inform decision-making to create the right business environment for scaling to national, regional, and global levels.

o The Initiative will closely collaborate with other One CGIAR Initiatives to enhance impact through complementarity with other interventions for food system transformation. These include: SHIFT-Sustainable healthy diets through food system transformation; National strategies and policies for driving transformation; Informing sustainable development pathways with foresight and metrics; Urban and peri-urban agri-food systems; Levering gender & social equality; Protecting human health through One Health approach; Resilient Aquatic Foods for Healthy People and Planet; Market intelligence for more equitable and impactful genetic innovation; Transformational agroecology across food, land and water systems; Harnessing digital technologies; and Regional Integrated Initiatives corresponding to targeted market contexts of this Initiative.

## Rethinking Food Markets and Value Chains for Inclusion and Sustainability

### Highlights

With direct engagement of scaling and innovation partners, key bottlenecks to efficient food market and value chain development will be identified and options for scaled-up investments and innovations for inclusive agri-food system transformation will be tested to empower food system actors to resolve bottlenecks in at least 6 country/market contexts.

Actionable policy advice will be provided on how to prioritize and reorient regulatory frameworks and incentive schemes for the scaling and promotion of sustainable practices, job creation, affordable and diverse food availability, and fair income sharing along agri-food value chains.

An improved integrated database measuring incomes, employment, environmental footprint, and degree of policy support across the agri-food system will fill a critical information gap for assessing the potential for and trade-offs associated with scaling of interventions and innovations for inclusive and sustainable food value chains.

Global, regional, and national level analyses will give direction on how to repurpose and reorient existing agricultural support and trade policies to create appropriate market incentives for sustainable production practices, technology transfer for value-chain innovation, and creation of inclusive linkages within and between domestic and global food value chains.

Evidence will be provided on how e-commerce platforms and other digital innovations can be leveraged to efficiently integrate food value chains and create greater income and decent employment opportunities for smallholders and SME entrepreneurs and workers, especially for women and youth amongst them.

### Work Packages

Scope of Work		3-year Outcomes
Policy coherence and market reform for inclusive and sustainable transformation of food markets and value chains	This workstream will fill an important knowledge gap by developing an integrated global database for measuring income and employment generation, environmental footprint and policy support across the agri-food system. It will underpin global, regional and national model-based analyses to assess options for policy reform and potential for scaling of specific interventions and innovations.	National policymakers, international organizations, and market actors make active use of the Initiative's innovative tools for food market diagnostics and policy analysis, driving evidence-based policy and investment decisions that improve the performance of food markets in terms of value-added sharing, employment creation, affordability and diversity of available foods, and environmental outcomes.
Making globally integrated value chains inclusive, efficient, and environmentally sustainable	This action-oriented workstream will identify incentives, inclusive business models, and trade measures for developing more efficient and environmentally sustainable value chains integrated in international markets. This work package will further study modalities for fair value-added sharing for domestic producers, distributors, and workers, especially women and youth.	In at least two developing countries, the effectiveness and scalability of pilot interventions and investments have been shown to have improved the efficiency and sustainability of food value chains connected to international markets and the incomes of smallholders and SMEs participating in those value chains.
Evaluating market and value-chain process innovations for job creation and income opportunities in domestic and regional markets for nutritious foods (including fruits & vegetables, and aquatic foods)	This workstream will test pilots of market innovations solving value-chain bottlenecks in domestic markets for fresh, packaged, and processed nutrition-rich foods. Food market and policy analyses will identify scaling conditions and gains for job creation and income growth (especially for women and youth), poverty reduction, food security and nutrition.	In at least two developing countries, domestic market actors, including SMEs, significantly improve economic opportunities for women and youth and reduce food loss and waste by addressing key value-chain gaps in domestic markets for fresh, packaged, and processed nutrient-rich foods (such as fruits, vegetables, and aquatic foods).
Innovations and policy design for development for cross-food market services to leverage new employment and income opportunities	Cross-food market services, including wholesaling, finance, insurance, e-commerce/procurement, logistics, consumer delivery, and digital technologies connecting these are crucial for the inclusive development of agri-food value chains. The potential for scaling process and market innovations for developing cross-value chain service will be identified, prioritizing opportunities for SMEs, women, and youth.	In at least two developing countries, the research has influenced policy and investment decisions that leverage digital technologies in critical food-market services in logistics, wholesaling, finance, and/or e-commerce/procurement to improve market access, employment and income generation, especially for women and youth working in small-scale farms and agri-food businesses.

## Rethinking Food Markets and Value Chains for Inclusion and Sustainability

### Impact Area Contributions

<b>Nutrition, health &amp; food security</b>	Better integrated and inclusive value chains contribute to making nutrition-rich foods more affordable and accessible for poor and food insecure households. Promotion of product innovation, standard setting for food quality and safety, and reducing food loss and waste will also help underpin better nutritional outcomes
<b>Poverty reduction, livelihoods &amp; jobs</b>	Influencing policy and market behavior change to promote efficient value-chain integration, improved market access for smallholders and SMEs and adoption of inclusive agribusiness models will contribute to poverty reduction, improved livelihoods, and the generation of millions of remunerative, mostly off-farm, jobs
<b>Gender equality, youth &amp; social inclusion</b>	Inclusive value-chain integration can provide millions of women and youth the prospect of making a decent living by creating many new, mostly off-farm, job and income opportunities. Promoting skills development, entrepreneurship, and adoption of sustainable and digital technologies, helps close existing gaps, generate equal opportunities and empower women and youth.
<b>Climate adaptation &amp; greenhouse gas reduction</b>	Cost-effective and productivity-enhancing investments and innovations that contribute to climate adaptation and reduction of greenhouse gas emissions are tested for scaling up. Evidence is provided on how food market incentives (taxes, subsidies, food standards, labelling) can be reset to promote the diffusion of such investments and innovations along value chains.
<b>Environmental health &amp; biodiversity</b>	A deeper understanding of the trade-offs between market efficiencies, income generation and environmental outcomes for use of environmentally sustainable and food loss preventing production and delivery processes will inform public and private sector agents how to redirect policies and investments in support of conservation of biodiversity and environmental health.

### Impact on SDGs



### Regions

Global Central and West Asia and North Africa (CWANA), East and Southern Africa (ESA), Latin America and the Caribbean (LAC), South Asia (SA)

### Countries



## Rethinking Food Markets and Value Chains for Inclusion and Sustainability

### Innovations

Creation of a global knowledge platform of best practices of game-changing interventions for inclusive food system transformations informed by impact assessments on effectiveness and scalability of bundles of interventions and inclusive forms of value-chain integration.

New evidence is generated about actionable market and value-chain process innovations that link domestic and global value chains and foster food trade integration in inclusive ways.

Linking digital technologies for e-commerce and e-procurement platforms to improve supply chain integration, market access for smallholders and agri-food SMEs and employment generation for women and youth.

Scaling of systemwide concerted and publicly-guaranteed certification schemes for food quality and sustainability which will also foster fairer value-added sharing and use of environmentally sustainable practices in production and distribution across food supply chains.

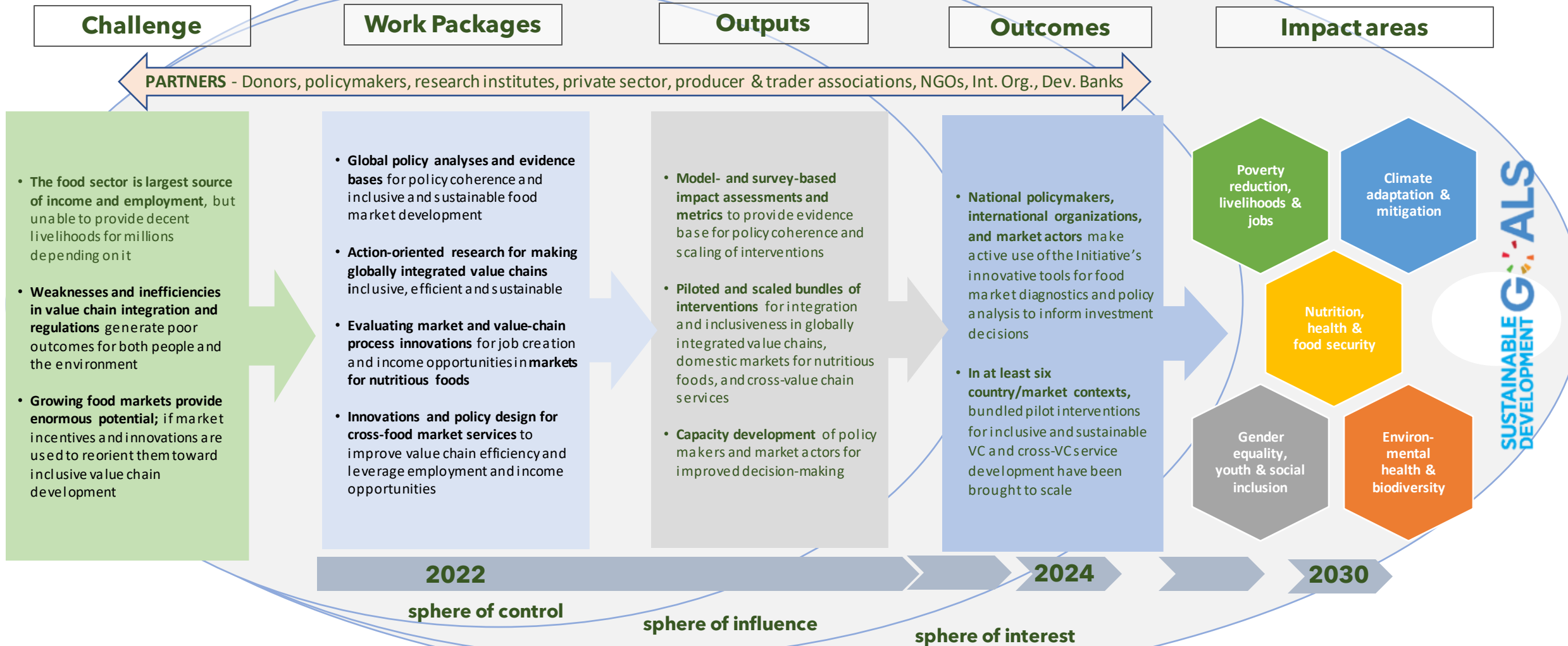
Development of an integrated global agri-food system database and related modeling tools to assess potential for and trade-offs associated with the scaling of interventions and innovations for job and income generation and reducing environmental footprints along food value chains.

### Key Partners

<b>Demand</b>	Government	National government agencies in selected pilot cases, typically including Ministries of Food and Agriculture, Environment, Commerce, Finance, Labor, Transport and Infrastructure, and Social Protection, as well as food regulatory agencies and National Agricultural Research Institutions.
	Multilateral	FAO, IFAD, and others
	Other	Donor partners
	Private Sector	Producer and trader organizations, individual private companies, and private business networks will be identified relevant to pilots and selected country/value-chain contexts
<b>Innovation</b>	Academic, Training and Research	To be selected, but as examples may include Michigan State University (MSU), Wageningen University Research (WUR), AGRODEP, ReNAPRI, ICRAF, World Vegetable Center
	International NGO	To be selected, but may include AGRA, SNV, CRS, CARE and others identified as relevant to pilots and selected country/value-chain contexts
	National NGO	To be selected, as relevant to pilots and selected country/value-chain contexts
	Private Sector in Aid Recipient Country	Producer organizations, individual private companies, and private business networks will be identified as relevant to pilots and selected country/value-chain contexts
<b>Scaling</b>	Government	National government agencies in selected pilot cases, typically including Ministries of Food and Agriculture, Environment, Finance, Labor, Transport and Infrastructure, and Social Protection, as well as food regulatory agencies), and National Agricultural Research Institutions
	International NGO	International NGOs to be identified as relevant to pilots and selected country/value-chain contexts, but - as examples - may include CARE, SNV, Rikolto, CRS
	Multilateral	IOs to be selected, but - as examples - may include WTO, FAO, OECD, SICA, African Union, ECA, SAARC
	Private Sector	Global processors, retailers, inputs suppliers, digital service providers, financial service providers; small and large domestic firms (to be identified relevant to pilots and selected country/value-chain contexts)
	Public Private Partnership	Multilateral development banks (e.g. IFAD, ADB, AfDB, IDB, World Bank) and national development banks in partnership with private sector scaling partners to be selected as relevant to pilots and selected country/value-chain contexts



# RETHINKING FOOD MARKETS AND VALUE CHAINS FOR INCLUSION AND SUSTAINABILITY





## Securing the Asian Mega-Deltas from Sea-level Rise, Flooding, Salinization and Water Insecurity

### Initiative Lead and Co-Lead

Bjoern Ole Sander  
Shakuntala Thilsted

### Primary CGIAR Action Area

Resilient Agri-food Systems

### Estimated 2022 - 2024 Budget

\$30 - \$45 M

### Challenge

Home to 400 million people, the densely populated AMDs are biodiverse, fertile and productive food baskets dominated by rice, fisheries and aquaculture that support millions beyond delta dwellers. Deltas are however reaching a significant tipping point<sup>1</sup>. Over 100 million small-scale producers and value chain actors face grave risks to food and nutrition security and livelihoods from direct and indirect impacts of climate change, aggravated by unsustainable development. Recent models of coastal elevation show that the AMDs are much lower in elevation than previously assumed, and thus, will be severely affected by increased incidence and intensity of floods, sea-level rise, salinization of soil and freshwater but also water shortage, severe cyclones and climate extremes<sup>2</sup>, leading to an annual loss of 6% of GDP in SEA, over twice the global average expected loss<sup>3</sup>. Furthermore, freshwater withdrawals far exceeding sustainable capacity contribute to land subsidence<sup>4</sup>. Rapid biodiversity loss caused by human activities particularly threatens protective mangrove forests, thereby reducing resilience<sup>5</sup>. Small-scale producers are critically vulnerable to these impacts with limited ability to independently manage risks. These trends will displace and disenfranchise people, threaten regional and global food and nutrition security, and will put increased pressure on those remaining, who are often aging women facing labor shortages, decreased productivity, and reduced livelihood opportunities. In response, AMD provides evidence and aligns partnerships to sustainably manage socio-economic development, including migration and its consequences that result in equitable and positive impacts for people and food systems while minimizing negative consequences within the diverse societal contexts of AMDs.

1 Renaud, F.G., Syvitski, J.P., Sebesvari, Z., Werners, S.E., Kremer, H., Kuenzer, C., Ramesh, R., Jeuken, A.D. and Friedrich, J., 2013. Tipping from the Holocene to the Anthropocene: How threatened are major world deltas?. *Current Opinion in Environmental Sustainability*, 5(6), pp.644-654.

2 Kulp, S.A. and Strauss, B.H., 2019. New elevation data triple estimates of global vulnerability to sea-level rise and coastal flooding. *Nature communications*, 10(1), pp.1-12.

3 Weiss, John. 2009. *The Economics of Climate Change in Southeast Asia: A Regional Review*. © Asian Development Bank. <http://hdl.handle.net/11540/179>. License: CC BY 3.0 IGO.

4 Minderhoud, P.S.J., Middelkoop, H., Erkens, G. and Stouthamer, E., 2020. Groundwater extraction may drown mega-delta: projections of extraction-induced subsidence and elevation of the Mekong delta for the 21st century. *Environmental Research Communications*, 2(1), p.011005.

5 DasGupta, R. and Shaw, R., 2013. Cumulative impacts of human interventions and climate change on mangrove ecosystems of South and Southeast Asia: an overview. *Journal of Ecosystems*, 2013.

### Objective

Our objective is to support the creation of resilient, inclusive and productive deltas, capable of maintaining socio-ecological integrity; adapting to, even thriving, in the face of climatic and other stressors, and supporting human prosperity and well-being. Achieving this will require attention to both the agro-environmental and human landscapes as interconnected social-ecological systems, whereby, technical interventions are tied to broader enabling environments so that technical 'wins' manifest themselves in human development outcomes and impacts, through continued opportunities, especially for women and youth within expanding market economies.

AMD will manage critical risks specific to AMDs such as flooding, salinity, water shortage and dependence on upstream activities for freshwater flows, with climate change exacerbating these challenges. Concurrently, conscious of the often-unequal social contexts in which risk management, climate adaptation, and food production occur, AMD will support enabling policies and regulatory systems, implement evidence-based adaptation and diversification technologies/practices, and advance decision-support tools across food system value chains to address capacity inequalities and poor cross-sector coordination while enhancing community-based resilience choices. This initiative will deliver inclusive adaptive research outputs for equitable and sustainable management of AMD landscapes, supported by multi-stakeholder exchanges informing investments in resource-efficient and environmentally-responsible practices. AMD will stimulate investments in sustainable production systems by co-developing inclusive business plans with value chain actors. Co-development of solutions with government, civil society and private sector are foundational. A hypothesis in our ToC is that improved decision support tools will help navigate the political economy around decision making.

### Theory of Change

Building on inclusive 'Two Degrees Initiative' partner engagements<sup>1</sup> in 2020, and aligned with the CGIAR 2030 Innovation and Research Strategy<sup>2</sup>, AMD mobilizes broad and impactful partnerships supporting the creation of resilient, inclusive and productive deltas, capable of maintaining socio-ecological integrity, adapting to climatic and social stressors, and supporting human prosperity.

Leveraging existing science and capitalizing on demand, innovation, and scaling partners, we will address key barriers that hinder widespread adoption of improved climate-adapted and diversified systems. These include: 1) Insufficient synthesis, contextual translation and explicit guidance has been provided to support farmers, policy-makers, investors to tap into potential solutions; 2) Transformative options have not adequately considered broader socio-economic challenges including shrinking agricultural workforces due to migration, greater commercialization of agri- and aquaculture, entailing significant socio-economic opportunities but also negative externalities on ecosystem functions; and 3) systemic barriers that arise from a disconnect between local communities and decision makers, and inequitable planning and governance of critical common resources like 'water'.

Our work packages address these barriers to change, unlocking and adding value from existing and new research generated by CGIAR and innovation partners. We will co-develop spatially explicit adaptation matrices for farming systems to guide development programs (WP1), co-design investment cases and digital tools strengthening socially-inclusive and environmentally-responsible value chains (WP2), leverage more efficient and equitable water and land management systems (WP3), co-design processes enabling marginalized groups, women and youth to better access resources and technologies (WP4), and build transboundary change scenarios to facilitate urgent policy interventions (WP5).

1) <https://www.wri.org/publication/two-degree-initiative-listening-sessions>

2) <https://cgspace.cgiar.org/bitstream/handle/10568/110918/OneCGIAR-Strategy.pdf>

## Securing the Asian Mega-Deltas from Sea-level Rise, Flooding, Salinization and Water Insecurity

### Highlights

Strong buy-in achieved from local and regional stakeholders through five "listening events", with 168 strategic participants from multiple sectors spanning demand, innovation and scaling, in 2020. With stakeholder inputs incorporated and key partnerships identified AMD is ready to immediately initiate impactful joint adaptive research.

Contextually relevant institutional models enabling marginalized groups, women and youth to inform and benefit from inclusive transformations in AMDs. These models are guided by local voices, and respond to gender-power barriers while leveraging local governments, assuring technical investments and interventions result in inclusive development outcomes.

Working with government, civil society, financial institutions and development partners to co-design targeted financial investment opportunities, AMD facilitates the adoption of inclusive, resilient and environmentally responsible practices. These include the initial operation of digitally-driven agro-climatic advisories, transparency and traceability tools, and proven options for circular agro-economy.

Use of system transformation and remittances to open avenues for youth participation and rural-urban linkages that supports dynamic and inclusive growth in the AMDs. These will improve food and nutrition security, livelihoods and well-being, whilst reversing feminization and aging within rural economies.

AMD catalyzes transformative change in water and land governance for more efficient and equitable use of water and land at the field- and landscape-scales to enable adaptation, support diversification and develop more inclusive participation in food systems with higher water and land use productivity.

### Work Packages

	Scope of Work	3-year Outcomes
Adapting deltaic production systems	Together with farming communities and local governments, we will scientifically validate the feasibility, resilience and social-acceptance of more diversified and resource-efficient farming systems based on salt-, flood- and drought-adapted technologies and practices (T&P)s. We will then identify context- and system-specific scaling strategies to guide decision-making for wide-scale impact.	At least 5 national/international public/private development/investment programs use our adaptation matrices to decide which climate-adapted agronomic, aquacultural and livestock technologies, which farming systems, can and should be scaled where and how, thereby initiating the scaling process and targeting least \$100M in evidence-based support for millions of producers.
Smart investments and digital solutions to de-risk value chains	To operationalize circular agro-economy and inclusive, sustainable production models, we will, together with public-private sector stakeholders, 1) prioritize and quantify investment impacts, 2) support development of inclusive investment packages, 3) identify innovative financing models/partnerships and 4) co-design de-risking strategies. This will be supported by digital transparency, advisories and traceability tools.	Public and private sector investor groups in 5 countries actively pilot with value chain stakeholders priority investment opportunities, innovative financing solutions, advisory services and insurance products. Such investments increase the willingness to adopt inclusive and resilient climate-, biodiversity- and environmentally-responsible value chain practices amongst 200,000 farmers and value chain actors.
Aligning policy and regulatory frameworks for integrated land/water management	Using evidence-based decision support tools, we will co-convene multi-sector and national, sub-national and local stakeholder dialogs to explore and prioritize inclusive land-water management options, to identify contextually appropriate, efficient and productive water and land use solutions, and facilitate supportive policy and regulatory reforms to be implemented.	More multi-functional and climate resilient deltas, supporting diverse and equitable food systems through better aligned land/water policy/regulatory frameworks and investments, informed by appropriate adaptation T&Ps (WP1), new scaling strategies and interventions (WP2), institutions for managing stakeholder inequalities (WP4) and anticipated socio-economic and environmental outcomes of development pathways (WP5).
Addressing resource access inequalities through multi-scale institutional strengthening/development	With communities, local governments and civil society partners, we will co-design and implement social processes that enable marginalized groups, women and youth to better access delta resources and technologies to become more equal partners in food systems innovation.	Women/youth/other marginalized groups empowered to access delta resources and technologies; becoming more equal partners in food systems innovation, by shaping adaptation T&Ps (WP1) and new scaling strategies/interventions (WP2), while benefiting from more inclusive water/land policies/rules (WP3); thereby better adapting to anticipated socio-economic and environmental outcomes of development pathways (WP5).
Transboundary development scenarios and Monitoring, Evaluation & Learning	WP5 will assess climatic and socio-economic trends (e.g. migration, youth aspirations, economic development, trade), develop transboundary change scenarios and organize and facilitate policy and collaborative dialogues to co-develop appropriate policies and collaboration mechanisms. We will coordinate across AMDs to ensure a coherent research-development-deployment approach and distill and apply lessons.	At least 3 policy interventions have been formulated by government agencies in AMDs and at least 3 development programs are being designed based on increased understanding of drivers and trade-offs in change processes. Actors in AMDs engage in cross-learning resulting in greater capacity to develop and scale appropriate interventions.

## Securing the Asian Mega-Deltas from Sea-level Rise, Flooding, Salinization and Water Insecurity

### Impact Area Contributions

<b>Nutrition, health &amp; food security</b>	Diversification and intensification of food systems with micronutrient-rich fish and livestock, vegetables and pulses, alongside staple foods, increase opportunities for diet diversity and quality available to communities. Equitable access to sufficient, nutritious and safe foods addresses the demands and aspirations of different population groups. (actioned through WP 1, 2, 4)
<b>Poverty reduction, livelihoods &amp; jobs</b>	Tailored climate resilient and diversified farming and food systems have large potential to attract investment by managing risk, offering income stability and reducing out-migration. Nature-based adaptation services can buffer the impacts of climate shocks for local communities as well as for poor consumers in urban areas. (actioned through WP 1,2,3,4)
<b>Gender equality, youth &amp; social inclusion</b>	Women, youth and other marginalized groups are effectively engaged in designing and implementing adaptive land and water use and management solutions; benefit from inclusive food systems through broader governance reform; thereby improving livelihoods and socio-economic empowerment. (actioned through WP 1, 2, 3, 4)
<b>Climate adaptation &amp; greenhouse gas reduction</b>	At AMD's core is developing and scaling socially-inclusive climate adaptation measures against sea-level rise, floods, water shortage, soil and fresh water salinization. Smallholders and policy-makers will have access to timely, relevant information and financial solutions supporting adoption of improved coping strategies (digital advisory services, early warning). (actioned through WP 1, 2, 3, 4, 5)
<b>Environmental health &amp; biodiversity</b>	Catalyzing adoption of nature-based, resource-conserving, efficiency-enhancing food systems through digital solutions, index-based actions, incentive mechanisms, AMD will reduce pressure on natural resources, accelerate ecosystem restoration, and curb habitat and biodiversity loss. AMD will catalyze intensification and diversification of food systems through sustainable approaches employing integrated, equitable water and land governance. (actioned through WP 1, 2 and 3)

### Impact on SDGs



### Regions

South Asia (SA), South East Asia and the Pacific (SEA)

### Countries





## Securing the Asian Mega-Deltas from Sea-level Rise, Flooding, Salinization and Water Insecurity

### Innovations

Locally-verified adaptation matrices describe which validated T&Ps can be scaled where and how. These spatially-explicit matrices can be visualized and build on adaptive research, resilience assessment, suitability and trade-off analyses of adapted farming systems and improved resources management. Development programs, government agencies use matrices as scaling 'blueprints' for intervention targeting.

Tools and advisories for smart investments and digital solutions to prioritize and quantify the impact of climate, biodiversity and environmentally smart investments, design innovative financing solutions and develop insurance products to de-risk investment. The tools/advisories will be used by public-private stakeholders to develop a portfolio of verified investment opportunities.

A portfolio of demonstrated and emerging options for better adapted and more equitable systems of water and land management that build resilience against intensifying cycles of water scarcity and excess, unlocking opportunities for enhancement and diversification of inclusive food production systems.

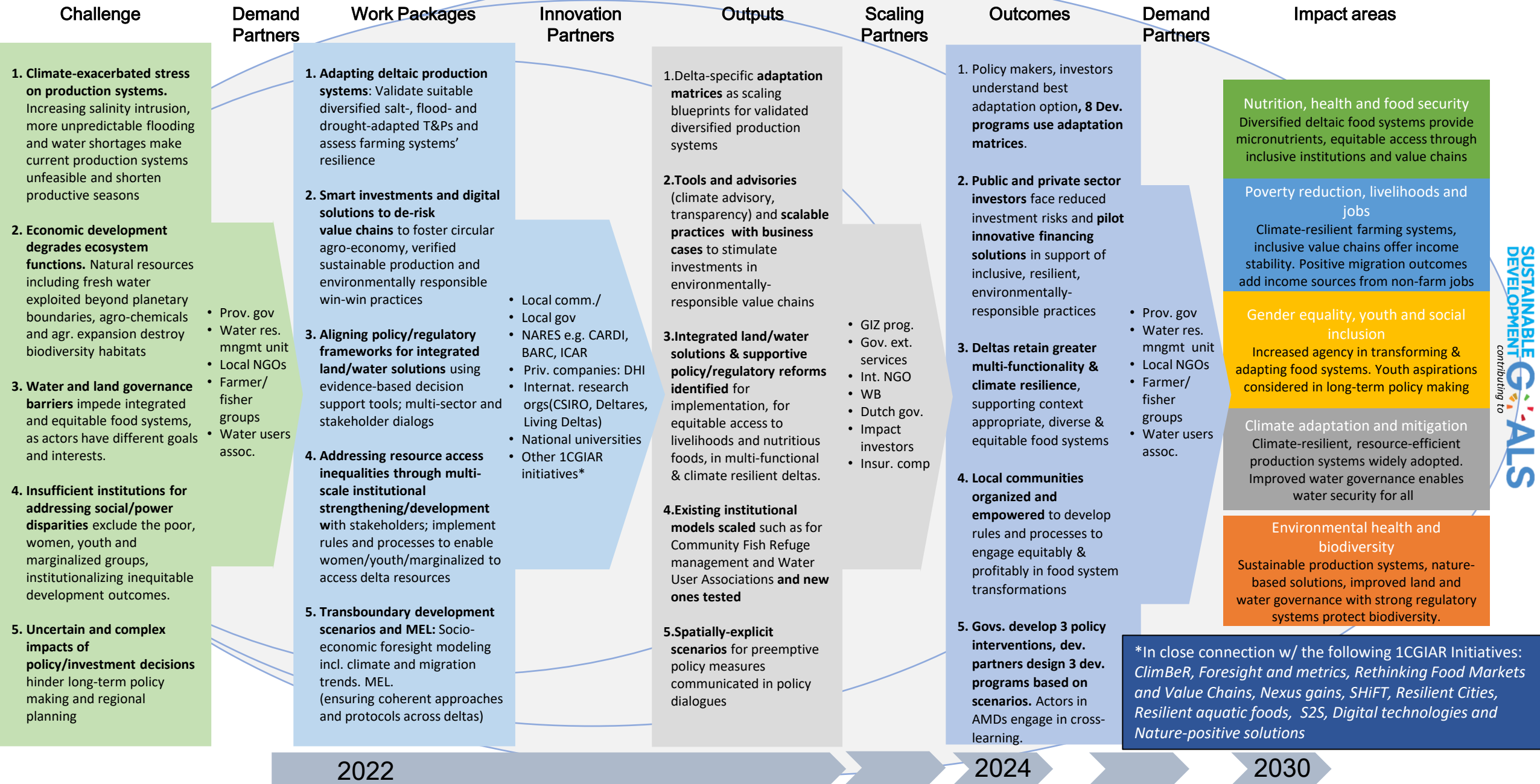
Existing institutional models, including Community Fish Refuge management and Water User Associations, that support multi-stakeholder benefits and ecosystem services through systems-level adaptation scaled. Iterative learning from scaling processes will facilitate the development, testing, and nurturing of new innovations.

Spatially-explicit scenarios for development pathways of AMDs will bring together socio-economic and climatic assessments. These scenarios will include insights from community and youth aspiration assessments as well as projected migration trends. They will provide a basis for appropriate policy and rulemaking.

### Key Partners

<b>Demand</b>	Government	Water Resources Management units (e.g. Bangladesh Water Development Board, National Water Resources Commission in My, Dept. for Water Resource Management in VN, Tonle Sap Authority in Cam)
	Local Government	Provincial Departments of Agriculture, Environment and Rural Development and their ministries (e.g. Provincial Department of Water Resources and Meteorology, Cambodia; Provincial Fisheries Departments, Myanmar)
	Partner Country based NGO	Local NGOs, e.g. BRAC, Bangladesh; Cambodia Development Resource Institute (CDRI); Greenovator, Myanmar
	Private Sector in Aid Recipient Country	Farmer/fisher groups, cooperatives, e.g. within the 'One Cooperation, One Product' (OCOP) scheme in Vietnam, Fisheries Research and Development Network, Myanmar
<b>Innovation</b>	Academic, Training and Research	CSIRO, Living Deltas Hub, Deltares
		Danish Hydraulic Institute, Institute of Water modeling (Bangladesh), Southern Institute of Water Resource Planning (Vietnam)
		Local universities (e.g. Can Tho Uni, Bangladesh Ag. Uni.; Yezin Ag. Uni, Myanmar; Royal University of Cambodia; International Center for Climate Change and Development)
		National research organizations, e.g. Cambodian Agricultural and Development Institute (CARDI), Vietnam Academy of Agricultural Sciences, Bangladesh Agricultural Research Council (BARC); Bangladesh Fisheries Research Institute (BFRI); ICAR (Indian Council of Agricultural Research); Centre for Ganga River Basin Management and Studies
	Private Sector in Aid Recipient Country	Local communities and local governments ( e.g. water user associations (Myanmar); Community Fish Refuge Management Committees, Cambodia
<b>Scaling</b>	Government	GIZ programs (e.g. Green Innovation Center, Mekong Delta Climate Resilience Program)
		Governmental extension services (e.g. Dept. Ag. Extension in BD, Nat. Ag. Extension Center in VN, Extension Division in My)
	International NGO	Dutch Gov/ SNV (e.g. Ag. Transformation program in MRD); AGRITERRA
	Multilateral	World Bank (e.g. 2030 Water Resources Group, Ayeyarwady Intergrated River Basin Management Project
	Private Sector	Sustainable Rice Platform members, Loc Troi Group, impact investors, insurance companies, Myanmar Rice Federation

# Theory of change for Asian Mega-Deltas (AMD) Initiative





## SeEdQUAL: delivering genetic gains in farmers' fields

### Initiative Lead and Co-Lead

Ian Barker  
Shoba Venkatanagappa

### Primary CGIAR Action Area

Genetic Innovation

### Estimated 2022 - 2024 Budget

\$30 - \$30 M

### Challenge

In many developing countries, limited availability of, and access to quality seed and propagation material for well-adapted varieties, hinders efforts to transform agriculture and agri-food systems. The dissemination of quality seed with trait packages preferred by farmers, consumers, and other agri-food system actors is a critical mechanism through which CGIAR and its partners will deliver on its five impact areas-nutrition, poverty, gender, climate, and environment-and the second Sustainable Development Goal of zero hunger by 2030. A key step to meeting these goals is a more focused, demand-led, well-resourced, and long-term investment in CGIAR breeding programs driven by accurate market intelligence. The success of CGIAR/NARS breeding programs hinges largely on the efforts to strengthen the links between breeding and the delivery of quality seed of climate-adapted and nutritionally enriched varieties to smallholder farmers in stress-prone and low-technology adoption environments. This technology transfer process relies on functioning and equitable seed systems operating in an enabling policy environment that incentivizes varietal turnover <https://bit.ly/32xuGQ5> and integrates formal and informal seed systems to work for all. Emphasizing farmers as seed users, and the need for "market pull", is also important. Timely access to and use of quality seeds- and the genetic gains they embody - are shaped by multiple factors, including gender relations <https://bit.ly/3adoDV2> and other intersectional factors. While new investments in seed systems development provide opportunities to increase the benefits of seed access and use for women and other unreached groups, more effort is needed to address constraints <https://bit.ly/3tp0jHc> that limit their rights, choices, and capabilities.

### Objective

Building on the Crops to End Hunger Initiative (accepting the recommendations of the CtEH Seeds Group whitepaper <https://bit.ly/3tl61n6>), CGIAR Excellence in Breeding Platform (EiB), and existing initiatives, SeEdQUAL will accelerate varietal turnover <https://bit.ly/3dlk90s>, quality seed use, and realization of genetic gains (2% p.a.) in farmers' fields through a concerted effort to strengthen national seed systems in focal countries and regions. The starting point is the modernization of CGIAR's role in seed system development and particularly seed delivery driven by a renewed and clarified comparative advantage of CGIAR with respect to its NARS and other partners (working with the new AGRA CoEiSS), in national innovation systems. CGIAR-derived breeding was estimated to impact 37MM ha in SSA alone in 2015, but with an average varietal age of 14 years; <https://bit.ly/32hClfJ> the goal being to reduce this age. The process to be pursued will incorporate the latest "gold-standard" methods of stage-gating in product advancement and variety portfolio management. The initiative also addresses the functioning of seed systems, ensuring that breeding innovations reach the most disadvantaged. Additional significant benefits will accrue to women <https://bit.ly/3gbRQ6t> by increasing their access to and use of quality seeds, and also by engaging them in seed production and distribution roles. This has multiplier effects on women's empowerment. A range of evidence-based innovative mechanisms and instruments will be leveraged to "reach the unreached" at scale, through close coordination between formal and informal channels. SeEdQUAL will realize the OneCGIAR breeding investment and provide an entry point for many other initiatives across the portfolio.

### Theory of Change

This initiative aims to deliver seed of climate-resilient, market-preferred, and nutritious varieties embodying a high rate of genetic gain to farmers ensuring that women and other disadvantaged groups are reached. It will achieve this with a product-life-cycle process managed alongside the Accelerated Breeding initiative generating strong feedback loops from seed users to breeding and design teams. Product advancement processes to prioritize varieties for commercialization will be standardized, based on industry best practice, and extensive on-farm testing, working closely with the Market Intelligence initiative. SeEdQUAL will validate rapid-seed-multiplication methodologies for wider use. New models of early-generation-seed (EGS) and certified/QDS seed production will be tested through demand-led public and private partnerships. New crowdsourcing methods will make possible monitoring varietal adoption more extensively at lower cost. Practical evidence-based approaches to designing more inclusive seed systems ensuring women and disadvantaged farmers are reached will be promoted, in tandem with new metrics for inclusive seed access. Consequently, seed companies and other public seed multipliers will more routinely access new varieties from CGIAR/NARS networks of a broader range of crops matched to their market needs through novel partnerships. Seed enterprises will multiply and disseminate EGS more extensively, accelerating varietal turnover. Regulators will create an enabling environment by reducing barriers to varietal turnover. Disadvantaged farmers have more choice and access to quality seed of new varieties that meet their needs. This will lead to faster and wider adoption of new varieties and consequent improvements in income, nutrition and climate resilience.

## SeEdQUAL: delivering genetic gains in farmers' fields

### Highlights

Seeds production research protocols based on industry good practice in use across CG/NARS networks to ensure new releases will be profitable and not fall outside acceptable risk parameters from a seed production (including both EGS and certified seed) point of view, promoting uptake of new varieties and accelerating turnover.

New metrics to track quality seed use by target socio-economic groups developed. The metrics will show barriers and opportunities in enhancing quality seed use for specific groups, including women, will shine a light on good practice and incentivize change for increasing seed access. Benchmarking seed indexes adopting metrics by 2023.

Driving cereal varietal availability and turnover through seed-based innovations linking from breeding to address production constraints (dry direct seeding in rice, zero tillage for wheat and barley) and supporting NARS (public and private) capacity for fast-track release of high value varieties and influencing an enabling policy

African Center of Excellence in Seed Systems for RTB crops established to strengthen African economies, delivering technologies & enhancing capacities to develop economically sustainable seed systems. With global outreach, it will build off the Roots, Tubers and Banana (RTB) CRP and link to AGRA's Center for Excellence in Seed Systems.

Expand the successful market-oriented, demand-led, multi-stakeholder models pioneered under the Pan Africa Bean Research Alliance to additional legumes and geographies. Broadening access to quality seed of improved farmer-preferred varieties through adequate EGS, adding fewer commercial crops to seed company portfolios and licensed from NARS.

### Work Packages

	Scope of Work	3-year Outcomes
Characterization, advancement and hand-over of new varieties: fewer, better varieties.	Context (crop-type, market and seed sector development) specific R4D on sustainable EGS production and business models. More effective germplasm exchange networks and expanded on-farm testing of candidate varieties. Research on demand creation and reaching the most disadvantaged ("last mile"). Production research and lowering the cost and risk of seed production.	Seed companies and other seed multipliers accessing and using quality seed of new varieties from CGIAR/NARS networks at greater scale, tailored to their needs and ensuring that women and other disadvantaged groups are reached.
Capacity-building, modernization and MEL.	Technical assistance for NARS (including seed units) and foundation seed organizations in EGS production and on-farm demonstration trialing, working through specialist partners and aligned with other planned seed investments. Development, staffing of a dedicated new OneCGIAR seed unit as recommended in the CtEH whitepaper. Tracking and reporting variety advancement and adoption. Licensing strategies.	Seed enterprises including NARS organizations adopting innovative and transformative models for accessing, multiplying and disseminating quality EGS for the full range of target focus crops in prioritized market segments following economically sustainable business models.
From intention to implementation: Policies for varietal turnover, seed quality assurance, and trade in seeds.	Evidence-based amplification of (1) policy guidance on early generation seed production and distribution, varietal release processes, quality assurance systems, and trade to encourage inclusive seed sector growth; and (2) program designs for smart input delivery, credit-linked extension, and other instruments to accelerate varietal turnover and deepen demand for quality seeds.	Robust policy implementation in 5-10 countries leading to: 50% increase in EGS production/distribution; qualitative reductions in time/effort required to release new varieties and produce quality seed; 5-10% increase in regional seed market values; and qualitative improvements in reach and impact of instruments to accelerate varietal turnover and increase seed demand.
Scaling equitable access to quality seed: reaching the unreached with quality seeds and traits.	The WP will design, test scale and track context-specific information and seed delivery channels, promote women's seed entrepreneurship, enhance access to affordable quality seed by disadvantaged socio-economic groups including women and test approaches to enhancing synergies between the formal and community-based/farmer managed systems.	Key private and public seed agencies and development organizations are using the new metrics for tracking inclusive seed access generating a robust evidence base. Key national seed innovation partner organizations are modifying or introducing new seed information-sharing and delivery mechanisms to enhance inclusive access to seed.



## SeEdQUAL: delivering genetic gains in farmers' fields

### Impact Area Contributions

<b>Nutrition, health &amp; food security</b>	Increased varietal turnover will provide resilient, nutrient-dense legumes, biofortified crops, and vegetables. Distribution of diverse high-quality crop varieties with market-relevant traits, mitigates micronutrient malnutrition and facilitates NARS partners and farmers to improve crop, diet and nutrient diversity, and combat food insecurity.
<b>Poverty reduction, livelihoods &amp; jobs</b>	Increased adoption of resilient higher-yielding market-preferred varieties, and faster turnover of varieties, will increase on-farm productivity, competitiveness and improve farmer incomes. Contract seed production of hybrid cereal and vegetable varieties by smallholder farmers will create employment for women and youth in rural communities.
<b>Gender equality, youth &amp; social inclusion</b>	An increase in the use of affordable seed of market-demanded, consumer-preferred and resilient varieties by women, youth, and disadvantaged social groups will contribute to reduced gender bias and yield gaps. Empowerment through training in quality seed production, meeting standards and complying with regulations, will open up opportunities for future entrepreneurship.
<b>Climate adaptation &amp; greenhouse gas reduction</b>	Seed systems that promote increased variety turnover will help farmers adapt to a changing climate. Productive climate-resilient varieties with traits for heat, flood and drought tolerance and pest and disease resistance will provide yield stability, reduce pressure on marginal land, and reduce greenhouse gasses from agriculture.
<b>Environmental health &amp; biodiversity</b>	Increased adoption of high-yielding, climate-resilient varieties with pest and disease resistance will reduce the usage of pesticides. Diversification of crops, including vegetables and traditional vegetables, will increase agro-biodiversity. Early maturing varieties in zero-till crop rotations will improve soil health and sequester carbon.

### Impact on SDGs



### Regions

Global

### Countries



## SeEdQUAL: delivering genetic gains in farmers' fields

### Innovations

Broad implementation of effective stage-gated product advancement decision-making approaches (including the Seeds2B handbook), in line with the CtEH whitepaper recommendation and in collaboration with the Market Intelligence IDT using better trait product profiles. Earlier involvement of private seed companies and other off-takers in the identification of varieties to commercialize.

Development of low-cost methods for monitoring varietal adoption (including DNA and novel crowd-sourced and image recognition tools) to monitor varietal turnover and ultimately assess the success of the seed delivery initiative (in line with the CtEH Eschborn principles).

Strategies for scalable, evidence-based approaches that leverage market, community, and digital channels, to increase access to and use of quality seeds by women, youth and other unreached groups and provide actionable information and recommendations for critical financing.

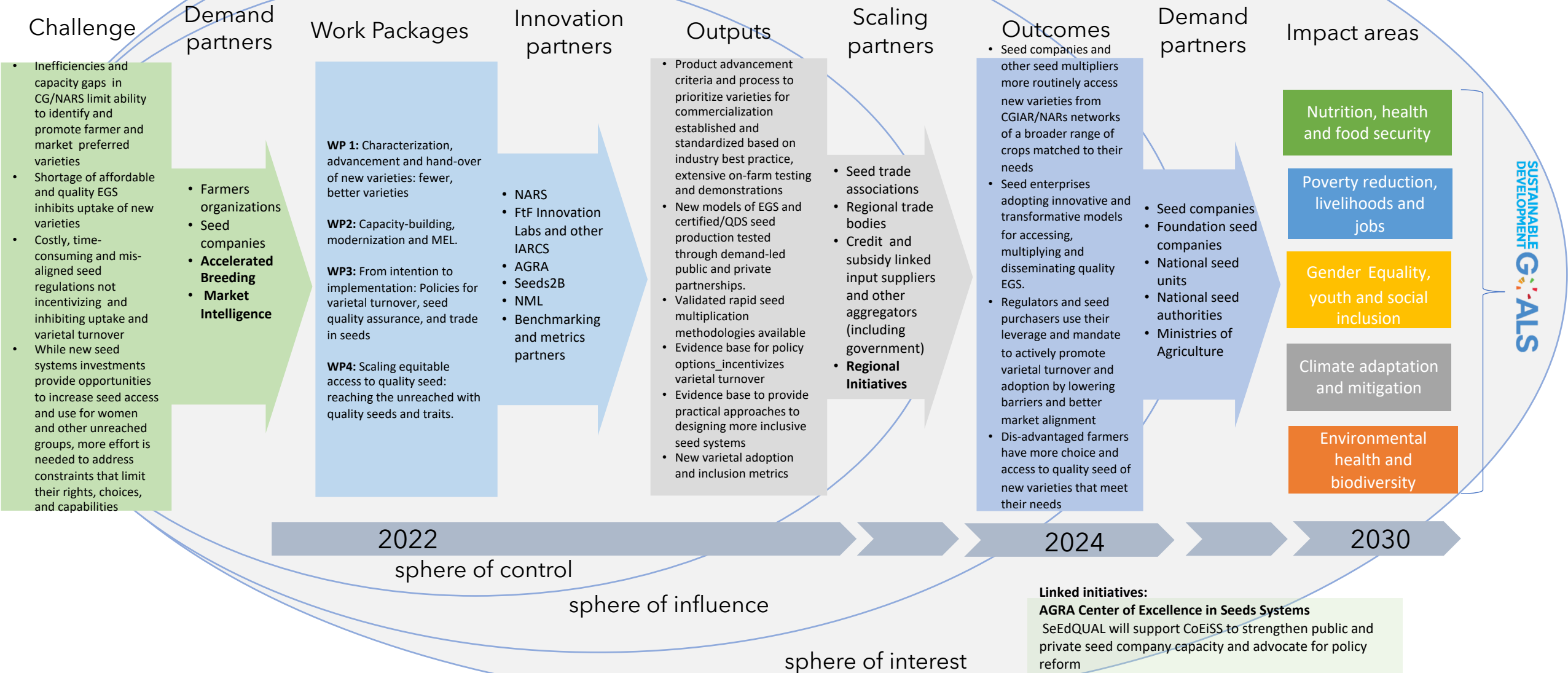
Development or refinement of EGS business models that employ novel ICT tools (such as Seed Tracker already being piloted for cassava in Nigeria, Tanzania and Brazil, and Yam in West Africa), Seed Cast in rice, and quality production protocols across crops for use by EGS producers (breeders and foundation seed)

Continued development and scaling of novel rapid seed propagation technologies for early generation seed, including SAH, aeroponics, TIBS micropropagation, rooted apical cuttings, detasseling techniques, seed treatment and good seed agronomy. These will ultimately improve the EGS business models and availability of seed and provide new opportunities for public-private partnerships.

### Key Partners

<b>Demand</b>	Government	Ministries of agriculture and Planning (input subsidy schemes), WFP, credit-linked input suppliers and other SHF aggregators
		NARS and other public seed units
	Other Public Sector	Benchmarking initiatives and indexes (such as World Bank EBA, TASA, Access to Seeds)
	Private Sector	AATF-Qualibasic and other foundation seed companies
Selected Seed Companies (including East-West Seeds DCM- Shriram)		
<b>Innovation</b>	Academic, Training and Research	FTF Innovation labs
		WorldVeg and ICRISAT
		WUR
	Foundation	Data 2x
	Other Public Sector	AGRA
<b>Scaling</b>	Foundation	SFSA Seeds2B
	International NGO	New Market Lab
	Multilateral	SAARC/COMESA/SADC/ECOWAS/ASEAN/NAFTA (Regional economic blocs)
		[Budget based on 20MM identified and aligned W1/W2 funding and requested additional 33MM to achieve enhanced delivery]
	Other Public Sector	Harvest Plus
Private Sector	APSA/AFSTA/NSAI (Seed Trade Associations)	

# SeEdQUAL: theory of change





## SHIFT: Sustainable Healthy Diets through Food Systems Transformation

Initiative Lead and Co-Lead	Primary CGIAR Action Area	Estimated 2022 - 2024 Budget
Marie Ruel Mark Lundy	Systems Transformation	\$30 - \$30 M

### Challenge

Food systems are not providing healthy, safe, affordable, and desirable foods for all: healthy diets are unaffordable for 3 billion people, disproportionately affecting women and children. Poor quality diets are a key driver of all forms of malnutrition (<https://bit.ly/3mJvMRU>) and cause 11 million premature adult deaths each year (<https://bit.ly/3wLNmJH>). Consumption of unsafe foods is responsible for 600 million foodborne illnesses and nearly 500,000 deaths yearly, mostly in low- and middle-income countries (LMICs) (<https://bit.ly/3a7LQrx>).

Food systems contribute significantly to environmental degradation, are responsible for more than 25 percent of greenhouse gas emissions, and operate beyond planetary boundaries (<https://bit.ly/3e2xl9o>). While food systems are an important source of employment in LMICs, many jobs are in the informal sector, often with low and uncertain income and poor labor conditions, especially for migrant workers, women and youth (<https://bit.ly/32cPX0Z>)(<https://bit.ly/3tfKkLy>).

Food demand and dietary patterns are rapidly evolving due to urbanization, changes in income, women's employment, and developments in technology, food marketing, and public policy (<https://bit.ly/3uRKmJl>)(<https://bit.ly/3uLGWIE>)(<https://bit.ly/3mM2XV4>). These changes encourage shifts in food environments that promote ready-to-eat, convenient, cheap, but often ultra-processed foods that are associated with poor health (<https://bit.ly/32cVrZM>).

There is global consensus on the urgency of transforming food systems and of the need to better understand and shape consumer demand towards sustainable healthy diets. We posit that the primary goals of transformation should be to improve diets to address the global burden of malnutrition while safeguarding planetary health and reducing poverty and inequity. Governance issues caused by the misalignment of government, private sector, and civil society goals often impede change, as does the absence of known transformative pathways and of evidence and tools to guide food system transformation to achieve sustainable healthy diets for all.

### Objective

Starting from the diet, nutrition, and health challenges faced by the poor and vulnerable in LMICs, this initiative aims to identify effective policy options, strengthen capacity, and develop robust metrics and tools to guide decision-making towards transforming food systems through pull, push and policy mechanisms to promote and support consumption of sustainable healthy diets for all and improve livelihoods, gender equity, and social inclusiveness.

These goals could be in conflict, as actions that improve diets may not always be economically wise, socially inclusive, or environmentally friendly. This initiative will analyze such trade-offs to better understand how to optimize healthy and safe diets while also fostering positive impacts on poverty, gender and youth equity, and environmental sustainability. In our target countries, we will analyze the political economy of food system transformation, focusing on barriers preventing adoption of sustainable healthy diets.

The specific objectives are to:

use rigorous and standardized methods to document the drivers of food choices and identify a set of policies and innovations to shape urban and rural food environments to assist consumers, especially the nutritionally and socially vulnerable, make healthier, safer, and environmentally sustainable food choices;

develop, evaluate (through causal impact evaluations), and build a body of scalable evidence-based enabling and incentivizing policies and innovations with MSMEs and other formal and informal actors (including smallholder producers) to help deliver sustainable healthy diets, gender equity, and social inclusion (including youth);

develop multidisciplinary, participatory methods to address trade-offs in interests, outcomes, or impacts occurring in food systems transformation and identify solutions to foster adoption of scalable, evidence-based innovation packages;

generate evidence-based governance and policy solutions to help food system actors incentivize production, improve delivery, and enable consumption of sustainable healthy diets and address political and social barriers preventing their uptake and implementation.

### Theory of Change

This initiative aims to identify transformative policies and innovations, strengthen capacity, and develop robust metrics and tools to guide decision-making towards food system transformations that support and enable consumption of sustainable healthy diets for all, while improving livelihoods, income, gender equity and social inclusiveness. The initiative will do so through pull, push and policy mechanisms by (1) fostering technological, policy, and societal innovations to stimulate the demand for and consumption of sustainable healthy diets; (2) helping micro, small, and medium enterprises (MSMEs) and informal businesses employing women, youth, and marginalized groups to respond to rapidly changing demand and deliver healthy, safe, and affordable foods; (3) identifying novel governance and policy solutions that move food systems beyond the current status quo; (4) developing multidisciplinary approaches to work with stakeholders on navigating trade-offs; and (5) helping to identify and promote transformation pathways that support consumption of sustainable healthy diets. The initiative will focus on nutritious (nutrient-rich) foods, including fruits and vegetables, (biofortified) pulses, nuts, and select animal-sourced foods. We will work in a set of target countries together with key food system actors (e.g., MSMEs, smallholder producers, and poor consumers); national and subnational policy makers; innovation and scaling partners (e.g., civil society, UN, and private sector); and in consultation with regional partners. This collaborative program will generate scalable evidence-based policy innovations; identify policy lock-ins and barriers to food system transformation; establish road maps for overcoming these barriers; and assist national stakeholders in initiating their country's food system transformations. Ultimately, this initiative will allow ALL individuals-especially the most nutritionally and socially vulnerable-to consume sustainable healthy diets comprising nutritious, safe, affordable, and acceptable foods produced by sustainable and resilient food systems that promote fair and equitable livelihoods.

This initiative will work closely with the following One CGIAR initiatives: HER+: Harnessing equality for resilience in the agri-food system; National Policies and Strategies for Food, Land and Water Systems Transformation; Rethinking Food Markets and Value Chains for Inclusion and Sustainability; Resilient Cities through Sustainable Urban and Peri-urban Agri-Food Systems; Harnessing Digital Technologies for Timely Decision-Making across Food, Land, and Water Systems; Market-Driven, Resilient and Nutritious Agri-Food Systems in the Humid Zones of West and Central Africa (WCA); Resilient and Sustainable LAC Agri-Food Systems: Driving Global Food Security, Inclusive Growth, and Reduced Out-Migration; Transforming Agri-Food Systems in South Asia (TAFSSA).



## SHiFT: Sustainable Healthy Diets through Food Systems Transformation

### Highlights

**Challenge:** Food systems are failing to provide access to sustainable healthy diets for 3 billion people and to create inclusive opportunities for the poor, women, youth, and other vulnerable groups. Poor quality diets are a key driver of all forms of malnutrition and cause 22% of premature adult deaths annually.

**What is different/unique about the initiative:** This initiative uniquely starts from a consumer perspective and focuses on how food system transformation can ensure that all individuals consume a sustainable healthy diet (defined as nutritious, protective against non-communicable diseases, safe, sustainable, affordable, and culturally acceptable [FAO 2019, <https://bit.ly/3a4K7TV>]). Focus foods include fruits and vegetables, (biofortified) pulses, nuts, and select animal-sourced foods.

**What we will do:** We will study the choices that different food system actors make vis-à-vis the healthfulness, safety, sustainability, affordability, and desirability of foods; analyze the demographic, sociocultural, economic, and political drivers of these choices and the barriers to adoption of sustainable healthy diets; and co-design and test relevant innovations that help food systems promote and enable consumption of sustainable healthy diets.

**How we will work:** We will focus on nutritious foods in a set of target countries with special attention to the informal sector, a major source of food and income for the poor, and to urban and rural food systems, acknowledging the role of women, youth, and vulnerable groups. We will focus on access, control, and decision-making leading to the co-design and implementation of innovations and policies with key stakeholders.

**What we will achieve:** This initiative will generate a suite of robust tools, scalable evidence-based innovations and context-specific policy options while building the capacity needed amongst actors to transform food systems so that they support and enable consumption of sustainable diets for all while improving livelihoods, income, gender equity and social inclusiveness.

### Work Packages

	Scope of Work	3-year Outcomes
Consumers and Their Food Environment (pull)	This work package addresses consumer demand and food environment innovations to stimulate demand for and consumption of sustainable healthy diets, with emphasis on informal markets and the rapidly changing food retail sector. We will develop analytical frameworks and tools and use causal impact assessment methods to evaluate implementation, impact, and cost of innovations.	In 8 target countries, food system stakeholders are made aware of, understand, and are interested in -and in 2 of these countries are implementing- scalable evidence-based interventions and policies to increase the demand for healthy sustainable diets.
MSMEs and the Informal Sector (push)	This work package will explore business and policy incentives to shape the ability of MSMEs and informal businesses (including food catering and street food vending) in LMICs to deliver and promote healthy, safe, and affordable foods; create inclusive income opportunities for women, youth, and vulnerable groups; and increase efficiencies and reduce waste.	In 8 target countries, policy makers are made aware of, understand, and are interested in -and in 2 of these countries are implementing- scalable evidence-based interventions and policies to improve the ability of MSMEs and informal businesses to deliver healthy, safe, and affordable foods and maintain or increase decent employment (ILO, <a href="https://bit.ly/2S6ONT6">https://bit.ly/2S6ONT6</a> ) and income opportunities.
Governance and Inclusive Food Systems (policy)	This work package will identify food system 'lock-ins' and barriers resulting from the concentration of economic and political power in the hands of incumbent actors and propose contextualized and evidence-informed governance and policy solutions for removing active resistance and transitioning food systems towards more equitable outcomes.	In 8 target countries, this work package leads to increased awareness, a better understanding, and the acknowledgement amongst the different stakeholders of the importance of addressing existing frictions and barriers that lock food systems into undesirable trajectories, leading to clear interests (for ~20 percent of these stakeholders) to address the barriers identified.
Trade-Off Scenario Analysis	This work package will focus on scenario analyses and will develop tools and approaches to work with stakeholders to identify desirable solutions and support decision-making around trade-offs related to multiple priorities and conflicting interests, values, and outcomes.	Decision support tool for trade-off scenario and analysis will have been developed, tested, and applied in at least four of the program's targeted countries, contributing to raised awareness and improved capacity of food system stakeholders to navigate potential trade-offs emerging from food system interventions and policies.
Catalyzing Food System Transformation	This cross-cutting work package will identify potential transformative technological, societal, and policy pathways that emerge from the other work packages and systematically explore how to help stakeholders concretize these pathways in their own context and ensure that countries can successfully transform their food systems towards sustainable healthy diets.	In at least two, and possibly four countries with the most tangible progress, the outcome of this WP will be the active involvement of key stakeholders in the identification, analysis and debate around a set of transformative pathways, to establish consultative processes exploring ways these transformative pathways can be implemented.

## SHiFT: Sustainable Healthy Diets through Food Systems Transformation

### Impact Area Contributions

<b>Nutrition, health &amp; food security</b>	By focusing on marginalized consumers and their food environments, our initiative will help improve diet quality and safety, increase the number of people in 8 target countries who demand and can afford (by 50 million) and consume (by 3 million) a sustainable healthy diet, and thereby contribute to reducing the burden of undernutrition, micronutrient deficiencies, diet-related non-communicable diseases, and foodborne illnesses.
<b>Poverty reduction, livelihoods &amp; jobs</b>	The initiative will provide evidence and identify co-created solutions on how food environment stakeholders can enhance employment and income for poor formal and informal actors, while mitigating trade-offs between delivering healthy and affordable foods and achieving jobs and income goals in diverse contexts.
<b>Gender equality, youth &amp; social inclusion</b>	Malnutrition originates in intergenerational processes of social exclusion. We will therefore generate evidence to address unequal access to healthy diets, employment, and income and the inequitable processes and policies that create them, while focusing on poverty, gender, and youth, and on how aspects of marginalization interact in different contexts.
<b>Climate adaptation &amp; greenhouse gas reduction</b>	As a secondary impact, the initiative will generate evidence to promote the uptake of practices and technologies to increase the efficient distribution of food and reduce food loss in the food environment, thereby contributing to overall climate adaptation goals.
<b>Environmental health &amp; biodiversity</b>	Our work on sustainable healthy diets will stimulate consumer demand for a diverse set of sustainably produced foods. This, together with work with MSMEs and informal food environments, will generate a secondary impact area by contributing to demand-pull for nature-positive shifts in the production system with a focus on smallholder farmers.

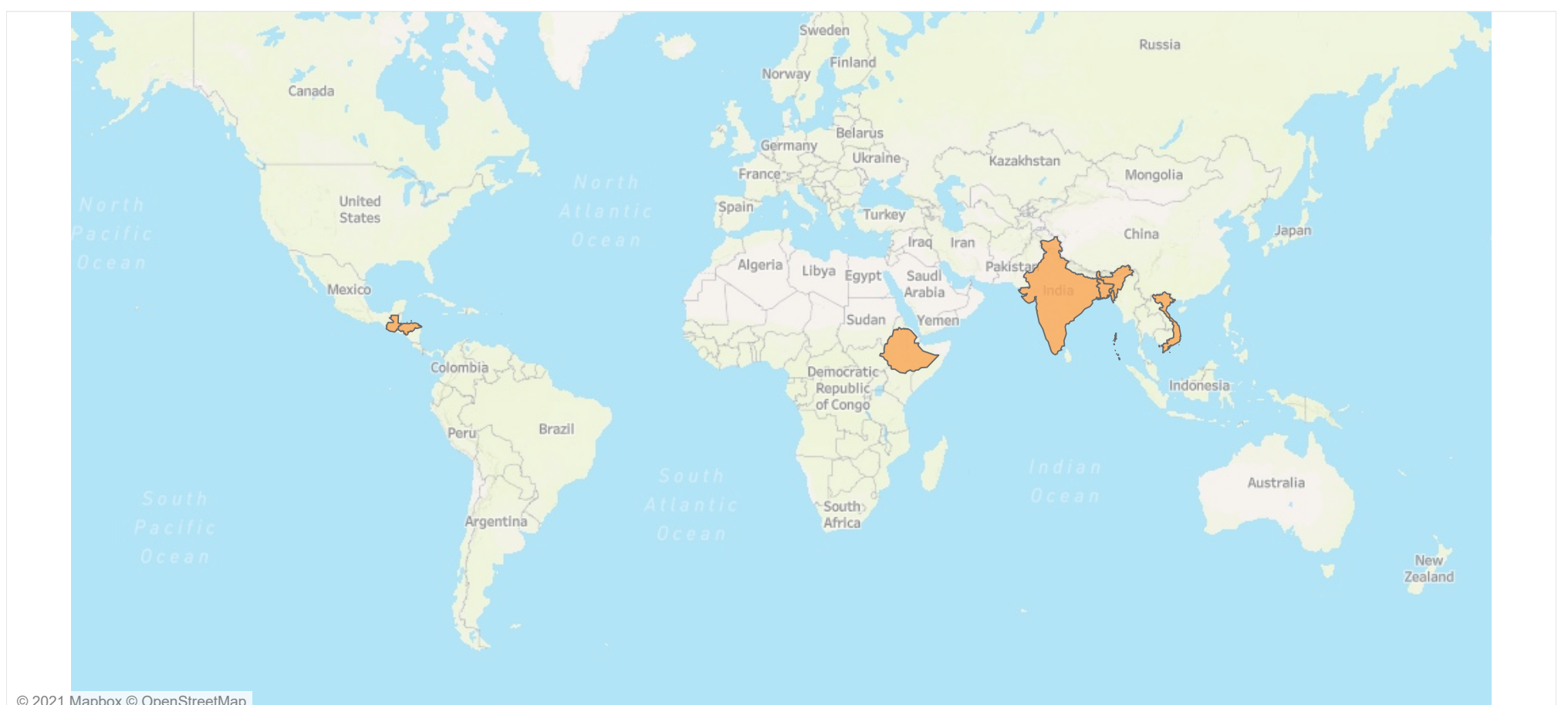
### Impact on SDGs



### Regions

Global East and Southern Africa (ESA), Latin America and the Caribbean (LAC), South Asia (SA), South East Asia and the Pacific (SEA), West and Central Africa (WCA)

### Countries



## SHiFT: Sustainable Healthy Diets through Food Systems Transformation

### Innovations

**Food System Learning Center** - This Center will host an open-access knowledge and information repository of frameworks, guidelines, metrics, and tools to assist global and national stakeholders in 'food systems for sustainable healthy diets' analysis. The Center will also include a Food System Idea Exchange (<https://bit.ly/3dijqx7>), a platform for learning, connecting, and communicating about food systems.

**Decision Support Tool for Food System Trade-Off Analysis** - This innovation package will be developed, tested, and used in the program's targeted countries to help food system stakeholders identify and navigate trade-offs resulting from food system transformation interventions and policies and to prioritize outcomes as needed.

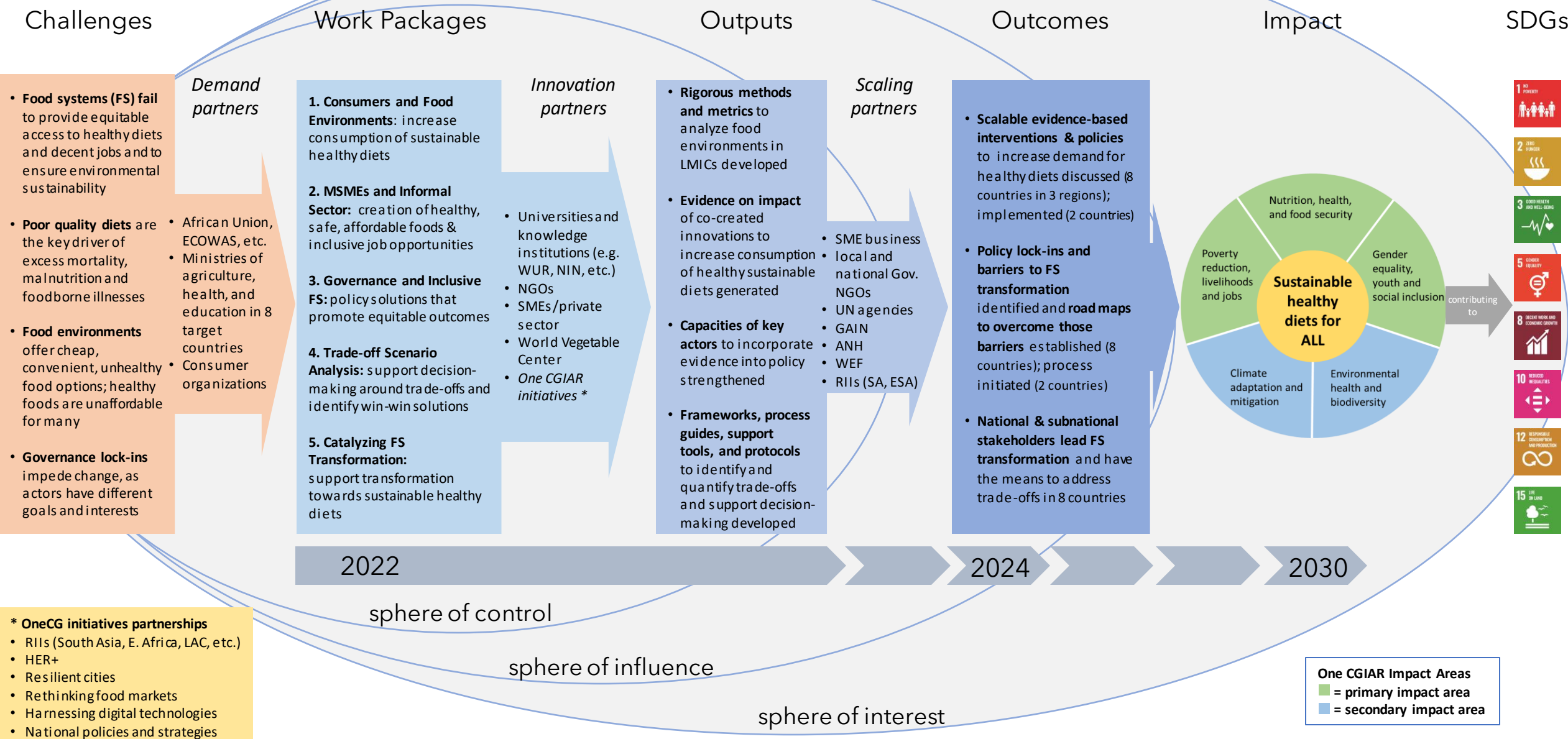
**Food Systems Country Profile Process Guide** - This innovation will support subnational and national stakeholders in navigating and interpreting food systems data relevant for decision making, weighing potential trade-offs, and co-designing interventions to increase demand for, access to, and affordability and consumption of sustainable healthy diets in ways that enhance livelihoods.

**Food System Transformation Strategy Development** - This innovation package will support food systems stakeholders from target countries to co-design and implement a national roadmap pursuant to UNFSS dialogues and comprised of a coherent, multisectoral set of actions (interventions, investments, and policies) necessary to catalyze food system transformation efforts towards sustainable healthy diets.

### Key Partners

<b>Demand</b>	Academic, Training and Research	IMMANA and ANH
	Government	Ethiopia, Vietnam, Bangladesh, Nigeria (Ministries: Agriculture; Health; Education);
	Multilateral	African Union, ECOWAS, NEPAD, AGRA
	Other	Consumer groups, farmers' cooperatives
<b>Innovation</b>	Academic, Training and Research	City University UK, NIN Vietnam, INSP Mexico, INTA Chile, INFORMAS, local Universities, EPHI Ethiopia, ICDDR Bangladesh, local universities, INCAP Guatemala
	Other	Wageningen University and Research, French research institutes (CIRAD, INRAe and IRD), World Vegetable Center, GAIN
<b>Scaling</b>	Government	National, local, and city governments
	International NGO	HKI, Rikolto International
	Multilateral	UN agencies: WFP, FAO, UNEP
	Other	Milan Urban Food Policy Pact, World Sustainable Urban Food Centre of València, EAT Forum, Eat Right India, One Planet Sustainable Food Systems Program, ICLEI/RUAF; Consumer groups
	Private Sector	Food Action Alliance, World Economic Forum

# SHiFT: Sustainable Healthy Diets through Food Systems Transformation: Theory of Change



\* OneCG initiatives partnerships

- RIIs (South Asia, E. Africa, LAC, etc.)
- HER+
- Resilient cities
- Rethinking food markets
- Harnessing digital technologies
- National policies and strategies





## Sustainable Animal Productivity for Livelihoods, Nutrition and Gender inclusion (SAPLING)

### Initiative Lead and Co-Lead

Isabelle Baltenweck  
Mourad Rekik

### Primary CGIAR Action Area

Resilient Agri-food Systems

### Estimated 2022 - 2024 Budget

\$20 - \$85 M

### Challenge

Globally, livestock is the fastest-growing, highest-value agricultural subsector, accounting for 15-80% of GDP in LMICs. At the same time malnutrition remains high in livestock dependent communities. In Africa and Asia, demand is expected to skyrocket 200% by 2030, an enormous opportunity for hundreds of millions of small- to medium-scale livestock producers who can meet the demand and provide nutrient dense foods for their families, countries, and regions (<https://bit.ly/3e1Qg4f>). But productivity is extremely low; annual milk yield of a cow in Sub-Saharan Africa and South Asia is 6% and 12% respectively of a cow in an OECD country. Value chain governance structures prevent producers from fully benefiting from markets and commercializing their farms (<https://bit.ly/2QoOAtJ>). Women, who do most of the work caring for livestock, have limited control over resources and decisions, and youth are marginalized from income-generation opportunities and assets (<https://bit.ly/3x6xpht>; <https://bit.ly/2Qt4GT7>; <https://bit.ly/2RFWol3>). Non-optimal use of livestock genetic potential, lack of quality feeds, poor animal husbandry, and insufficient animal health technologies are widespread biotic constraints to sustainable productivity (<https://bit.ly/3tn5mYP>; <https://bit.ly/3uLIHFH>; <https://bit.ly/3mUsMCb>) leading to increased pressure on natural resources and GHG emissions (<https://bit.ly/3sgP7et>). Livestock producers face new risks from climate change (<https://bit.ly/3aa51B3>; <https://bit.ly/3dieRmq>) and the COVID-19 pandemic (<https://bit.ly/3uSMpxu>). Innovations in improved forages, breeding programs, herd health, and markets have demonstrated sustainable gains in on-farm productivity (<https://bit.ly/2Qqh9qo>; <https://bit.ly/3uVFh3n>; <https://bit.ly/3adIK6F>; <https://bit.ly/3wYhIX>) but need to reach impact at scale. More broadly, evidence for decisions is lacking, resulting in underinvestment by the private sector and weak policies, limiting scale potential. New research approaches are needed to generate solutions that incentivize and enable producers to invest in sustainable production and achieve better livelihoods.

### Objective

SAPLING aims to enable one million livestock producers, 50% women, in 6 countries to engage in inclusive value chains and achieve sustainable productivity gains between 30-50%, resulting in improved livelihoods. Central to SAPLING's approach is leveraging livestock's huge ability to drive change for women and youth by providing evidence to decision-makers on how and why to be inclusive. SAPLING promotes approaches to ensure benefits of increased productivity translate into healthy, sustainable diets through consumption of safe animal source foods (ASFs). SAPLING aims to fill critical productivity and value-chain competitiveness gaps by developing a pipeline of new and existing demand-driven health, genetics, feed, and market systems innovations, including climate-smart and digital solutions. It will generate robust proof-of-concept results for production technologies and tools and inclusive business models for delivering innovations that incentivize producers to invest in sustainable productivity. SAPLING aims to support inclusive development in 7 value chains with high potential for small- and medium- scale producers to capture market growth. SAPLING will co-create innovation packages that address not only technology requirements but also necessary market structures, capacity and policies, and work with "next user" partners as a starting point to achieve scale. SAPLING will facilitate innovations to reach producers in 4 countries with quick wins for scaling, and 2 countries where relationships will be built and packages co-created, generating evidence and lessons. SAPLING will leverage these results to scale approaches that motivate producers to invest in sustainable production in other countries and to stimulate investment globally in sustainable livestock production.

### Theory of Change

SAPLING, with ANIMALS, OneHealth and Sustainable Intensification, supports sustainable growth of the livestock sector in LMICs, developing market-driven solutions to incentivize small- and medium-scale producers to invest in sustainable productivity and capture growing demand, while enhancing social inclusion, supporting improved nutrition, and contributing to environmental protection. It will do this by (1) developing a pipeline of new and contextualizing existing health, genetics, feed, and market systems innovations - technologies, practices, tools - that fill critical productivity and value-chain competitiveness gaps, (2) generating evidence and tools for enhancing equity, inclusion, and food and nutrition security in value chains, (3) developing, piloting, and facilitating scaling of context-specific innovation packages, and (4) leveraging resulting evidence to guide policies and increase investment for sustainable livestock productivity. Co-creation with private sector and other "next user" and co-design partners is expected to 1) generate solutions that better meet the needs and preferences of users resulting in higher adoption and 2) facilitate investment from partners to take innovations to scale. SAPLING will work in 4 countries where strong partnerships exist and innovation packages are ready for scaling, and 2 countries where relationships will be built and packages co-created. By 2024, this approach will enable one million livestock producers (50% women) of cattle, chickens, small ruminants, and pigs to engage in inclusive value chains and achieve sustainable productivity gains between 30-50%. Results will inform policy change and guide investments in countries and drive the global dialogue on livestock's contribution to livelihoods, leading to increased investment in sustainable livestock production

## Sustainable Animal Productivity for Livelihoods, Nutrition and Gender inclusion (SAPLING)

### Highlights

**Market-Oriented Innovation Packages:** Scaled adoption of market-oriented, co-designed, demand-driven and evidence-based innovation packages for small- and medium-scale producers that include production enhancing technologies/practices, models for competitive value chains, capacity development for public/private partners, and support for effective policies will generate triple impacts for livelihoods (income, nutrition, social inclusion).

**Accelerated Global Impact:** Scaling existing pilot-tested innovation packages in 4 countries with strong existing partnership and favourable scaling environments in 3-years will demonstrate feasibility and impact of interventions across sites and value chains. Resulting evidence will be leveraged to guide and advise national and global policies and investments

**Novel Product Pipeline:** Investment in novel research solves for priority technology/practise gaps within our innovation packages approach. Components of the "improving productivity" pillar of "Transforming Livestock Food Systems" are integrated to SAPLING as a platform to accelerate generation of productivity enhancing research products in health, genetics, and feed/forages.

**Co-creation Handover:** "Next-users" of research products (private companies, other incentivized groups) are embedded in design and development and invest in dissemination. Examples include selecting and testing new veterinary medicinal products with pharmaceutical companies who will take them to market, and co-designing business models with buyers who source from livestock producers.

**Transformative Inclusion:** Innovation packages are designed to support gender and age equity by overcoming gaps in livestock productivity, ownership, and technology access/adoption. Packages include solutions, such as labour-saving technologies, digital tools for information/finance, and entrepreneurship skills, demanded by women and youth to achieve profitable participation in livestock market systems.

### Work Packages

	Scope of Work	3-year Outcomes
Technologies and Practices for Sustainable Productivity	With "next user" delivery partners: Develop, adapt, test, demonstrate, and pilot new and existing productivity enhancing, climate-smart, scalable technologies and practices including improved feeds, forages and dual-purpose crops, novel animal health products, herd health packages, improved genetics, improved husbandry, and cross-cutting solutions for environmental sustainability.	Private and public sector partners invest at least \$30M in co-development and dissemination of novel climate-smart, demand-driven, gender and youth inclusive, and productivity enhancing technologies and practices for genetics, feed/forages, and health
Food and Nutrition Security	Generate evidence on effectiveness of approaches to strengthen the role of ASFs in diets and to reduce social barriers to sub-optimal consumption. Develop and test practices for safe production and appropriate handling of ASFs along livestock value chains. Co-create innovative models to deliver affordable, safe ASFs to consumers.	12 public and private sector nutrition education strategies and/or campaigns incorporate Initiative-developed social behaviour change communication strategies and tools for incorporating safe ASFs into a diverse diet leading to increased access to nutrition education. Value chain partners invest in innovative strategies and business models for reaching consumers with affordable ASFs.
Equity and Inclusion	Design and test accommodative and transformative approaches addressing gender- and youth-related constraints (accessing, benefiting, and controlling opportunities and resources) throughout the livestock market system and at the household level. Design and test women- and youth- demanded innovations that provide opportunities and capabilities to engage in competitive livestock value chains.	Public and private decision-makers in 4 countries use Initiative-generated evidence, knowledge, and tools to advance equality and social inclusion in 5 livestock value chains resulting in increased and beneficial participation by 400,000 women and 150,000 youth. Evidence on successful approaches to increase equity and inclusion informs investments and policies with global reach.
Innovation Packages for Value Chain Competitiveness	Generate evidence on innovation packages across sites and value chains. Prioritize innovations at the farm, value chain and landscape level via trade-off analysis. Co-create gender and youth inclusive innovation packages that include technologies/practices, veterinary/diagnostic services, input, extension and service delivery mechanisms, farmer and SME finance and insurance, and market information and output marketing systems	1 million women and men livestock keepers in 6 countries adopt the Initiative-supported co-created, demand-driven innovation packages, transitioning their systems to sustainable, climate-smart production while engaging in well-functioning, inclusive livestock value chains that provide transparent and efficient output markets, resulting in a 30-50% increase in livestock productivity.
Evidence, Decisions and Scaling	Provide compelling scientific evidence and tools that feed into co-delivery of technologies/practices, business-models and policies that will sustainably improve livelihoods. Synthesize evidence and develop communication and engagement strategies to disseminate and advocate for increased investments and better policies at country level and globally.	Public and private decision makers utilize Initiative-developed tools and recommendations 1) to inform policies and investments in 6 countries, resulting in better animal health, feed and genetics policies and reduced barriers to inclusive value chains and 2) to inform the global dialogue on livestock's contribution to livelihoods, leading to increased investment in sustainable livestock production.

## Sustainable Animal Productivity for Livelihoods, Nutrition and Gender inclusion (SAPLING)

### Impact Area Contributions

<b>Nutrition, health &amp; food security</b>	SAPLING contributes to ending hunger and enabling affordable healthy diets by 1) significantly increasing availability of safe, affordable, and micro-nutrient dense ASFs through increased livestock productivity and better-functioning value chains and 2) stimulating behaviour change of consumers and other actors to incorporate recommended quantities of ASFs in the diet and employ safe ASFs handling practices.
<b>Poverty reduction, livelihoods &amp; jobs</b>	SAPLING contributes to poverty reduction, livelihoods & jobs by making demand-driven productivity enhancing innovation packages available to livestock producers and enabling their participation in well-functioning and growing inclusive livestock value chains, leading to a doubling in sustainable livestock productivity, increased cash income for producers, and business opportunities and jobs for value chain actors.
<b>Gender equality, youth &amp; social inclusion</b>	SAPLING contributes to equality and social inclusion by leveraging livestock as a pathway to empowerment for women, youth, and other marginalized groups. These groups will have equal opportunity to participate in and benefit from strengthened livestock value-chains leading to increased livestock ownership, decision-making and control over income
<b>Climate adaptation &amp; greenhouse gas reduction</b>	SAPLING contributes to reducing emissions and increasing climate adaptation by providing producers with knowledge, tools, climate-adapted innovations (e.g., more adapted breeds, better feeds, improved health), and well-functioning value chains needed to increase productivity from low levels, significantly reducing GHG emission intensity.
<b>Environmental health &amp; biodiversity</b>	SAPLING contributes to environmental health & biodiversity by 1) supporting producers to achieve higher resource use efficiency, improve manure management, and appropriately manage livestock health to reduce residues and 2) preserving and enhancing agro-biodiversity of livestock breeds (for select species) and feeds through genetic and feed improvement programs.

### Impact on SDGs



### Regions

Global East and Southern Africa (ESA), South Asia (SA), South East Asia and the Pacific (SEA), West and Central Africa (WCA)

### Countries



## Sustainable Animal Productivity for Livelihoods, Nutrition and Gender inclusion (SAPLING)

### Innovations

An optimized vaccine formulation for contagious caprine pleuropneumonia, one of the most severe and highly infectious diseases of goats, developed in partnership with an animal health company and used by livestock keepers to significantly reduce morbidity and mortality in their herds.

Market-driven business models that integrate multi-platform digital tools for livestock value chain actors to enhance value chain linkages and efficiency and improve livestock keepers' access to services and profitable input and output markets.

Playbook of social and behavioural change strategies targeted at the household level that include all those involved in decision-making (e.g., men and other influencers), not only the primary caregiver, for practitioners to support appropriate consumption of ASFs

Toolkit of gender-transformative approaches for extension services, NARS, NGOs, private sector actors and multinational organizations to ensure livestock interventions lead to increased agency and decision-making power for women and other marginalized groups as a pathway toward empowerment through livestock

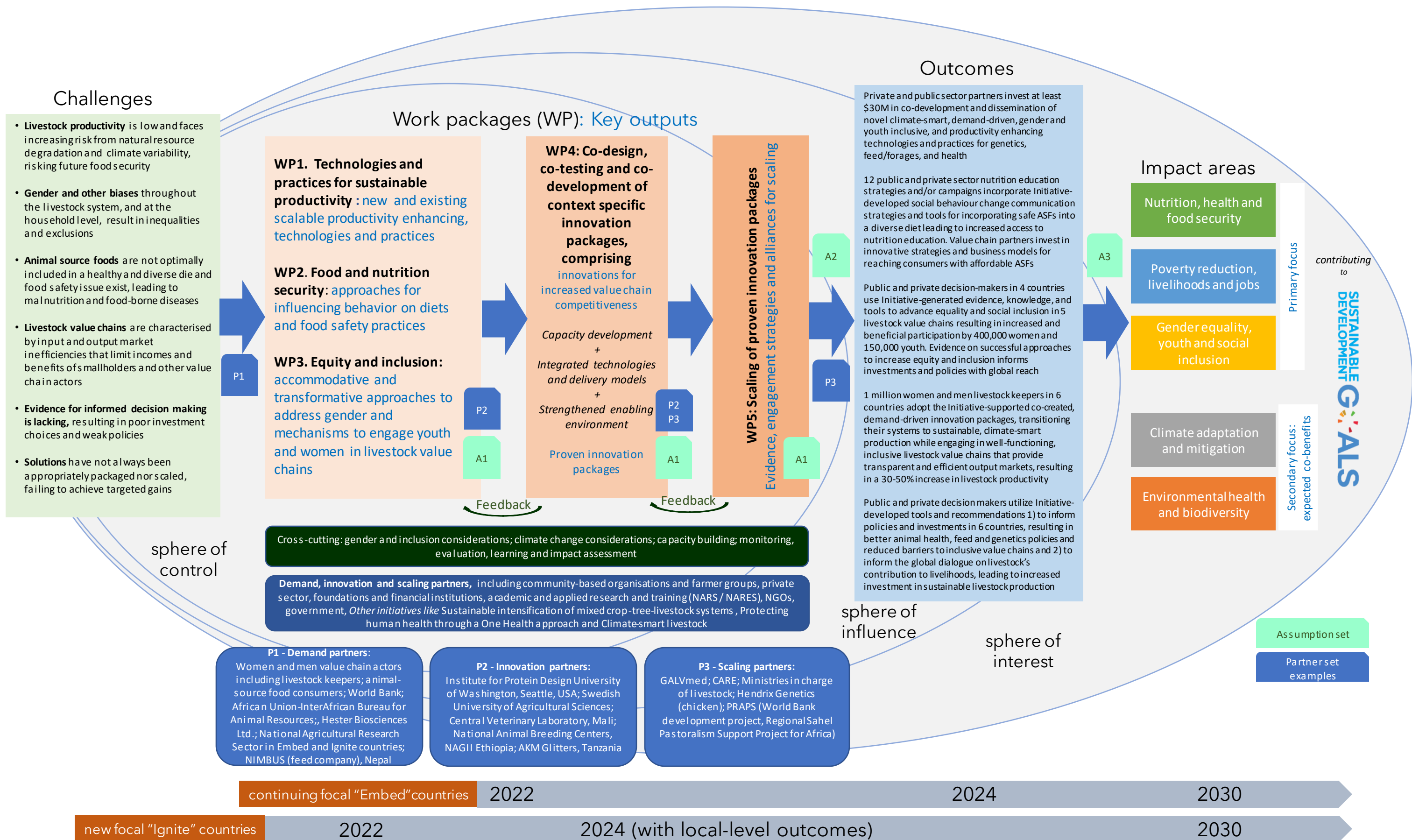
Decision-support system (integrating ex-ante modelling tools) that helps development actors, donors, and governments to assess trade-offs between social, economic, and environmental outcomes at different scales guiding the evidence-based planning of investments in sustainable livestock production.

### Key Partners

<b>Demand</b>	Academic, Training and Research	National Agricultural Research Sector in Embed and Ignite countries
	Multilateral	World Bank
	Other Public Sector	African Union- InterAfrican Bureau for Animal Resources
	Private Sector	Hester Biosciences Ltd.
NIMBUS (feed company), Nepal		
<b>Innovation</b>	Academic, Training and Research	Central Veterinary Laboratory, Mali
		Institute for Protein Design, University of Washington, Seattle, USA
		Swedish University of Agricultural Sciences
	Other Public Sector	National Animal Breeding Centers, NAGII Ethiopia
	Private Sector	AKM Glitters, Tanzania
<b>Scaling</b>	Government	Ministries in charge of livestock
	International NGO	CARE
		GALVmed
	Other	PRAPS (World Bank development project, Regional Sahel Pastoralism Support Project for Africa)
Private Sector	Hendrix Genetics (chicken)	



# Theory of change for Sustainable Animal Productivity for Livelihoods, Nutrition and Gender inclusion (SAPLING)



Assumption set	Key assumptions
1 Activities to outputs	<ul style="list-style-type: none"> <li>▪ Demand, innovation and scaling partners support the co-design, testing and scaling of innovations and innovation packages.</li> <li>▪ Sufficient incentives and safety-nets exist for stakeholders to adopt the innovation packages, including for risk-adverse groups.</li> <li>▪ The livestock sector is attractive to private and public sector engagement.</li> <li>▪ The enabling environment is conducive for scaling.</li> </ul>
2 Outputs to outcomes	<ul style="list-style-type: none"> <li>▪ Sufficient incentives and safety-nets exist for stakeholders to adopt the innovation packages, including for risk-adverse groups.</li> <li>▪ The livestock sector is attractive to private and public sector investment.</li> <li>▪ The enabling environment is conducive for scaling.</li> <li>▪ Smallholder livestock keepers remain competitive in the livestock sector.</li> <li>▪ There is sufficient demand for animal source foods and other livestock products.</li> </ul>
3 Outcomes to impacts	<ul style="list-style-type: none"> <li>▪ Smallholder livestock keepers remain competitive in the livestock sector.</li> <li>▪ There is sufficient demand for animal source foods and other livestock products.</li> <li>▪ Innovation packages are sustainable including from social, economic, and environmental perspectives.</li> </ul>



## Sustainable Intensification of Mixed Farming Systems

Initiative Lead and Co-Lead	Primary CGIAR Action Area	Estimated 2022 - 2024 Budget
Irmgard Hoeschle-Zeledon Bruno Gerard	Resilient Agri-food Systems	\$30 - \$30 M

### Challenge

Most agricultural production in the global south takes place in mixed farming systems (MFS). Key drivers - climate change, population pressure, urbanization, water scarcity, changing diets, volatile food prices - mean that flexible and accelerated changes in MFS will be needed to achieve global targets such as the UN Sustainable Development Goals (Herrero et al. 2010 - <https://bit.ly/3e5NYRH>).

Sustainable intensification (SI) research outputs must address multiple biophysical and socio-economic issues in MFS to deliver critical outcomes, involving a range of farm products and stakeholders, that result in inclusive multiple desired impacts at scales. Two types of hurdle must be overcome for the CGIAR to adequately meet the challenge at farming systems level. One hurdle is to ensure efficient coordination, integration, and transfer of innovations, information, tools, and standardized methodologies. A second hurdle is to integrate multiple biophysical and socio-economic thematic-level outputs and identify strategies that minimize tradeoffs and maximize synergies, resulting in multiple impacts at scale.

Accelerating SI of MFS will require well-coordinated, prioritized, and focused efforts that efficiently bring together multiple thematic elements (e.g. agronomy, plant health, genetics, livestock, aquaculture, soil and water management, mechanization, socio-economics) in order to minimize sectoral tradeoffs (e.g. between productivity and environment) and maximize synergies (e.g. women's empowerment and mechanization). This will only be possible with streamlined coordination, integration, and transfer of innovations, information, tools, and standardized methodologies from thematic levels to regional and global levels. Similar coordination, integration, and transfer activities are also critical across each level (e.g. farming systems levels).

### Objective

The objective is to provide equitable, transformative pathways for improved livelihoods of actors in mixed farming systems (MFS) through sustainable intensification (SI) within target agro-ecologies and socio-economic settings. We aim to improve overall systems productivity by 15% across regions by 2024, while reducing the environmental footprint, covering over 10 million ha and benefiting 15 million men and women equally in sub-Saharan and Northern Africa, South and Southeast Asia, and Latin America. By 2024, strong innovation systems will be initiated in relevant regions and MFS. NARES, local universities, and international partners will have made efforts towards incorporating systems thinking for SI in their programs.

This will be achieved through:

- (i) identification and dissemination of validated SI pathways applying robust, flexible approaches and tools to target, support, and scale a co-design process with MFS actors to equitably improve resource-use efficiency, resilience, and sustainability;
- (ii) support for an enhanced enabling environment to transform policies, markets, institutions, socio-cultural norms, and governance for increased, inclusive participation with equitable benefits;
- (iii) participatory design, implementation, and monitoring of interventions at systems level, following e.g. the DEED cycle (Descheemaeker et al. 2016 - <https://bit.ly/3gf62eN>), to provide guidance and generate evidence for SI approaches that respond to the CGIAR impact areas and the SDGs;
- (iv) coherent application of tools and methods across CGIAR farming systems initiatives, integrating outputs from CGIAR thematic initiatives, and contributing to regional and system transformation initiatives through multiple partnerships enabling scaling of SI from field/farm to landscape, from household to community, and from national to regional.

### Theory of Change

Sustainable intensification (SI) of farming systems aims to achieve the increased food production needed to support the growing global population without compromising the needs of future generations. This initiative focuses on SI to deliver more productive and equitable livelihoods for current and future actors in crop-tree-livestock farming systems (subsequently called mixed farming systems, MFS), along with a reduced environmental footprint. When those within these farming systems share this vision and contribute to co-designing and sustainably intensifying MFS, productivity, income generation, and resilience are significantly improved. This initiative aims to lift 50 million households out of poverty and provide healthy diets by 2030.

Coordinated, integrated approaches at farm and landscape levels will eliminate waste and improve resource-use efficiency. Participatory development of technical, institutional, and social innovations will amplify synergies among MFS components, and minimize associated tradeoffs. Farmers, value chain actors, researchers, extensionists, and development partners (MFS actors) will jointly identify, develop, and assess tailored, adoptable, and scalable options for SI of MFS in a wide range of agro-ecological and socio-economic settings.

This initiative will engage stakeholders in building capacity to support mainstreaming of supportive and transformative policies, markets, and institutions, creating an enabling environment for SI through socio-technical innovation packages and gender-transformative approaches.

Key activities include identification, co-development, and adaptation of SI pathways; provision of decision-support methods; and capacity-building strategies for a paradigm shift among MFS actors. Multi-disciplinary country teams will co-implement activities and provide technical backstopping to national agricultural research and extension systems (NARES), and public and private sectors.

This initiative will work with all CGIAR regional integrated initiatives (RIIs) to identify needs of focal farming systems, while benefiting from their local partnerships and exchanging data.

It will also collaborate with the other farming systems initiatives - ASPIRE-building integrated agro-silvo-pastoral food systems resilient to climate change and other crises, and Resilient Cities through Urban and Peri-urban Agrifood Systems - on harmonization of tools and methods, indicators, and metrics for systems design, analysis, and impact assessment. Importantly, this initiative will integrate outputs from thematic initiatives, especially those on Excellence in Agronomy, Sustainable Animal Productivity for Livelihoods, Nutrition and Gender Inclusion (SAPLING), Nature-Positive Solutions: enhancing productivity and resilience, while safeguarding the environment, and promoting inclusive growth within communities, and Accelerated Breeding: Meeting Farmers' Needs with Nutritious, Climate-Resilient Crops.

We anticipate drawing MFS-related data from, and providing data to, the initiative on Foresight and metrics to accelerate inclusive and sustainable agri-food system transformation. We also see synergies with the initiative NEXUS Gains: Realizing Multiple Benefits Across Water-Energy-Food-Forest-Biodiversity Systems, and the initiative on Transformational agroecology across food, land and water systems, regarding co-development and harmonization of agro-ecological system approaches for MFS. We will also connect with the initiative on National Policies and Strategies for Food, Land and Water Systems Transformation to inform agricultural, economic, and social policy development in support of sustainable intensification of MFS.

## Sustainable Intensification of Mixed Farming Systems

### Highlights

This initiative addresses coordination and integration challenges. It will respond to prioritized needs of focal farming systems co-identified with CGIAR regional integrated initiatives and their partners, and support harmonization of the use of proven tools and methods to guide and capitalize on other relevant CGIAR initiatives.

An inclusive, participatory, gender-transformative approach will be used to identify, co-develop, and adapt sustainable intensification (SI) pathways for more productive, effective, resilient mixed farming systems (MFS). This will ensure equitable distribution of the benefits among MFS actors, increasing the acceptability and sustainability of proposed MFS adjustments (Mulema et al. 2020 - <https://bit.ly/3ebhN3t>).

The initiative will generate evidence-based, context-specific design and assessment toolboxes to support the improvement of MFS. These toolboxes will guide the co-design and assessment of future development investments in SI and farming systems research within and beyond the CGIAR (e.g. the Sustainable Intensification Assessment Framework; Stewart et al. - <https://bit.ly/3x0xsew>).

There is the potential to generate a high rate of return on research investment. Data from ongoing analysis of the returns on investment of the Africa RISING project in the Ethiopian Highlands, attributable to adoption and scaling of SI pathways, suggest a benefit of at least USD7 per USD1 invested.

The initiative adds value to the achievements of existing efforts by CGIAR and other institutions to sustainably intensify MFS, placing previous disciplinary component research within a holistic systems approach. It harnesses synergies among different objectives, reduces tradeoffs and unintended consequences, maximizes synergies, and bundles social and technical innovations.

### Work Packages

	Scope of Work	3-year Outcomes
Engaging, communicating, and integrating with other initiatives	Build links with CGIAR regional integrated initiatives (RIIs) and locally active partners to describe and contextualize mixed farming systems (MFS), and with thematic initiatives and their networks to identify research priorities and capitalize on outputs of separate disciplines for integration in MFS.	Jointly identified and implemented synergistic research activities lead to sustainably intensified mixed farming systems (MFS), based on shared understanding of the challenges and opportunities for sustainable intensification (SI) in priority MFS within this initiative, and the CGIAR's regional integrated initiatives (RIIs) and relevant thematic-level initiatives.
Building methods and tools	Develop proven methods and tools for foresight, targeting and implementing sustainable intensification innovations for MFS in specific agro-ecological and socio-economic settings. Capture the diversity of farming systems including gender inequalities and how SI innovations may equitably transform MFS, allowing assessments of what might work, where, and for whom.	Actors in research for development jointly use a systems approach and a set of novel tools adapted to different agro-ecologies and socio-settings to identify potential context-specific, integrated and gender-transformative solutions for SI in MFS.
Supporting, co-designing, and validating sustainable intensification pathways	Co-design MFS and validate SI innovations for improved efficiency, equity and resilience using proven tools and methods, mainly through RIIs and local partners, taking into account local realities and multiple objectives at different scales.	CGIAR RIIs, local partners, and farmers develop, implement, and validate, through a participatory and inclusive process, SI options to increase efficiency, equity, and resilience in selected MFS.
Advancing and supporting scaling of innovations	Scale proven and gender-transformative approaches to SI and build an enabling environment for more sustainably intensified MFS. Generate policy, market, and institutional innovations to ensure the scalability of interventions that amplify the synergies of MFS components in context, together with local partners and actors.	Local development partners apply proven approaches and scaling mechanisms within an improving enabling policy and institutional environment to scale validated and gender-transformative SI innovations for MFS.
Capacity building for systems design and analyses	Develop training materials and build capacity of MFS actors in socio-technical, inclusive, participatory, and gender-transformative approaches for systems design and analyses to support understanding of context-specific challenges and identification of opportunities for systems intensification with suitable SI innovations.	Academic training and education partners gradually implement a capacity development strategy aiming at mainstreaming in their curricula farming systems thinking and gender-transformative approaches for SI in MFS. Extension services use novel training materials to build capacity of their agents in participatory approaches to farming systems design and analysis.



## Sustainable Intensification of Mixed Farming Systems

### Impact Area Contributions

<b>Nutrition, health &amp; food security</b>	Higher efficiency and diversity of products generated by mixed farming systems (MFS) will provide more and diversified food and nutritional security to rural and urban households through healthy and affordable diets, contributing to SDGs 2 and 3.
<b>Poverty reduction, livelihoods &amp; jobs</b>	Increased incomes from sustainably intensified MFS, along with participation by rural households in multiple associated value chains, will be crucial for generating jobs, reducing poverty, and improving livelihoods, contributing to SDGs 1 and 8.
<b>Gender equality, youth &amp; social inclusion</b>	Redressing discriminatory norms and institutions in MFS will result in enhanced and equitable livelihoods for women, youth, and other disadvantaged social groups through increased co-design of and benefits from innovations, contributing to SDGs 5 and 10.
<b>Climate adaptation &amp; greenhouse gas reduction</b>	Diversity in MFS will allow farmers to adapt resource allocation to different climatic situations, increasing efficient use of renewable and non-renewable resources by whole systems, thus reducing greenhouse gas emissions, contributing to SDG 13.
<b>Environmental health &amp; biodiversity</b>	Sustainably intensified MFS will generate more agricultural production with less use of water, pesticides, fuel, and in many cases external inorganic nutrients, reducing their release into natural ecosystems and water bodies and thus shrinking the environmental footprint of MFS, contributing to SDGs 14 and 15.

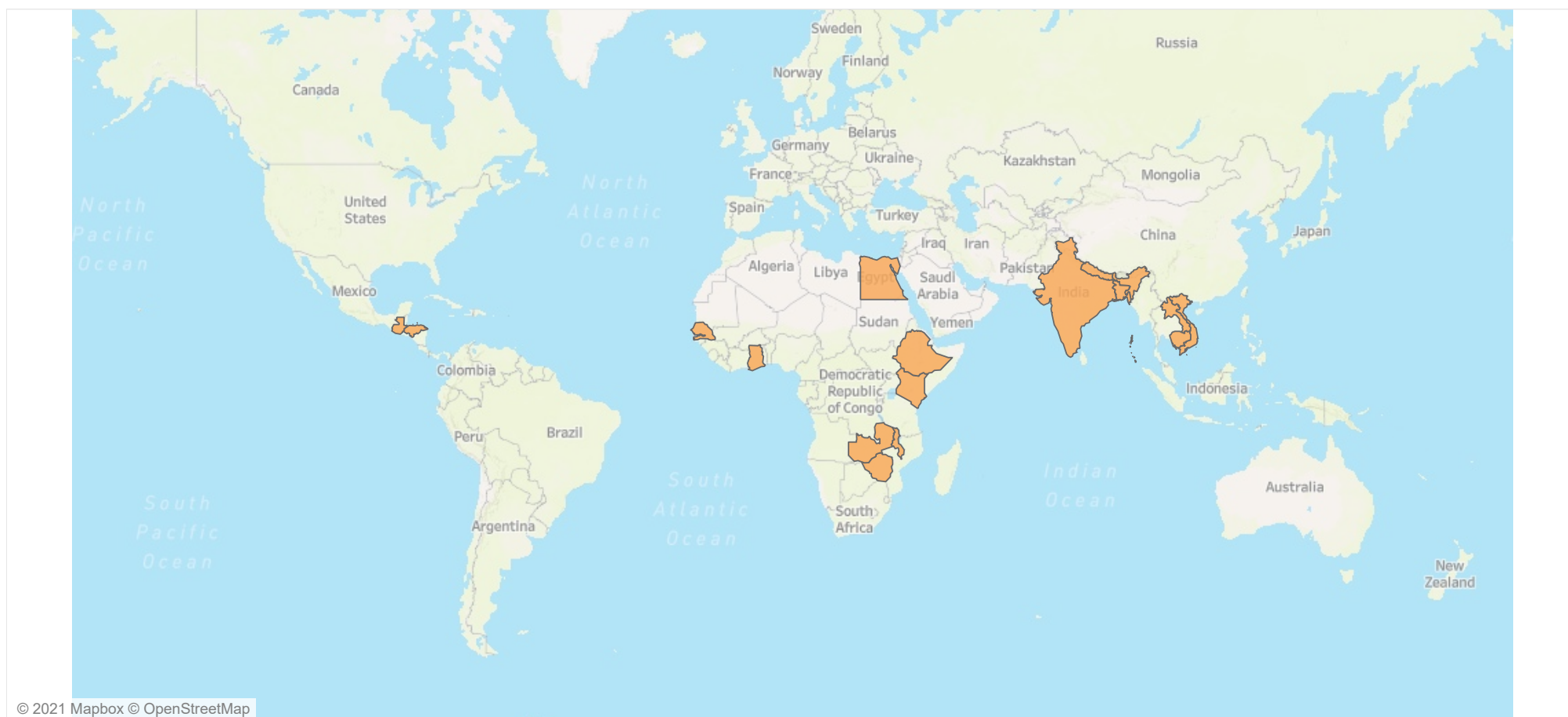
### Impact on SDGs



### Regions

Global	Central and West Asia and North Africa (CWANA), East and Southern Africa (ESA), Latin America and the Caribbean (LAC), South Asia (SA), South East Asia and the Pacific (SEA), West and Central Africa (WCA)
--------	--

### Countries





## Sustainable Intensification of Mixed Farming Systems

### Innovations

Socio-technical innovations, gender-transformative approaches, and decision-support tools that enable actors in mixed farming systems (MFS) to define, fine-tune, adapt, and transform MFS in specific agro-ecologies and socio-economic settings. These will support the co-creation of more efficient, equitable, and resilient MFS. See Fischer et al. 2019 - <https://bit.ly/3agrXys>

A toolbox for multi-criteria assessment of MFS, providing methods for systems actors, the CGIAR, and partners to minimize tradeoffs and capitalize synergies. For example, whole-farm modelling in India allowed quantification of tradeoffs between profit and water savings, and targeting SI innovations at different farm types. See Toorop et al. 2020 - <https://bit.ly/3skOyjQ>

A toolbox for multi-criteria assessment of MFS, providing methods for systems actors, the CGIAR, and partners to minimize tradeoffs and capitalize synergies. For example, whole-farm modelling in India allowed quantification of tradeoffs between profit and water savings, and targeting SI innovations at different farm types. See Toorop et al. 2020 - <https://bit.ly/3skOyjQ>

A strategy for capacity building and curriculum development, aiming for a long-term shift by all MFS actors towards more integrated approaches in the design and assessment of these systems, which will be co-designed with and co-implemented by international, regional, and national development, research, and training institutions.

A research and development strategy, co-developed and based on a systems approach, to guide the CGIAR, donors, and partners in addressing main tradeoffs and capitalizing on synergies in MFS, e.g. using the Sustainable Intensification Assessment Framework (Stewart et al. - <https://bit.ly/3x0xsew>) to highlight interdependencies across MFS and conduct tradeoff assessments.

### Key Partners

<b>Demand</b>	Academic, Training and Research	National agricultural research and extension partners in implementing countries
		Universities in implementing countries
	Multilateral	African Union
		Development Banks
	Other Public Sector	International Development Agencies (GIZ, SDC, DFID, USAID, BMGF, EU,...)
<b>Innovation</b>	Academic, Training and Research	Feed the Future Innovation Laboratories
		International agricultural research institutions
		National agricultural research institutions in implementing countries
		Universities in implementing countries
	Private Sector in Aid Recipient Country	Private sector companies in implementing countries
<b>Scaling</b>	Academic, Training and Research	Universities in implementing countries
	International NGO	International NGOs (e.g., Promundo, OXFAM, CRS,...)
	National NGO	Local NGOs
	Other Public Sector	Public extension services in implementing countries
	Private Sector in Aid Recipient Country	Private sector organizations in implementing countries

# Sustainable Intensification of Mixed Farming Systems (MFS) Initiative: Theory of change

## Challenges

- Mixed Farming Systems are under pressure from key drivers – climate change, water scarcity, diet change
- Biophysical and socioeconomic research outputs are insufficiently integrated to achieve critical outcomes
- Inequalities in resource access and restrictive norms do not support decent and equitable livelihoods for MSF actors
- Limited consideration of the system as a whole results in unintended consequences
- Disconnected efforts to support sustainable intensification fall short of the effectiveness and scale needed

## Work Packages

- Engaging, communicating, and integrating with *RILs* and *Thematic Initiatives* to identify integration research priorities
- Building methods and tools for foresight, targeting and implementing gender-transformative SI innovations for MFS
- Supporting, co-designing, and validating SI pathways for improved efficiency, equity and resilience
- Advancing and supporting the scaling of innovations while building an enabling environment to scale validated and gender-transformative SI innovations for MFS
- Capacity building for systems design and analyses through developing training materials in socio-technical, inclusive, participatory and gender-transformative approaches for systems design and analyses

## Outputs

- Synergistic CGIAR efforts for co-designing, targeting and foresight towards SI in integrated MFS
- Toolboxes adapted to different contexts in MFS to improve synergies and minimize tradeoffs
- Support services with gender and social inclusive co-designing and validation of SI innovations
- Programs and policies for scaling more sustainable and equitable MFS pathways adapted for specific contexts
- Capacity building strategy for systems design and analysis with gender-transformative options and training materials

## Outcomes

- Jointly identified and implemented synergistic research activities lead to sustainably intensified MFS
- MFS actors jointly use a systems approach and a set of novel tools adapted to different settings
- MFS actors develop, implement, and validate in an inclusive participatory process SI options for efficient, equitable, and resilient MFS
- Scaling of validated SI innovations for intensified MFS applying proven gender-transformative approaches
- Academic training and education partners gradually implement a capacity development strategy

## Impact areas

- Nutrition, health and food security**  
Higher efficiency of MFS & greater diversity of products result in food and nutritional security
- Poverty reduction, livelihoods and jobs**  
Increased incomes from intensified MFS generates jobs
- Gender equality, youth and social inclusion**  
Redressing institutional issues in MFS leads to equitable livelihoods for women and youth
- Climate adaptation and mitigation**  
Diversity in MFS will allow farmers to adapt their resource allocation
- Environmental health and biodiversity**  
Sustainably intensified MFS generate more production with higher resource use efficiency and lower environmental footprint

contributing to  
SUSTAINABLE DEVELOPMENT GOALS

### Demand Partners

- (i) African Union
- (ii) Universities
- (iii) Intern. Dev. Agencies
- (iv) NARES
- (v) Dev. Banks

### Innovation Partners

- (i) *RILs*
- (ii) *Other Farming Systems level Initiatives*
- (iii) *Thematic Initiatives: e.g., EIA, SAPLING, Foresight, Accel. Breeding, Agroecology, Nat. Policies, & NEXUS Gains*
- (iv) Universities
- (v) Nat. Agric. Res. Institutions
- (vi) Int. Agric. Res. Institutions
- (vii) Feed the Future Innov. Labs
- (ix) Private Sector

### Scaling Partners

- (i) Extension
- (ii) Universities
- (iii) Int. NGOs
- (iv) Local NGOs
- (v) Private Sector

### Demand Partners

- (i) African Union
- (ii) Universities
- (iii) Intern. Dev. Agencies
- (iv) NARES
- (v) Dev. Banks



sphere of control

sphere of influence

sphere of interest



## Transformational agroecology across food, land and water systems

### Initiative Lead and Co-Lead

Marcela Quintero  
Matthew McCartney

### Primary CGIAR Action Area

Systems Transformation

### Estimated 2022 - 2024 Budget

\$30 - \$30 M

### Challenge

Climate change, land degradation, loss of biodiversity, depletion of water resources, and pollution are all impacted by, and act as a major contributor to our degraded food, land, and water systems (FLWS), exacerbating vulnerability to extreme events (e.g. floods and droughts) and other shocks (e.g. COVID-19). In many settings, sociopolitical and economic conditions have favored agricultural practices that have undermined our FLWS with: (i) 40% of arable land degraded (<https://bit.ly/3gkfON3>); (ii) 64% of agricultural land contaminated by agrochemicals (<https://go.nature.com/3soRjAx>); and (iii) forest and biodiversity loss reducing healthy diet and livelihood options for men, women and young people (<https://bit.ly/3aeWQ6i>). Smallholders (83% of all farms globally) play a critical role in global food and nutrition security (producing 30%-53% of the world's calories), yet 95% of published agricultural research is not relevant to smallholders' needs with regard to rural poverty alleviation and food insecurity reduction (<https://go.nature.com/3e6sOTx>). Agroecology-understood as an approach to shift FLWS towards equity, resilience, and sustainability-has the potential to transform elements of FLWS in order to reduce hunger and malnutrition, decrease land and water degradation, and contribute to social inclusion and job creation (<https://bit.ly/2Q8bZQ2>). However, although the multiple benefits of agroecological options have been demonstrated in specific contexts and are gaining prominence in scientific, agricultural and political discourse, enabling mechanisms for widespread implementation remain limited (<https://bit.ly/3dorQ6a>).

### Objective

This Initiative will analyze the impact of agroecological approaches to food production, and aims to minimize adverse environmental impacts, improve farmer-consumer connectivity, and inclusive relationships among food system actors. Through technical, socio-economic and policy innovation pathways, the Initiative will develop and scale agroecological innovations for small-scale farmers (~20% more farmers and ~20% increase in area within exemplar landscapes), and other agricultural and food-system actors across different socio-ecological contexts in seven low and middle income countries (LMIC) (Burkina Faso, Kenya, India, Lao DR, Peru, Tunisia, and Zimbabwe). This will lead to: (1) Improved ecosystem health through- (a) reduced impacts from environmentally-disruptive inputs; (b) 20% increased use of environmentally-sound inputs; and (c) redesigned agricultural systems and landscapes that conserve biodiversity, reduce soil degradation, and improve water quality, availability and productivity; (2) Increased social inclusion and equity through inclusive participation of women, men, and youth in seven business partnerships (one per focus country) that improve profitability of agroecology innovations and generate jobs; and (3) Improved local innovation processes that value local knowledge, and favor social inclusion and local governance in all initiative sites (living labs).

### Theory of Change

This initiative contributes to transforming food, land and water systems (FLWS) to make them more equitable, sustainable and resilient. The transformed systems will encompass diversified agroecosystems and diets, reduced land and water degradation and biodiversity loss, enhanced equity and profitability of farmers and communities. The initiative uses an agroecological approach to food production to harness nature's goods and services whilst minimizing adverse environmental impacts, and to improve farmer-consumer connectivity, knowledge co-creation and inclusive relationships among food system actors (<https://bit.ly/3mZYrIN>)

The initiative follows a holistic, adaptive process which:

- (1) Establishes a network of user-centered multi-actor environments (living labs) to inclusively co-develop context-specific agroecological innovations (technologies, institutional arrangements, policies, services);
- (2) Assesses benefits and trade-offs, in comparison to business as usual and other approaches, of agroecological innovations applied in intertwined FLWS across diverse contexts, and based on available evidence;
- (3) Develops innovative business partnerships and sustainable financial strategies to trial inclusive business models for scaling in targeted territorial food systems;
- (4) Facilitates multi-stakeholder dialogues to identify policy instruments and approaches. This will allow the integration required across sectors and scales to mainstream agroecological principles in FLWS; and
- (5) Explores behavioral barriers constraining changes in practices and attitudes needed for implementing agroecological innovations. This will help understand and influence bottlenecks and accelerate equitable, inclusive agroecological transitions.

The initiative will prioritize scalable innovations by generating user-centered inclusive environments for co-development of agroecological options, underpinned by scientific evidence and local knowledge. Working with farmers, business partners and policymakers, the initiative will contribute to agroecological transformation across equitable, sustainable and resilient FLWS in 7 countries in the Global South.

This initiative will build synergies with other initiatives such as: Nature-Positive Agriculture, National Strategies and Policies, Foresight and Data for Development Pathways, Nexus Gains - Realizing Multiple Benefits Across Water-Energy-Food-Forest Biodiversity Systems, Excellence in Agronomy, From net carbon sources to sinks, ASPIRE, RIs (in common countries of intervention and for knowledge exchange with other countries in the region). By applying a territorial food system approach that addresses institutional, behavioral, and political economy bottlenecks and then co-developing agroecological innovations with food system actors, our initiative complements the Nature-Positive Agriculture Initiative, which focuses mainly on changes at the farm and community level. The Initiative will work closely with the Enabling Gender and Social Equality through Resilient and Inclusive Agri-food Systems Initiative to ensure that the design of the Living Labs incorporates participatory mechanisms that intentionally and systematically solicit the equal participation of men, women and youth. In co-designing and co-trialing the innovations, women and young people will be empowered as active participants in change rather than passive end users. This initiative will also seek synergies with initiatives operating in the same countries to share methods to assess multiple benefits of agroecological practices. For example, we will approach the One Health and Healthy Diets initiatives during the next round of proposal development to discuss collaboration mechanisms for measuring environmental and nutritional health impacts.

## Transformational agroecology across food, land and water systems

### Highlights

**Reframing the productivity argument for multi-dimensional outcomes** - This initiative proposes a shift in focus from primarily increasing agricultural yields per resource unit used (traditionally key characteristics of CGIAR research) to a focus on FLWS that enhance social agency, deliver socioeconomic outcomes; and prioritize healthy nutrition and environment.

**Inclusive innovation and scaling** - This Initiative recognizes that scientific contributions to problem solving are necessary but insufficient to bring about transformative change. Thus, it will work with local communities and other food system actors and partners to co-develop, test, and scale innovations (technology, institutional arrangements, and services) in various settings (in target countries). Results and learnings will be used to develop innovation processes and approaches that incorporate universal agroecological principles (<https://bit.ly/2QvHiEe> , <https://bit.ly/3x4p8KW> ) and that can be applied elsewhere to promote scaling of agroecology.

**Adaptive learning** - Co-developing agroecological options and scaling-up strategies will consider a non-static environment, where a variety of external factors will continue influencing food-system outcomes. Consequently, the Initiative will use an adaptive approach, where emerging learnings and uncertainties will be recognized and factored in wherever possible.

**Evaluation of trade-offs** - The Initiative will produce tools, metrics and methods required to understand context-specific trade-offs and cost-effectiveness of agroecological approaches. It will also convene debate on contentious issues and tradeoffs (including across social, economic (including income) and environmental impacts) prevalent in current and possible future food-system options.

**Recognizing different starting points** - Depending on local contexts, this Initiative conceptualizes three transition pathways: (i) "intensifying" agroecologically (in current low-production systems with low inputs); (ii) "redesigning" small-scale farming with high external inputs use; and (iii) "converting" (profitable medium-scale enterprises with high external inputs use). This Initiative focuses on the first two.

### Work Packages

	Scope of Work	3-year Outcomes
Agroecological Living Labs (ALLs)	Building an international network of diverse user-centered, multi-actor environments for inclusive co-development of context-specific innovations (technologies, institutional arrangements, and services) and science-based learning combined with local knowledge. These support scale-out and continuous innovation for agroecological transitions in geographically-targeted food systems, in countries with contrasting agroecosystems, and ecological and institutional conditions. Innovation processes and multi-stakeholder dialogu..	Small-scale farmers participate in an international network of "agroecological living labs" (ALLs), bringing together farmers, researchers, and other partners for multi-stakeholder dialogues and co-developing, testing, and scaling context-relevant agroecological innovations (i.e. technologies, institutional arrangements, and services) within the milieu of intertwined FLWS.
Agroecology evidence-based assessments	Research (including participatory monitoring and modeling) to generate usable evidence (underpinned by science and local knowledge) from the current conditions and changes in FLWS related to ecosystem health and biodiversity, resilience, social equity, profitability, water productivity and nutritional diversity. This evidence will enable comparisons of benefits and tradeoffs between 'business-as-usual' and agroecological alternatives across ALLs.	Researchers, farmers, communities, policymakers, and investors use knowledge gained from science-based assessments (implemented in all ALLs, in conjunction with local knowledge, to determine the environmental and socioeconomic costs and benefits of agroecological interventions for different user groups), to implement agroecological innovations that are economically viable, environmentally sound and socially inclusive.
Inclusive business models and financing strategies in the ALLs	Develop innovative partnerships and financing strategies with low-income groups excluded from agri-food businesses (e.g. many farmers and communities), trading partners, investors, and policy-makers, to support developing inclusive, equitable business models and financial mechanisms that encompass agroecological principles, speed up and scale agroecological transitions across landscapes, and promote greater connectivity with consumers.	Investors, trading partners, NGOs, and farmer organizations participate in at least one strategic business partnership established in each ALL and co-develop or adapt business models and financing modalities, linking bundled, contextually-relevant, agroecological innovations to markets and investment.
Strengthening the policy enabling environment	Generate knowledge for overcoming systemic policy bottlenecks to agroecological transitions across ALLs (WP1), and explore policy mechanisms to effect the integration (across sectors and scales) required to support these transitions. Results will feed policy dialogues within ALLs and with national policymakers to strengthen their ability to deliver supportive policies and align agroecology impacts to national commitments (e.g. NDCs, NAPs).	National and regional policymakers and representatives of sectoral organizations co-develop and promote recommendations to effect horizontal (across sectors) and vertical (across scales) policy integration required to mainstream agroecological principles in FLWS, in targeted countries and beyond
Understanding and influencing behavior change	Systematic approaches to understand underlying mechanisms for behavioral change (including incentives) in targeted stakeholders (farmers, investors/trading partners, consumers, policymakers), the political economy of vested interests, and causes of possible unequal participation of women, men, and youth in agroecological transitions. The results will be used to develop effective interventions in WP1, WP3 and WP4.	Scientists, funders and civil society, re-orient or adjust their strategies and action plans based on knowledge gained from scientific studies about the mechanisms driving behavioral change and capacities of farmers and consumers to implement effective agroecological transformation



## Transformational agroecology across food, land and water systems

### Impact Area Contributions

<b>Nutrition, health &amp; food security</b>	The Initiative will test, demonstrate, and scale agroecological innovations that enhance food security and contribute to improved nutrition and health through greater production diversity and reduced use of harmful agrochemicals. By promoting increased connectivity between producers and consumers, we will increase accessibility to and consumption of diverse foods.
<b>Poverty reduction, livelihoods &amp; jobs</b>	By implementing the Initiative's "Agroecology innovation accelerator" approach and inclusive business partnerships, the Initiative will create mechanisms for generating revenues and jobs that will help to sustain livelihoods supported by agroecological principles.
<b>Gender equality, youth &amp; social inclusion</b>	The Initiative will evaluate the contribution of agroecological innovations to improved social inclusion on farm and in business models. Adaptive scaling strategies (e.g. business models and policy instruments) and dialogue platforms within ALLs will increase the agency of women, youth, and marginalized social groups to benefit from expanded options.
<b>Climate adaptation &amp; greenhouse gas reduction</b>	By reducing dependence on external inputs and energy requirements, reversing soil degradation, enhancing water management, and reducing pressure on forests, agroecological production reduces GHG emissions from these sources and increases carbon sequestration. By diversifying and strengthening livelihoods, the Initiative will enhance households' resilience, thereby improving their adaptive capacity.
<b>Environmental health &amp; biodiversity</b>	By conserving and actively managing biodiversity (from farm to landscape scales) and ecosystem services, agroecological approaches will protect terrestrial and aquatic biodiversity, reduce soil erosion, improve soil health, and improve water availability and quality (by reducing environmental pollution related to inappropriate management of external inputs).

### Impact on SDGs



### Regions

Global Central and West Asia and North Africa (CWANA), East and Southern Africa (ESA), Latin America and the Caribbean (LAC), South Asia (SA), South East Asia and the Pacific (SEA)

### Countries



## Transformational agroecology across food, land and water systems

### Innovations

An international network of Agroecology Living Labs (ALLs) for farmers, scientists, policymakers and other food system actors to co-develop context-specific agroecological interventions, combining local knowledge and science-based evidence, to prioritize interventions and compare the costs and benefits of applying agroecological approaches in diverse settings.

Holistic assessment framework, comprising indicators and metrics underpinned by participatory monitoring and modeling that capture food production, ecosystem health, food security and nutritional diversity, social inclusion, resilience, and profitability to enable evidence-based comparison of agroecological (and non-agroecological) interventions. Will facilitate tracking and reporting on the progress of agroecological transitions.

Inclusive, and equitable business partnerships created through collective action among stakeholders of the targeted territorial food systems to bring agro-ecological farmers together with market agents, investors, and agricultural service providers to make agroecological transitions viable and scalable.

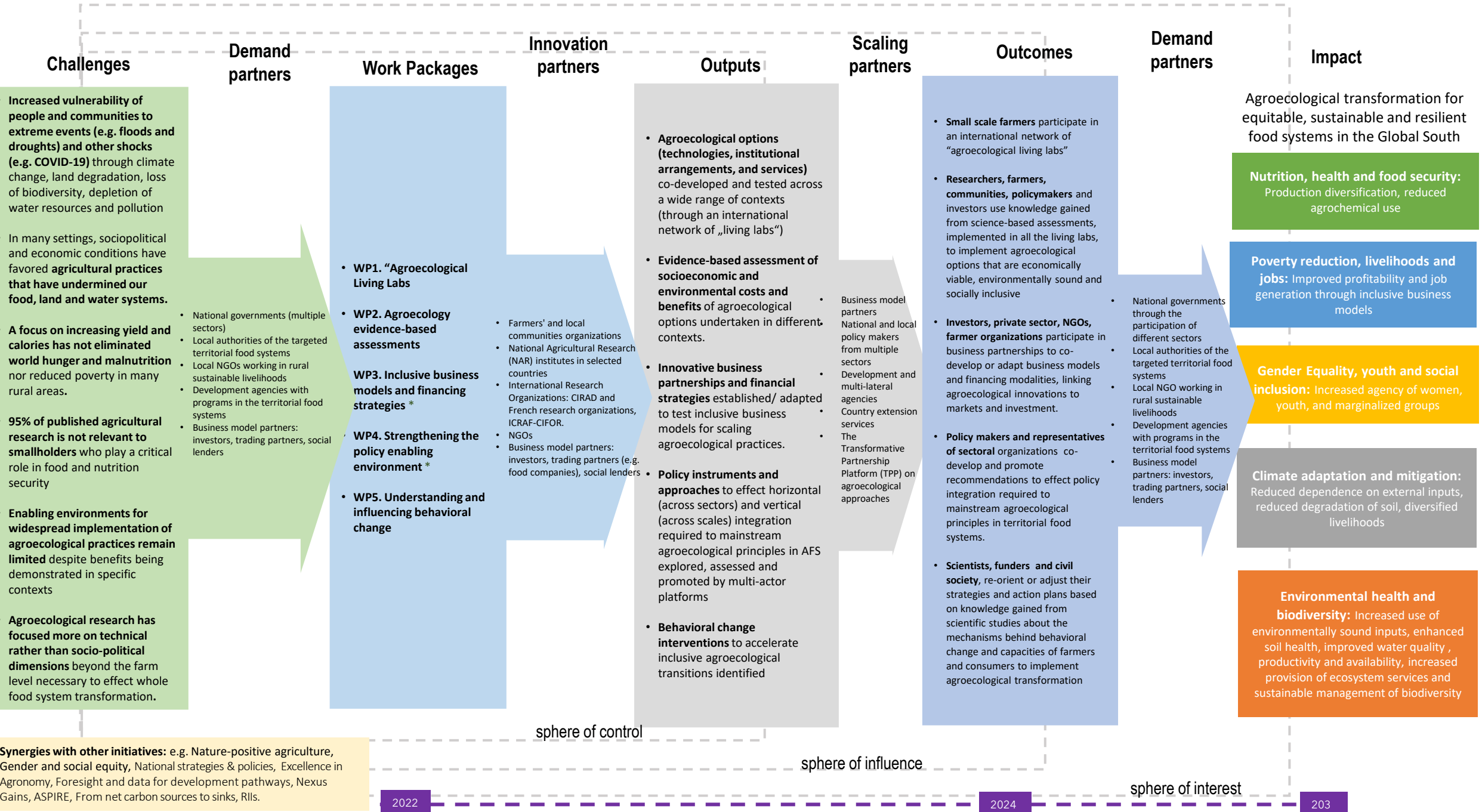
An Agroecological Innovations Accelerator helps local stakeholders (especially youth and women), consumers, and other food-system actors to implement innovative agroecological ideas, connecting them with business partnerships, public investment programs and technical assistance providers, to support the replicability of these ideas at the landscape level, improve income streams, and support poverty-reduction.

Multi-actor agency strategies for agroecological transformation of territorial food systems. These strategies will be informed by the results of the behavior-change research and the contextual understanding of the relationships between different roles and techniques that actors utilize, and the broader dynamics that shape the territorial food systems.

### Key Partners

<b>Demand</b>	Government	National governments through the participation of different sectors (agriculture, environment, health, economic development)
	Local Government	Local authorities of the targeted territorial food systems
	Other Public Sector	Development agencies with programs in the territorial food systems
	Partner Country based NGO	Local NGO working in the targeted territorial food systems on rural sustainable livelihoods
	Private Sector	Business model partners: investors, trading partners, social lenders
<b>Innovation</b>	Academic, Training and Research	International Research Organizations: CIRAD and French research organizations, ICRAF-CIFOR.
		National Agricultural Research (NAR) institutes in selected countries
	International NGO	Biovision
	Other	Farmers' and local communities organizations
	Private Sector	Business model partners: investors, trading partners (e.g. food companies), social lenders
<b>Scaling</b>	Academic, Training and Research	Country extension services
	Government	National and local policy makers from multiple sectors
	Multilateral	Development and multi-lateral agencies (e.g. IFAD, FAO, UNEP)
	Private Sector	Business model partners: investors, trading partners (e.g. food companies), social lenders
	Public Private Partnership	The Transformative Partnership Platform (TPP) on agroecological approaches ( <a href="https://bit.ly/3tqcdk3">https://bit.ly/3tqcdk3</a> )

# Transformational agroecology across food, land and water systems: theory of change



contributing to SUSTAINABLE DEVELOPMENT GOALS



# Outcome:

Contextually relevant agroecology principles are applied by farmers and communities across a wide-range of contexts and supported by other food system actors

## Living Labs

User-centered multi-actor environments for codevelopment, participatory and evidence-based assessment, and co-adaptation of inclusive agroecological options in agro-landscapes (Work Package 1)



## Science-based evidence

Agroecology evidence-based assessments (Work Package 2)



Understanding and influencing behavioral change (Work Package 5)



Planned comparisons across different contexts under different agroecological transition pathways

- i) intensify" (i.e. low production systems with low inputs)
- ii) "redesign" (i.e. unprofitable small-scale farmers using high levels of external inputs)
- iii) "convert" (i.e. profitable medium-scale enterprises that use high levels of external inputs)

## Adaptive scaling strategies

Inclusive business models with a focus on agroecological principles (Work Package 3)



Coherent policies and institutional arrangements conducive to agroecological transitions (Work Package 4)




# INALL

International Network of Agroecology Living Labs: a Network of territorial food system for scaling out and accelerating innovation for agroecological transitions





## KEY DEFINITIONS (adapted for this initiative):



**Agroecological Living Labs** is a space for all actors to exchange their views and codevelop and adapt agroecological solutions. Integrate activities of agricultural, environmental and socioeconomic research as part of a continuous innovation cycle with a territorial approach. Involve a diverse set of partners (e.g. producers, consumers and local authorities ) that are part of the territorial food systems and landscapes into which living labs are embedded. Partners get involve in the design of agroecological adaptive scaling strategies (business models, policies, economic mechanisms, etc) and in multi-stakeholder dialogue to promote these. (<https://bit.ly/3siUtpu>)



**Territorial Food Systems** in territories of all sizes are linked in multiple direct and indirect ways to land and water systems. All include both formal and informal markets, intermediary marketers, distributors and processors, as well as many small-scale producers, local processing, and agricultural and food system workers. A territorial approach in food systems foster direct links with consumers, encompasses diversity of food products from the territory, facilitate -and encourage- a collaboration between spaces and sectors. (<https://bit.ly/32IGswl>, <https://bit.ly/3snU8St>)




**Agroecology** encompasses the science, practice and social movements working towards transformation to sustainable and equitable food systems from production through to consumption. They emphasise use of biodiversity, natural processes and recycling to reduce impact of environmentally disruptive inputs and increase the resilience of farming systems, the co-creation of knowledge with local stakeholders to ensure culturally relevant innovation and responsible and inclusive governance of natural resources. They recognise the importance of agency of all actors involved in food systems and of connecting producers and consumers to ensure that methods of production and processing match consumer expectations. (<https://bit.ly/3mQAMnV>)



**Agroecological transitions** describe, for a defined context, how agroecosystems or food systems change over time through the application of agroecological principles to become more environmentally and economically sustainable and socially equitable. Transitions may focus on the application of some but not necessarily all agroecological principles and encompass parts of whole food systems, for example, farming. Transitions are grounded in the state of the system at the starting point for the transition and the context that shapes trajectories of change. (<https://bit.ly/3toHDrb>)



**Agroecological principles** are explicit statements comprising normative and/or causative aspects, that guide decisions and action towards meeting agroecological objectives. There are 13 widely accepted agroecological principles derived from the literature, which are complementary to FAO's ten elements of agroecology, but more explicit and, therefore, consistently interpreted. (<https://bit.ly/2QvHiEe>, <https://bit.ly/3x4p8KW>)



**Agroecological transformation** describes the change of whole food systems to sustainable and equitable states, involving change in norms and institutions in the public and private sector that govern how food is produced, processed, transported, sold and consumed and the relationship between consumers and other actors along food chains, including producers. A transformation may be contributed to by a number of incremental transitions occurring over time. (<https://bit.ly/3uVrbPj>)



## Transforming Agri-Food Systems in South Asia (TAFSSA)

Initiative Lead and Co-Lead	Primary CGIAR Action Area	Estimated 2022 - 2024 Budget
Timothy J. Krupnik Purnima Menon	Resilient Agri-food Systems	\$30 - \$45 M

### Challenge

Home to a quarter of humanity—a fifth of whom are youth—South Asia carries the highest density of poverty and malnutrition globally. Despite producing over a quarter of the world's consumed food, the region's agri-food systems suffer from social, economic, and geographic inequalities, and face formidable environmental issues. These challenges can only be overcome by transforming food, land, and water systems to support healthy diets. Such changes require evidence-based and coordinated actions across the production to consumption continuum. Agri-food systems currently fail to produce an adequate and affordable supply of the diverse foods needed for sustainable healthy diets accessible to people of all means in all areas. Unhealthy food consumption is rising. Many nutritious foods are too costly for the poor. Farming systems are threatened by unsustainable groundwater withdrawal (the region extracts a quarter of global groundwater) due to food and energy policy distortions. Declining soil health, poor nutrient and energy resource use efficiency, and nonpoint source, agriculture-based air pollution harm human health. South Asia's farmers are both contributors to, and victims of, climate change and extreme weather (erratic precipitation, droughts, storms, and floods) and rarely earn enough to fully support their families, driving youth out-migration and agricultural feminization. Socially embedded and economic inequalities create enormous barriers across the production to consumption continuum, disproportionately affecting the poor. Actionable evidence and coordinated efforts are urgently needed to overcome these challenges and achieve productive, environmentally sound agri-food systems supporting equitable access to sustainable healthy diets in South Asia. (References: <https://docs.google.com/document/d/1bZKhAgpy-7wogRchcn-98e3GQPo7StWD93xiNCErYw8/edit?usp=sharing>).

### Objective

South Asia's agriculture, food, and health and nutrition challenges are inextricably linked to socio-economic conditions, and land, water, and energy resources. The transformative changes required to overcome these challenges urgently need participatory agenda-setting to generate pro-active and responsive research yielding relevant and actionable evidence and innovations. TAFSSA will propel evidence into impact through systematic and coordinated engagement with public and private partners across the production to consumption continuum. Operating in the region's most marginal and poverty-dense cereal-based farming systems, TAFSSA will test, adapt, target, and position agronomic technologies and practices supporting crop and livestock diversification among next-users, while developing strategies to render agricultural value chains more inclusive by 2024. Insights from behavioral sciences and market research will galvanize actions tackling climate risks among farmers. Participatory value chain studies addressing market inefficiencies and infrastructural challenges will inform financial services; established and versatile business models supporting rural entrepreneurship for young men and women will be expanded to contribute to food environments that support sustainable healthy diets. Complementary research will identify strategies to reduce agriculture-related air pollution and regenerate land and water resources. Pathways to sustainable healthy diets, i.e., greater awareness, improved affordability, and lower gender and time constraints to food acquisition and preparation, will be identified and positioned with partners focusing on improving sustainable healthy diets & reducing unhealthy consumption at scale. TAFSSA's partner-supported research and engagement across the agri-food value chain will deliver a coordinated program improving sustainable healthy diets, boosting smallholder livelihoods and resilience, and protecting land, air, and groundwater resources.

### Theory of Change

Solutions to complex obstacles at the nexus of agriculture, food, and nutrition in South Asia are inextricably linked to land, water, energy, and socio-cultural and economic challenges, all exacerbated by climate change. Overcoming these challenges requires an ambitious research program to close crucial knowledge gaps and provide strategies for next users such as well-positioned policy makers, extension organizations, large-scale development and livelihoods initiatives, environmental organizations, and the private sector. Scientists in TAFSSA have collectively nurtured this diversity of partnerships for decades, positioning this initiative to rapidly amplify the development impacts accrued from research outputs and resultant technical, institutional, and policy innovations. TAFSSA's pathway to impact begins with generating robust evidence that responds to questions of deep regional development relevance. Five interlinked work packages span the continuum from production to markets to consumption, thus providing building blocks towards impact. Close involvement of next users in identifying, producing, and interpreting research findings assures relevance. Actively placing research within development practice considerably shortens the research innovation-to-implementation gap. Working closely with South Asia's major change agents in agriculture, environment, public health, social equity and food systems to integrate solutions across farms, value chains, and food environments, TAFSSA charts new pathways to move South Asia's agri-food systems towards more diverse, productive, profitable, inclusive, and environmentally sound futures supporting sustainable healthy diets. Our ultimate goal is resilient production systems capable of reducing greenhouse gases, groundwater depletion, and air pollution, while also linking farmers to profitable markets that increase consumers' access to affordable and sustainable healthy diets.



## Transforming Agri-Food Systems in South Asia (TAFSSA)

### Highlights

TAFSSA leverages a 10+ year history of significant bilateral investments in celebrated cross-CGIAR center projects that have nurtured exceptionally strong relationships with scaling partners, enabling significant development impacts (see: <https://bit.ly/3e2w7Lw>). This unique partnership advantage positions TAFSSA's research innovations to be rapidly integrated into real-world use from production to consumption.

Harnessing synergies with multiple thematic initiatives spanning science groups, TAFSSA will amplify CGIAR's impact in the world's most poverty-dense and malnourished region, one with deep inequities and major resource degradation challenges. High-caliber scientists with strong relationships with governments, development and private sector partners, will facilitate increased cross-initiative impact.

TAFSSA embraces interdisciplinarity to shed light on producer, retailer, and consumer choices. Insights from behavioral sciences will inform actions nurturing resource-conserving, resilient, and profitable farms and value chains; experimental methods will help to understand retailer and consumer choices. Together, these will deliver insights stimulating and supporting equitable agri-food systems change.

Food environments-where consumers access food-are diverse and range from fair price shops to local wet markets to supermarkets. TAFSSA will deliver insights on how diverse populations across multiple geographies access food, providing evidence to shape local food environments in support of equitable sustainable healthy diets.

Fostering sustainable healthy diets for all requires a strong understanding of how social, economic and structural consumer-level inequalities shape food acquisition, preparation, and consumption. Using interdisciplinary and behavioral methods, TAFSSA will generate evidence across South Asia' diverse geographies and social groups to inform solutions in different sectors.

### Work Packages

	Scope of Work	3-year Outcomes
FACILITATING AGRI-FOOD SYSTEMS TRANSFORMATION THROUGH INCLUSIVE LEARNING PLATFORMS, PUBLIC DATA SYSTEMS, AND PARTNERSHIPS	Leveraging well-established partnerships, TAFSSA will engage academia, government, development partners, environmental organizations, and the private sector to diagnose and respond to crucial agri-food systems challenges. Activities will generate in use-focused public datasets on production, markets, food safety and food environments and consumption, emphasizing gender, social equity, and spatially disaggregated analytics.	At least three major scaling partners in each TAFSSA country will collaborate with demand and innovation partners to design novel and recurrent data collection, vet evidence, and apply research results to inform catalytic activities towards productive, environmentally sound, and equitable agri-food systems that support jobs and healthier diets.
TRANSFORMING AGROECOSYSTEMS TO INCREASE INCOMES AND IMPROVE AVAILABILITY OF DIVERSE AND HEALTHY FOODS	Generating actionable evidence on varietal performance, farming technologies, and decision support systems, TAFSSA charts gender-equitable and inclusive strategies to sustainably increase farmers' productivity and incomes through rural entrepreneurship and improved crop and livestock management in the Indo-Gangetic Plains, Himalayan foothills, India's central highlands, and in select coastal areas.	By clearly communicating the value-addition of evidence generated through field- and landscape-level farming systems research, TAFSSA will help align policy and extension systems with private sector and farmers' interests, increasing uptake of farm-management practices and supporting services that create jobs and facilitate profitable production of diverse and healthy farm products.
ALIGNING EVIDENCE WITH ACTIONS ACROSS VALUE CHAINS TO INCREASE ACCESS TO SUSTAINABLY PRODUCED AND DIVERSE FOODS	More sustainable agri-food value chains must support farmers' incomes - particularly for women and marginalized groups - and enable consumers' equitable access to healthy foods. This work package, focused on markets and policy research, aims to inform production aggregation models, strengthen risk-reducing market mechanisms, re-orient safety nets and reshape diverse food environments.	Employing cross-country studies, policy process evaluations and bundled value chain and business models generated and tested with the public and private sectors will enable increases in farmers' bargaining power, create jobs, address infrastructure gaps across value chains, and strengthen food environments to include healthy and affordable foods for poor consumers.
TACKLING MULTIPLE BEHAVIORAL DETERMINANTS OF SUSTAINABLE HEALTHY DIETS	We will study dietary choices, synthesize regional evidence, and test behavioral-change innovations to support consumption of sustainable healthy diets. With an equity focus, we will assess ways to increase affordability through safety nets and women-focused agricultural programs to identify ways of confronting gendered and structural constraints across the acquisition-preparation-consumption spectrum.	At least two major nutrition behavior change programs per country will focus on the major drivers of food choices-including access, preferences, and gendered cultural constraints related to food, fuel, and water-to provide evidence-based consumer guidance to reduce consumption of unhealthy foods and increase access to sustainable healthy diets.
BUILDING RESILIENCE AND MINIMIZING ENVIRONMENTAL IMPACT	This work package examines how improvements in policy, technology, farm management, and value chains can improve nutrient, water, and energy resource-use efficiency to limit air pollution, groundwater stress, and greenhouse gases. It will also assess how focused climate services communicated through easy-to-understand and gender-appropriate methods can reduce risks for smallholders.	Relevant research generating robust evidence positioned among TAFSSA's partners will influence environmental policies, NGO strategies, and the actions of agricultural extension agencies in ways that will build farmers' resilience while offering viable options for mitigating air pollution, reducing over-exploitation of land and groundwater resources, and cutting greenhouse gas emissions.



## Transforming Agri-Food Systems in South Asia (TAFSSA)

### Impact Area Contributions

<b>Nutrition, health &amp; food security</b>	Work packages 1, 2, 3, and 4 inform strategies used by nutrition programs, agricultural extension, development partners, and governments to increase production and affordable and equitable access to healthy foods. Prominent behavior change programs will strengthen activities on sustainable healthy diets. Bundled technology and policy innovations will curtail agricultural pollution.
<b>Poverty reduction, livelihoods &amp; jobs</b>	Applying research insights to private sector partnerships in Work packages 2 and 3 will reduce poverty and support jobs by boosting male and female farmers' access to cost- and time-saving machinery services offered by youth entrepreneurs. This frees time, opening opportunities for additional remunerative off-farm employment to support rural families.
<b>Gender equality, youth &amp; social inclusion</b>	Research across all work packages will make gender and inclusion issues sharply visible. Analyses will inform large-scale development programs and private sector partners to improve women's agency, decision making, and access to agricultural inputs and machinery. Insights on gendered differences in food acquisition, preparation, and consumption will guide cross-sectoral actions.
<b>Climate adaptation &amp; greenhouse gas reduction</b>	Climate variability and extremes threaten farm production and cause price spikes, lowering food availability. Work package 5 generates evidence improving climate and farm management advisories scaled by extension agencies. Farm- and policy-level research on efficient use of low-carbon irrigation pathways and energy will inform efforts to mitigate greenhouse gases.
<b>Environmental health &amp; biodiversity</b>	Leveraging ambitious partnerships across government, the fertilizer and energy industries, and the environmental conservation and public health sectors, Work package 5 will identify and facilitate opportunities to mitigate soil degradation, limit unsustainable groundwater use, and mitigate agriculture-based pollution through technologies, practices, and supportive policies.

### Impact on SDGs



### Regions

South Asia (SA)

### Countries





## Transforming Agri-Food Systems in South Asia (TAFSSA)

### Innovations

**TRANSFORMATIVE FARMING SYSTEMS MANAGEMENT AND ENTREPRENEURSHIP MODELS INCREASING DIVERSITY AND PROFITABILITY.** Rural out-migration, agricultural feminization, and farm drudgery are widespread in South Asia. Innovations bundling public-private partnerships and youth-based entrepreneurship will accelerate access to cost-reducing farm mechanization and crop and livestock services and boost farmer's incomes through diversified production.

**PATHWAYS TO OVERCOME ACCESS AND AFFORDABILITY CONSTRAINTS TO SUSTAINABLE HEALTHY DIETS.** Agri-food systems transformation becomes possible when production and market access align with affordability and preferences. Shorter value chains and high-value produce aggregation methods increasing farmers' capacity to respond profitably to consumer preferences will be tested with the private sector.

**TOOLS FOR UNDERSTANDING MAJOR DRIVERS OF DIETARY CHOICES.** Combining insights from agriculture, nutrition, anthropology, economics, and sociology with data-collection innovations in ethnography and survey methods, we will partner with large-scale nutrition projects to test and generate a repository of tools deepening insights on dietary determinants and informing adaptive project management.

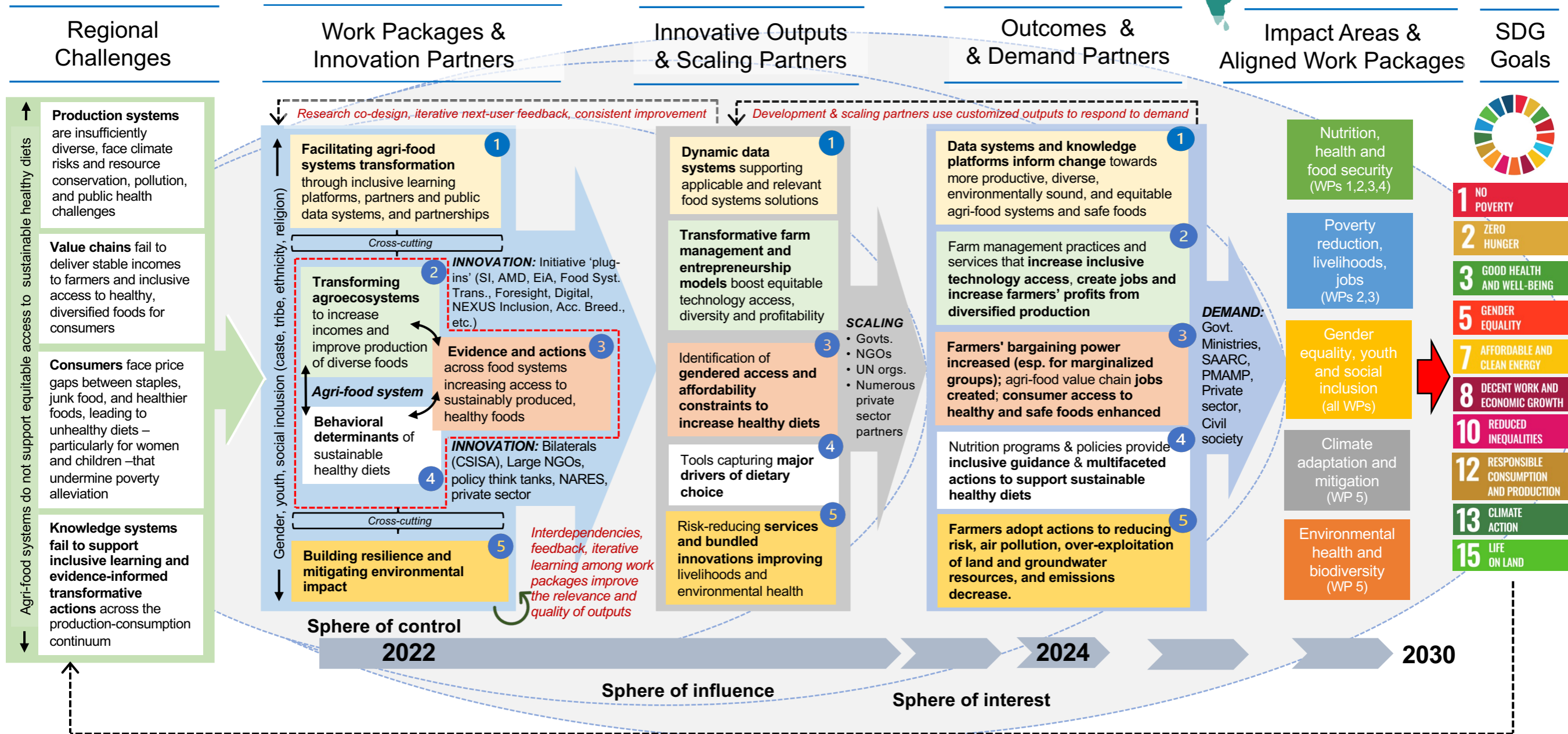
**RISK-REDUCING INNOVATIONS FOR IMPROVING LIVELIHOODS AND ENVIRONMENTAL HEALTH.** Tailored climate services delivered through extension services will improve farmers' risk-adaptive capacity. Focusing on links between crop-residue burning and unsustainable groundwater management, TAFSSA will research and provide options for policy makers in India to mitigate air pollution and reduce stress on groundwater.

**DYNAMIC DATA SYSTEMS FOR RELEVANT FOOD SYSTEM SOLUTIONS.** Collaborating with partners, TAFSSA will create a dynamic data collection and analysis system capturing production, consumption, price, food markets, and environmental data. This end-to-end system, with a strong social equity lens, will support design and course correction in agriculture, environmental, and nutrition programs implemented by partners.

### Key Partners

<b>Demand</b>	Government	Ministries of Agriculture, Energy, Environment, Food, Public Health, Rural Development and Planning Commissions in Bangladesh, India, Nepal, and Pakistan, including Regional, national, and sub-national training academies for civil servants and parliamentarians
		Prime Minister's Agricultural Modernization Project (PMAMP; Nepal)
	Multilateral	South Asian Association for Regional Cooperation (SAARC) Agriculture Center
	Other Public Sector	Civil society organizations and self-help groups
	Private Sector	Agricultural machinery manufacturer's associations in Bangladesh, India, Nepal and Pakistan For details, see Section C here: <a href="https://docs.google.com/document/d/1bZKhAgpy-7wogRchcn-98e3GQPo7StWD93xiNCErYw8/edit?usp=sharing">https://docs.google.com/document/d/1bZKhAgpy-7wogRchcn-98e3GQPo7StWD93xiNCErYw8/edit?usp=sharing</a> ; numerous private sector input companies, ITC firms, farm equipment companies, seed companies, alternative energy firms (full details can be found in Section G, here: <a href="https://docs.google.com/document/d/1bZKhAgpy-7wogRchcn-98e3GQPo7StWD93xiNCErYw8/edit?usp=sharing">https://docs.google.com/document/d/1bZKhAgpy-7wogRchcn-98e3GQPo7StWD93xiNCErYw8/edit?usp=sharing</a> )
<b>Innovation</b>	Academic, Training and Research	Councils of Agricultural Research in Bangladesh, India, Nepal, and Pakistan
		Policy research institutions in Bangladesh, India, Nepal, and Pakistan (For details see Section D here: <a href="https://docs.google.com/document/d/1bZKhAgpy-7wogRchcn-98e3GQPo7StWD93xiNCErYw8/edit?usp=sharing">https://docs.google.com/document/d/1bZKhAgpy-7wogRchcn-98e3GQPo7StWD93xiNCErYw8/edit?usp=sharing</a> ), Universities and advanced research institutions within the region and abroad)
	International NGO	The Nature Conservancy, Helen Keller International, BRAC
	Private Sector	More than 10 private sector innovation partners can be found in Section G here: <a href="https://docs.google.com/document/d/1bZKhAgpy-7wogRchcn-98e3GQPo7StWD93xiNCErYw8/edit?usp=sharing">https://docs.google.com/document/d/1bZKhAgpy-7wogRchcn-98e3GQPo7StWD93xiNCErYw8/edit?usp=sharing</a> )
	Private Sector in Aid Recipient Country	National business and industry associations in Bangladesh, India, Nepal, and Pakistan (Key examples show in Section G here: <a href="https://docs.google.com/document/d/1bZKhAgpy-7wogRchcn-98e3GQPo7StWD93xiNCErYw8/edit?usp=sharing">https://docs.google.com/document/d/1bZKhAgpy-7wogRchcn-98e3GQPo7StWD93xiNCErYw8/edit?usp=sharing</a> )
<b>Scaling</b>	Foundation	Syngenta Foundation
	Government	National and sub-national departments of agricultural extension in Bangladesh, India, Nepal, and Pakistan
	International NGO	Large-scale NGO development implementers in Bangladesh and Nepal (For details see Section E here: <a href="https://docs.google.com/document/d/1bZKhAgpy-7wogRchcn-98e3GQPo7StWD93xiNCErYw8/edit?usp=sharing">https://docs.google.com/document/d/1bZKhAgpy-7wogRchcn-98e3GQPo7StWD93xiNCErYw8/edit?usp=sharing</a> )
	Multilateral	United Nations International Children's Emergency Fund (UNICEF), national offices of the Food and Agriculture Organization (FAO)
	Private Sector	More than 15 private sector innovation partners can be found in Section G here: <a href="https://docs.google.com/document/d/1bZKhAgpy-7wogRchcn-98e3GQPo7StWD93xiNCErYw8/edit?usp=sharing">https://docs.google.com/document/d/1bZKhAgpy-7wogRchcn-98e3GQPo7StWD93xiNCErYw8/edit?usp=sharing</a> )

# Transforming Agri-food Systems in South Asia



*Achievement of CGIAR impact areas and contributions towards SDGs feeds back, influencing the transformation of South Asia's agri-food systems towards increased equitable access to sustainably produced foods supporting livelihoods and healthy diets*

**Objective:** Deliver a coordinated program of research and engagement across the food production to consumption continuum to improve equitable access to sustainable healthy diets, improve farmer livelihoods and resilience, and protect land, air, and groundwater resources.



## Transforming food systems from greenhouse gas sources to sinks (S2S)

Initiative Lead and Co-Lead	Primary CGIAR Action Area	Estimated 2022 - 2024 Budget
Louis Verchot Wei Zhang	Systems Transformation	\$25 - \$30 M

### Challenge

The US\$ 12 trillion global food system produces 21 - 37% of global GHG emissions, including from land-use change, with 72% from the global South. Policy and financial instruments to reduce food systems emissions and enhance sinks focus on subsistence agriculture (e.g. REDD+) or commodity production (e.g. zero-deforestation supply chains) and miss the national/domestic food systems that are primarily responsible for emissions in tropical countries (<https://bittylink.com/aid>). Key challenges include:

- National food systems are not well characterized, emissions are poorly quantified (esp. food loss/waste) and not well linked to nutrition and environmental targets, making it difficult to set intervention priorities, track progress, and report impacts.
- Private sector action is stymied by misaligned incentives and lack of regulatory frameworks for emissions. Transnational companies are only starting to voluntarily green their supply chains and offset emissions in response to consumer pressure, which addresses emissions linked with international but not domestic markets.
- Domestic policies support the private sector pursuit of short-term profits in ways that externalize environmental (i.e. long-term economic) costs of GHG emissions at the expense of long-term food system viability.
- Best practices exist to reduce the GHG intensity of all components of food systems and create or enhance sinks in soils and forests, but scaling these up has been challenging, as the constraints faced by different change actors are poorly understood or difficult to overcome and incentives are missing or misaligned.
- Broader understanding of food systems approaches and their contributions by decision makers is needed to create both policy momentum and investment in food system solutions.

### Objective

- Improve emissions quantification and monitoring systems for: i.) Better intervention targeting through ex-ante impact assessments with disaggregated socioeconomic data; ii.) More efficient use of financial and human resources through better implementation monitoring; and iii.) Enhanced implementation of NDCs and the Global Stocktake through improved reporting.
- Strengthen planning and coordination at local/national scales to integrate food system actions like reduced food loss/waste, efficient supply chains, reduced deforestation, and reduced production-related emissions in ways that incentivize sustainable and agroecological intensification, reduce climate risks, promote regenerative agriculture, and increase sinks through natural ecosystem restoration and conservation, while improving inclusiveness and equity.
- Co-develop innovative emissions reductions and carbon removals programs with communities/jurisdictions through technology- and nature-based solutions (e.g., agroforestry, soil carbon, land restoration, stable forests, irrigation decarbonization, mangrove restoration, sustainable aquaculture), food loss/waste reduction, consumer behavior change, and value chain interventions. Increase public and private sector financing and market-based mechanisms for adoption of mitigation/sequestration measures.
- Create enabling conditions through policy-maker engagement, providing demand-driven studies/analysis, and co-developing tools to enable better informed, coherent decisions in alignment with NDCs and provide trusted advice to governments. The policy analysis will anticipate leakage and tradeoffs, and promote cross-agency collaboration and coordination.
- Foster greater awareness/buy-in of the potential for food system investments to contribute to low GHG emissions climate-resilient development among national policy makers, private enterprises involved in the food system, financial institutions (local and international), civil society, and academics.

Countries are proposed based on emissions, NDC commitments, short-term impact potential, and CG strengths.

### Theory of Change

Achieving global and national climate goals requires changes throughout food systems to reduce short- and long-lived greenhouse gas (GHG) emissions, reduce deforestation, and conserve/increase carbon sinks and biodiversity. This Initiative aims to accelerate progress toward meeting the 2.0/1.5 C target through the transformation of food systems of (tentatively) seven partner countries supplemented by trans-national activities through sociotechnological innovations, business models, and policies. GHG mitigation approaches will integrate consumer demand, sustainable production, ecosystem conservation, supply chain efficiency, and food loss/waste reduction into climate action planning. To achieve low GHG emissions, climate-resilient development, local communities (including women, youth), producers, policy makers, private sector, and scientists must act in concert to lower emissions.

This Initiative will facilitate change through CHANGE PATHWAYS: (1) improving transparency, accuracy, completeness, comparability, and consistency of data for planning, monitoring, and reporting; (2) strengthening local and national planning and coordination to integrate socially inclusive food system changes that reduce GHG emissions and create sinks in production systems, improve sinks in stable natural ecosystems, reduce food loss/waste, and reduce the GHG intensity of supply chains; (3) applying food systems approaches in living labs and incorporating lessons into scaling up approaches; (4) scaling up best practices in next generation Nationally Determined Contributions (NDCs) and mitigation actions by creating enabling environments, including sustainable financing opportunities; and (5) fostering greater international and national integration of food system solutions that contribute to GHG mitigation targets. This initiative will reduce food system GHG emissions by 1.18GtCO<sub>2</sub>e y<sup>-1</sup> and enhance sinks by (To Be Determined) (OUTCOME).

As this Initiative is one of only two Initiatives (the other being Levering gender & social equality in agrifood systems) that covers a particular CGIAR Impact Area (climate change mitigation), it will have collaboration across the entire portfolio.

With a common goal on equality and inclusiveness, the S2S Initiative will work closely with the Harnessing equality for resilience in the agri-food system to harness (from its WP1) the evidence that Initiative will gather on institutional barriers, levers, and entry points to the inclusion of women and youth in modern agri-food systems and (from its WP4) best practices and models for boosting gender and youth inclusion, empowerment, and agency in important national-level plans, strategies, and policies relating to climate mitigation (e.g. next generation of NDCs). Specifically, the Initiative will capitalize on the HER+ Initiative evidence and learning to (A) integrate stronger gender inclusion mechanisms into the design of the Living Laboratories in WP3 so that the participation of women and youth is intentionally sought and accommodated, and (B) identify and work with a national CSO/development/advocacy partners to ensure that the voices of women are adequately represented in the planning work in WP2 focused on defining priorities, scopes and goals for low-emission food systems and developing action plans.

The Initiative will work with the Food Systems Transformation for Sustainable Healthy Diets through Food Systems Transformation Diets Initiative to ensure there is complementarity between the Initiatives. Specifically, the Initiative will contribute data that will refine the SHiFT Initiative's trade-off scenario analysis (WP4) designed to steer stakeholders toward decisions or actions that improve diets, reduce emissions, and foster environmental integrity (e.g., win-wins) through nature-positive food crops and value chains. The Initiative will also contribute evidence required by the SHiFT Initiative to support the uptake of practices and technologies for efficient distribution and reduced food loss, thereby contributing to overall climate mitigation goals (one of SHiFT's Impact Area outcomes).

We also anticipate strong collaboration with the initiatives on Building Systemic Resilience against Climate Variability and Extremes (ClimBeR), Transformational Agroecology Across Food, Land and Water Systems Initiative, and Excellence in Agronomy - Solutions for Agricultural Transformation (EiA). Likewise, the initiative will foster thematic and logistical synergies with the Regional Initiatives (Latin America & Caribbean, East & Southern Africa and the Asian mega-deltas) as well as those relevant to specific production systems (resilient aquatic foods, climate-smart livestock, etc.).



## Transforming food systems from greenhouse gas sources to sinks (S2S)

### Highlights

This initiative adopts the logic of the Paris Agreement (PA, Art 2.1), which states that finance flows need to support "low GHG emissions and climate-resilient development." This initiative will demonstrate that targets can be achieved by a food systems approach that reduces emissions and enhances sinks to achieve this vision.

This initiative builds on NDCs and integrates an inclusive living labs (<https://bittylink.com/oyl>) approach to co-creative innovation by testing and demonstrating sociotechnical approaches, business models, and governance arrangements to low emissions pathways (including sinks) under real-world conditions. Rather than strictly enabling technology adoption, this approach tests the desirability/feasibility of certain transformations.

This Initiative builds on accomplishments of ongoing CGIAR investments and external initiatives, and incorporates lessons learned about what has worked and what has not delivered. It combines data generation and modeling, with sequenced actions on the ground for proof of concept and 'quick gains' (2022-2024), upscaling (2025-2027), and outscaling (2028-2030).

Low-emissions climate-resilient development offers ample opportunity for local benefits, but combining objectives adds complexity (<https://bittylink.com/nah>). Mitigation actions may lead to maladaptation if policies and projects fail to incorporate equity and development tradeoffs. This initiative will develop integrated decision-support tools (<https://bit.ly/3wXPiyO>) to inform strategies that balance tradeoffs while achieving emissions reductions.

Despite widespread interest in projects and policies that integrate climate-resilient development and mitigation, few relevant actions have been implemented by organizations engaged in climate finance. This initiative will prioritize mobilizing public/private financing at local and national levels, thereby demonstrating productive pathways for international finance to support low-emissions climate resilient development.

### Work Packages

	Scope of Work	3-year Outcomes
Closing evidence and data gaps	This WP supports subnational, national and global actors, to close data, methods, evidence, and capacity gaps across food system life cycles, assess baselines, monitor safeguards and inclusion criteria, implement accurate higher-Tier GHG accounting, conduct gender-sensitive evaluation of mitigation and co-benefits of food system interventions, and support the Global Stocktake.	Improved transparency, accuracy, completeness, comparability, and consistency (TACCC) of data on food systems and their GHG emissions will be incorporated into national communications to the UNFCCC, reporting lags for GHG inventories will be shortened, and data will be used to target new NDCs (due to be submitted in 2025).
Strategy development and planning	This WP supports country stakeholders across governance levels to define priorities, scopes and goals for low-emission food systems and develop action plans with synergies for conservation, food security, livelihoods, gender equity, youth, and social inclusion. We will co-design, develop and, test, planning tools, including those that provide climate information.	Subnational and national government agencies, civil society, and private sector planners will use tools, data and analyses that were co-designed and developed by this initiative to design inclusive (women and other groups), food-system emissions reductions and sinks initiatives. Several plans will be developed and used for fund raising with local and international financial institutions.
Learning landscapes laboratories	To foster innovations, the WP uses a living labs approach ( <a href="https://bittylink.com/slb">https://bittylink.com/slb</a> ) to conduct participatory action research, including tailoring low-emissions climate-resilient development approaches to specific contexts, adapting best practices, and assessing their contributions to climate mitigation and resilience, biodiversity, and gender/age-responsive livelihoods, thus promoting collective learning, and ensuring inclusive (including women) participation.	At least one living lab per country will be functionally engaged in piloting emission reductions and negative emissions activities (including forest sinks), improving the efficiency of supply chains and reducing food loss with communities/jurisdictions and will have secured public and private sector financing for the adoption of mitigation and carbon sequestration measures.
Scaling low emissions, climate resilient food systems development	The WP analyzes governance structures; finance opportunities; land, water, and resource rights; tradeoffs; and implementation experiences through a political economy lens to support wider adoption of food systems approaches to low emissions, climate resilient development. The WP uses inclusive multi-stakeholder platforms to enhance adoption and innovation, and promote collective learning.	Analyses will have identified specific ways to increase adoption of effective and equitable food system emissions reductions/sinks that increase climate resilience. Multistakeholder platforms will ensure inclusive priority setting and widespread adoption in 7 (tentative) countries. Food system mitigation will be part of national discussions on new NDCs (due in 2025).
Engagement and agenda transformation	This WP engages in regional and global forums (e.g. UNFCCC, Committee on World Food Security) to share innovations and lessons learned; support the evidence-based decision making by governments, private sector, and financial institutions; support national funding-raising for low-emissions climate resilient development; and elevate 1CG's profile in the S2S agenda.	Food systems approaches to low GHG emission climate resilient development will be high on the world's political agenda. Decision-making that affects food systems will be based on solid science and principles of good governance, and reflect the perspectives of developing countries, local communities and marginalized segments of society.



## Transforming food systems from greenhouse gas sources to sinks (S2S)

### Impact Area Contributions

<b>Nutrition, health &amp; food security</b>	This initiative will test and scale innovations that increase awareness of nutritious and low-carbon diets and catalyze transformative social norm changes toward sustainable consumption behavior for ~20% of consumers per country. Our ambition to halve food loss/waste, as a mitigation strategy, will contribute to food security and environmental sustainability.
<b>Poverty reduction, livelihoods &amp; jobs</b>	By selecting innovations with demonstrated potential to achieve socioeconomic co-benefits, and testing and scaling market-based mechanisms that incentivise farmers and other actors in the food system to reduce emissions and conserve/increase sinks, this initiative will target improving food sector livelihoods and employment by 20% from baseline, thus reducing poverty.
<b>Gender equality, youth &amp; social inclusion</b>	Applying a gender-youth-inclusion lens to the diagnostic analysis of target food systems, planning and implementation of innovations, and engagement, this initiative will work with partners to identify and address barriers for women, youth, and other marginalized groups to participate in and benefit from S2S innovations, while contributing to systemic equity and empowerment.
<b>Climate adaptation &amp; greenhouse gas reduction</b>	This initiative will reduce food system emissions (including land-use change) by 1.18Gt CO <sub>2</sub> e y <sup>-1</sup> across 7 countries, representing a 7% reduction in global food system emissions (enhanced sinks calculations TBD). The underlying premise of this initiative is to achieve the emissions objective in ways that support climate-resilient development.
<b>Environmental health &amp; biodiversity</b>	By catalyzing adoption of nature-positive, resource-conserving, and efficiency-enhancing solutions to food system mitigation and promoting sustainable low-emission consumption behavior, this initiative will reduce pressure on forests, wetlands, and other ecosystems, accelerate restoration, and curb pollution, habitat loss and fragmentation, by ~20% from baseline projections, improving environmental health and biodiversity.

### Impact on SDGs



### Regions

Global East and Southern Africa (ESA), Latin America and the Caribbean (LAC), South Asia (SA), South East Asia and the Pacific (SEA)

### Countries



## Transforming food systems from greenhouse gas sources to sinks (S2S)

### Innovations

Data-driven approaches to planning, implementation, and impact assessment ensure that solutions and plans are supported by factual information, allow for adaptive implementation management and improve the likelihood of achieving targets. Improved data transparency and comparability will improve the global effort to solve the climate change problem.

Linking consumer demand, dietary choices, market incentives, and production, with a systems approach favors engagement with a broader set of actors and institutions in a cross sectorial approach. The opportunity created by a cross-sector, cross-ministry approach is greater sustainability of emission reductions, and forestry and agricultural sinks.

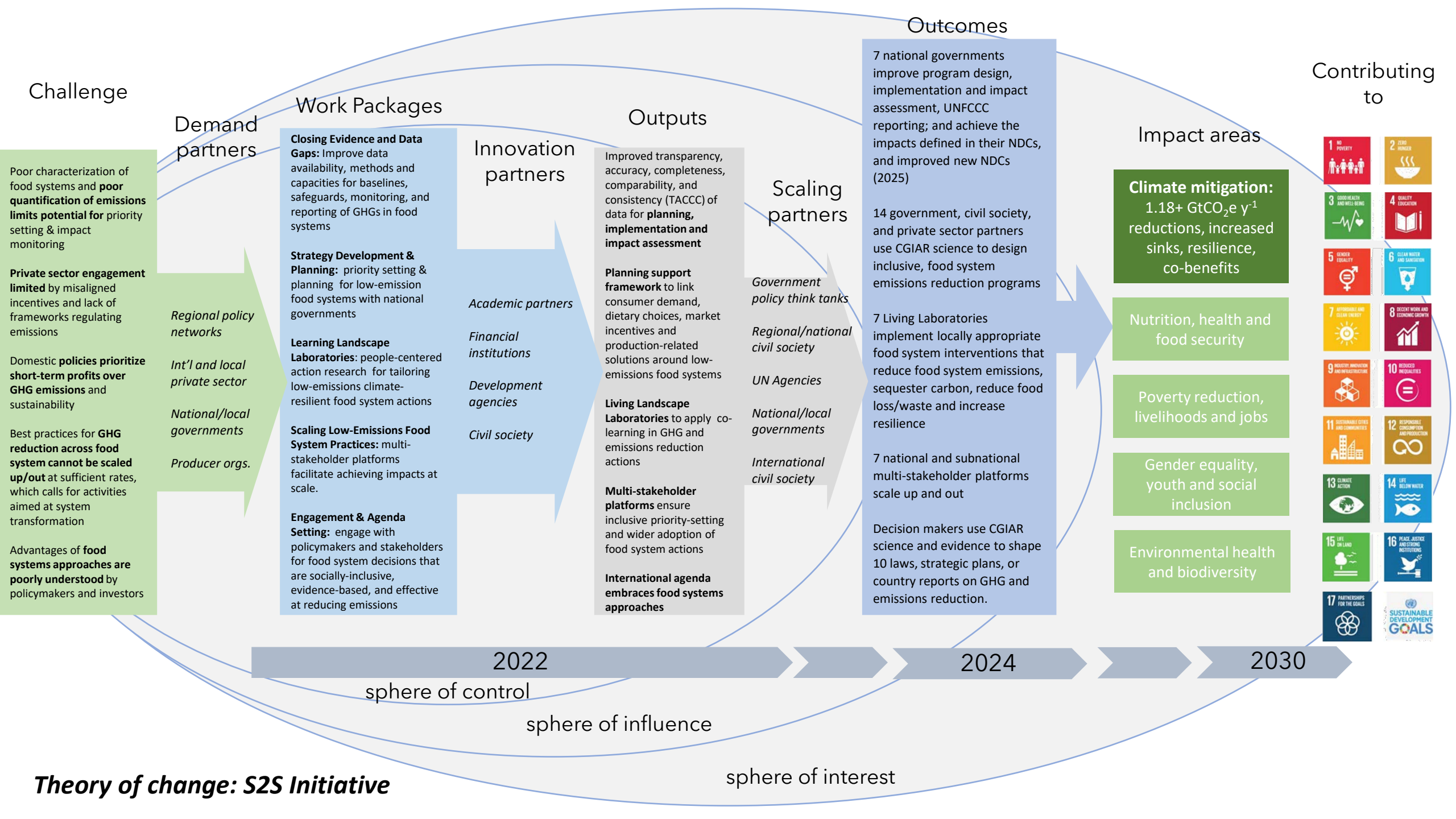
The initiative applies the living lab research concept based on a systematic model of user co-creation, exploration, experimentation, and evaluation of food system GHG reduction and enhanced sinks interventions. The approach simultaneously addresses innovation and governance to facilitate the emergence of sustainable solutions. The approach will be implemented in an inclusive manner.

This project builds on CGIAR and other investments in big data analytics. We will work with governments, private sector and civil society to co-develop tools and applications, build capacity, and pilot applications so that institutions can develop more equitable, effective, and evidence-based approaches to food system efficiency and GHG reductions.

Climate solutions have unique potentials to mitigate societal conflict by improving access to land, water, and resources. Living labs focus on improving governance and strengthening local institutions to transform conflict based on UN safeguards aimed at conflict prevention and securing the rights of indigenous peoples and local communities.

### Key Partners

<b>Demand</b>	Government	Local governmental authorities (e.g. Water Development Boards, subnational technical services, etc.)
		National governments (e.g. Environment, Agricultural, Renewable Energy, Planning, & Finance Ministries)
	International NGO	Regional policy networks (e.g. ASEAN Climate Resilience Network (CRN))
	Private Sector	International private sector organizations (e.g. World Business Council for Sustainable Development)
Producer and exporter organizations (e.g. commodity or regional development corporations)		
<b>Innovation</b>	Academic, Training and Research	Advanced Research Centers in the north and national universities
	Foundation	Local and international development foundations and initiatives (e.g. 4 per mille, Global Research Alliance (GRA), etc.)
	Multilateral	Development agencies (World Bank, USAID, etc.)
	National NGO	Agricultural, environmental, and rural development civil society organizations.
	Private Sector	Financial institutions like asset managers, impact investors, local banks, investor advisory groups (e.g. Carbon Trust), etc.
<b>Scaling</b>	Academic, Training and Research	National research for development agencies
	Government	Government supported policy research institutions
	International NGO	International NGOs (WWF, TNC, WCS, etc.)
		Regional non-governmental organizations
	Other Public Sector	UN Agencies (FAO, UNDP, UNEP, UNFCCC)







## Ukama Ustawi (U2) Water Secure and Climate Resilient Agricultural Livelihoods in East and Southern Africa

Initiative Lead and Co-Lead	Primary CGIAR Action Area	Estimated 2022 - 2024 Budget
Dr. Inga Jacobs-Mata Dr. Evan Girvetz	Resilient Agri-food Systems	\$30 - \$45 M

### Challenge

East and Southern Africa (ESA) is a climate hotspot, with over US\$ 45 billion in agricultural production at risk from higher temperatures, shorter growing seasons, worse droughts and floods (<https://bit.ly/3dZJ711>). These risks cascade, increasing disease and pest outbreaks, affecting post-harvest storage and transport, jeopardizing businesses and supply chains, and undermining livelihoods. Maize is particularly vulnerable: 15% climate-related declines in yield (without adaptation), cropland suitability (<https://bit.ly/3dZJ711>) and degrading environmental services and health (low soil fertility, water quality and availability) (<https://bit.ly/3taJWxP>). Maize production covers over 75% of the cropping area (<https://bit.ly/2RxqMET>) in many places, increasing the vulnerability of large, growing and often malnourished populations (largely women and youth), since maize provides most of their calories and income (<https://bit.ly/3taT6KJ>). Diversification and de-risking of maize-mixed systems is vital. Farmers and market systems in these areas face key challenges limiting food/water security and climate resilience, including: access to inputs, advisories, capacity, finance; youth unemployment and interest in agriculture, social inequality hindering equitable growth; tensions over owning or using scarce resources; increased environmental migration; human-wildlife conflict; and challenges to collaborative governance. Integrated farm and natural resource management, building climate resilience and producing nutritious foods are imperative to achieving the SDGs, UNFCCC and other commitments. Solutions exist; the challenge is deploying and rapidly scaling these actions in a coordinated and inclusive way to ensure lasting food/water security and climate resilience, while overcoming systemic barriers, empowering youth and women through innovative partnership models and fostering entrepreneurship and financial access, and strengthening underpinning governance mechanisms: the rationale for Ukama Ustawi.

### Objective

Ukama Ustawi (U2) will identify, leverage and accelerate policies, practices, technologies and services for climate-smart innovations to diversify and de-risk agriculture in maize-mixed areas of ESA at multiple scales through science-based innovation, capacity strengthening, policy support, and collaborative governance. U2 builds off the Two Degree Initiative-Southern African Challenge (<https://bit.ly/32dLkUs>) success, where we partnered with 300 diverse stakeholders to co-create a research for development agenda for water-secure, climate-resilient, low-emission, inclusive livelihoods and landscapes. This needs tailoring to region and country contexts by scaling out (greater numbers), scaling up (institutionalizing) and scaling deep (embedding). Five nested work packages promote fit-for-use innovation bundles, capacity, collaborative governance, multi-stakeholder partnerships, and communications to achieve food/water security, climate resilience, and environmental, social and governance (ESG) impacts in targeted ESA countries, benefitting 1 million people, through three objectives:

1. Diversify and de-risk maize-mixed systems, focusing on farms, markets and consumer behavior, and improving water/land management, soil health, nutrition, resilience to climate shocks, pest and disease outbreaks. A regional hub supports scaling strategies and implementation plans (<https://bit.ly/3e1pUiU>; <https://bit.ly/3acwrpY>) by integrating, adapting, and scaling technologies, practices, agro-advisory services, communications, and financial products;
2. Unlocking private sector investment, promoting empowerment of women and youth in value chains, through capacity strengthening (incubators, accelerators, internships), spurring start-up/SME growth, jobs, inclusive finance and social equity; developing investment roadmaps;
3. Ensuring landscape-scale environmental health, sustainable water/land management, policy implementation and governance promoting water security and other ecosystem service and human movement flows as adaptation strategies; renewable energy technologies; and greenhouse-gas emissions (GHG) reductions.

U2 will collaborate closely with thematic initiatives that will undertake work in this region, bringing their advances into the innovation bundles and leveraging partnerships for impact in ESA. As per the first round of submissions made, the following initiatives are noted.

Several global initiatives with an expressed focus on ESA:

ST: NEXUS Gains: Realizing Multiple Benefits Across Water-Energy-Food-Environment System; ClimBeR: Building Systemic Resilience against Climate Variability and Extremes; SHiFT: Sustainable Healthy Diets through Food Systems Transformation; Enabling gender and social equality through resilient and inclusive agri-food systems; Harnessing Digital Technologies for Timely Decision-Making across Food, Land, and Water Systems

RAFS: Sustainable Intensification of Mixed Farming Systems; ASPIRE - building systemic resilience to climate variability and extremes through AgroSilvoPastoral Investments and Restoration; Resilient Cities through Sustainable Urban and Peri-urban Agrifood Systems; Climate Smart Solutions for Livestock Agri-food Systems (Policy and Practice); Protecting human health through a One Health approach; Implementing Nature-Positive Solutions to enhance system productivity and resilience, safeguard the environment, and promote inclusive growth

In addition, the following global initiatives will make direct contributions to U2's workpackages as follows:

WP 1: Diversify and sustainably intensify: SeEdQUAL delivering genetic gains in farmers' fields; Accelerated Breeding: Meeting Farmers' Needs with Nutritious, Climate-Resilient Crops; Sustainable Intensification of Mixed Farming Systems; SHiFT: Sustainable Healthy Diets through Food Systems Transformation; Implementing Nature-Positive Solutions to enhance system productivity and resilience, safeguard the environment, and promote inclusive growth; Transformational agroecology across food, land and water systems

WP 2: De-risk: ClimBeR: Building Systemic Resilience against Climate Variability and Extremes

WP 3: Empower and engage women and youth: Enabling gender and social equality through resilient and inclusive agri-food systems

WP 4: Incubate and accelerate: Resilient Cities through Sustainable Urban and Peri-urban Agrifood Systems; Rethinking Food Markets and Value Chains for Inclusion and Sustainability

WP 5: Restore and conserve water, land and biodiversity health across landscapes: National Policies and Strategies for Food, Land and Water Systems Transformation; NEXUS Gains: Realizing Multiple Benefits Across Water-Energy-Food-Environment System; Transforming food systems from greenhouse gas sources to sinks (S2S)

### Theory of Change

Ukama Ustawi (U2) supports water security and climate-resilient agricultural livelihoods in East and Southern Africa (ESA), helping millions of vulnerable smallholders transition maize-mixed systems to more intensified, diversified and de-risked systems, fostering enterprise development, unlocking private investment, especially for socio-economically disadvantaged women and youth, and ensuring landscape-scale environmental health. U2 will do this by applying science-based innovation, capacity strengthening, policy support and communication. An innovation scaling hub for ESA will research adaptive scaling in the region, producing fit-for-purpose innovation-bundle delivery models implemented with partners. Digital platforms embedded with partners (NARS, private sector, etc.) will develop agro-advisory applications de-risking agriculture. These hubs and platforms feed into private-sector engaged multi-stakeholder dialogue spaces fostering a pipeline of SMEs strengthened through incubation and acceleration, linked to inclusive finance spurring sustainable growth. Empowering vulnerable groups (women, youth, migrants) is integrated through capacity strengthening activities, e.g., change agent identification, internships/mentorships, networks/cooperatives. Enabled by integrated water/land/energy management, collaborative governance and multi-stakeholder shared visions, targets and plans for food/water security, will spillover to regional trade and human movement patterns. U2's theory of change is based on the assumption that transformative change emerges from the relationships among/between actors and not the actions of any single actor; through a set of well-functioning hubs, platforms and partnership-based networks, which will be aligned with large development initiatives such as the OneCGIAR global initiatives, and private investments reaching farmers at scale. By 2024, we envisage more informed policies across six countries, 250,000 farmers (90,000 women) having more diversified and resilient production, 750,000 receiving climate information services, and 250 SMEs incubated/accelerated.



## Ukama Ustawi (U2) Water Secure and Climate Resilient Agricultural Livelihoods in East and Southern Africa

### Highlights

**DIVERSIFY, INTENSIFY AND DE-RISK** maize-mixed systems, supporting climate-smart, nutrient-dense crop and livestock production/market systems; sustainable and integrated management practices, digital agriculture, extension services, and technologies improving climate resilience, productivity, food/water security, soil health and nutrition. Regional scaling hub supporting innovation-bundle delivery models that are equitable, locally-appropriate co-designed with partners.

**EMPOWER AND ENGAGE** women and youth, prioritizing those socio-economically disadvantaged groups, through innovative partnerships, leveraging networks and cooperatives to remove systemic barriers; build-out digital ventures catalyzing equalizing opportunities; use multi-partner platforms/dialogues to unlock inclusive finance, increase market linkages, create enabling policy environments; generate opportunities through internships/mentorships/change agent identification, promoting equitable and accessible business environments.

**INCUBATE AND ACCELERATE** start-ups and small and medium enterprises (SMEs) to de-risk agriculture, water, and climate investments via innovation hubs providing research-informed technical assistance, SME pipeline and job growth, sustainable finance mechanisms, and supporting regional trade. Focus on youth, women, input delivery (seeds, machinery, irrigation), value addition, digital entrepreneurship.

**RESTORE AND CONSERVE** water, land and biodiversity to support foundational ecosystem services by improving management practices, capacity strengthening, collaborative governance and a shared, inclusive, transboundary and multi-stakeholder vision, targets and plans for building water, food and climate security and resilience, and honoring national commitments to SDGs, CBD-Kunming, UNFCCC.

**INTEGRATE AND EMBED** OneCGIAR (locally, nationally, regionally) through innovative business and legal models, capitalizing on demand-driven opportunities by embedding research and partner innovations into public, private and civil society sector activities; championing and spotlighting impactful research outcomes, actions, and partnerships; and supporting political transformations driving transformative change.

### Work Packages

	Scope of Work	3-year Outcomes
Diversify and intensify maize-mixed systems	Diversify and sustainably intensify maize-mixed systems by rapidly scaling innovation bundles through the scaling hub, promoting climate-adapted legumes, fruits & vegetables, roots & tubers (e.g. cassava), agroforestry, fisheries, livestock, and other staples (rice, sorghum, millet, teff) from farm-to-market-to-consumer. Improve inputs, delivery systems and management practices (irrigation, mechanization, minimum till) that enhance climate-smartness, productivity, nutrition, incomes, and gender equity, through research such as multi-sc..	By 2024, 200,000 farmers/value chain actors/consumers have begun to transition from maize-mixed systems to more diversified, integrated and resilient climate-smart farming systems, on a path towards resilience, soil fertility, sustainable land and water management practices, ultimately resulting in higher productivity, profitability, and nutrition. Regional scaling hub catalyzes this transformation by leveraging partnerships and providing fit-for-purpose innovation-bundle delivery models.
De-risk farm and market systems	De-risking market systems by enhancing access to and use of de-risking technologies, digital agro-advisory and climate services, and decision-support tools for early warning, action and preparedness through open access platforms and applications. Co-designed with farmers, SMEs, governments and investors, focusing on targeted communication activities, multi-media dissemination, and data sharing.	By 2024, 1,000,000 farmers and other next users of climate information have improved access to climate information, digital agriculture and agro-advisory services to enhance early warning for early action and preparedness, and improved climate resilience; communication strategies broadly developed for digital agriculture and financial services availability.
Empower and engage women and youth	Empower and engage women and youth across work packages by strengthening capacity (financial literacy; targeted agricultural extension, internships/mentorships, digital innovations for youth); identifying financial support to compete on and off-farm (credit; revolving funds); targeting incentives for on-farm innovations (closing gender yield-gaps; preferential-procurement mechanisms for women-owned enterprises).	By 2024, clear targets identified across work packages reaching 60,000 women (30% of total farmers/next users); of which 600 women and youth (100 per country) are identified as change agents for building capacity, financial support; and targeting incentives; 30% of new jobs created are for women and 40% for youth.
Incubate and accelerate start-ups and SMEs	Incubate and accelerate start-ups and SMEs through entrepreneurship innovation hubs, building a pipeline of investable SMEs contributing to ESG targets; using multi-partner platforms and multi-stakeholder dialogue spaces that strengthen the enabling environment; linking SMEs to a sustainable finance facility; scaling environmentally-sustainable, socially-equitable and responsible financial (e.g. micro-lending and insurance) products.	By 2024, at least 250 SMEs (30% run by women and 40% by youth) have been incubated or accelerated and are in process or have received financing for a total of at least US\$5 million of new finance, that has been unlocked and invested (through debt, equity or grants).
Restore and conserve water, land and biodiversity health across landscapes	Restore and conserve water, land and biodiversity health across landscapes, strengthening local, national and regional enabling environments; creating coherent policies, regulations, investments (e.g. Payment-for-Ecosystem-Services (PES), exclosures) and institutional coordination; data sharing across sectors/countries; inclusive, multi-stakeholder visions and integrated ecosystem management; renewable energy use, emissions reduction and nature-based solutions.	By 2024, 60 partnerships activated, 6 strategies/policies supported, and US\$300 million of investments informed, enabling collaborative governance of multifunctional landscapes supporting regional and national commitments for biodiversity, climate, SDGs, as articulated through shared national monitoring and reporting processes.

## Ukama Ustawi (U2) Water Secure and Climate Resilient Agricultural Livelihoods in East and Southern Africa

### Impact Area Contributions

<b>Nutrition, health &amp; food security</b>	Millions more people have access to more nutritious food, with greater food security, and improved health. Smallholder farmers, especially women, in ESA have moved beyond maize-mixed systems to maize-mixed/diversified systems, and biofortified crops, consuming more diverse foods, diversifying food sold in market systems, and (re)using safer water for safe food.
<b>Poverty reduction, livelihoods &amp; jobs</b>	Improved on-farm productivity enhances incomes and livelihoods; more diversified production creates new off-farm opportunities in value chains and facilitates intra/inter regional trade; start-ups and SMEs support new jobs, increasing livelihood options and reducing poverty, especially in vulnerable populations of women and youth.
<b>Gender equality, youth &amp; social inclusion</b>	Women and youth are more empowered, have ownership security and greater employment opportunities after investments, capacity and support are targeted and expanded to them; greater social inclusion and equality result from lifting structural/productivity barriers.
<b>Climate adaptation &amp; greenhouse gas reduction</b>	Overall, improved resilience to climate and shocks, and adaptation across food, land and water systems are supported for millions of small-scale producers and vulnerable groups (women, youth, migrants) on cropland spanning 12 countries and supporting improved soil health, while improving resilience in agro-food value chains and supporting renewable energy use.
<b>Environmental health &amp; biodiversity</b>	Environmental health, including water and land management, is restored and managed to support ecosystem services, ensuring lasting benefits across broad landscapes and people. Collaborative management planning and integrated policy implementation at landscape scales, with an on-going community of practice on water/food/climate security, and climate resilience in the region.

### Impact on SDGs



### Regions

East and Southern Africa (ESA)

### Countries



## Ukama Ustawi (U2) Water Secure and Climate Resilient Agricultural Livelihoods in East and Southern Africa

### Innovations

Regional scaling hub, advancing diversified/de-risked climate-smart technologies and practices; inclusion; capacity strengthening; and policy implementation that will enhance adaptive scaling capacity in the ESA region on the science of scaling out (more people or areas); scaling up, (policies and institutions); and scaling deep (behavioral change).

Climate information and agro-advisory services linked to local technical advisory committees (<https://bit.ly/3g7nJNh>), regional platforms, (<https://bit.ly/3mNURes>), and digital delivery channels (<https://bit.ly/2PQhYJv>), with parallel actions tailoring and targeting these strategies to women and youth, in ways that support de-risking agricultural production, value chain activities, and SMEs.

Agribusiness start-up incubators and accelerators providing business support and technical assistance to nascent, but highly innovative and impactful, agriSMEs, linking them to investors and sustainable finance sources (e.g. impact investors and sustainability funds), supporting their growth, and benefitting farmers, youth, and supply chains, while creating/expanding SMEs and jobs.

Climate-smart financial products for smallholder farmers (e.g. Village Savings and Loan Associations and/or self-managed women's groups) build financial literacy while providing members with secure financial mechanisms for savings, accessing loans, and obtaining emergency/weather/climate-risk based insurance, thereby enabling investments in farm diversification, climate-resilient agriculture, and local value-chains.

Regional/national/local policy monitoring with partners: a) on international and regional agreements; of policy results frameworks and ESG impact reporting; and b) Policy implementation through on-the-ground actions and incentives (e.g. exclosures, managed aquifer recharge (MAR), PES) for restoring and protecting natural resources.

### Key Partners

<b>Demand</b>	Government	RECS and regional organizations: SADC/EAC/IGAD; Community Market For Conservation (COMACO); COMESA; River Basin Organizations (RBOs); Transfrontier Conservation Areas (TFCA); national ministries of Agriculture, Environment, Climate, Water, Trade, Enterprise Development, Rural Development (Zambia/Kenya/Eswatini/Zimbabwe/Tanzania/Malawi)
	National NGO	Farmers, farmer unions, cooperatives especially for women and youth, NGOs, civil society
	Other Public Sector	Meteorological Departments/Agencies and National Disaster Management Centres e.g. NDMC Eswatini
	Private Sector	Finance institutions (MFIs, commercial banks e.g. ABSA, asset managers)
	Private Sector in Aid Recipient Country	Start-ups, SMEs, Business in the Food System
<b>Innovation</b>	Academic, Training and Research	International research (World Vegetable Center, CABI) and regional research centers, NARS in focus countries, national universities and research funding agencies (WRC) and centers (CST)
	Other Public Sector	Networks: CCARDESA/ASARECA; RUFORUM; Waternet; FANRPAN, GRP, GWP, Youth networks, women networks, Digital SME hubs eg Nourishing Africa
	Private Sector	Fund/Asset managers, impact investors
		Seed companies, machinery manufacturers and importers
Public Private Partnership	Knowledge and Innovation Hubs and Initiatives: Digital SME hubs eg Nourishing Africa, Lusaka Hub, WE4F, ILSSI, GIZ Scaling Task Force, USAID-Resilient Waters Program	
<b>Scaling</b>	Multilateral	RECS and regional organizations: SADC/EAC/IGAD; Community Market For Conservation (COMACO); COMESA; River Basin Organizations (RBOs); Transfrontier Conservation Areas (TFCA)
	National NGO	NGO/NGO networks: Total LandCare, Solidaridad, WorldVision, Water for People, Catholic Relief Services, SNV, Aquaculture Zimbabwe; Community Development Trust Zimbabwe, CARE, AWARD
	Private Sector	Mobile companies, telecommunications, media
	Private Sector in Aid Recipient Country	SMEs and SME networks (Vitalite, GoodNatureAgro, VIA, FuturePump, Africa Agribusiness Academy)
	Public Private Partnership	Innovation hubs/labs: Digital SME hubs eg Nourishing Africa, Lusaka Hub, WE4F, ILSSI, GIZ Green Innovation Centre Zambia, NatuRES partnerships, African Fertilizer and Agribusiness Partnership (AFAP), SWPN



# Ukama Ustawi (U<sup>2</sup>) Theory of Change

Regional anchor countries: Zambia, Kenya  
 Quick wins: Eswatini, Rwanda, Mozambique  
 High needs: Zimbabwe, Tanzania, Malawi, Madagascar  
 Piggy-backs: South Africa, Ethiopia



SUSTAINABLE DEVELOPMENT GOALS



\*Ukama Ustawi (U<sup>2</sup>) is a multi-lingual concept - Ukama (Shona) means humanity's relatedness to the natural and to each other. Ustawi (Kiswahili) means welfare including health, safety, well-being, happiness and prosperity.

2022

sphere of influence

2024

sphere of interest

2030