



**United Nations Food Systems Summit**  
**Action Track 1: Ensure Access to Safe and Nutritious**  
**Food for All**

**Potential Game Changing and Systemic Solutions:**  
**A Second Compilation**

*Submitted to the UN Food Systems Summit Secretariat, 10 May 2021*



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## Acronyms Used

Excludes those used only within the context of a specific game changer, which are described in the text

AT(1) – Action Track (1)

BMGF – Bill and Melinda Gates Foundation

CGIAR – Consultative Group on International Agricultural Research

FAO – Food and Agriculture Organization

(UN)FSS – (United Nations) Food Systems Summit

GAIN – Global Alliance for Improved Nutrition

GHG – Greenhouse gas

ILRI – International Livestock Research Institute

LMICs – Low- and middle-income countries

NCD – Non-communicable disease

NGO – Non-governmental organisation

SDG – Sustainable Development Goal

SMEs – Small- and medium sized enterprises

TA – Technical assistance

UN – United Nations

UNICEF – United Nations International Children’s Emergency Fund

WFP – World Food Programme

WHO – World Health Organization

**DISCLAIMER:** This paper presents a second initial set of ideas submitted to the UN FSS Secretariat by Action Track 1 (i.e., the second ‘wave’ of ideas). The ideas presented here are far from final: they will continue to be developed further and contextualised, through active stakeholder engagement. Note that while these ideas are emerging from an interactive and collaborative process, Action Track 1 is a diverse and broad group, containing varied perspectives and opinions: inclusion of a solution here should not be interpreted as an endorsement of that idea on behalf of all Action Track 1 members or their institutions.

## Introduction

### Action Track 1 Goals

This paper follows on an initial paper (available [here](#)) to present a second set of ideas for game-changing and systemic solutions to achieve the goals of Action Track 1 (AT1) of the UN Food Systems Summit. With these ideas, AT1 aims to end hunger and all forms of malnutrition and reduce the incidence of diet-related non-communicable disease (NCD). Achieving this goal requires delivering on the right to food to ensure that all people at all times have access to sufficient quantities of affordable and safe food. This in turn entails a need to increase the availability of safe and nutritious food, making food more affordable and reducing inequities in food access.

AT1 has thus been working to identify, collect, co-create, and iteratively tailor a set of systemic and game-changing solutions to achieve these aims. AT1 organised our search for sustainable, actionable solutions with potential for impact at scale along three main themes—our ‘Action Areas’:

1. **Zero Hunger:** Approximately 700 million people are undernourished, and one quarter of the world’s population is food insecure. This merits urgent action. Addressing it will likely involve significantly increasing agricultural productivity in sustainable ways, enhancing social protection that builds productive assets, and reducing inequalities in food access, among other things. Moreover, the countries that are experiencing conflict and fragility are where hunger is rising the fastest, motivating paying special attention to humanitarian contexts and fragile, conflict-affected settings.
2. **Access to Nutritious Food:** Simultaneously, a large share of the global population is not eating a healthy, balanced diet – and about 3 billion people cannot currently even afford to purchase one. Improving access to nutritious foods and making them the preferred option will require addressing three main barriers to access: price (i.e., how to make nutritious food cheaper and nutrient-poor foods relatively more expensive without compromising producer incomes), purchasing power (i.e., increasing purchasing power via social protection, wages, etc. and perhaps adjusting poverty lines to accommodate true pricing of food), and perceived affordability (i.e., changing how people value nutritious foods relative to their price).
3. **Food Safety:** The WHO estimated that foodborne diseases caused 600 million illnesses and 420,000 premature deaths in 2010; other estimates have produced even higher figures. Addressing this, particularly in the low- and middle-income countries that suffer the highest burdens, will require focusing on the markets where vulnerable people buy food by implementing relevant, appropriate interventions that can reach lower-income consumers while not excluding lower-income producers and vendors; shifting from hazard thinking to risk thinking, which focuses on understanding relative risk to cause harm; creating an enabling regulatory ecosystem that provides the right incentives and support for actors to adopt improved practices; and fostering consumer demand for food safety.

Across all these action areas, we prioritised solutions in line with the Summit’s key criteria for ‘game changing and systemic solutions,’<sup>1</sup> as well as supporting gender equity, empowering youth, and creating synergies with other ATs.

### Action Track 1 Structure

To identify, co-create, and iteratively tailor systemic and game-changing solutions to achieve these aims, AT1 has set up a leadership team. The leadership team is well-balanced in terms of gender, age, region, and sector and includes a growing number of member state representatives. Full membership of the leadership team is listed [here](#); this list does not include affiliated member states. Within the

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<sup>1</sup> These include: impact potential at scale, actionability (taking into account politics, capacity, costs), and sustainability.

leadership team, work has been divided into three working groups aligning to the Action Areas noted above, each led by AT1 leadership team members:

- (1) Reducing hunger, led by Samuel Benin and Natalia Strigin
- (2) Increasing access to affordable, nutritious foods, led by Corrina Hawkes
- (3) Increasing food safety, led by Delia Grace and Pawan Agrawal

The other members of the working groups are also drawn from the larger leadership team, including the cross-cutting thematic members focused on gender, finance, and innovation as well as member states affiliated to the Action Track. The full leadership team meets approximately once a month. The working groups set their own schedules according to leaders' and members' preferences. Also, the FAO as UN anchor, and the Science Group lead have all been actively involved in the AT1 internal idea-identification and -vetting process.

### Process for Identifying and Developing the Ideas in this Paper

Ideas were identified and put forward in two 'waves': a first wave developed between November 2020 and January 2021 and submitted to the Summit Secretariat in February, and the second wave developed between February and April 2021 and presented here. For this second wave, Action Track 1 used the following process to select game-changing ideas:

- We created an online Google Form through which stakeholders and members of the public could submit their ideas, which then fed into an idea database; this form has been promoted through our different Public Forums as well as via social media and email list-serves and the online Summit community.
- Members of the AT1 support team reviewed a number of recent high-profile international reports (e.g., SOFI 2020, Ceres2030, PARI 2020, OECD 2021) to extract relevant ideas with broad and/or high-level support, which were added to the abovementioned database.
- The ideas added to the database were shared with the leads of the three AT1 working groups, approximately every two weeks; they then vetted those ideas with their working group and decided how and whether to pursue and refine them further. Most working groups met weekly to discuss and debate the developing ideas.
- In parallel, each working group identified its own potential solutions through their own internal processes, which relied on the diverse expertise and experience of the working group members, their broader networks, and research and case studies of which they were aware; the AT1 leadership also contributed ideas.
- AT1 also engaged directly with relevant outside stakeholders, such as the International Livestock Research Institute, to solicit novel perspectives and ideas, interviewed key scholars and practitioners to hone the ideas, and referred certain ideas to other bodies within the Summit process (e.g., the Science Group, the Gender Cross-Cut Group) to consider taking forward.
- Finally, AT1 members participated in various Food System Summit Dialogues and reviewed reports emerging from other Dialogues to identify priorities and ideas for solutions.

Many of the second wave ideas aimed to address specific gaps identified in the review of the first wave ideas; once these gaps were identified, teams of experts were convened around those subject areas to fill the gaps. All ideas were considered within the context of the ideas already put forward in the first 'wave' of ideas, both by AT1 and other Action Tracks, as well as emerging priorities of other Action Tracks and feedback from stakeholders, including the public. The initial thinking on various ideas was presented to AT1 leadership team members for feedback and debate both via written feedback and through online presentation sessions in April 2020.

The following sections present Action Track 1's second set of game-changing solutions, for consideration. For each solution we briefly explain what it is, the problems it is addressing, and how it would affect change, then explain why it aligns to the Summit's 'game changing and systemic solution' criteria, and finally discuss potential political support and contexts for its implementation. As noted above, the solutions presented here will continue to be refined, developed further, and contextualised through active engagement with diverse stakeholders, including member states and those working on other Summit Action Tracks.

## Potential Solutions for Reducing Hunger and Boosting Food Security

### 1. Decrease Hunger Among Smallholder Farmers by Investing in Soil Health

**The Solution:** Use the far-reaching impact of healthy soils to unlock a diverse range of capital flows that can be directly invested into either improved and sustainable farm production or cash transfers, with the end goal of lowering rates of household hunger for low-income smallholder farmers.

**Source(s) of the Solution:** internal discussions within AT1 around the need for financially sustainable smallholder production-focused gamechangers.

**Problem addressed within food systems:** The yield gap - representing what fields can potentially produce versus what they actually produce - has remained stubbornly large for smallholder farmers. A significant reason for this is that low-income farmers - often [living in areas of depleted soils](#) – do not have access to the optimal inputs to maximise the potential yields of their soils. In these situations, *the soil itself becomes a barrier to production*. However, scaling the requisite soil testing and optimal input distribution to rectify this reality is expensive. While current market forces are not solving this gap for poor populations, if the value of healthy soil<sup>2</sup> were better monetised, new resources could be unlocked to help smallholders improve soil health and close the yield gap, or simply receive cash payments, to better feed their families and communities.

Within the AT1 Action Area of reducing hunger, we approach this problem primarily as a path to driving down hunger rates for low-income smallholders by creating a sustainable path to either increased production or cash payments. However, this is very much a cross-cutting idea; at its core it provides a new way of thinking about financing input distribution, in ways that might be relevant to other Summit solutions (e.g., through providing a possible financing mechanism for input subsidies or to supplement environmental sustainability-focused soil health initiatives.)

**How this solution will address that problem:** Sustainably solving this problem requires scaling new financing models, backed by healthy soils, that could either fund seismic shifts in service delivery for smallholder farmers (e.g., logistics infrastructure for input distribution), or simply pay them cash to focus on soil regeneration on a portion of their land (e.g., letting some acres lay fallow), so they can use this cash for food.

One possible mechanism for this would be to issue *impact bonds* sourcing private capital to fund soil-friendly input distribution and extension for low-income smallholders in partnership with governments, SMEs, or social enterprises that have distribution networks. Farmers would be told that if they correctly applied the inputs to maximise soil health, they would receive the inputs at a discount or for free. Public- or private-sector investors would provide the upfront capital, which would then be paid back by the direct beneficiary of the improved soil outcome - most likely governments (linked to a range of public goods) or corporations involved in sourcing high value farm production once simple, measurable soil health indicators (or if proxy indicators, like lime application) were achieved.

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<sup>2</sup> Beyond just farmer's fields, soil plays a key role in carbon sequestration, and [as much as 80%](#) of soil degradation occurs in the wider community, through increased prevalence of water/sanitation problems, landslides, infrastructure damage, etc.

Alternatively, *carbon markets* could be leveraged, as well-managed soils [will tend to sequester carbon](#). To tap into these markets, though, the initiative would need to partner with governments or companies that have strong rural farmer networks, to meet the high bar for certification and monitoring, reporting and verification that these markets require, which is challenging when working across dispersed smallholdings. Finally, *commercial value chain finance* could also be leveraged. For example, premium soya or coffee markets in the US or Europe could potentially add enough margins to products to fund the soil-health focused input distribution downstream to smallholder farmers with whom they work. While this is less directly useful for staple crops, healthier soil for commercial crops could also indirectly benefit production of adjacent staple crops.

The principal challenge to valuing this asset is the *scalable measurement of verifiable soil health indicators*. While facilities exist to verify and [monetise soil health for richer farmers](#), these must be developed for smallholders. If sufficient capital were available, then the most direct route would be through farm-level soil monitoring and including the value of these improvements in the asset value of land. However, given the expense of running the requisite soil testing at scale at the smallholder level, a possibly more scalable alternative could be to focus on easier-to-measure proxy indicators. A good example of this would be using agricultural lime application [as a proxy for soil pH](#): with lime, one could apply blanket recommendations and distribution across wide areas where soil acidity was too high, and then simply measure adoption by farmers (in areas of high acidity, lime and composting alone can increase yields by upwards of 40%).

**Solution's alignment to the 'game changing and systemic solution' criteria:** The large number of smallholders globally with depleted soils indicates a considerable potential for *impact at scale*. The need to put soil health at the centre of food system reforms is a clear priority of the Summit, making this idea *actionable*. This idea would be based around *a sustainable financing stream* that would unlock the scalable access to either proven, productivity-increasing inputs or cash payments for smallholders in return for maintaining high-quality soil health.

**Existing evidence:** There is considerable evidence of the value of soil as a public good. For example, in *Societal Value of Soil Carbon* (Journal of Soil and Water Conservation, 2014), Dr Rattan Lal suggests what the monetary value of carbon sequestration in soil might be. Moreover, evidence that leveraging payments for soil health as unconditional cash transfers could decrease hunger rates is found in the [randomised impact assessments](#) of GiveDirectly, which show that recipients of their transfers spent significant portions on food.

**Current/likely political support:** There are a number of ways this could be integrated into the work of other Summit Action Areas, and multiple member state representatives involved with AT1 have indicated preliminary support for the idea.

**Contexts where this is well/not well suited:** This idea will succeed or fail to the extent that the monitoring and verification can be well executed, which can be extremely difficult given the diffuse and unmapped nature of small landholdings. Given the limitations of existing remote sensing technology, it might only work in contexts where there is the ability to do this on the ground (e.g., leveraging partner organisations with deep field presence, like farmers' cooperatives).

## 2. Put farmers' access to crop diversity first in seed policy and practice

**The Solution:** The diversity of plant genetic resources for food and agriculture is crucial for farmers' ability to adapt their food production to the effects of climate change and ensure access to safe and nutritious food. This proposal calls for a fundamental re-think of how seed system development is supported globally. Our proposal is to ensure and promote – through legislation, seed policies, and action – farmers' access to a diversity of well-adapted varieties of crops that meet agroecological and



nutritional needs and preferences. Farmers' seed systems are key to providing farmers with access to both local varieties developed over millennia of farmer selection and modern varieties developed with modern plant breeding. We call for a bottom-up demand-driven approach to seed security to complement the currently dominant top-down supply-side approach, thereby supporting farmers' agency and recognising farmers' seed systems' contribution to global food security.

**Source(s) of the Solution:** This solution emerged from a food system forum in Norway consisting of actors from the government, NGOs, and academia. Norwegian farmers later joined the group. These actors have a history in the agrobiodiversity space – including hands-on experience with conservation and use of agrobiodiversity, research on governance and management of crop genetic resources, and active participation in international fora for governance of agrobiodiversity. This brief was authored by the Norwegian Ministry of Foreign Affairs, Norwegian Ministry of Agriculture and Food, Norad, Norwegian Farmers Union, Development Fund Norway, Caritas Norway, and staff at the research institutions Fridtjof Nansen Institute and the Norwegian University of Life Sciences.

**Problem addressed within food systems:** Food security starts with a seed. This is recognised in SDG2, the Zero Hunger goal, where target 2.5 is about maintaining the diversity of plants and animals used in agriculture. Yet the currently dominant approach for seed system development is unable to meet the needs of the majority of the farmers in the Global South. In most LMICs, farmers' seed systems supply the bulk of the seeds used by smallholders. This proposal addresses the problems of meeting the needs of farmers and halting the loss of agrobiodiversity by moving seed security centre stage in all seed policy and action. Seed security exists when men and women within a household have sufficient access to quantities of available, good quality seed and planting materials of preferred crop varieties at all times in both good and bad cropping seasons (FAO, 2016).

Placing farmers' access to crop diversity first in seed system policy and practice will link 'upstream' efforts to conserve agrobiodiversity with 'downstream' efforts to strengthen farmers' livelihoods and food security. Changing the rules of the game of this central part of the food sector by putting the needs of the smallholder farmer at the core will enable local breeding and development of these resources as a vital contribution to seed and food security. This approach will expand on the vast diversity of local crop varieties that are adapted and adaptable to local environmental conditions and climate change. It will also meet nutritional needs and local preferences for food and fodder.

The proposed actions will be gender-responsive, considering the differences in use, preferences, and benefits between men and women. Women and men often have access to different spaces and environments and fulfil different tasks that may give them distinctive information and practical knowledge about local agricultural biodiversity. Clarifying the differences and complementarities is essential to ensuring gender equality in community-based agrobiodiversity management and to meet the particular needs of women in this context.

**How this solution will address that problem:** The solution is to ensure farmers' access to a diversity of affordable quality seeds of preferred crop varieties in a systemic way, from the local, via the national, to the international level, and vice versa. This will transform the sector to truly adapt a 'demand side' focus with farmers at centre stage, scaling up and out successful models from a local to a national and international level. Actions include establishing and scaling up community seed banks, collaborative plant breeding programmes, and cooperative seed production; improving rural livelihoods through capacity building at the community level and related micro-finance programmes; and providing assistance to countries in reviewing and adjusting their seed policies and legislation to support such a development. These actions will benefit from close collaboration between national, regional, and local authorities as well as national and international gene banks, scientists, NGOs, and farmers.

**Solution's alignment to the 'game changing and systemic solution' criteria:** This proposal aligns with the UNFSS definition of a game changer by being a "thorough conceptual framework that would shift

operational models or underlying rules, incentives, and structures that shape food systems, acting on multiple parts of – or across – the food system, to advance global goals which can be sustained over time”. The proposal can be scaled up and benefit millions of smallholder farmers, strengthening their potential as food producers and providers of food security. The investment will be paid back in terms of increased food production, food security, and conservation of agrobiodiversity. The actionability of the proposal is guaranteed by its alignment with international agreements and the proposed actions being well-documented practices. The proposal’s sustainability lies in strengthening, well beyond 2030, agrobiodiversity and the systems to manage it, and increasing farmers’ possibilities to continuously adapt food production to climate change, which will reduce poverty and humanitarian needs.

**Existing evidence:** Research shows that farmers’ seed systems provide most of the seed supply for many crops and countries and play an important role in circulating planting material among farmers globally (Coomes et al. 2015). This empirical evidence is the rationale for saying that supporting these systems must be the goal of seed policy, legislation, and action. Proofs of concepts to be used as references for a global up-scaling of approaches to support farmers’ seed systems are readily available, such as the Inventory of Good Practices developed by the Expert Group on Farmers’ Rights established by the International Treaty.<sup>3</sup> Also the external evaluation of the third project cycle of the Benefit-sharing Fund of the International Treaty on Plant Genetic Resources for Food and Agriculture documents the impact of activities such as participatory plant breeding and establishing community seed banks in strengthening farmers’ seed security.

**Current/likely political support:** The proposal is closely linked to implementation of key provisions of the International Treaty as well as of the Second Global Plan of Action for Plant Genetic Resources for Food and Agriculture. There are 146 Contracting Parties to the International Treaty. The proposal involves scaling up the implementation of the International Treaty to facilitate this development in collaboration with the FAO and other relevant international institutions such as the CGIAR and Global Crop Diversity Trust. The International Treaty’s Benefit-sharing Fund is an efficient financial mechanism to support this development in collaboration with the Global Environmental Facility.

**Contexts where this is well/not well suited:** Appropriate and diverse seeds are needed wherever food is produced, in all countries in all regions. In the Global North, the approach is particularly important in support of sustainable use of seed diversity and to adopt food production to climate change, while in the Global South strengthening farmers’ seed systems is fundamental to achieving food and nutrition security.

### 3. Boost sustainable food production through solar powered irrigation in multi-stakeholder partnerships

**The Solution:** A multi-stakeholder and integrated approach to promote wide-scale adoption of small-scale solar-powered irrigation systems (SPIS) by individual farmers or farmer organisations, such as women’s agricultural groups. SPIS consist of a pump powered by photovoltaic panels that pumps (ground)water into a storage tank or directly to the field, where it feeds an irrigation system. The solution aims to improve farmers’ access to water in order to secure more stable and increased crop production while adapting to the effects of climate change. SPIS is truly a ‘nexus’ solution that includes food and energy security as well as optimised use of natural resources and thus contributes to the goals of Action Track 3 as well as those of Action Track 1.

**Source(s) of the Solution:** This is proposed by the joint international initiative Water and Energy for

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<sup>3</sup> [na906en.pdf \(fao.org\)](#)

Food ([WE4F](#)). In crafting this solution, WE4F capitalised on the lessons learned from its predecessor programme Powering Agriculture: An Energy Grand Challenge for Development and the Securing Water for Food Grand Challenge. Both programmes concluded that SPIS is a mature solution that could play an essential role in boosting food production in arid and semi-arid areas.

**Problem addressed within food systems:** In LMICs, 76.7% of the small-scale farms are located in water-scarce regions, while most of them rely on rain-fed agriculture<sup>1</sup>. These food systems are extremely vulnerable to climate change, increasing the risks of food insecurity and hunger. Furthermore, because of climate change and the growing pressure on water resources, smallholder farmers encounter more and more difficulties accessing water while conventional diesel pumps use a limited resource that emits GHG and an electricity grid is often unavailable or unreliable in rural areas in LMICs. Addressing these issues is essential for reducing hunger because agricultural production can only be sustained with access to water in sufficient quantity and quality. Access to water for smallholder farmers, especially women, who are often marginalised in terms of access to high-quality land, will allow a significant increase in productivity, crop quality. and diversification. Hence, making reliable, sustainable, and affordable irrigation technology available to smallholders contributes strongly to ensuring access to safe and nutritious food. According to a recent study, small-scale irrigation has the potential to lift more than 150 million people out of hunger and poverty at an investment cost of less than 30 USD per person<sup>4</sup>.

**How this solution will address that problem:** We expect that an increased uptake of SPIS in LMICs will lead to three key impacts: *social impacts* like improved food and nutrition security; *economic impacts* such as increased productivity, additional income, and job creation; and *environmental impacts* like more sustainable water and energy use and reduced GHG emissions. Experience has indicated that the main barriers to farmers adopting irrigation innovations are knowledge of the technology, affordability (cost effectiveness, ability to pay etc.), availability (distribution network, market, etc.), and attraction (functional value, perceived quality). Therefore, encouraging adoption of SPIS needs a market-driven approach that takes account of the availability of high-quality technology; better access to information, markets, and finance; and improved technical and business capacities. Currently, WE4F Regional Innovation Hubs (in West and East Africa) work with the private sector to accelerate irrigation innovation and transform food value chains. The Hub model could be replicated in different regions in order to: 1) disseminate required information on SPIS through informational campaigns, south-south exchanges, experience sharing, etc.; 2) train and educate farmers, their organisations, and other value chain actors on new innovations; 3) collaborate with finance institutions to develop customised finance instruments and products for smallholder farmers; and 4) provide SPIS suppliers with technical assistance (TA), investment facilitation, and business development support.

Regardless of the energy source, irrigation can pose environmental risks like groundwater depletion, overuse of surface water, and degradation of irrigated lands and the regional ecology. Therefore, it is of vital importance to manage surface water, groundwater, and irrigation systems in a sustainable fashion. In order to facilitate sustainable management and decision making, WE4F is developing an online SPIS Suitability Map in cooperation with the International Water Management Institute (IWMI) and WE4F is testing SPIS monitoring solutions together with the International Centre for Advanced Mediterranean Agronomic Studies in southern Italy.

**Solution's alignment to the 'game changing and systemic solution' criteria:**

*Impact potential at scale:* although only 6% of the agricultural land in Africa is irrigated, irrigated land produces 38% of the crop agricultural value. This indicates the possible impact of upscaling SPIS on

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<sup>4</sup> Laborde, D., Murphy, S., Parent, M., Porciello, J. & Smaller C., Ceres2030: Sustainable Solutions to End Hunger - Report, Cornell University, IFPRI and IISD, 2020.

the social, economic, and environmental fronts.

*Actionability:* SPIS has been an overarching subject ever since the beginning of WE4F precursor programmes Powering Agriculture and Securing Water for Food. Therefore, WE4F has a profound background and a very capable staff on this topic. Leading international institutions like FAO and IWMI were involved in the development of the SPIS knowledge and tools. With the institutional experience of the global initiative's partners, WE4F is well able to act and foster change with its solutions.

*Sustainability:* Irrigation empowers farmers to grow more and a wider variety of crops and grow crops with a higher market value (especially nutrient-dense fruits and vegetables), thereby increasing their income and risk-bearing capacity while making farming more attractive for future generations. Irrigation permits longer growing periods in area that currently rely on rain-fed production. With the right financing mechanisms in place, SPIS can be accessible for farmers. Payment plans can be fulfilled by approaches like "pay as you grow" while increased yield and income allow farmers to pay for repair and maintenance.

**Existing evidence:** Recent studies show that an integrated approach in the context of multistakeholder efforts is needed to sustainably modernise the food system in LMICs. Priority should be given to investing in water- and energy-efficient and climate-resilient food system solutions and supporting local, private sector-led development.<sup>5</sup> Irrigation in LMICs has the potential to increase crop yields by 100-400%<sup>6</sup>. The increasing number of suppliers of SPIS technology shows the demand for SPIS and thus the relevance of the solution.

**Current/likely political support:** This solution is promoted by WE4F, a joint international initiative of the German Federal Ministry for Economic Cooperation and Development (BMZ), the European Union (EU), the Ministry of Foreign Affairs of the Government of the Netherlands, Sweden through the Swedish International Development Cooperation Agency (Sida), and the U.S. Agency for International Development (USAID). FAO and IWMI expressed their interest to proactively support this idea and engage in associated events. Finally, the ECOWAS Centre for Renewable Energy and Energy Efficiency and WE4F are setting up a partnership to scale-up high-potential innovations in agribusiness.

**Contexts where this is well/not well suited:** The solution is particularly relevant for Africa, where the great dependence on rain-fed agriculture makes food systems extremely vulnerable to climate change and climate variability, increasing the risk of food insecurity and hunger.

#### 4. Increase Farmer Incomes, Agricultural Productivity, and Equity by Scaling up Access to Mechanisation Services

**The Solution:** Mechanisation is the deployment of technologies, processes, and procedures to improve the effectiveness and efficiency of food moving along value chains; it ranges from small solar dryers and rice threshers to tractors and high-tech drone-enabled soil testing. Mechanisation can benefit diverse stakeholders across agriculture and food systems and be key to future development and growth of smallholder agriculture. Mechanisation, as a market-demand driven service, increases financial viability and allows for full life-cycle service delivery, while generating new employment opportunities and increasing smallholders' market shares. Mechanisation can improve equality and productivity competitiveness between farmers in the industrialised world and farmers in LMICs. To raise agricultural productivity, make rural employment more attractive, and achieve future growth and poverty reduction, food systems stakeholders should embrace the technological, policy, and institutional innovation opportunities afforded by mechanisation by fostering innovative partnerships

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<sup>5</sup> Braun et al. October 12, 2020. Ending Hunger by 2030 – policy actions and costs

<sup>6</sup> FAO (1996), World Food Summit – Food for all

to pilot and scale up mechanisation and full life-cycle support for it (e.g. reliable services, cooperation arrangements) ([MaMo Panel, 2018](#)).

**Source(s) of the Solution:** Field experience, practical observations, key publications by researchers on agricultural mechanisation. Specifically, representatives from African Green Revolution Forum, Makerere University, IFPRI, and the International Rescue Committee contributed to this solution development.

**Problem addressed within food systems:** Mechanisation is emerging as critical for staple crops such as rice, maize, and wheat in Asia and especially in Africa, where food prices continue to rise despite import growth. Appropriate mechanisation can contribute to Zero Hunger by reducing the production costs of staple food, shortening value chains, and increasing local production, in turn lowering reliance on imports. It can further value addition by contributing to product differentiation (e.g., enabling milling grain of different coarseness yields different products, targeting more markets). By creating opportunities for technical, skilled jobs and increasing motivation to work in the agricultural sector, especially for the growing youth population, mechanisation contributes to diversified livelihoods and income growth. Moreover, digital and technical skills are transferable and with growing digital literacy and technical skills, training of people in STEM (science, technology, engineering, and maths) areas will become increasingly easier, growing the pool of locally skilled labour. Moreover, mechanisation has great potential to address gender inequalities through opening opportunities for women that in the past were determined by physical capacities. Mechanisation can help lower women's time and effort spend on manual tasks while simultaneously enhancing their profits. For example, the Arid Lands Resource Management project has worked with women mango farmers to maximise profits and reduce losses by facilitating access to fruit processors to process and transform surplus mangoes. The introduction of mechanisation in the processing segment has greatly improved the women's income since mango juice sells for US\$1 per litre, compared to a mere US\$0.01 for four mangoes ([MaMo Panel, 2018](#)). Globally, agricultural mechanisation can potentially reduce vulnerable employment, including that among women ([Zhou & Ma 2021](#)).

State-led mechanisation efforts across Africa in the 1950s and 1960s failed largely due to widespread governance challenges (e.g., lack of access to locally adapted tools and machinery, limited or no access to spare parts and qualified operators or technicians) and missing links to viable market opportunities. Coupled with operational inefficiencies of current owners of mechanised equipment, the result is dead capital on entrepreneurs' books. Yet, food system mechanisation is vital for ensuring timely land preparation in the face of increasing climatic uncertainty, reducing production costs where labour cost is rising, reducing on-farm losses through more efficient harvesting and post-harvest methods, and improving the welfare of the farming populations by reducing drudgery.

Presenting mechanisation as a market-demand-driven service increases its financial viability and allows for full life-cycle service delivery, while generating new employment opportunities and increasing smallholders' market-shares. Existing services range from research and technology development (e.g., CAMARTEC in Tanzania) and technology and machinery access (e.g., storage and retail services by Zambian NWK Agribusiness; rental solar tunnel dryers from Sosai Renewable Energies in Nigeria) to financial and information services for mechanisation (e.g., Moroccan Association of Importers of Agricultural Equipment and Plan Maroc Vert) ([MaMo Panel, 2018](#)).

Custom-hiring machines and other mechanisation services is one of the most promising options to make often costly machines accessible to smallholders, who constitute the core of the global food system. However, the growth of viable custom-hiring mechanisation service needs to be facilitated by addressing various challenges, including high transaction costs for matching service providers and areas needing mechanisation at a specific time as well as insufficient knowledge on machine selection and skills for machine utilisation, operations, repair, and maintenance ([Diao et al. 2020](#)).

**How this solution will address that problem:** *Theory of change:* Mechanisation as a service (rather than an end in itself), helps address the core sustainability problems of the past, while its agility allows for adaptation to different contexts and all kinds of mechanisation solutions by creating long-term, financially viable opportunities for market-creating entrepreneurs. In turn, increased demand for mechanisation services will grow the demand for skilled labour and the training of these skilled professionals.

A learning platform will be created to share experiences with using mechanisation services (e.g., Hello Tractor, TroTro Tractor, FarMart, Cold Hubs), building mechanisation training institutions (e.g., Ghana), or cross-country knowledge sharing on agricultural mechanisation (e.g., AGCO Agribusiness Qualification at Strathmore University in Kenya, the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) in Asia), and researchers (including the Malabo-Montpellier Panel) to build a knowledge and evidence base to identify successful business and partnership models and analyse how they can be scaled up.

This information will be used in co-creation hubs to be established at national, regional, and global levels (e.g., technology innovation parks, blue sky innovation hubs, food technology incubation centres, 'Dragons Den' pitches to potential funders for commercialisation) for generating and growing solutions. Hubs will offer services to support intellectual property registration and financing for scaling up and taking products to market. They could include an 'Impact Marketplace' to facilitate the matching of emerging ideas to potential funding mechanisms. They could also include mechanisms for South-South learning on mechanisation growth and for sourcing new ideas from traditional knowledge by linking them to scientific innovation support. Supporting the growth of a skilled workforce is required for effective mechanisation service provision, including machine selection, machinery design, manufacturing, operation, repair and maintenance, and utilisation, as well as the network that links service providers with farmers, including smallholders who can afford such services if accessible. Internships could assist with inspiring youth; for example, the Igbo apprenticeship system has been shown to benefit participating entrepreneurs' business outcomes.<sup>7</sup>

**Solution's alignment to the 'game changing and systemic solution' criteria:**

*Impact potential at scale (MaMo Panel, 2018):* Estimates show that a farmer using a combination of power-based mechanisation and animal power can provide food for up to 50 people, compared to just six when using draught animal power alone. In the food processing sector, machines and frugal technologies have allowed women farmers to transform their crops and, through value addition, to diversify and improve their incomes. Post-harvest operations such as peeling, chipping, grating, and drying can greatly enhance the value of the cassava crop, allowing farmers to produce fried cassava chips and starch for cooking or flour. The same applies to processing fruit, such as mango or bananas, that can be sold as dried fruits or jams. Transformed oilseeds, such as peanut or coconut, are used to produce soaps and oil, while processed rapeseed can be used as high-protein livestock and poultry feed. Other estimates indicate that around one million tons of additional milled rice (17% of current annual rice imports, worth USD 410 million) could be available in sub-Saharan Africa by halving on-farm post-harvest losses using appropriate milling machines.

*Actionability:* Several governments show interest in learning from viable mechanisation service provision models. Various enabling factors are necessary (including market opportunities, subsidies to support the acquisition of equipment, registration and protection of intellectual property (IP), a regulatory environment for business development, skills development, and innovative finance mechanisms that take into account start-up phases) before solutions can be taken to scale.

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<sup>7</sup> [Economic assessment of the Igbo entrepreneurship model for entrepreneurial development in Nigeria: Evidence from clusters in Anambra State](#)

**Sustainability:** By connecting innovation capacity with market demand, we ensure that current and future technologies and services can be sustainably and viably developed, as has been demonstrated through other innovation hubs (e.g., CCHub, iHub, as well as larger-scale innovation hubs linked to research institutions, e.g., MIT, Wageningen University, Kista Science City) around the world.

**Existing evidence:** Previous attempts to scale up the adoption of mechanisation through direct investment have not been successful. The recent emergence of multiple market-creating agribusiness start-ups across the world, focused on developing and deploying mechanisation solutions as services, indicates that more appropriate business models that make the unit price of services affordable, increase the operational lifecycle and efficiency of equipment through better maintenance, address the seasonality, availability and reliability of services, and create additional livelihood opportunities across the value chain can be pursued (see multiple examples in the [MaMo Panel report](#), page 12).

**Current/likely political support:** Various member states in Africa and Asia show interest in developing effective mechanisation service provision models. Several African governments, such as Ghana, are also interested in integrating training and skill-enhancement components into their mechanisation programmes. Interests in models utilising mechanisation services like HelloTractor and FarMart are growing across African and Asian countries, including Ethiopia, Ghana, Kenya, Nigeria, and India. Also, various countries support the emergence and growth of innovation hubs as a means of connecting multiple stakeholders to create new products and services. Similarly, various companies see the value in investments in up-skilling in order to expand their market shares (e.g., [Schneider Electric](#) and investment in solar energy solutions technicians).

**Contexts where this is well/not well suited:** This is suited for all contexts that provide sufficient entrepreneurial stability for service-business models to be operationalised and sufficient stability for farmers to make investment commitments; it is particularly well suited to countries with low and medium levels of mechanisation.

## 5. Increase the Returns to Fertiliser Subsidies for Smallholders

**The Solution:** Increasing the returns to fertiliser subsidies as an incentive for smallholder farmers to use more fertilisers

**Source(s) of the Solution:** The idea draws on public submissions to AT1 through a Google Form, experience of the leadership of AT1, and members of the action track's 'Zero Hunger Working Group.'

**Problem addressed within food systems:** Low use of fertilisers is a major constraint to increasing smallholder agricultural productivity in Africa. It is why African leaders in 2006 declared to increase average fertiliser use from 8 to 50 kilograms of nutrients per hectare by 2015 ([Abuja Declaration](#)). Most efforts to raise fertiliser use among smallholder farmers have focused on fertiliser subsidy programmes (FSPs) with hopes that they could later be withdrawn once the profitability of using inorganic fertiliser had been verified by beneficiary farmers and once they had become sufficiently capitalised to be able to afford the inorganic fertilisers on their own. The evidence shows that FSPs have not been efficient because many of the beneficiary smallholder farmers obtain very low crop response rates to the application of the subsidised inorganic fertilizers and, hence, cannot use them profitably at full market prices ([Jayne et al. 2013](#)). The main reason for the low crop response rates to inorganic fertiliser application by farmers is due to misuse from blanket application rate recommendations, as there is a lack of information on specific soil-crop-fertiliser combinations under different agronomic and soil health practices (e.g., use of organic fertilisers<sup>8</sup>) in different agroecologies ([IFPRI/MSU/IFDC/IITA Report](#)).<sup>9</sup> Without this information, especially in situations where soils are depleted of organic matter and improved germplasm is not used ([Vanlauwe et al. 2011](#), [Roobroeck et](#)

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<sup>8</sup> Use of organic fertilizers is also included in the [Abuja Declaration](#).

<sup>9</sup> Also related are uncertainties and late announcements of FSPs leading to late distribution of the subsidized fertilizers to farmers for timely application as well as diversions leading to under application in some cases ([Jayne et al. 2013](#), [IFPRI/MSU/IFDC/IITA Report](#)).

[al. 2021](#)), it is difficult to see how FSPs can demonstrate the profitability of using inorganic fertilisers at market prices to smallholder farmers.

Fertiliser subsidies remain popular with governments and politicians, and they are also costly. Between 2006 and 2011 in Malawi and Zambia for example, the governments there spent about 8% and 4% of their national agricultural GDP per year on their respective FSPs ([Jayne et al. 2013](#)).<sup>10</sup> Thus, addressing this problem so that smallholder farmers can purchase inorganic fertilisers on their own will increase what governments can make available for other higher-impact public investment. Because many smallholders depend on their yields to feed themselves and meet the caloric requirement of their families, addressing this problem is important for reducing hunger. A main concern about fertiliser subsidies is market distortion and crowding out commercial sales. But the evidence also shows that crowding out is a problem among relatively large-scale farmers who can purchase the fertilisers on their own as well as in areas of high demand for commercial fertiliser ([Jayne et al. 2013](#)). Therefore, proper targeting should be central to addressing the problem.

**How this solution will address that problem:** *Theory of change:* If smallholder farmers can be provided with and use the right types and amounts of inorganic fertilisers that are appropriate for their organic-rich soils, crops with improved germplasm, integrated soil fertility management (ISFM) practices, and local production environment in a timely manner, then they will be able obtain higher crop response rates. The value of this is likely to be greater than the market cost of the inorganic fertilizers. This will empower them to demand more fertilisers that they can purchase on their own (or require less subsidies from the government) and utilise them more profitably to meet their food needs or sell the output and use the income to purchase other food items that they may need.

*Inputs:* The framework by [Jayne et al. \(2019\)](#) shows that farm technologies (including fertilisers) and practices (integrated soil fertility and pest management—ISFPM) are likely to be used more/less intensively according to their location, characterised by population density and economic dynamism and how these factors are influencing agricultural factor (land, labour, capital) prices. In general, there is need for public support for research programmes to map the state of soil fertility (e.g., pH, organic C, N, P, K, etc.) and identify area-specific (e.g., at region, district, or community level) best practices for amending soil conditions, including specific organic and inorganic fertiliser application rates for major crops (e.g., build on [AfsIS project](#)); enhance development of the market for precision agriculture that is already underway for testing/monitoring of soil nutrients (e.g., [SoilCares](#)) and for extension services (e.g., [Precision Agriculture for Development](#)); and promote private-sector input distribution systems that make available a wider set of customisable soil enhancing products (e.g., [Fertrell](#)) and institute fertiliser quality regulation (e.g., [ECOWAS Fertilizer Quality Regulations](#)). Then, in the appropriate target areas (e.g., areas of low population density and economic stagnation with potential for capital-intensive land investments—[Jayne et al. 2019](#)), link the government FSP to relevant private-sector initiatives so that the FSP target farmers can access the customised inputs, technologies, and related services through them. For example, target farmers can be given three vouchers—the first for soil testing, the second for obtaining customised fertiliser and soil health products using the soil test results, and the third one for related extension services. This solution is not meant to fully replace FSPs but rather to complement them and make them more effective and efficient.

*Assumptions:* Farmers respond to incentives. Governments and politicians are eager to get smallholder farmers going on their own and to stop subsidising fertiliser (except for targeted subsidies to the poorest farmers as part of a broader social protection programme).

**Solution’s alignment to the ‘game changing and systemic solution’ criteria:**

*Impact potential:* Farmers in higher income settings that have higher crop yields have long been using fertilisers that are customised to their soils, crops, and farming conditions ([Funk 1982](#), [Funk and](#)

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<sup>10</sup> Shares calculated using agricultural GDP data from [WDI](#).



[Downey 1983](#)) according to detailed [fertiliser plans](#). Moreover, there are input suppliers that deliver customisable products (e.g., [Fertrell](#)). This works for large-scale farmers, but the minimum customisable amount is usually more than the total amount that a smallholder farmer may need. So, pooling smallholder farmers is critical. As indicated from the evidence from micro-dosing ([Aune et al. 2017](#)), the main change is reducing the amount, and therefore cost, of the needed nutrients to optimise their use ([Optimizing Fertilizer Recommendations in Africa](#)).

**Actionability:** Governments are already spending hefty amounts on FSPs, but they are not realising the anticipated increase in yields, food security, and poverty reduction. So, there is nothing or little for them to lose by using a portion of the FSP funds to purchase and distribute fertilisers that are more suitable for their target farmers. This is particularly actionable once linked to other AT1 solutions on precision agriculture (Wave 1) and soil health (Wave 2).

**Sustainability:** Once farmers realise the benefits of the customised inputs, technologies, and related services, they will demand more, which will create the incentive for more private-sector actors to get into the business. Poor farmers may still need subsidies.

**Existing evidence:** See evidence under impact potential.

**Current/likely political support:** Support is likely to be strong in countries with significant FSPs (e.g., Ghana, Ethiopia, Kenya, Malawi, and Zambia).

**Contexts where this is well/not well suited:** This will be suitable for smallholder farmers with growth potential but poor access to commercial fertilisers. Poor farmers without the means to purchase fertilisers may continue to need subsidies as a form of social protection. It is not well suited to farmers who can purchase the fertilisers on their own, in areas of high demand for commercial fertiliser, or for fertile soils.

## 6. Provide more affordable high-yielding varieties of staple crops for food-insecure farmers in fragile environments

**The Solution:** Providing more affordable high-yielding varieties of staple crops (millet, sorghum, teff) that food-insecure farmers in fragile environments rely on.

**Source(s) of the Solution:** The idea draws on public submissions to AT1 through a Google Form, experience of the leadership of AT1, and members of the action track's 'Zero Hunger Working Group.'

**Problem addressed within food systems:** Many smallholder farmers in fragile environments, such as the [Sahel](#) and [Horn of Africa](#), are unable to obtain adequate yields to meet the caloric requirement of their families because they do not have access to or cannot afford higher-yielding varieties of traditional crops such as sorghum, millet, and teff that they rely on for food. The global average yields of these crops (sorghum = 1.4 mt/ha, millet = 0.9 mt/ha) are much lower than those of other cereals like maize (5.5 mt/ha), rice (4.5 mt/ha), or wheat (3.3 mt/ha).<sup>11</sup> The higher global average yields of maize, rice, and wheat seem consistent with their importance in global consumption of cereals, where they together make up 94% (rice = 45%, wheat = 38%, maize = 11%) of the total global cereal consumption between 2014 and 2018 [[FAOStat \(FAO 2021\)](#)]. However, such analysis at the global level can be misleading in identifying solutions for local-level food insecurity where other crops are prevalent. In Africa, for example, sorghum, millet, and teff jointly make up 18% of the total cereal consumption. But in the Sahel and Horn of Africa, where food insecurity is also very high, these crops make up much more of the diet. In the Sahel, for example, sorghum and millet make 32% and 28% of total cereal consumption, respectively. In the Horn of Africa, teff and sorghum make up 20% and 15%

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<sup>11</sup> Averages for 2010 to 2019 based on [FAOStat \(FAO 2021\)](#).

of total cereal consumption, respectively [[FAOStat \(FAO 2021\)](#)].<sup>12</sup> Thus, it is difficult to see how global food insecurity can be solved without improving the productivity of the crops that those in the Sahel and the Horn of Africa rely on for food.<sup>13</sup>

Many of the world's food-insecure people are farmers with small farmlands (less than 0.5 acres in many cases). They will be able to grow and consume more food if they have access to higher-yielding seed varieties that are available in their communities, adapted to their environments, and that they can obtain from their neighbours, extension officers, or previous harvest. Because these traditional crops are rich sources of macro- and micro-nutrients and health-beneficial compounds (e.g., [Xiong et al. 2019 on sorghum](#), [Gull et al. 2014 on millet](#), [Baye 2014 on teff](#)), addressing the problem will be important for achieving the nutrition, diversity, and sustainability goals of food systems beyond hunger.

#### **How this solution will address that problem:**

*Theory of change:* If farmers have access to improved cultivars/seeds of the traditional crops that perform better under their local production environments, then they will be able to acquire and use them to obtain higher yields to meet their food needs.

*Inputs:* The priority-setting framework for research in the CGIAR, for example, includes several criteria comprising baseline factors (geography, agroecology, value of production, poverty, and area under production) and modifiers (alternative sources of research, strength of NARS, yield gap, nutrition, equity, sustainability, etc.), it does not determine funding targets for or resource allocation to specific centres/commodities ([Gryseels et al., 1992](#)). Thus, even though sorghum and millet, for example, are favoured when more weight is given to the modifiers, they have attracted less than 10% of the total budget on cereals. Currently, the [CGIAR commodity research portfolio](#) is dominated by rice and maize followed by livestock, wheat, and fish. So, it is critical to revisit the CGIAR priority-setting framework and resource allocation process<sup>14</sup> to increase public resources going to the traditional crops (sorghum, millet, teff) on (1) genetic improvement and seed systems on the production end of the system and (2) nutritional value and product development on the consumer demand end of the system. The project on [Harnessing Opportunities For Productivity Enhancement \(HOPE\) on sorghum and millets](#), led by ICRISAT with several partners in Africa and South Asia, is a good example to build on and take to scale.<sup>15</sup>

*Assumptions:* Farmers know their production environments and can assess profitability or suitability of different cultivars/seeds.

#### **Solution's alignment to the 'game changing and systemic solution' criteria:**

*Impact potential:* In the [HOPE project](#) for example, productivity increases for these crops are substantial: Eritrea (sorghum 60%), Ethiopia (sorghum 45%), Mali (sorghum 129%, pear millet 50%), Nigeria (sorghum 21%, pear millet 150%), and Tanzania (finger millet 17%). The large variation in productivity increases reflects differences in the production environments and especially soil health and fertility management practices; so complementary extension and farm investments in soil health will be needed.

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<sup>12</sup> The countries used in the analysis are those with relevant data in the respective subregions. These include Chad, Mali, Mauritania, Niger, and Sudan for the Sahel; and Djibouti and Ethiopia for the Horn of Africa. Teff is included in the "Cereals, other" category of the FAOStat database.

<sup>13</sup> A similar global versus Africa subregional analysis applies to other starchy crops and staples (e.g., cassava, plantains, sweet potatoes, yams, and other root crops excluding potatoes) that are important food sources in the same subregions of Africa.

<sup>14</sup> The [new OneCG strategy to 2030](#) also emphasises the various dimensions of geography, agroecology, efficiency, nutrition, poverty, equity, sustainability, etc., but is not clear how the commodity research portfolio will change.

<sup>15</sup> The [HOPE project](#) was implemented in Africa and South Asia. It released 47 cultivars of sorghum, finger millet, and pearl millet and raised productivity of the 183,421 households reached.

**Actionability:** It seems that the limited research on these crops has been focused on quality improvement rather than yield because their growers are mostly poor subsistence farmers growing them for their own food rather than for economic reasons. However, with increasing pressure (population growth, climate change) to make the most of the land and water resources available for growing food, the need to increase research on yield seems inevitable. This solution is particularly actionable when linked to other solutions on underutilised or orphan crops.

**Sustainability:** These traditional crops are already well adapted to the harsh environments under consideration. By raising their consumption demand beyond the production areas (through public-supported research on their nutritional value and product development), it will attract private-sector investment in the seed development and distribution systems.

**Existing evidence:** See evidence under impact potential.

**Current/likely political support and contexts where this is well suited:** Countries in the Sahel region, Horn of Africa, and parts of South Asia where these crops are important in the production system.

## 7. Buffer Risks faced by Livestock Keepers through Index-Based Drought Risk Financing Solutions

**The Solution:** Index-based risk financing approaches (IBRFs) have emerged as an innovative means to mitigate risks in agriculture, developed by private insurers, NGOs, and donors. IBRFs help to address covariate risk, when entire communities suffer a shock, often due to weather. IBRFs depend on area yield indexes or weather indexes. Index-based livestock insurance (IBLI), which uses a forage yield index, is one example. IBLI is a private sector-supplied financial product that provides pay-outs to vulnerable livestock keepers in dryland systems when drought occurs and forage is depleted. Pay-outs are pegged to measurements of forage conditions made via satellite data using normalised difference vegetation index (NDVI). Pay-outs to insured herders are made not when they lose their animals but rather when the forage availability in their area falls below a certain objectively measured productive threshold. The pay-outs aid pastoralists in accessing and providing essential services for their households and livestock, thus keeping them alive during severe dry conditions.

**Source(s) of the Solution:** A pilot of IBLI took place in Mongolia in 2005, under a World Bank lending operation. This programme involved a combination of self-insurance by herders, market-based insurance, and social insurance ([Mahul and Skees, 2007](#)). The approach was further developed in Kenya among pastoralists by ILRI with Cornell University and University of California at Davis ([Chantarat et al 2012](#); [Mude et al 2010](#)). It was introduced in southern Ethiopia in 2012 and now is being expanded in some post-conflict areas in Ethiopia.

**Problem addressed within food systems:** The key problem being addressed is that of vulnerability to climate shocks in arid and semi-arid lands, which leads to recurrent poverty and hunger, as well as forced displacement and societal disruption and decreased environmental resilience. Recurrent drought causes extreme poverty and hunger among livestock keepers in dryland areas as well as out-migration to urban areas; the deaths or distress sales of livestock can lead to poverty traps among affected households. Conventional livestock insurance programs are prone to fraud and face high costs of implementation. IBRF solutions enable protection of the livestock assets and consumption-smoothing during drought shocks. Over the medium to long term, livestock IBDRF reduces the need for pastoralists to maintain large herds as a buffer against losses due to droughts. Greater security of livestock assets allow herders to keep smaller and more productive herds, thus reducing the threat of overgrazing and more intensive GHG emissions.

**How this solution will address that problem:** Drought is a co-variate risk that affects most livestock keepers within a region, making community-based systems of sharing risk ineffective. The administration costs and moral hazards of conventional livestock insurance to cover individual cases of loss limit their effectiveness. Index-based insurance overcomes these issues. Because IBLI protects against the main threat of shock to pastoral communities, drought, it acts as a broad social safety net. Research (see below) has confirmed that the benefit-cost ratio of IBLI exceeds those of cash transfer programmes.

**Solution's alignment to the 'game changing and systemic solution' criteria:** This is a game-changing solution because it can have impact at a wide scale and is designed to target large populations of vulnerable households. In fact, the larger the number of participants, the more efficiently the product is delivered. It is actionable through private-public partnerships and therefore highly sustainable. In addition, donor agencies have found that subsidising IBRF programmes provide a low-cost and efficient social safety net in dryland areas, which is much more efficient than targeted cash transfers. IBRF solutions also help crowd in private-sector actors providing services that support livestock production systems, thus creating a market in these high potential but often neglected areas.

**Existing evidence:** IBLI is arguably one of the best-studied institutional innovations in the livestock sector, with multiple papers in prestigious journals. These studies have addressed the complexity of the product, the manner of its implementation, and how to facilitate understanding and uptake among pastoral communities, and over the years, resulted in a refined product, better designed outreach and improved implementation strategies. Numerous pilots and studies have been conducted on IBLI, with multiple public-private development initiatives. An impact assessment was conducted jointly by ILRI and Cornell University on the outcomes of the IBLI program in Kenya (see [Jensen et al 2015](#)). The study found strong positive impacts on subjective, economic, and health-related indicators of well-being, and the benefits are particularly strong amid drought events. Among the indicators, the marginal benefit/cost ratio of IBLI substantially exceeds that of unconditional cash transfers, such as the Kenyan Hunger Safety Net Program; these gains emerge despite IBLI's imperfect coverage of purchasers' risk exposure. Uptake of the product by livestock keepers has been significant, with more than 40% of sampled households purchasing IBLI at least once. A recent evaluation study carried out after the 2017 drought suggested that the beneficiaries were using their pay-outs mainly for purchasing feed, fodder, veterinary drugs, food for the household, and paying school fees.

**Current/likely political support:** As a demonstration of official public interest, the Kenyan government established the Kenya Livestock Insurance Program, based on IBLI, as a key social safety net. In addition, the World Bank, African Development Bank, African Risk Capacity, Intergovernmental Authority on Development, and their partners are planning a drought risk financing initiative for the Horn of Africa that will include livestock index insurance (Fava, Jensen, and Banerjee, 2020). They recognise that IBRF has now been tested, refined, and proven and is ready for scaling up on a much wider scale, with the potential to improve lives in vulnerable livestock-dependent dryland communities in Africa, South Asia, and Central Asia.

**Contexts where this is well/not well suited:** This approach is particularly suited for dryland areas with substantial livestock populations that are dependent on natural rangelands and where sources of water are seasonal and limited. It is less suited for more intensive production systems where the effects of drought can be mitigated by importing forages or water.

## 8. Support systemic food systems change in rural communities through nutrition-sensitive agricultural extension services

*Note: Multiple stakeholders have been working on developing solutions for the Summit related to nutrition-sensitive agricultural extension; this solution is a placeholder for an integrated solution from all of them, which is to be developed.*

**The Solution:** The solution aims to bring about systemic food systems change for rural communities through nutrition-sensitive agriculture services implemented by agricultural extension staff, advisors, and lead farmers ('frontline staff'). We understand nutrition-sensitive agriculture services to mean that nutrition is integrated into broader agricultural programmes that, for instance, help farmers produce more efficiently or get products to market. Thus, these programmes provide farmers with options for better nutrition while still making a living.

The Global Forum for Rural Advisory Services ([GFRAS](#)) has developed a nutrition-sensitive extension training module and other modules to teach functional skills, such as gender-sensitive extension, to frontline staff. However, training staff on nutrition-sensitive agriculture is not enough. Since extension services face challenges, the solution will simultaneously strengthen extension systems governance, management, and operations. Extension staff are a key provider of education and support to smallholder farmers but lack the tools and incentives to do so effectively. Through this solution, frontline staff will have not only the tools and knowledge but also the incentives to support rural communities to produce, process, and consume more nutritious food.

The solution will deliver nutrition-sensitive agriculture programmes through extension services supported by existing GFRAS networks and local platforms to (a) train frontline staff on nutrition-sensitive agriculture using a cadre of master trainers and (b) work with national partners to set up a system of incentives for frontline staff through certificates and recognition while working through existing extension mechanisms like demonstrations or farmer field schools.

**Source(s) of the Solution:** This solution emerged from a 10-year process by GFRAS to enhance functional capacities of extension staff and to advocate for better quality advisory services globally. GFRAS brings together a network of public, private, and civil society extension actors at the global, national, and regional levels. The national 'country forums' provide a platform for diverse actors to train, exchange information, identify capacity gaps, advocate for extension, and coordinate service provision in a country, as well as an entry point for regional and international initiatives working on rural advisory services.

**Problem addressed within food systems:** This solution will ensure sustainable access and affordability of nutritious safe foods to rural people, helping to address hunger and malnutrition, including micronutrient deficiencies.

**How this solution will address that problem:** Extension services play a critical role in addressing these challenges, as they are in close proximity to farmers and have an established infrastructure and technical knowledge to provide information on food security, food production, and food preparation and consumption (Fanzo et al., 2015; FAO, 2021; Hawkes et al. 2020). However, extension services are also challenged, being under-resourced, with insufficient incentives for staff and limitations in outreach and technical and functional capacities. In particular, many staff lack knowledge of and experience with practical applications of nutrition and crop and livestock choices and production methods that impact the nutritional value of rural communities' diets.

The solution will reduce hunger and malnutrition through transforming food systems at the community level by supporting extension systems and staff to educate farmers and community members about nutrition-sensitive agriculture. Working through the GFRAS network and training modules, thousands of staff can be equipped in dozens of countries. The GFRAS national platforms will be used to support extension systems transformation. Supporting frontline staff through training and incentives will result in better quality services that provide communities with the practical

knowledge and motivation for nutrition-sensitive agriculture, resulting in increased availability, accessibility, and affordability of nutritious foods. This will reduce hunger and malnutrition among small-scale farmers and other rural community members (its ultimate impact).

**Solution's alignment to the 'game changing and systemic solution' criteria:** This solution has potential for impact at scale because it uses the GFRAS country forums and regional networks, supported by master trainers who backstop frontline staff. Scaling up will occur by offering digital learning approaches for staff training and community engagement, where appropriate. The solution is actionable because the training materials already exist; the GFRAS network structure is in place, reaching from global level through 18 regional networks to some 50+ national extension platforms; and the modality of master trainers and country forums to back up the training is in place. Incentives for extension staff to take on additional tasks will help ensure sustainability, as will the integration of nutrition-sensitive agriculture into extension services and training. Incentives will include certificates for modules completed and community recognition (e.g., a signpost indicating their role as a community nutrition advisor). Trained advisors can provide services to programmes on nutrition-sensitive agriculture, thus generating income as a further incentive. Sustainability is also ensured through local institutional support (using the GFRAS country platforms) and technical backstopping (using the master trainers) (Kiptot and Franzel, 2020).

**Existing evidence:** New Extensionist Learning Kit modules have been used in over 35 countries, and an estimated 5,000 people have attended trainings (GFRAS, 2020; PIM, 2021). The modules have also been mainstreamed into undergraduate and postgraduate curricula at several universities worldwide (PIM, 2021). A study led by the CGIAR Research Program on Policies, Institutions, and Markets is currently underway to better document evidence on effectiveness of the learning kit.

**Current/likely political support:** Rwanda is customising New Extensionist Learning Kit modules, including the nutrition module. India, Brazil, and the European Union are possible countries/regions of interest, as are GFRAS country forums in Bangladesh, Kenya, Guinea, Colombia, Guatemala, Philippines, Indonesia, Ethiopia, Uganda, South Africa, and Malawi. FAO is very interested in this topic and supported the recent global learning needs assessment for nutrition-sensitive agriculture (FAO, 2021). The Swiss Agency for Development and Cooperation is strengthening its focus on nutrition but more broadly than extension. Moreover, GIZ has been involved with developing a similar solution for the Summit, and it is planned to integrate the two ideas.

**Contexts where this is well/not well suited:** This solution is best suited for situations where there is a local enabling environment and will work best in countries with extension systems that provide motivation, awards, and institutional support. It will initially focus on countries where GFRAS has strong national platforms to undergird the work.

## 9. Launch a Coalition for Youth in African Agriculture

**The Solution:** A Coalition for Youth in African Agriculture that will convene youth-led and youth-serving networks, associations and organisations, coordinate youth action, eliminate fragmentation, build talent in the sector, amplify youth efforts, and accelerate their work on the continent.

**Source(s) of the Solution:** The solution was generated through reports like CERES2030, which showed that up to double the current size of public and donor investment will be required until 2030 to prevent 490 million people from experiencing hunger, double the incomes of 545 million food producers and their families, and limit GHG emissions in the agriculture sector. The CERES2030 Report also summarises that for the required funds to be effectively channelled for meaningful impact, it is more effective to create integrated portfolios of interventions rather than seek improvements in isolation from one another. Given that 80% of Africa's food consumption is marketed and handled

mostly through private operations, driven mainly by the youth, it becomes imperative that there is coordination and aggregation of the various youth initiatives across the continent.

**Problem addressed within food systems:** Currently representing the largest demographic group on the continent, youth hold the key to transforming the African food system. Despite their fundamental role in producing, processing, and distributing food on the continent, young people struggle to raise funding and access critical resources and opportunities to scale their interventions and truly transform the food systems. This is largely because many such youth interventions are micro, small, and medium enterprises, associations, and organisations that are both informal and fragmented. The small size and fragmented nature of the youth interventions increases the transaction costs and risk for potential investors who find it difficult to implement solutions and provide meaningful support across the silos.

However, the continent is awash with examples of young scholars, entrepreneurs, and professionals developing innovative and unconventional ideas, approaches, and initiatives that are transforming how the continent produces, adds value, stores, sells, and consumes food. In the same vein, there are bodies of youth associations that have emerged in the landscape to provide support to these various youth interventions. Leveraging their power of convention and local, national, and regional networks and knowledge, youth associations connect with the various youth categories in ways that other organisations cannot. The Coalition will convene and coordinate youth actions and foster the proliferation of youth-led innovations and solutions in the food system, critical to driving hunger reduction and increasing the flow of nutritious foods to low-income populations.

**How this solution will address that problem:** A Coalition for Youth in African Agriculture will eliminate fragmentation in the ecosystem, thereby reducing the transactions costs and risks for potential investors. The aggregation of the various youth interventions through youth-serving and youth-focused organisations will provide a centralised one-stop hub that lays out investible opportunities for investors and stakeholders to sustainably engage. Thus, the Coalition will generate visible investment areas and impactful propositions for these investors through a series of interconnected activities. The Coalition will engage in a range of services (outputs) to support youth in agriculture across Africa, including attracting investment, advocacy, knowledge transfer, and capacity building and strengthening.

Through the Coalition, increased investment in the food system can be realised. Further expected outcomes include increased production and distribution of nutritious foods across the continent; development of a sustainable talent pipeline for the sector; increased income and resilient livelihoods for smallholders and SMEs; and an increase in innovation in and adoption of technology in agriculture.

**Solution's alignment to the 'game changing and systemic solution' criteria: Impact at scale:** The Coalition provides a unique alliance that will drive impact at scale through aggregation. The Coalition will represent a conveyor belt that identifies, develops, supports, and engages youth across all categories vertically (including i) rural youth, ii) young people in academic and vocational training, iii) young professionals, and iv) innovative start-ups and SMEs) and horizontally across all geographical areas and key value chains on the continent. As such, the Coalition will create the required integrated portfolio of interventions that reduce transaction costs and risks for investors while ensuring that impact can be adequately tracked and measured.

**Actionability:** Due to the vertical and horizontal approach of the Coalition, multiple country actions are possible. Donors, investors, and other stakeholders will be able to find and support more interventions across multiple areas.

**Sustainability:** The Coalition is uniquely positioned to effectively deliver on its mandate over the long-term. By engaging youth across all ages and geographies, the Coalition will ensure the availability of a reliable talent pool, food systems solutions, and investment pipeline, thereby future-proofing African food systems beyond 2030. In the short to medium term, the Coalition will require a blend of public

and private financing and technical support from the respective country governments and development partners to set up activities and raise its profile. In the long term, the Coalition will be sustained through annual membership fees from member organisations, programme implementation, and fundraising efforts.

**Existing evidence:** The CERES2030 Report provides evidence that investing in youth in agriculture is critical to transforming food systems in Africa. Also, the African Green Revolution Forum in September 2020 brought together youth groups at its Summit to deliberate on youth solutions; however, follow up was difficult due to the considerable fragmentation in the landscape – again, alluding to the need for coordination. In March 2021, Nourishing Africa partnered with the African Green Revolution Forum to engage various youth-led and youth-serving networks in agriculture in a virtual roundtable discussion to examine the potential of a Coalition as a solution to shared challenges. The roundtable participants, consisting of 15 youth organisations across three African regions, unanimously agreed that a Pan-African Coalition is critical to coordinating actions and developing investible solutions for stakeholder engagement and support.

**Current/likely political support:** It is expected that the Coalition will draw support from national and regional governments across Africa, in whose interest it is to drive youth engagement in agriculture on the continent. The Coalition will also rely on support and anchorage with relevant pan-African or regional organisations, including the African Union, the African Development Bank, the Africa Green Revolution Forum, the Economic Community of West African States, the East African Community, and the Southern Africa Development Community.

**Contexts where this is well/not well suited:** The Coalition will have a national and regional focus on Africa and is particularly suited for youth in Africa's food and agriculture sector.

## 10. Leverage women's tenure security in collectively held lands for equitable and sustainable food systems

*Note: additional background information for this idea and the following one can be found in Annex 1.*

**The Solution:** Women's tenure security in collectively held lands as a lever for equitable and sustainable food systems.

**Source(s) of the Solution:** This solution (and Solution 11) was contributed by representatives from government, civil society and research institutes from across the globe, including (but not limited to) LANDac/Netherlands Land Academy and Utrecht University (Mr. Guus van Westen), the Dutch governments' LAND-at-scale programme (Ms. Gemma Betsema), the World Resources Institute (Ms. Celine Salcedo-La Vina), Espaço Feminista, and their numerous partners across the world. The proposed solutions build on years of research and practice in the field of strengthening women's land and property rights and the various linkages to food and nutrition security, as captured in case studies combining policy, literature review, and fieldwork.

**Problem addressed within food systems:** Despite the crucial role of women as guardians of household food security, in many collective communities, women lack secure access and rights to land and productive resources. Of the total global population of agricultural landowners only 14% are women, and that number is dramatically lower across Africa and East Asia (UN Women 2020). An analysis of 80 legally established community-based tenure regimes in Asia, Africa, and Latin America found that less than a third explicitly extend community membership rights to women (RRI 2017).



Advocacy for women's land rights is rooted in significant evidence of the benefits. Studies have shown a direct correlation between secure land rights for women and improvements in household food security. When women own a larger share of household farmland, families allocate a larger portion of their household budget to food (Doss 2006). Children whose mothers have secure land rights are up to 33% less likely to be severely underweight (Allendorf 2007) and up to 10% less likely to be sick and absent from school (Menon et al 2014). Secure land rights also enhance women's status in their household and community and empower them to participate more effectively in community assemblies and hold positions in community governance bodies. Women's participation in decision-making is fundamental to their contribution to food security.

**How this solution will address that problem:** Case studies of five collective communities conducted by the World Resources Institute and Resource Equity show that where women possess tenure security in collectively held lands, two sets of enabling conditions are present. The first is the formal recognition of women's tenure rights under the rules governing collective land rights, while the second is the mix of interventions on the ground by external and internal actors that catalyse rights in practice. Formal recognition confers legitimacy and allows women to claim rights, while operational interventions, particularly interventions to economically and socially empower women, pave the way to the exercise of rights in practice.

#### *1. Formal Recognition of women's tenure rights*

In the case studies reviewed, the rules that legitimised rights for women are laws that recognise rights or devolve control over communal lands to the community and at the same time explicitly mandate gender inclusion. The recognition of communal land rights accorded women, as members of the community together with men, legal protection against outsiders. The gender mandate allowed women to overcome customary tenure systems that accorded them only secondary tenure rights or no rights at all, ushering in land rights for women in their individual capacity. For example, in Cameroon, the 1994 Forestry Law recognised community forestry and the 2009 Community Forestry Manual mandated women's inclusion and representation in the community forest association; these entitled women in the case study community to be formal members or rights holders as individuals, either representing the household together with the husband or in their own capacity as female household heads. The inclusion of women as members in their own right enabled them to participate in decision-making regarding the use and management of the community forest (e.g., what to plant), as well as decisions on what community projects to prioritise with the income earned from the sale of forest products and how to allocate the income distributed to household members. Among other uses, the women voted to install potable water wells and solar panels in the community, supplying clean water and energy, both of which are critical inputs to food safety and security and would otherwise be hard for them to acquire individually. As full-fledged members, they are also entitled to decide with their husbands how to spend the income distributed to households. Among others, women acquired homewares and cooking implements that contribute to food safety and help ease their domestic burdens. The women also received training on agricultural practices and marketing that otherwise would not have been available to them.

#### *2. Interventions that catalyse rights on the ground*

*Economic interventions:* Research shows that the establishment of women's collective enterprises helps empower women to exercise land tenure rights granted under formal laws or rules. The creation of livelihoods and independent income for women increases their skills and personal endowments, in turn leading to greater self-confidence and the capacity to claim greater access to household and community resources and decision-making arenas (see Mello 2014; Schmink and Gómez-García 2015). Women's collective enterprises created as part of natural resource management interventions also

demonstrate recognition of women as predominant users of natural resources in most rural communities and the important role they play in their day-to-day management (New Course 2010). For example, in the Nepal case study, a donor-funded collective enterprise established for female members of the community forest user group—the processing and marketing of a fruit native to the communal forest—expanded livelihood opportunities for women. As the business took off, the men asked to join, eventually making it a community-wide enterprise and the principal income-generating activity in the community. Women and men benefit both individually, through livelihoods and wage income for those who participate and provide labour, and collectively, in terms of community development projects funded through the profits earned. Among the projects funded is piped water to all member households, easing women’s burden of daily water collection and contributing to food safety. Community members also derive environmental benefits from improved forest conditions, including increased tree cover as they planted more trees in the communal forest and on their household plots. Increased income from the community enterprise and improved forest conditions contribute to food security in the community.

*Social interventions:* The case studies also demonstrate that social interventions such as gender sensitisation and capacity-building initiatives help overcome discriminatory customary norms that may hinder women from exercising their land tenure rights under new or existing rules (Agarwal 2001; Flintan 2008). For example, in Jordan, a government and donor-led initiative granted four pastoral tribal communities exclusive land rights to restore degraded pastures using the hima system, a traditional rangeland management system. The initiative required the four communities to manage the hima through a pasture association. Traditionally, women are excluded from pasture associations because of cultural norms barring them from working outside the home. While women are traditionally responsible for grazing livestock, it is considered part of household duties and therefore not work outside the home. Men make the decisions on buying and selling animals and animal products.

A national women’s NGO proposed to the donor an initiative to raise awareness about the benefit of including women in pasture management under the hima system. Their main message was that women knew much about the land given their day-to-day use of it in grazing livestock and collecting natural resources like herbs. Therefore, their skills and knowledge were crucial for improving community livelihoods and reviving degraded pastureland. The NGO employed a culturally sensitive approach, deliberately avoiding connecting the discussion to religion or political rights, knowing it would threaten men and close the doors to change. After a year of gender sensitisation, coupled with the NGO-organised women’s collective enterprise — herbal tea production and marketing, which allowed women to contribute financially to the household and community — attitudes of men and women alike shifted. Men recognised women as legitimate stakeholders in the hima, and the women acquired abilities and confidence to become members of the pasture association and its executive committee. As members of the association, women’s first-hand knowledge of pasture management has helped regenerate vegetation on the land. As in Nepal, the increased income from the women’s collective enterprise and the improved pasture conditions contribute to food security in the community. Moreover, the women gained the ability to organise around other issues of importance to them and effect changes, something they were unable to do before the project. For example, the women successfully organised a council for children’s education.

**Solution’s alignment to the ‘game changing and systemic solution’ criteria:**

*Impact potential at scale:* Addressing women’s tenure security reaches a vast target population of poor people, if not the majority, and the impact on food and nutrition security among needy people is amplified because of the effect on children, as well. The inclusive nature of collective rights

promotes impact among a large population: around 2.5 billion people, of which more than half are women.

**Actionability:** The widespread acceptance of collective tenure arrangements, rooted as they are in customary institutions, enhances the opportunity for implementing these reforms. Moreover, current fit-for-purpose land administration approaches also increasingly depart from the existence of collective tenure.

**Sustainability:** Social sustainability can be derived from the rooted nature of customary arrangements as well as the inherent spread of benefits. Collective tenure arrangements, given proper conditions, aim at preserving natural resources on which the community depends.

**Existing evidence:** See the report *On Equal Ground: Promising Practices for Realizing Women's Rights in Collectively Held Lands*, which is based on case studies of five diverse indigenous and customary communities in five countries that have all secured women's rights to communal lands and resources. In all five communities, laws and policies granted women rights, and livelihoods and social interventions enabled women to realise them.

**Current/likely political support:** There is broad support for securing women's land rights. The SDGs recognise women's land rights as essential components for achieving the goal of gender equality (Goal 5, Target 5A) and a crucial element of the goals of ending poverty and hunger, attaining food security, and promoting sustainable agriculture (Goal 1, Target 1.4; Goal 2, Target 2.3). Other key international instruments include the Voluntary Guidelines on the Responsible Tenure of Land, Fisheries, and Forests, which designate gender equality as one of 10 essential implementation principles for the responsible and equitable governance of land tenure. Most countries have enshrined gender equality in their constitution, and many have elaborated this to specify land and property rights in legislation.

**Contexts where this is well/not well suited:** This solution is suited for collectively held lands, such as Indigenous Peoples' lands and customary communities in rural geographies.

## 11. Vernacularise women's land rights

**The Solution:** One concrete way to improve food security in the Global South is related to secure women's access, ownership, and control over land and natural resources, generally referred to as women's land rights. We propose to make **the vernacularisation of women's land rights** an explicit part of the global and national agenda to secure women's land rights. Local agents (such as NGOs, civil society organizations and grassroots movements) should be systematically supported in advancing the cause for women's land rights by making legal frameworks understandable, accessible, and applicable in the local contexts where they are (to be) implemented, and vice versa, by putting local realities onto national and international agendas.

**Source(s) of the Solution:** The concrete suggestions for this solution, build upon Women's Land Rights in Africa (WLRA; 2017-2018), an action research programme in which women, NGOs working at the grassroots level (including GROOTS Kenya, ActionAid Kenya, ADECRU, Forum Mulher, Oxfam in Malawi, and Enda Pronat in Senegal), and the Netherlands Land Academy (LANDac) co-produced knowledge (see the synthesis report of this programme: *Securing Women's Land Rights in Africa*). The concrete reflections on vernacularisation are worked out in a paper: *The Land is ours: grassroots organisations' strategies in securing women's access, control and rights to land in rural communities in Kenya, Mozambique, Senegal and Malawi*, submitted for a special issue on women's communal land rights in the open-access journal *Frontiers in Sustainable Food Systems*.

**Problem addressed within food systems:** Secure and equal access, ownership, and control for women and men is key for food security in the Global South. Secure rights have a substantial impact on the ability and willingness of farmers to make investments and adopt productivity-enhancing inputs. Secure land rights also provide households with enhanced food security and the ability to produce for local, regional, and global markets. From this perspective, secure women's land rights have clear development benefits to women, their households, and their communities. Over the past decades, positive changes in international spheres and national constitutions and legislation have been made. However, progressive legal frameworks and international initiatives and programmes that aim to empower women in securing their land rights are often top-down and do not result in intended outcomes as long as they are not combined with translating, implementing, and monitoring processes on women's land rights at and from the grassroots.

**How this solution will address that problem:** Concrete vernacularisation activities that translate women's land rights into grassroots languages are an effective strategy to increase decision-making power for women when it comes to land and natural resources. It can strengthen knowledge, improve the realisation of women's land rights on the ground, and keep track of women's land rights. Local actors play a role in shaping, fine-tuning, and articulating national land laws according to their specific realities. Through the organisation of concrete activities (e.g., community workshops, radio broadcasts, national conferences, community-led mapping exercises, they provide a space for local stakeholders, including grassroots organisations, rural women and men, and (traditional) authorities to learn and interact on the subject of women's land rights. These spaces allow for the identification of challenges and misconceptions on women's land rights and land reforms, some of which may be solved, while others will be translated back into (national and international) policy spaces. This reverse process of translation could be further encouraged by further connecting women at local, regional national, and international levels. Regional and country exchanges between grassroots organisations and other type of community exchange visits are of major value. Further support for these concrete activities will further improve the vernacularisation process.

**Solution's alignment to the 'game changing and systemic solution' criteria:**

*Impact potential at scale:* Bridging the gap between macro-level (national) institutions and legislation and locally lived realities and practices can contribute to consistency and effectiveness of policy.

*Actionability:* Women's land rights are widely supported among authorities, civil society, and in communities. Interventions on the ground, however, tend to be limited to a project approach, which makes their promotion piecemeal. By bridging the gap between the overall (national) legislative framework and local practices, efforts can be scaled up considerably and gain more impact.

*Sustainability:* Secure land tenure enhances people's motivation to preserve the quality of the natural resource base. More equitable distribution of land rights promotes inclusiveness and social cohesion within the community.

**Existing evidence:** During the WLRA programme, the organisation of activities with and in local communities in Sub-Saharan Africa proved effective to realise the vernacularisation of women's land rights. This can be illustrated by a concrete case from Kenya. In a community workshop, a discussion between representatives from the national Ministry of Lands and Physical Planning and the Laikipia group ranch members made clear that land issues related to divorce and widowhood were not effectively addressed in the Community Land Act of 2016. Divorced women explained how they were removed from community land registers where they were married, while at the same time are not included in community land registers in the communities of their birth. Based on this discussion, the

ministry representatives realised that the Community Land Act was underdeveloped and that further amendments were needed to protect women in these kinds of situations.

**Current/likely political support:** Secure women's land rights are high on the global agenda on sustainable development, and gender equality and local organisations are already supported in achieving these goals. This support is, however, very project-based and focused on short-term outcomes. This idea calls for a more coordinated effort to acknowledge local organisations' mediating role in the action arena of women's land rights. More structural and long-term support and evaluation of their work will further encourage the change that is already envisioned in the reviewed legal frameworks on land and other natural resources.

**Contexts where this is well/not well suited:** We suggest focusing on rural communities in sub-Saharan Africa. These solutions have been piloted in rural communities in Sub-Saharan Africa and fit well that context, especially if the overall aim is to contribute to food security, and in these contexts the issue of implementation of progressive women's land laws is often at the fore.

## 12. Set poverty lines and safety nets to support affordability of healthy diets

**The Solution:** To make healthy diets affordable in each country, national governments and development agencies can use data on the cost of healthy diets and meal preparation to adjust poverty lines and eligibility for safety-net assistance, accompanied by investments to ensure that needy households can acquire enough foods to meet global dietary standards. Safety nets designed around access to a healthy diet can be the foundation for social inclusion and sustainable food systems, moving rapidly towards food security for all.

**Source(s) of the Solution:** Our focus on poverty lines and safety nets designed for nutrition security emerged from 'true cost of food' analysis conducted by Science Group. This analysis of nutritional safety nets builds on past research using market prices to calculate diet costs and affordability. We reviewed recent findings on the cost of growing or buying locally available foods needed to meet international standards for food security and nutrition. This is a first step towards extending previous work published in [SOFI \(2020\)](#) and elsewhere, which showed that improving agricultural production and supply chain performance can increase access to more diverse food sources and lower market prices to some degree, but not enough to bring an overall healthy diet within reach for all people, at all times. To extend that earlier work, we investigated how hidden costs of meal preparation affect affordability, comparing the lowest-cost items in each country that could be used to prepare a basic meal from raw ingredients, versus use of precooked items such as bread instead of raw forms of starchy staples, and use of canned beans, tomatoes, or fish instead of dry pulses, fresh tomatoes, and fresh or dried and salted fish. More detail can be found in the Scientific Group Policy Brief "Cost and affordability of preparing a basic meal around the world." The result is a step towards more comprehensive analysis of the cost of nutritious diets, for the purpose of guiding food system interventions.

Recent improvements in data collection and analysis allow rapid identification of the most affordable locally available foods to meet dietary needs at each time and place. This in turn, allows agencies to target and deliver cost-effective nutrition assistance tailored to local needs. Scaling up nutritional safety nets implies use of food-based poverty lines to set related programme design parameters, using market prices for the most affordable, healthy, and sustainable foods to determine benefit amounts for each demographic group and delivering through locally adapted instruments including cash, vouchers, and in-kind assistance.

**Problem addressed within food systems:** The international poverty line of \$1.90/day is insufficient to reach even the lowest-cost items needed for a healthy diet. Using new data on consumer prices in 168 countries, around 3 billion people currently cannot buy or grow sufficient foods for lifelong health and physical activity (SOFI 2020). Food system investments to improve production and access to more diverse markets can expand access to some degree, but even at the lowest prices, many households are unable to reach minimally adequate standards of diet quality. Making basic meals affordable can be the foundation for social inclusion and safety nets. Clear, evidence-based poverty lines can be used to target and deliver aid in locally appropriate ways, from the World Food Programme's (WFP's) work in the world's poorest places to Supplemental Nutrition Assistance Program (SNAP) electronic benefit transfer cards in the United States.

**How this solution will address that problem:**<sup>16</sup> Using local food retail prices and dietary guidelines, governments can examine food poverty thresholds. These thresholds can help understand if benefit amounts allow purchasing healthy diets, and if consumption behaviour, supply constraints, or other issues would need attention in order to make interventions effective. Nutrition assistance can then be delivered through locally adapted instruments such as cash, voucher, and in-kind assistance.

**Solution's alignment to the 'game changing and systemic solution' criteria:** Targeting and delivery of social safety nets based on healthy diets are a game-changer because they recognise the universality of dietary needs, along with the location-specificity of how those needs are met at each place and time. This solution uses data and targeting technology to deliver on the fundamental promise of a healthy diet for all people at all times. Because all food groups are represented in the healthy diet, using safety nets to ensure access brings together all agriculture and food stakeholders around the common goal of creating a sustainable, inclusive food system.

**Existing evidence:** Many countries already collect sufficient food price monitoring data to estimate the cost of a healthy diet annually or monthly. Some countries already use thresholds based on diet cost to determine benefit amounts for assistance programs. For example, Myanmar uses a food poverty line that is determined from caloric needs and local food consumption surveys (Herforth et al 2020). Extending this to an overall healthy diet is increasingly feasible in LMICs, and is practiced in higher-income countries. In the United States, for example, households in need receive SNAP benefit amounts that are targeted based on the retail cost of a basket of foods that meets nutritional requirements and dietary guidelines, after accounting for the cost of housing and other unavoidable expenses.

**Current/likely political support:** Governments are rapidly transitioning towards safety nets that use a combination of cash, vouchers, and in-kind support, harnessing new data sources and modern technology to target aid for market purchases of goods and services required for a healthy life. Using food-based safety nets to make healthy diets affordable for all is politically attractive because it is a universal principle to be implemented in diverse, locally adapted ways. It enlists the private sector as food suppliers, targets public investment towards the most cost-effective actions, and ensures that aid is targeted to the basic needs from which people graduate as they rise out of poverty.

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<sup>16</sup> Of note, being able to afford sufficient food is necessary but not sufficient for people to actually consume a healthy diet. For success, food-based poverty lines and safety nets should be complemented by efforts to improve the food environment as described in other game-changers – and those improvements are unlikely to succeed unless households can afford to grow or buy the healthy diets that may become available at each time and place. Consumption behaviour is another important consideration. Especially those who live on a limited budget and constantly prioritise between competing essential needs might not allocate the necessary budget share to a healthy diet – even if they can afford it. Behavioural change campaigns and improving food literacy can thus be crucial elements to the success of food-based poverty lines. Moreover, we cannot consider affordability of healthy diets in isolation. Food and nutrition security hinges on meeting other essential needs such as being healthy and having access to adequate hygiene and sanitation. Therefore, we need to look beyond expenditures for healthy diets when designing safety nets or setting of eligibility thresholds – even if the primary objective is a healthy dietary outcome.

**Contexts where this is well/not well suited:** In the lowest-income countries, food-based safety nets (like other public services) will require some expansion and refocusing of current external assistance but are logistically feasible as long as targeting and delivery are adapted to local conditions. The approach is most valuable in middle-income countries, where the fraction of people who cannot afford a healthy diet is small enough for government budgets to support targeted aid. Some high-income countries provide sufficiently high levels of social support that all households are already able to afford a healthy diet, but in many wealthier countries like the United States, food-based assistance remains one of the principal instruments used for resilience against economic downturns, helping households at times and places where incomes fall below the levels needed to afford a healthy diet.

### 13. 'Reset' wasting prevention and treatment to catalyse action and accountability

**The solution:** This solution aims to coalesce and clearly communicate the dialogue around what is required to reduce global wasting incidence and prevalence. A child may be born wasted or become wasted due to inadequate dietary intake and/or infection. Wasting is associated with a significantly elevated risk of mortality yet is one of the most ignored nutrition problems globally. With 45.4 million children under five years of age currently suffering from wasting ([WBG 2021](#)), a number that has only minimally declined over the past decade, the time has come for a 'reset'.

It is hoped that discussions initiated at the FSS will lead to the announcement of a 'reset' of childhood wasting prevention and treatment at the Nutrition for Growth (N4G) Summit in December, to catalyse global action and accountability in the 2022-2030 period. Underpinning this reset will be a manifesto and action plan, developed through a high-level roundtable meeting. A maximum of 30 people, comprised of high-level representatives from government, UN, academia, and NGOs will liaise with working groups (see below) to establish consensus-driven solutions that are realistic actions that national governments can take in order to significantly reduce wasting by 2030. This solution will enable wasting to be elevated from technical domains to higher political levels, and from a medicalised problem to a food systems concern.

**Source of the solution:** The inspiration for this solution evolved from an informal civil society alliance. This alliance has had input from UN agencies, members of the [No Wasted Lives coalition](#), members of the [Global Nutrition Cluster Technical Alliance](#), members and observers of the WHO guideline development group on the prevention and treatment of wasting in infants and children, global and regional wasting advocacy groups, and the AT1 Leadership Team. This group of stakeholders is united by the understanding that wasting is the 'tip of the iceberg' of global hunger and that it is increasingly urgent to reset the dial on action on, and accountability for, wasting prevention and treatment.

**Problem addressed within food systems:** The estimated 45.4 million wasted children under five years of age is likely an underestimate, given that new cases occur throughout the year; when all new cases are accounted for, the number of wasted children triples ([Isanaka et al, 2016](#)). High levels of wasting are seen in both fragile and stable contexts, with the burden most keenly felt in African and South Asian countries ([WBG 2021](#)). Most countries are not on course to meet SDG nutrition targets ([GNR, 2020](#)). Further challenges lie ahead, including anticipated increases in wasting and other forms of undernutrition due to the effects of climate change ([WFP, 2018](#)) and the COVID-19 pandemic ([Robertson et al, 2020](#)). The need for radically improved prevention and treatment efforts at scale is critical, as emphasised by the UN Global Action Plan on Child Wasting ([UNICEF et al, 2020](#)). The bedrock for effective nutrition programming is a conducive financial and policy environment, driven by strong political will and established within food systems that operate to prevent undernutrition.

**How this solution will address that problem:** The solution involves a reset of thinking, funding, and practice, discussed at the FSS and followed by the launch of a manifesto for combating wasting at the

N4G Summit, in order to reach SDG 2 (Zero Hunger) by 2030. To realise this vision, a set of actions will need to be put in motion simultaneously as the basis for a new global commitment to ending wasting. Numerous blockages are preventing wasting prevention and treatment from scaling up to the required levels, despite the various groups, initiatives, and agencies trying to generate momentum. More of the same is not going to be enough; course corrections need to be identified through re-examination of what has been successful (identifying exemplars) and what obstacles remain.

The six domains through which actions will be articulated are:

1. **Prevention:** How food systems can be better oriented to the prevention of wasting through diverse, equitable, sustainable diets that increase resilience to wasting; how prevention of wasting in women and children can be best advocated for and how approaches to tackling wasting can build on and be harmonised with the substantial global efforts on stunting prevention. Best practices from country exemplars (e.g. Pakistan, Malawi) will be summarised and disseminated, and lessons incorporated from important initiatives such as [‘No Time to Waste’](#) and the Emergency Nutrition Network ([ENN](#)).
2. **Financing:** How scaled-up wasting prevention and treatment can be sustainably financed through the identification of realistic costs, financial targets, and commitments. This will build on initiatives led by Results for Development ([R4D](#)), the Global Nutrition Cluster ([GNC](#)), and the Scaling Up Nutrition ([SUN](#)) movement.
3. **Advocacy:** Improving cross-sectoral coordination and advocacy efforts for wasting and tools to support this. This will draw on work spearheaded by the International Rescue Committee ([IRC](#)) and the SUN movement.
4. **Technical programming:** Considerations about what is required to scale up wasting treatment, harnessing the momentum from the UN Global Action Plan on Child Wasting ([GAP](#)), outputs of a recent [international conference](#) on wasting scale-up, ENN’s [report](#) on scale-up of severe wasting management within the health system, the SUN Movement Community of Practice 2 (social mobilisation, advocacy, and communication for scaling up nutrition), and GNC recommendations.
5. **Policies and guidelines:** Ensuring evidence is acquired and translated into guidelines in a timely, transparent, and accessible manner, including clear implementation guidance. This requires active contribution to the WHO guideline development group on wasting prevention and treatment and a focus on how the UN GAP will be taken up and effectively implemented.
6. **Products:** How costs for products used to treat wasting (ready-to-use therapeutic foods; RUTF, ready-to-use supplementary foods; RUSFs) can be reduced, how their regulation can be streamlined, how local production of RUTF and RUSF can be encouraged, and how supply chains made more reliable. This builds on a [scoping study](#) led by ENN and a [project](#) by R4D on increasing access to RUTF.

**Solution’s alignment to the ‘game changing and systemic solution’ criteria:** The solutions to wasting must be embedded in AT1 (hunger), AT2 (safe nutritious foods for all consumers), and AT5 (resilience). All action plans arising from the WGs will be carefully reviewed by government, academic, and practitioner representatives to ensure that targets and actions are realistic, sustainable, and have the ability to be delivered at scale. Translating what is known in technical circles into actionable political steps is the key driver of this solution.

**Existing evidence:** Cost-benefit analyses looking at the critical impact of improved management of wasting have highlighted the vital importance of focusing on this solution, such as the *Lancet* 2013 Maternal and Child Nutrition Series ([Bhutta et al. 2013](#)), the World Bank estimates on ‘Scaling Up Nutrition: What Will it Cost?’ ([Horton et al. 2010](#)), and Save the Children’s report on the cost-efficiency and cost-effectiveness of the management of wasting in children ([Save the Children et al. 2020](#)). Wasting and stunting co-exist and are causally related ([Wells et al. 2019](#)), hence strategies to reduce



child wasting will also improve stunting. Low birthweight infants are more likely to be born wasted and/or stunted ([Mwangome M, et al, 2019](#)). There is a wealth of literature on the grave economic costs associated with childhood stunting and the resulting rationale for investing in improved nutrition (e.g., [McGovern et al. 2017](#); [Hoddinott et al. 2013](#)).

**Current/likely political support:** There is considerable international interest and investment in reducing wasting as well as strong support from national governments, especially from countries with high burdens of wasting. This is exemplified by the UN agencies launching a Framework for Action for the UN Global Action Plan on Child Wasting ('GAP Framework') in 2020. The launch aimed to galvanise a coalition of partners to work closely with national governments with the ultimate goal of reducing the global burden of child wasting. Currently 23 GAP frontrunner countries across the regions of Africa, the Middle East, and Asia and Pacific have committed to implement the 'GAP Operational Roadmaps,' which are more detailed action plans to achieving the overall GAP Framework.

**Contexts for which this is well suited:** Countries experiencing a high burden of undernutrition; highly relevant also for many fragile and conflict-affected states.

## Potential Solutions for Increasing Access to Nutritious Foods

### 14. Improve young children's diets through a systematic analysis and a systems approach

**The Solution:** Countries need to design programmes to improve the diets of young children based on a systematic analysis of the determinants and drivers of young children's diets, to deliver an essential package of interventions through the food, health, and social protection systems. This solution aims to propose an effective approach to achieve that goal.

**Source(s) of the Solution:** Proposed by UNICEF (with the support of Micronutrient Forum and GIZ).

**Problem addressed within food systems:** The poor quality of young children's diets is a critical determinant of malnutrition in all its forms. Globally, barely one in four children is eating the nutritious and diverse diets required to grow, develop, and learn to their full potential. Yet, efforts to deliver interventions to improve young children's diets are scattered, siloed, and often not grounded in sound situation analyses. Interventions to improve young children's diets are primarily delivered through health systems. However, improving young children's diets requires leveraging the three key systems – food, health, and social protection – with the potential to address the barriers to the three main determinants of young children's diets: food, services, and practices.

While it is increasingly understood that food systems play a central role in providing nutritious, safe, affordable, and sustainable diets for young children, their role in improving young children's diets is often not assessed as part of country situation analysis. Moreover, the situation analysis often does not dig deeper to understand the drivers of poor diets among children. As a result, the actions that are implemented do not address the context-specific drivers of children's diets. In the case of food systems, the actions delivered are often not child-centred and, in most contexts, do not support food systems in guiding caregivers of young children towards healthy diets. An approach that is focused on evidence-based, context-specific interventions for young children delivered across the relevant systems – food, health, and social protection – in a coordinated manner is critical for accelerating progress on young children's diets at scale and with equity and ultimately ensuring children's right to good nutrition.

**How this solution will address that problem:** If a country undertakes a systematic analysis of barriers across all the three determinants of young children’s diets (food, services, and practices) using the approach proposed, their priority actions to improve young children’s diets will address the context-specific barriers to healthy diets. These priority actions will likely be required to be delivered through one or more systems (food, health, and social protection) with coordinated action by several actors. This, in turn, will lead to programming for young children that is child-centred and addresses the critical issues causing poor quality of children’s diets. Delivery of evidence-based priority actions through the food system and its supportive systems—health and social protection—will also lead to improved coverage of essential interventions for improving young children’s diets.

To facilitate the roll-out of this systematic and systems approach to improving young children’s diets, UNICEF has developed an action framework specifically focused on the diets of young children, which is described in [this programming guidance](#). UNICEF is supporting governments and partners in applying this systematic analysis and systems approach to improve young children’s diets across Africa, Asia, and the Middle East. Our vision is to implement it across all seven UNICEF regions to contribute to the SDGs by reducing all forms of childhood malnutrition.

**Solution’s alignment to the ‘game changing and systemic solution’ criteria:** The application of this approach would facilitate a rapid shift from scattered, siloed, and stand-alone interventions for young children to an integrated child-centric systems approach grounded in context-specific analysis. This approach would serve as a tool to strengthen the capacity and accountability of food systems to improve the quality of children’s foods, food environments, and food practices. Guided by the Innocenti Framework on Food Systems for Children and Adolescents, this approach facilitates evidence-based actions by public and private stakeholders in the food system. The approach is actionable, and its application has the potential to accelerate results at scale and with equity.

**Existing evidence:** The systematic analysis and systems approach to improving children’s diets have been adopted across Africa and Asia to refocus regional and country-level efforts to improve the quality of young children’s diets. UNICEF regional offices - in close collaboration with the government and partners (UN Agencies, international and local NGOs, and academia) - have undertaken regional landscape analyses to understand the status and drivers of young children’s diets. This systematic analysis has guided the prioritisation of regional and country-level actions to improve young children’s diets through the food, health, and social protection systems. The uptake of this approach, its application, and its use across five regions and over 15 countries by government and partners to prioritise a systems approach to improving young children’s diets show the potential of this game-changing solution.

**Current/likely political support:** This systematic analysis and systems approach to improving young children’s diets has been adopted and endorsed by the Southern African Development Committee and their member states as well as by the national governments and regional partners in East Asia and Pacific, South Asia, and Western and Central Africa. With 2021 as ‘The Nutrition for Growth Year of Action’, the political support for improving early childhood nutrition through the food system is high. The FSS can support efforts to mobilise new policy and financial commitments, while positioning nutrition as an essential development priority.

Moreover, this solution is timely. With just one in four children eating a nutritious and diverse diet and lagging progress in improving the quality of young children’s diets over the last decades across countries, regions, and globally, there is an urgent need to seize every opportunity to accelerate progress on young children’s diet quality. Food systems have a key role to play in improving the diets of young children and the FSS provides a timely opportunity to leverage the discourse on food systems to advocate for systematic analysis and a systems approach for improving young children’s diets. Further, COVID-19 has had a significant impact on maternal and child nutrition, and the global

nutrition community needs to be able to come together to provide decisive, coordinated, and impactful responses to mitigate the impact of the pandemic on the progress made to reach the SDGs.

**Contexts where this is well/not well suited:** This approach is suited for all contexts, as it allows for analysis and prioritising actions based on the country context.

## 15. Increase fruit and vegetable consumption through consumer-level subsidies

**The Solution:** The solution is a subsidy for fruits and vegetables (F&V), in the form of a payment card or mobile phone application that could be used to purchase F&V. Taking into account different national and subnational contexts from a food systems approach, this card or application could be used to purchase F&V from different vendors, including street markets, small-scale and family farmers, and if necessary imported F&V. While an application might be more convenient for certain contexts, the payment card, similar to a credit card, would ensure that even people without access to smart phones would be able to access the benefit.

Criteria for receiving this card could include households with high levels of food insecurity or malnutrition, including low-income households, rural households, and female-headed households with children. This card would be accompanied by food education that raises awareness of the benefits of fruits and vegetables and the importance of their consumption. This could be provided through the application itself and/or through social marketing, television, and in-person activities. These two measures (card/application and education) would form key components within a nutrition-sensitive social protection framework for a timeframe of at least three months.

**Source(s) of the Solution:** The Elige Vivir Sano Secretariat, part of the Ministry of Social Development and Family in Chile, proposed this solution.

**Problem addressed within food systems:** This solution seeks to aid vulnerable populations like low-income households and children by facilitating access to fruits and vegetables, while at the same time supporting F&V vendors—thus helping to increase access to nutritious foods. Low-income populations struggle to access fruits and vegetables due to their high prices, and consequently consume them less frequently than high-income populations, exacerbating health disparities and inequalities. Healthy diets cost 60% more than nutrient-adequate diets and are almost five times as expensive as energy-sufficient diets.<sup>17</sup> At the same time, it is essential that everyone in the population is able to access fruits and vegetables, as these foods play a fundamental role in population health. They are essential for healthy development in children as well as the prevention of NCDs like cardiovascular diseases and many types of cancer. The WHO estimated that 3.9 million deaths worldwide in 2017 were due to inadequate fruit and vegetable consumption.<sup>18</sup> The lack of access to nutritious foods, already present under normal circumstances, can be exacerbated during times of crisis, as the COVID-19 pandemic has demonstrated.

**How this solution will address that problem:** This solution would provide people at risk of food insecurity with a payment card or app that could be used to purchase F&V, thereby encouraging the consumption of healthy foods in low-income populations. To achieve these goals, the payment card or app would need to be developed, produced, and distributed to a population that had been educated about the initiative. Vendors would simultaneously need the corresponding machinery or system in order to process the payments as well as training in the usage of these items. Once these tasks have been accomplished, low-income households would be able to increase their purchases and

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<sup>17</sup> FAO, IFAD, UNICEF, WFP and WHO. 2020. The State of Food Security and Nutrition in the World 2020. Transforming food systems for affordable healthy diets. Rome, FAO. <https://doi.org/10.4060/ca9692en>

<sup>18</sup> WHO (2019) Increasing fruit and vegetable consumption to reduce the risk of noncommunicable diseases. E-Library of Evidence for Nutrition Actions. [https://www.who.int/elena/titles/fruit\\_vegetables\\_ncds/en/](https://www.who.int/elena/titles/fruit_vegetables_ncds/en/)

consumption of fruits and vegetables while at the same time supporting the F&V market. A major assumption is that high prices are one of the primary obstacles to accessing F&V (rather than a lack of availability, for instance); it is also assumed that providing people with a payment card or application will lead them to purchase more F&V than they had previously.

This strategy would be implemented by the government, specifically the part of government in charge of nutrition-sensitive social protection programmes (in the case of Chile, this would correspond to the Ministry of Social Development and Family at a national level, but in other countries the main actor might be the Ministry of Food and Agriculture, or Ministry of Health and Family Welfare, or could perhaps be delegated to state or local governments).

The general objective is to improve diet quality for vulnerable households, while the specific objective is to increase purchases and consumption of F&V. Depending on the country context, the card or app could include other nutritious foods like legumes and milk, but the current focus on F&V is due to the fact that in many contexts these items are often more expensive and thus less accessible than other healthy products.

**Solution's alignment to the 'game changing and systemic solution' criteria:** This solution is a feasible, evidence-based, multi-sectorial initiative that would support vulnerable populations, which would at the same time be supporting different vendors of F&V. In regards to impact potential, Flores and Rivas (2016) argue that subsidies offer 'the best balance between effectiveness and monetary benefits to society' and can also 'lead to a significant surplus considering the savings they cause in the long term to the social security system.'<sup>19</sup> In terms of sustainability, this proposal could be implemented either as a short-term initiative for a period of a minimum of three months as an emergency relief measure, or as a long-term programme within a social protection system to assist low-income families in accessing healthy foods. Regarding actionability, the proposal would require political will and the participation of different ministries and services. This idea behind this solution is currently being developed in a joint initiative with the Chile-Mexico Cooperation Fund, in which actors in the public sector and academia in both countries are working to implement a pilot programme on social benefits for the promotion of F&V consumption in vulnerable populations.

**Existing evidence:** There is a wide range of evidence to support this solution. Subsidies have been shown to significantly increase the purchase and consumption of healthy foods<sup>20</sup>, and F&V subsidies directed at low-socioeconomic-status households may change eating behaviour and reduce weight.<sup>21</sup> It is also worth noting that the WHO recommends the use of economic tools like subsidies that create incentives for healthy behaviours and improve the affordability of healthy foods to encourage their consumption.<sup>22</sup>

Additionally, initiatives similar to the one proposed have been implemented successfully at scale, such as the Supplemental Nutrition Assistance Program in the United States providing financial assistance for food purchases to approximately 40 million people.<sup>23</sup> However, the present proposal differs in its emphasis on F&V and its support for different vendors of F&V. To our knowledge a subsidy of this kind has never been implemented on a national scale, and similar measures have been evaluated primarily in pilot programs and small-scale studies in countries like Australia, where F&V consumption increased

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<sup>19</sup> Flores, M. and Rivas, J. (2017), CASH INCENTIVES AND UNHEALTHY FOOD CONSUMPTION. *Bulletin of Economic Research*, 69: 42-56.

<sup>20</sup> An, R. (2012). Effectiveness of subsidies in promoting healthy food purchases and consumption: a review of field experiments – CORRIGENDUM. *Public health nutrition*. 16. 1-14. 10.1017/S1368980012004715.

<sup>21</sup> Powell, L. M., & Chaloupka, F. J. (2009). Food prices and obesity: evidence and policy implications for taxes and subsidies. *The Milbank quarterly*, 87(1), 229–257. <https://doi.org/10.1111/j.1468-0009.2009.00554.x>

<sup>22</sup> WHO (2013) Follow-up to the Political Declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Non-communicable Diseases. [https://apps.who.int/gb/ebwha/pdf\\_files/WHA66/A66\\_R10-en.pdf?ua=1](https://apps.who.int/gb/ebwha/pdf_files/WHA66/A66_R10-en.pdf?ua=1)

<sup>23</sup> Marion Nestle, 2019: The Supplemental Nutrition Assistance Program (SNAP): History, Politics, and Public Health Implications. *American Journal of Public Health* 109 1631\_1635, <https://doi.org/10.2105/AJPH.2019.305361>

among disadvantaged Aboriginal children thanks to a subsidy programme<sup>24</sup>, and New Zealand, where researchers carried out a modelling study of a F&V subsidy in conjunction with taxes on saturated fat, sugar, and salt and found that such an initiative could have considerable positive health effects.<sup>25</sup>

**Current/likely political support:** The COVID-19 pandemic has thrown into sharp relief the necessity of nutrition-sensitive social protection programmes and has seen political support shifted to interventions that focus on food distribution and other measures that seek to ensure food security. However, measures like the shipment of food boxes to vulnerable families, which have been implemented by many national governments, can present logistical challenges, particularly when they involve perishable foods. Consequently, a simple system in which vulnerable families could receive payment cards or use applications that would allow them to access healthy foods within their own neighbourhoods, without the need to coordinate complicated nation-wide food deliveries, is likely to garner considerable support. Political support would need to be directed simultaneously at farmers and the producer community to ensure a consistent supply of F&V.

**Contexts where this is well/not well suited:** In the case of Chile, the country context is defined by a strong agricultural sector as well as an extensive system of street markets that offer F&V at much lower prices than supermarkets and are consequently frequented by low-income families. However, even countries without these factors could adapt the proposal as necessary, for instance enabling the use of the card or application in supermarkets, or other types of retailers. The F&V supply would need to be ensured to allow cardholders or app users to purchase them. One option in this respect is to implement and support areas known as “green points”, which refer to options like street markets that offer healthy foods in convenient areas and allow payment by card or application. The timeframe for the solution is flexible, as it could be implemented as a long-term project or be applied as part of emergency relief measures.

## 16. Modernise the Micronutrient Value Chain by Improving Data Access and Use to Accelerate Effective Coverage of Large-Scale Staple Food Fortification Programmes

**The Solution:** The solution proposes to tackle head-on the lack of essential vitamins and minerals in the daily diet of vulnerable populations through modernising data generation and use for the development of evidence-based fortification standards, building the capacity of government and the private sector to monitor and enforce these standards, developing new tools and approaches to accelerate progress, empowering global advocacy, and equipping civil society to hold government and industry accountable.

**Source(s) of the Solution:** The institutions that have contributed to shaping this gamechanger are: Bill & Melinda Gates Foundation (BMGF), Food Fortification Initiative, GAIN, Helen Keller International, International Zinc Nutrition Consultative Group, Iodine Global Network, Micronutrient Forum, Nutrition International, PATH, UNICEF, USAID, and World Food Programme. The solution draws on a series of discussions convened through the Global Fortification Technical Advisory Group (GF TAG), as well as from the BMGF nutrition strategy refresh and the new USAID Large-Scale Food Fortification Results Framework (both currently in-process). This solution is also aligned with other proposed solutions in FSS AT1 focusing on biofortification, anaemia and data: The data initiative described here would assist countries in coordinating LSFF and biofortification as part of a comprehensive national

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<sup>24</sup> Black, A. P., Vally, H., Morris, P., Daniel, M., Esterman, A., Karschimkus, C. S., & O’Dea, K. (2013). Nutritional impacts of a fruit and vegetable subsidy programme for disadvantaged Australian Aboriginal children. *The British journal of nutrition*, 110(12), 2309–2317.

<sup>25</sup> Blakely, Tony & Cleghorn, Christine & Mizdrak, Anja & Waterlander, Wilma & Nghiem, Nhung & Swinburn, Boyd & Wilson, Nick & Mhurchu, Cliona. (2020). The effect of food taxes and subsidies on population health and health costs: a modelling study. *The Lancet Public Health*. 5. e404-e413. 10.1016/S2468-2667(20)30116-X

strategy to combat micronutrient malnutrition; LSFF would contribute to the proposed Anaemia Alliance, as LSFF can combat iron deficiency at scale through fortification of rice and flours; and the data collected under this solution could feed into the micronutrient data gap workstream of the 'Digital Data Cornucopia' solution.

**Problem addressed within food systems:** Micronutrient deficiencies and malnutrition are an enormous global challenge, undermining health, survival, and child development, and costing the global economy billions in lost productivity and health care expenses each year. Anaemia is estimated to contribute to 20% of maternal deaths and a large proportion can be attributed to iron deficiency, 250-500 million children are blind because of vitamin A deficiency, and more than 500 million individuals in Southeast Asia are estimated to have inadequate iodine status that is associated with risk of impaired mental function. One of the most cost-effective, scientifically proven interventions to address this global challenge through the food system is large-scale food fortification (LSFF).

LSFF enriches the micronutrient content of commonly consumed staple foods by adding essential vitamins and minerals during processing. Commonly fortified staple foods include salt, flours, rice, cooking oil, and dairy products. LSFF works across large populations to prevent and reduce micronutrient deficiencies by making everyday foods more nutritious, complementing efforts to diversify diets and increase production and consumption of fruits, vegetables, and animal-source foods. Given its potential for impact and the number of countries that have not adopted fortification programs and policies, LSFF is hugely underutilised globally. Even where sufficient conditions exist to fortify at scale and at low cost, coverage of adequately fortified food is uneven.

In LMICs, a lack of national and subnational, disaggregated data regarding the prevalence and impact of micronutrient deficiencies as well as a lack of transparent data regarding the quality and impact of LSFF hinder government decision-making. This prevents bottlenecks from being identified and addressed in a timely manner, stifles innovation, denies businesses a level playing field, undermines government and industry accountability, and makes it impossible to track and build on success. Systematically addressing data gaps and prioritising investment in the focus areas identified below will support the ability of government, industry, civil society, donors, and development partners to work together to maximise the impact and effectiveness of LSFF.

**How this solution will address that problem:** This solution proposes to catalyse progress and accelerate the impact of LSFF in LMICs by revitalising the collection, analysis, and dissemination of data relevant to LSFF and by prioritising and increasing investment in LSFF to utilise this data across four key focus areas:

*Standards and Regulations:* With increased access to timely data on micronutrient status and consumption, governments can review national dietary guidelines, decide how to incorporate fortified foods into national strategies, and assess the appropriate level and type of fortification by food vehicle. Improved data will enable regional cooperation to harmonise standards and regulations across borders, facilitating trade and creating market efficiencies.

*Monitoring and Enforcement:* Public regulatory agencies often lack capacity, resources, and data to adequately enforce LSFF mandates. Increased investment to develop better, more cost-effective monitoring tools for industry is needed as is additional investment to build the capacity of government and industry to ensure regulation is efficient and effective. Commitment by these same stakeholders is needed to pilot new monitoring tools, use the data to diagnose and address problems and bottlenecks, and document and share learning so that successful approaches can be adopted and scaled up elsewhere.

*Innovation, Research, and Development:* Better data on LSFF bottlenecks from government and industry will help to inform the next generation of LSFF solutions, including new food vehicles and improved processing, packaging, data platforms, financing, and marketing. Improved data can be

leveraged to inspire and inform new investment in R&D and innovation by a range of stakeholders, including donors, NGOs, governments, researchers, food producers, and other businesses. These efforts will be catalysed by donor and development partner investments, business interests, and civil society pressure.

**Advocacy and Accountability:** Timely and accessible data on fortification quality equip civil society to drive compliance and accountability of national fortification programmes through strategic use of media and coordinated action at national level. This aspect of the solution is about using compliance data to hold government and industry accountable through coalition-building with national non-government stakeholders (consumer associations, public health advocates, and others) and investment to elevate their voices and build their power through enhanced coordination, communications support, and capacity building.

Under this solution, improved access to timely micronutrient data will be facilitated by:

- Enhanced collection of market and household data to assess availability of adequately fortified foods and contributions of fortification to addressing dietary inadequacies
- Improved record keeping, surveillance at production facilities and border entry points, and more effective regulation and data collection at the factory level
- Increased use of modelling to provide actionable and timely information for government officials, donors, and other stakeholders
- Piloting and scaling up the use of low-cost, digitally connected analytical devices to capture fortification quality data and trusted platforms to share data more efficiently and securely.

**Solution’s alignment to the ‘game changing and systemic solution’ criteria:**

**Impact potential at scale:** LSFF is one of the most cost-effective food system interventions to combat micronutrient malnutrition. For example, 88% of the global population (around 6 billion people) consume iodised salt. As a result, the number of countries with high levels of iodine deficiency has declined from over 110 in 1990 to 20 today. This success could be replicated with other nutrients and other widely consumed food vehicles.

**Actionability:** Over 140 countries currently mandate fortification of one or more food vehicles, indicating strong, widespread political support for the inclusion of LSFF in national nutrition strategies.

**Sustainability:** The success of salt iodisation to dramatically reduce iodine deficiency in LMICs over the past 30 years speaks to the potential impact and sustainability of LSFF as an approach.

**Existing evidence:** A recent systematic review of 50 studies indicates the impact of LSFF in LMICs: food fortification programs with iodine, folic acid, vitamin A and iron have led to dramatic reductions in serious disease. An estimated 2 billion people are affected by micronutrient deficiencies. Increasing access to adequately fortified foods would address preventable death and disability that is linked to micronutrient deficiency.

**Current/likely political support:** LSFF has emerged as a priority area in several national food systems dialogues. Independent dialogues on fortification have been held or are being planned in Bangladesh, Cambodia, Ethiopia, Kenya, Mozambique, Nigeria, and Pakistan, with high-level government participation. A solution proposal on rice fortification is anticipated from India. LSFF solution proposals are also under consideration in Indonesia and Pakistan.

**Contexts where this is well/not well suited:** LSFF is well-suited for contexts in which one or more staple foods are centrally processed by a modest number of large or medium-sized producers or for contexts where the overall trend is towards market consolidation.

## 17. Reduce the burden of food preparation in resource-poor households

**The Solution:** This game-changer addresses the ‘last mile’ of food security, as households acquire ingredients and prepare meals in the home. Hidden costs of meal preparation are a large and often unrecognised barrier to food security and nutrition, especially in settings without reliable electricity from renewable sources and in settings where caregivers are unable to acquire pre-cooked items that facilitate preparation of healthy meals at all times. Food acquisition and preparation often places high burdens on caregiver time and can impose additional financial costs for cooking fuel, equipment, and transportation. Overcoming these barriers in cost-effective ways requires a rapid transition to universal electrification from renewable sources at sufficient levels of power for cooking and refrigeration, and also support for helpful processing that preserves and enhances the nutritional value of foods while reducing time and fuel requirements for meal preparation within the home, alongside regulatory approaches to limiting harmful ultra-processing that removes beneficial components and adds attributes associated with diet-related diseases. Enabling households to prepare healthy meals quickly with low fuel use requires a clear distinction between helpful processing and harmful ultra-processing, based on the growing evidence about what kinds of precooking and food preservation can retain and enhance nutrition.

**Source(s) of the Solution:** Our focus on the burden of meal preparation for resource-poor households emerged from the true cost of food analysis conducted by Science Group and is described in detail in the Science Group’s policy brief, “Cost and affordability of preparing a basic meal around the world.” This work built on past research using market prices to calculate diet costs and affordability. The working group’s estimation of externalities related to environmental, social, and health externalities led to an exploration of the impact of these costs on the poorest. This led to the determination of the *cost of meal preparation* to reflect hidden costs within households, especially women’s time use and fuel requirements for cooking basic meals. The resulting research brief reveals opportunities for more comprehensive analysis of barriers to healthy eating and game-changing interventions to end hunger and all forms of malnutrition. This solution is also closely related to a number of other proposals raised through the FSS dialogues and consultations. Our aim is to provide a unified framework through which to communicate the need for inter-related initiatives that remove barriers to healthy and sustainable meals while limiting the role of unhealthy and unsustainable foods.

**Problem addressed within food systems:** Eating a nutritious diet is essential for a healthy, active life. Food prices are just one aspect of helping people consume healthy diets. The SOFI (2020) report highlighted the widespread unaffordability of nutritious and healthy diets, but addressing constraints beyond affordability will help to improve diet quality and reduce food insecurity and malnutrition. While much is written about how food processing can contribute to unhealthy food environments and health problems, food processing can also contribute positively to solving food system challenges related to food safety, seasonal availability, and the burden of food preparation. Healthy diets are unaffordable for many of the world’s poor, first because production costs and market prices of even the least-cost items exceed their available income, but also because of hidden costs of meal preparation, especially women’s time and the fuel required for acquiring and preparing daily meals.

**How this solution will address that problem:** Reducing the burden of food preparation involves three main steps:

(i) *Electrification* powered by renewable energy sources is typically seen as essential for industrial machinery and residential lighting, communications, cooling, and heating and is also extremely important for meal preparation, cooking, and food storage. In households that are connected to electrical grids or standalone photovoltaic systems, electricity is by far the least costly form of power.



Electricity in the kitchen allows people to use food preparation equipment that requires less time and attention and allows for safe storage of fresh and prepared foods. Electrification based on renewables can make food systems dramatically more inclusive and sustainable.

(ii) *Support for helpful processing* that retains and improves foods' nutritional value (as opposed to ultra-processing that removes beneficial components, introduces harmful attributes, and is associated with poor health outcomes). Food processing inside or outside the home is a universal step in meal preparation, for which it is increasingly urgent to identify processing techniques that reduce drudgery and preserve or add to the nutritional value of foods—such as canning, freezing, drying, and fortification—and distinguish them from harmful ultra-processing that may add convenience, brand recognition, and shelf stability but compromises nutritional value by removing nutritious food components such as fibre and adding unhealthy components such as added sugar, sodium, and solid fats.

(iii) Government should create a *regulatory environment* that supports businesses, especially local SMEs, that provide helpful and healthy processing.<sup>26</sup> An initial definition for helpful and healthy processing could start with the [NOVA classification](#), including NOVA groups 2 and 3 (processed foods) but excluding any foods with added trans fats as well as all cured and smoked meats due to their harmful effects. Key actions to support this solution would include further research regarding what kinds of processing are helpful and preserve or enhance the nutritional value of foods, what kinds of processing might be neutral, and what kinds of processing are harmful to health.

**Solution's alignment to the 'game changing and systemic solution' criteria:** Interventions to facilitate preparation of healthy meals are a game changer because they recognise the universal need for cooking and food preservation, along with the very diverse cultural and socioeconomic contexts in which meal preparation takes place. Universal electrification from renewables, combined with a clear distinction between helpful healthy processing and harmful ultra-processing, can use 21<sup>st</sup> century technology to deliver food and nutrition security through inclusive and sustainable food systems. Gender differences in caregiving responsibilities make these steps crucial for maternal and child health, as well as education and employment for adolescent girls and women who are otherwise required to spend a large fraction of each day on meal preparation, starting with the water and fuel required for cooking. Public support for electrification with renewables as well as support for SME food processing enterprises that preserve and enhance nutritional value is a game-changer because it harnesses large-scale employment of youth and marginalised groups, pursuing universal basic needs to develop locally appropriate food systems that are increasingly inclusive and sustainable over time.

**Existing evidence:** Focusing attention on the hidden cost of meal preparation, and the difference between helpful healthy processing versus harmful ultra-processing, builds on the large evidence base about the efficacy and cost-effectiveness of those programmes and policies.

**Current/likely political support:** Focusing on the hidden costs of meal preparation can enlist a wide range of stakeholders in developing an inclusive and sustainable food system. Electrification from renewables is already a central focus for governments around the world, addressing climate change in cost-effective ways through job creation to transform the energy sector. The importance of electrification for inclusive and sustainable food systems underscores our common interest in ensuring universal access to reliable grid power or standalone systems in both rural and urban areas.

**Contexts where this is well/not well suited:** Electrification powered by renewables for home kitchens and SME food processing firms will proceed at different speeds in different settings, as part of the

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<sup>26</sup> It will also be important to continue to use regulation and taxation to limit production and consumption of foods with harmful ultra-processing.

larger global push towards fossil-free economic development. Regulatory support for companies that provide helpful healthy processing, while also limiting unhealthy ultra-processing will also require tailoring to each country's national nutrition policies but can be expedited through global standards and data sources that distinguish between healthy and unhealthy forms of food processing.

## 18. Promote production and consumption of sustainably produced high-quality proteins

**The Solution:** A global, multi-stakeholder engagement that promotes production and consumption of sustainably produced high-quality proteins to mitigate global risk of protein-energy malnutrition (PEM) and other related conditions. The initiative will also seek ways of assessing the land use and environmental implications of consuming a diet consisting of fewer high-quality protein sources. The initiative will seek commitments from global food/agriculture companies and organisations to conduct the necessary research to assess global dietary protein needs more accurately. Progress will be determined and reported globally via published research, symposia at high-level international health/nutrition conferences, and expert workshops.

**Source(s) of the Solution:** The initiative builds off ongoing research on the measurement of dietary protein quality as called for in FAO Report #92 (Dietary Protein Quality Evaluation in Human Nutrition, 2013). The report indicated that existing methods for measuring protein quality tend to overestimate the quality of some protein sources and called for a more accurate measurement to be developed. This systematic error can have great health implications when planning and promoting diets and food sources, particularly (but not exclusively) in LMICs, where high-quality protein sources are often scarce or expensive. Current partners of the initiative are the Global Dairy Platform, International Dairy Federation, and Dairy Sustainability Framework. Potential partners may include groups such as FAO, Sustainable Agriculture Initiative Platform, and ILRI and other private-sector actors, donors, NGOs, academia, civil society, and governmental and intergovernmental organisations.

**Problem addressed within food systems:** The initiative will encourage a more in-depth understanding of the health and environmental implications of high-quality protein sources and the potential for unintended consequences by dramatically de-emphasising their use in the human diet.

Malnutrition is a universal public health problem among both children and adults globally. It is not only a public health concern but also an impediment to global poverty eradication, productivity, and economic growth. By eliminating malnutrition, it is estimated that 32% of the global disease burden would be removed. One prevalent form of malnutrition, particularly in the developing world, is PEM. Children with PEM present with marasmus and kwashiorkor. Marasmus is characterised by a lack of protein and energy in the diet, while an inadequate intake of protein causes kwashiorkor. Both can cause stunting and wasting, as well as lifelong health issues. According to the WHO, 462 million adults are underweight; in children under 5 years of age, 155 million are stunted, 52 million are wasted, and 17 million are severely wasted. More accurate information on the protein quality of foods and diets will lead to more informed policy and ultimately better diets and enhanced food security.

**How this solution will address that problem:** Access to sufficient high-quality protein sources can help to minimise or alleviate several of the aforementioned health conditions. A greater understanding of the foods (and their production) that can optimise the consumption of high-quality protein sources is imperative. High-quality proteins represent a more efficient way of producing and consuming dietary protein, which not only has great health implications but also can impact the amount of land needed to grow food. It is also noteworthy that many high-quality protein foods are often also rich in other nutrients (e.g., iron, zinc, vitamin B12) that may be limiting in the diet.

Further, it should be noted that while a lack of high-quality protein foods represents an ongoing issue in LMICs, it is also not an insignificant problem for several demographic groups in high-income countries. Numerous studies have identified protein as a key nutrient for well-fed elderly adults. High protein intake may improve muscle health, prevent sarcopenia, and help maintain energy balance, weight management, and cardiovascular function in the elderly and others. Multiple health benefits have also been noted in physically active people, children, and individuals consuming specialised diets who reside in Western countries.

**Solution's alignment to the 'game changing and systemic solution' criteria:** Greater understanding and support for consumption of more high-quality protein sources has implications for all five of the FSS action tracks, as well as several SDGs, particularly SDGs 2, 3, 10 and 12, making this a strong game changing solution. High-quality protein foods, so important in the fight to reduce hunger and malnourishment, have an important role in the attainment of more equitable and sustainable food systems. Removing high-quality foods from the diet, or diminishing their use, may have severe unintended consequences.

**Existing evidence:** There are numerous studies that have demonstrated the benefits of adding more high-quality protein to the diets of malnourished people, particularly in LMICs. Several studies using dairy, eggs, and several other animal-source foods to supplement existing local diets have shown (though not exclusively) improved MUAC scores in children, greater cognitive performance, improved immunity, and several other health benefits. In the developed world, studies in the elderly, physically active people, people losing weight, and other demographic groups have not only demonstrated improved health and performance measures but, in many cases, indicate that present protein recommendations may be too low, suggesting the need for even more high-quality protein in the diet. Finally, recent modelling exercises suggest that to consume enough protein to reach recommended daily levels, individual adults would need to ingest about 300 more calories per day if they subsisted on lower-quality protein sources. This has implications not only for human health but also the amount of land that would be needed to produce this extra food, particularly in the face of a growing global population. These are not 'black and white' issues, and certainly require greater understanding and assessment of the intended and unintended consequences of dramatically altering our global food systems. Furthermore, conclusions reached concerning the environmental footprint of food protein production can be altered greatly when the quality of food proteins are considered.

**Current/likely political support:** The initiative is aligned with several of SDGs; particularly SDG 2 (Zero Hunger); SDG 3 (Good Health and Wellbeing); SDG 10 (Reduced Inequalities); and SDG 12 (Responsible Consumption and Production). The initiative also builds on and aligns with established international processes such as the United Nations Framework Convention on Climate change reporting on Nationally Determined Contributions and the Koronivia Joint Work on Agriculture. We believe this approach would be largely supported by the scientific community and those who view these issues based on empirical science. Already several scientific organisations and food sectors are involved in the work.

**Contexts where this is well/not well suited:** This game changer has global implications but is most well-suited for regions of the world where high-quality protein sources are scarce and daily protein intake remains far below recommended levels, and where arable land is in short supply.

## 19. Increase the Production and Consumption of Vegetables for Livelihoods and Health

*Note: this solution is preliminary and has not yet developed specific actions; if it moves forwards, these actions will be made more concrete – likely working through other existing solutions related to nutritious food production and consumption.*

**The Solution:** This solution will increase the production and consumption of vegetables, with positive livelihood and health ramifications, through three interrelated systemic changes: valuing vegetables, collective action, and relational and structural change.

**Source(s) of the Solution:** These game-changer ideas emerged from writing and discussion processes around the publication of the UNFSS Scientific Committee position paper "[Fruits and vegetables for healthy diets: Priorities for food system research and action](#)". The paper identified multiple opportunities for action (with very different levels of evidence) at macro, meso and micro levels, as well as pinpointing further evidence required. Based on a figure on 'systems change' shared by Lawrence Haddad as part of the UNFSS process, the ideas below focus on structural, relational or transformative levels of change, as 'big-picture' ideas for the UNFSS. This is not to negate all of the meso- and micro-level actions that need to be undertaken, from improving cold-chains to improving social marketing; these are summarised in Annex 3. What we provide here are the game-changers that would allow those other actions to be prioritised.

**Problems addressed within food systems and approaches for doing so:**

***Valuing vegetables through transformative change (mental models) and structural change (policies and Practices):*** Vegetables are already a financially valuable crop: the annual farmgate value of global fruit and vegetable production is nearly \$1 trillion and exceeds the farmgate value of all food grains combined (US\$ 837 billion). But beyond economic value, these foods tend to be less prioritised in people's diets: As incomes rise, the consumption of meat, dairy and ultra-processed foods rise much faster than that of vegetables, and vegetable purchase in some contexts changes little across income groups, particularly if they are not considered an acceptable or desirable food choice, for instance due to food safety or contamination concerns, taste preferences, or cultural appropriateness. Large structural changes outside of the food system, such as changing demographics and urbanisation, have shaped food regimes to prioritise foods that are non-perishable and globally tradable, the very opposite of most fruits and vegetables. We need to make vegetables more valued in societies therefore, beyond how much money they can make for farmers or retailers.

From a public health angle this can focus on nutrition literacy, but this is not a game-changer; rather we need better understanding of consumers' preferences and behaviours with respect to these foods and what kinds of incentives might promote more consumption in different contexts. Marketing is a key factor shaping desirability but is consistently applied for 'hedonic' (processed) rather than 'healthy' (nutrient-dense) foods. On marketing issues, much is known about high-income countries but less about low- and middle-income contexts where these approaches (understanding market segments and speaking to issues of desirability, aspiration, emotion and imagination) can be adapted to promote societal valuing of vegetables.

From a policy angle, there is much that governments can do (supported by international agencies) to value vegetables as part of healthy diets rather than just as saleable commodities. Making sure that national horticulture policies and strategies are focused on domestic consumption and not just export (using 'reverse thinking' to start from diets and work back to food system policy that can support this); making sure that they cover the promotion (in seed networks, extension and markets) of traditional vegetables and not only exotic tradeable vegetables); and making sure that agricultural policy links with public health policy in coherent ways, to signal that governments value vegetables and underpin efforts with their citizens.

***Collective action, involving relational change (Relationships and connections, and power dynamics):*** In many contexts the concentration of inputs, distribution and retail of foods (including vegetables) in the hands of a few large companies has shifted food system choices away from the livelihood interests of producers, the health interests of consumers, and the environmental interests of all. It is clear that the precise food system issues and the solutions to these vary by food system context and by population, and that there are multiple potential routes towards solutions that sometimes clash on

ideals. These actions therefore need to be considered in context and by those affected by change, in light of an understanding of food system issues and bottlenecks limiting healthy diets in different places and for different people.

It is likely that the best way to start is to bring together diverse groups of people interested in these issues at different levels, to understand the issues and options from different perspectives and together prioritise which actions should be undertaken first in their own context. This is not easy, given inherent power disparities among interested parties, but with care and inclusion a strategy, policy or plan can be made to move towards enabling vegetable-rich food systems. As with all proposed solutions or actions, these can be informed by evidence but must be discussed by those affected by the changes through existing multilateral fora such as the UNCFS, with explicit efforts made to acknowledge and address inherent power imbalances among discussants. Having these conversations through the lens of equity, to address the needs of both winners and losers of food systems change (and other food system trade-offs), will be a vital part of the process in making change.

***Relational change (Power dynamics) and Structural change (Resource flows):*** The Green Revolution in the latter part of the 20th century transformed agriculture's ability to produce sufficient calories to feed the world, but the focus on grain crops through funding, research, extension and technology development limited supply of nutrient-dense fruits and vegetables both through losses of wild sources with the promotion of monocultures, and through policy and structural impediments that crowded out non-staple crops. Today, the combined international public research budget for maize, wheat, rice, and starchy tubers is 30 times than for vegetables for instance, and these incentives skew many of the technology and infrastructure drivers of food systems. This has fed into national food policies, which are normally focused on the production or import of staple crops (as a source of cheap calories) rather than diet quality through diversity of fresh foods (as a source of other essential nutrients).

Public investment in agriculture is shown to impact the growth of production through the private sector, but different types of investment produce different results for different foods in different contexts, so we need to know more about how specific investments such as in breeding, production subsidies, and extension support play out in food environments for different fruits and vegetables. Clearly there are political challenges to re-shaping public investment in agriculture, and discussions to be had around what form future sustainable agriculture should take. The CGIAR and various donors under the proposed Global vegetable Research Initiative are already moving in this direction, in recognition of the above issues and actions. Sustainable relational change will require acknowledging how food system lock-ins have been created through the interplay of money and the power it has created in distinct parts of the food system, and explicitly addressing these in moving food systems towards fruits and vegetables.

## Potential Solutions for Making Food Safer

### 20. Launch a Food Safety System Innovation Facility to co-finance low-cost solutions for improving food safety risk management and consumer engagement

**The Solution:** The Food Safety System Innovation Facility (FSSIF) would co-finance and assess a portfolio of low-cost solutions for improving food safety risk management and consumer engagement. Technical guidance, rigorous impact assessment, and experience-sharing functions will enable the Facility to serve as an incubator for effective solutions that can be applied by LMICs globally.

**Source(s) of the Solution:** The idea came from the AT1 Food Safety Working Group. A competitive ‘challenge’ fund with knowledge management functions is a well-established concept, particularly in the context of addressing complex food system issues.

**Problem addressed within food systems:** There is growing recognition of the significant public health and economic burdens imposed on LMICs by unsafe food and of the need to strengthen the incentives and capacities to manage foodborne risks. Yet, there exists a relatively thin roster of well-tested, fit-for-context solutions. To date, most efforts to enhance food safety systems in LMICs have been informed by the experiences and institutional landscapes of today’s high-income countries, which do not fit well with LMIC contexts, including their available resources, underdeveloped infrastructure, and often fragmented institutions. There is a need to identify, incubate, and validate a variety of alternative solutions that are more cost-efficient and effective in the market and institutional settings of LMICs.

There are no quick technological fixes or proven shortcuts that LMICs can take to develop well-functioning and trusted systems for food safety management. For most LMICs, the institutional ecosystem for food safety is underdeveloped across government, the private sector, and civil society, both at central and sub-national levels. Further, food safety challenges are becoming more complex as those countries experience major demographic, economic, and dietary shifts. Identifying cost-effective and fit-for-context solutions to manage food safety risks and engage consumers in this process will help LMICs prevent food contamination and reduce the incidence of foodborne illness.

**How this solution will address that problem:** The FSSIF would identify and act as an incubator for lower-cost institutional, social, and technical innovations that bring considerable improvements in how food safety risks are managed in the formal and informal segments of LMIC domestic markets. The Facility would support interventions that have clear demonstration and learning benefits. It could support the application of different approaches across a broad set of institutional actors, for example:

- *Innovations within public-sector regulatory systems*, such as risk-profiling of businesses, value chains, and food imports, incentive-based enforcement for the regulated/the regulators, food vendor, restaurant and other site grading schemes, use of quick detection technologies, etc.
- *Enhancing consumer demand for and contribution to improved food safety* via consumer organisations, parent/teacher alliances for food safety in schools, consumer reporting systems, applying easy-to-understand labels, and using various techniques and modalities for increasing consumer food safety awareness and changing consumer behaviour.
- *Collective action by private actors* at different points in the food system, include third-party certification schemes, peer-based food safety benchmarking, producer/vendor codes of practice, etc.
- *Innovative public-private co-management arrangements*, including joint traceability/recall systems, regulatory tiering on the basis of compliance with private standards, collaborative programmes supporting adoption of best practices targeting SMEs, street/market vendors, or others.

The FSSIF would act specifically to:

- Identify and develop innovations useful for LMICs.
- (Co-)finance the development and validation of locally driven, low-cost, and appropriate innovations for enhancing incentives and/or capabilities for food safety risk management, perhaps working through regional centres.
- Support the design and testing of these innovations by government (at the national, regional and/or municipal level), private sector, and/or civil society organisations.
- Validation: Assess the impact and sustainability of those innovations in terms of the safety of food and the practices/performance of food operators and focal institutions involved with food safety governance in LMICs.
- Engage with LMICs for the transfer of knowledge as a global public good.

The **theory of change** behind the proposed FSSIF is as follows:

- **Inputs:** Financial and technical support to a diverse set of entities to co-create and implement low-cost solutions to address food safety risk management in LMICs; Tools and assistance to assess the effectiveness and impacts of the funded interventions.
- **Processes:** Calls for proposals; design and implementation of a range of interventions; close monitoring and rigorous assessment of results; documentation and knowledge sharing (via a portal, events, etc); and support to mainstream the validated approaches/solutions.
- **Outcomes:** More cost-effective interventions; increased strategic planning and investment and co-responsibility in the management of food safety; improved functioning of the food safety systems of LMICs; improved design of future development assistance interventions in this field.
- **Impacts:** Sustainable reductions in the incidence of foodborne disease in LMICs.

**Major assumptions:** Sufficient resources to support the initiative. Managing entity for the Facility (e.g., the Global Network for Food Safety Innovation and Capacity Building or regional development banks), has convening power and mobilises appropriate partners/networks. Recognition and support for domestic food safety measures in LMICs continues to grow.

**Solution's alignment to the 'game changing and systemic solution' criteria:** This proposal directly addresses the need for solutions that will effectively address weaknesses in the food safety systems of LMICs in a manner that is effective, cost-efficient, and sustainable. The FSSIF will be characterised by having:

**Impact potential at scale:** The FSSIF would support the design and implementation of a range of interventions that would likely differ in scale from the local value chain or individual municipality level to the national scale. The testing of these interventions would take place within a common framework for assessing impact and sustainability. Successful innovations would be replicated elsewhere.

**Actionability:** The FSSIF would support the design/implementation of solutions by multiple actors considering prevailing capacities and resources. Co-financing would provide reliable expectation of local support, motivation, and capacity for the proposed action. Support will be provided to applicants to ensure that those with less capacity and/or involving marginalised groups (including women) are not excluded. The Facility could be managed either centrally by the Global Network for Food Safety Innovation and Capacity Building or regionally through existing regional development banks. The managing entity must have or work in partnership with an entity with prior experience managing competitive grant facilities and with strong fiduciary capabilities.

**Sustainability:** The entire focus of the FSSIF is to bring about sustainable improvements in how food safety risks are managed in LMICs. The interventions would likely have a multi-year timeframe to enable adjustments, generate multi-stakeholder buy-in, and facilitate rigorous assessment of impacts, including distributional ones. The pool of well-tested solutions can then be replicated by other countries and supported through mainstreamed development assistance and partnership programmes.

**Existing evidence:** Effective mechanisms for solving critical food-related problems have come from innovation facilities that have brought together public- and private-sector organisations to co-develop approaches to fill gaps that neither sector could fill on its own. Blended finance with advisory services offers great potential, and there are many proven successful models to follow that have generated evidence and models for scale. Successful examples of targeted innovation facilities include: the Global Innovation Fund, the Global Agriculture and Food Security Program, the Global Partnership for Education, and the GSMA fund for Digitization of Agricultural Value Chains, to name a few.

**Current/likely political support:** Many LMICs are struggling to strengthen their food safety systems, especially in the context of food destined for local rather than export markets. While it is evident that many of the approaches that are widely employed in high-income countries are not transferable to the contexts of many LMICs, knowledge of workable solutions remains limited. The need for locally appropriate solutions has been recognised by many LMICs, which are beginning to test alternative approaches. There is great interest in this issue among international institutions and the food safety practitioner community in the quest for innovative solutions that will bring sustained improvements in the safety of food in LMICs, at scale.

**Contexts where this is well/not well suited:** Priority should be given to low- and lower middle-income countries in which the food safety institutional ecosystem is weakest and in an effort to prevent an escalation of food-borne disease that could come from rapid economic development and demographic and dietary change.

## 21. Motivate and Measure Progress on Food Safety through a Global Food Safety Indicator

**The Solution:** To motivate and measure progress in making impact through food safety, it is proposed to have global food safety indicator, including health outcome indicators on foodborne diarrhoeal diseases.

**Source(s) of the Solution:** The idea was suggested by the WHO and further discussed within the food safety working group.

**Problem addressed within food systems:** About 600 million people (one in ten) are annually affected by foodborne diseases. Children under five years of age are at particularly high risk, comprising 30% of total foodborne disease deaths annually.<sup>27</sup> The magnitude of the public health burden due to foodborne diseases is comparable to that of malaria, HIV, or tuberculosis—and this is believed to be just the tip of the iceberg. Foodborne disease is also responsible for a wide range of economic costs, as it interacts with other development goals such as improving equity and access to nutritious foods or livelihoods for women and lower-income people. It is estimated that in LMICs USD 95 billion a year is associated with productivity loss alone.<sup>28</sup> Global issues like climate change, emerging diseases, and changes in food production and supply systems are pushing the food safety community to address new challenges. For tracking progress on the SDGs, 247 indicators are currently monitored<sup>29</sup> across a broad range of areas, but no food safety indicator is recognised. While food safety actions are linked to many of these indicators, particularly under SDG 2, 3, and 8, this data segmentation and limitations in measuring and reporting impede progress, camouflaging areas that need more attention and jeopardising progress towards other SDGs.

At a recent international conference of over 500 participants from 110 governments, various food safety problems were discussed, and solutions proposed. As the community moves ahead to implement such measures, it also needs a system to benchmark their activities, capacities, and performance because ‘what cannot be measured cannot be managed’. For priorities to be managed, it is helpful to have explicit goals (targets) and indicators that can measure progress towards attaining these goals. Given the extremely high (and likely growing) burden of foodborne diseases, especially in LMICs, food safety should be a priority for public health. Global indicators can contribute to the SDGs

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<sup>27</sup> <https://apps.who.int/iris/handle/10665/199350>

<sup>28</sup> <http://hdl.handle.net/10986/30568>

<sup>29</sup> <https://unstats.un.org/sdgs/indicators/indicators-list/>



and are also useful for countries in benchmarking, identifying strengths and weaknesses, and motivating and measuring improvements.

**How this solution will address that problem:** One reason why there has been no global consensus on food safety indicators, despite various attempts, is complexity. There are over 250 biological hazards (such as bacteria, viruses, parasites, and chemical contaminants) that are recognised to be transmitted by food, and many more hazards may be relevant locally. While these diseases are largely preventable, this requires action all along the food chain by various public, private, and informal stakeholders and across multiple sectors, including food, animal, health, and environment. It will be essential for any potential global food safety indicators to overcome this complexity by having more than one indicator, which can assess capacity at output, outcome, and impact level. Indicators should be seen as a catalyst to motivate countries and other contributors to make positive and objectively measurable changes.

While most actions to increase food safety are in the food or agriculture sector, the ultimate impact is to ensure consumers' health. Health outcome indicator(s) are therefore an ultimate summary measure of all food safety actions in the food system. While such ultimate health indicator should represent a significant impact on population health, some aspects specific to food safety need to be taken into account including, but not limited to, the following:

- *Global relevancy of hazards:* not all hazards are relevant worldwide. There are several foodborne disease hazards that together contribute a large burden but have localised distributions. For example, *Taenia solium* and fish-borne trematodes are large problems where they occur but are geographically restricted. While they could be key to include in national or regional indices, other hazards more common across the world are more appropriate for global indicators.
- *Sensitivity to differences between countries:* indicator(s) should be sensitive enough to distinguish different levels of food safety status across different countries.
- *Sensitivity to changes made in food safety (i.e., not in WASH, climate change, the economy, or healthcare):* finding a true attribution of a certain health outcome to unsafe food remains a challenge. It is known that diarrhoeal disease cases, for example, tend to decrease when the general development level of a country increases. It is therefore important to take into account the relative attribution of certain health outcomes to foodborne transmission.
- *Feasibility and affordability:* many countries have limited resources: indicators could be modular starting with simple, cheap metrics and building up to the more epidemiologically complex.
- *Objective measurability:* The experience of several global initiatives is that self-reporting can sometimes be unreliable. It may be best to build in some form of objective, external support, and validation from the onset.

Given the growing evidence of an enormous burden of foodborne diseases in LMICs, yet the extreme scarcity and unreliability of information about the extent of the burden, its consequences, and how it can be best managed, it seems safe to conclude that metrics and measures for better understanding foodborne diseases are important. Reflecting upon what we currently know from the first (and still only) report on the global burden of foodborne diseases (published in 2015)<sup>1</sup>, of 600 million total foodborne incidences, 550 million of them were diarrhoeal, comprising about half of the total public health burden, and 40% were seen in children under five years of age. Foodborne diarrhoeal diseases also accounted for 58% of the foodborne disability-adjusted list years (DALYs), followed by invasive infectious disease agents (24%), helminths (18%), and chemicals and toxins (3%). This is a significant proportion. While underestimated, particularly for chemical hazards, this is still believed to be the most credible and appropriate data from which to start measuring food safety progress globally.

Considering the required criteria discussed above for such global indicators, reflecting the key findings from the most credible source of information on foodborne diseases, the most logical choice would be to consider foodborne diarrhoeal diseases as a summary measure of health, associated with any investment, commitment, and actions in food safety. Given the complexity of the task to identify the most appropriate indicators and the need to integrate data from many different sources, such indicators can only be implemented through international collaboration. Participating in new reporting on a complex health problem is an arduous process, and it will be essential to build a multi-stakeholder coalition through communication, out-reach, and leveraging popular support for food safety to ensure buy-in from the participating countries.

**Solution’s alignment to the ‘game changing and systemic solution’ criteria:**

*Impact potential at scale:* The global food safety indicator will be developed at the global level, utilising multiple data sources collected by and/or reported to WHO.

*Actionability:* The global food safety indicators will be developed through a global taskforce convened by WHO. The WHO Foodborne Disease Burden Epidemiology Reference Group (FERG) will advise WHO on the methodology to develop and monitor indicators, in addition to their main function to regularly monitor the burden of foodborne diseases.

*Sustainability:* WHO is developing a global food safety strategy (mandated by WHA73.5) for expected adoption by the World Health Assembly in 2022, and the indicators could be hosted as part of the monitoring and evaluation framework of the strategy.

**Existing evidence:** Global or widely used indices such as the Human Development Index, Transparency International Index, and Programme for International Student Assessment have been very effective in helping supra-national strategy and planning and in motivating change at the national level. There are some national or regional efforts that exist to establish measurement systems for food safety, such as the African Food Safety index (AFSI), launched in 2018. AFSI is comprised of a food safety system index, food safety health index, and food safety trade index, and 50 out of 55 countries submitted data.<sup>30</sup>

**Current/likely political support:** WHO has been working to develop global food safety indicators in the content of monitoring and evaluating a new global food safety strategy, which is requested under the recent resolution (WHA73.5). WHO FERG is also officially being established with an additional mandate to support this area of work.<sup>31</sup> FAO is also active in this area, as indicated by their publication of “Measuring Food Safety: Indicators to Achieve SDGs. Food Safety Technical Toolkit for Asia and the Pacific No. 9”<sup>32</sup> in 2021.

**Contexts where this is well/not well suited:** Suited to all countries/contexts.

## Potential Cross-Cutting Solutions

### 22. Launch a Digital Data Cornucopia: A Global Food Systems Data Consortium

**Note:** Annex 4 includes a summary of this idea, a list of contributors, example use cases, and the references cited herein.

**The Solution:** This solution proposes a *Global Consortium for Accessible Food Systems Data* that convenes cross-sector organisations that have (1) subject matter expertise in food systems issues or

<sup>30</sup> <https://cgspace.cgiar.org/handle/10568/108691>

<sup>31</sup> [https://www.who.int/docs/default-source/food-safety/call-for-experts/tor-for-reference-ferg-31aug2020.pdf?sfvrsn=b0a3d1f\\_4](https://www.who.int/docs/default-source/food-safety/call-for-experts/tor-for-reference-ferg-31aug2020.pdf?sfvrsn=b0a3d1f_4)

<sup>32</sup> <http://www.fao.org/3/cb4111en/cb4111en.pdf>

(2) technical expertise on data platforms. This consortium aims to fully research user needs and then design and develop a single place for data owners, data analysts, and decision-makers that includes both (1) datasets and (2) the technical tools to work with the data. The first step is to deepen our collective understanding of stakeholders across action tracks on their data needs, building on the founding consortium's initially proposed efforts, which may serve as use cases for design and testing (Annex 4). The second step is to develop a set of common criteria for the operational policies and norms and the technical infrastructure, with the support of Johns Hopkins University (JHU) and Google. The third and fourth steps are to build the platform and enable configuration for these initial use cases, serving as examples for a well-governed scalable expansion for any other organisation.

This consortium is not the first to call for an integrated mechanism that enables data-driven decision-making and action in food systems.<sup>1-9</sup> In fact, a number of organisations have already begun to create pieces of this vision - their impact can be dramatically enhanced through this proposed coalition.<sup>5,10,11</sup> Learning from those endeavours and taking a systems approach, this game changer aims to overcome current challenges with user-centred data governance and technical infrastructure. These include:

- Acknowledging existing efforts: Aggregation, standardisation, and governance<sup>3,5,12-16</sup>
- Designing for the user: Understand both data owners and users, and design for their needs
- Identifying sentinel indicators: Agreeing on key indicators e.g., affordability, waste etc.
- Setting quality guidelines: For data collection and format e.g., disaggregation and frequency
- Developing intermediation and registration policies: Align to unique incentives of each sector
- Building on technology: Leverage cloud computing and indexing to enable discoverability of data

**Source(s) of the Solution:** Several successful efforts inspire this game-changer:

- Google Supported Platforms:* Google has precedence enabling development partners with technical infrastructure through the [Global Fishing Watch](#) and [Global Forest Watch](#). The former has enabled 25% reduction in illegal fishing practices and the latter monitoring of forest loss in near real time.<sup>21-23</sup> These coalitions share common traits with food systems including common property resources, cross nation-state boundaries, sparse data, and complex regulatory environments. Both platforms now thrive on philanthropic dollars and earned revenues.
- Food Systems Dashboard:* A collaboration between JHU and the GAIN, this [Dashboard](#) is Version 1.0 of a 'Google Map for the Food System'. The current dashboard manually manages data and is not yet fully comprehensive of all aspects of food systems.

Combining Google's more purpose-built platforms with initial efforts in the Food Systems Dashboard inspires the question: Could there be a 'Global Food Systems Watch'?

**Problem addressed within food systems:** Better and more data coupled with improved data processing capabilities can catalyse food systems transformation by enabling rapid evaluation of solutions and associated trade-offs. Many resources exist, but none are inclusive of all aspects of food systems nor are they equipped to fully facilitate the use of data by researchers and decision-makers. Tackling the underlying problems of malnutrition in all its forms, food insecurity, and food waste require these capabilities. The Consortium can bring together individual repositories and repository networks to build capacity, align policies and practices, and act as a global accountability mechanism for food systems action. Guided by a Steering Committee and inclusive processes, we will create the information infrastructure to drive financial and physical flows governing our food system towards food security and sustainable, healthy diets.

Numerous groups across the Summit, including through dialogues and the Science Group, have called for more and better data that are discoverable, accessible, and usable at relevant disaggregation for

analysis and visualisation that can drive change. There is a mismatch with owners of proprietary data, for whom sharing requires incentives, aggregation, etc. The figure below summarises the challenge of the 'data journey' at present.

### The Data Journey Today



**How this solution will address that problem:** Each group working independently to build their own data dashboard from foundation to presentation will require a significantly higher total amount of investment than if we joined forces, built common elements together, and then built our applications on top. If we are successful, every dollar raised should go further. This consortium brings together academia, tech companies, agriculture, food and beverage companies, governments and multilateral organisations, the UN (e.g., FAO and WHO), and government agencies (e.g., NASA, OECD) to build, invest, and share data in *one consistent manner*, that serves all users' purposes. Such a consortium not only permits integrating existing data but more importantly can develop standards and protocols for interoperability.

The promise offered by this solution is underscored in the *2021 World Development Report: Data for Better Lives*, which describes enabling the 'sharing and reuse' of data as a central pillar to unlocking the potential for data to improve lives.<sup>24</sup> We propose two key elements. The first is to make it frictionless for data owners to share the existence of their data sets, through automated processes that can transform the data into a form data owners are able to share without their having to undertake this low-reward activity each for themselves. The second is to provide data formatting, analysis, and visualisation tools to make it easy for any researchers, analysts, or decision-makers to generate visualisations and insights, set goals, and track progress. It will also strengthen the ability of civil society to hold decision makers accountable for their decisions related to food systems.

**Solution's alignment to the 'game changing and systemic solution' criteria:** This proposal provides a unique, so far non-existent solution, providing an overarching foundation for many potential game-changing solutions that could result from better information. The potential for impact at scale is as far-reaching as an internet connection and a smartphone. If governments around the world are to take responsibility for the whole of their food systems, they require easy-to-access and -use decision-making tools. The existence of such a platform magnifies the return on the investment made in data creation in the first place. This gamechanger is also in many ways low-hanging fruit; with the power of Google and its ability to intermediate with the private sector, the experience of JHU attempting to manually curate existing food systems data, and the expertise of the Consortium members with respect to gender, nutrition, and food systems transformation, this gamechanger is nearly immediately actionable. With the careful stakeholder engagement planned to design the system, the consortium is also well-placed to understand and mitigate any potential political risks, particularly with respect to technology, data privacy, and the agri-food industry. Finally, this will be a sustainable solution because it will build automation and efficient processes in from the ground up, reducing the highly inefficient process required at present to find and integrate data from many sources or make data ready for public sharing. Funding and hosting are still to be determined. The likelihood is a consortium of key non-partisan organisations, including JHU and potentially World Wildlife Fund or World Resources Institute. Funding the technical aspects of the platform is not an issue, as Google will

likely be able to arrange for this and funding for the content development is dependent on the respective partners for their areas of expertise. Once built and operating smoothly, the marginal cost for expansion is near zero; the ongoing costs are human, ensuring the system remains well-governed.

**Existing evidence:** Recent exponential growth in computing power and data storage has remarkably increased the use of data in decision making.<sup>25</sup> However, using data and evidence to drive change remains both a goal and a challenge, particularly for scholars and researchers aiming to influence policy with their work<sup>26</sup> and for decision makers in the public and private sectors looking to drive evidence-driven action.<sup>27</sup> Greater data availability and analytical tools can drive change, for example, by helping policymakers better understand the effectiveness of their policies.<sup>28,29</sup> Greater data availability and analytic tools have also enabled private-sector organisations to directly tie financial incentives e.g., credit facilities, to their sustainability goals, aligning all their financial shareholders appropriately; but these tools remain proprietary.

As an analogue, platforms for accessing and analysing health data have been successfully adopted and have influenced policy.<sup>30-32</sup> Many argue that Covid-19 will alter health policy and administration decision-making processes indefinitely and could even spur new action to address food insecurity<sup>33,34</sup> and climate change.<sup>35</sup> This proposed solution is a timely response at a moment of opportunity where the current crisis has spurred a greater understanding of science, scientific evidence, and the role of data in policymaking and commerce and greater awareness of threats to food systems.

**Current/likely political support:** Food systems are vital to nutrition, food security, livelihoods, and environmental sustainability. Despite this, the world's leaders are lacking easily accessible data, analysis and visualisation tools and thus, in effect, flying blind as they aim to change food systems for the better. This solution is meant to make it easier for governments, businesses, civil society, and international agencies to make more effective decisions to transform food systems to deliver on the SDGs. The founding members of this coalition (see Annex) represent all sectors including civil society, government institutions, academia, development partners, and business. The cross-sector support in and of itself is a proxy for the likely political support for this idea.

**Contexts where this is well/not well suited:** The solution we propose is intended to be especially flexible to different contexts and audiences. Serving the global level, it can inform the extent to which broad trends are moving in the right direction in terms of achieving the SDGs. With data at the country level, it is well-suited to inform national policies - the scale at which many of the policies that are key drivers of food systems (e.g., trade, agricultural policies, environmental regulations) are made. Sub-national data, where available, can help drive regional and municipal-level decisions. Where data are not of high enough quality to be included, or do not exist at all, the use of data and evidence in other places and the benefits accrued will hopefully spur action by data producers to improve, update, collect, and share additional data.

## 23. Develop National Development Plans for a Sustainable and Inclusive Livestock Sector

**The Solution:** The solution is a national investment plan for the livestock sector known as a Livestock Masterplan (LMP). Through an LMP exercise, groups of stakeholders, including government, the private sector, and research and development organisations jointly develop a vision for livestock development and establish a five-year plan to guide the development of a sustainable and inclusive livestock industry.

**Source(s) of the Solution:** The initial toolkit on which this approach is based, called LSIPT (Livestock Sector Investment Planning Tool), was developed under the umbrella of ALIVE (African Partnership for

Livestock Development) by the World Bank and the Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD) with inputs from FAO and ILRI. LSIPT provides a comprehensive baseline assessment of livestock production systems. The LMP approach has recently been upgraded and improved by ILRI to use dynamic foresight models alongside LSIPT for long-term forecasting and strategy development, as these new models better reflect food systems complexities and inherent trade-offs and consider impacts along several economic, welfare, climate change and environment, livelihoods, nutrition, and gender indicators.

**Problem addressed within food systems:** Chronic under-investment is a major constraint to the livestock sector: even though globally the livestock industry comprises on average 40% of agricultural GDP, less than 5% of agricultural investment goes to livestock in LMICs. At the same time, livestock is often the main source of livelihoods for the poorest and most vulnerable communities, and the increasing demand for animal-source food presents new livelihood opportunities for smallholder livestock keepers. In addition, continued child malnutrition requires better access to quality animal-source foods for protein and micronutrients. Adequate and targeted investment in sustainable livestock systems is thus essential for attainment of several key SDGs.

Livestock investment efforts are constrained by the lack of reliable data, and interventions have frequently been narrow, overly technical in nature, poorly adapted to local settings, and giving little consideration to trade-offs and synergies within the livestock sector. The LMP approach tackles these problems directly informed by evidence and guided by stakeholders.

**How this solution will address that problem:** An LMP is a five-year sector investment plan guided by the government's objectives for the livestock sector, which may include reducing poverty, increasing economic growth, and improving food and nutrition security. An LMP is comprised of three parts: a Livestock Sector Analysis (LSA) of the country's trends; a long-term (15-year) forecast based on scenarios and policy options regarding the impact, benefits, costs and trade-offs of the impact of livestock sector strategies (LSS); and a medium-term (5-year) actionable investment plan with commodity value chain roadmaps. Next-generation LMPs use the enhanced foresight models developed by ILRI to generate the LSS.

The LMP begins when full ownership is agreed by the relevant government ministry, which officially convenes the stakeholders and assigns specific staff to participate directly, including receiving thorough training in the quantitative tools. International consultants are typically embedded within ministry offices for the duration of the exercise. Throughout the exercise, there are regular stakeholder consultations, including public, NGO, civil society, and private actors to review plans and interim findings, and at a high level, the ultimate results to ensure a bottom-up, inclusive process drives both data collection and policy recommendations. A steering committee assigned by the ministry oversees the entire exercise.

The LMP process enables livestock ministries to lead, co-own, and accomplish this work through several steps. First, it helps build their capacity in livestock sector quantitative analysis using secondary and primary data gathered by government analysts, supported by international experts. These are used to carry out foresight or ex-ante investment analysis to demonstrate the potential returns on investment of combined livestock technologies and policies and their impacts on the target objectives, which can include economic as well as gender, equity, and environmental criteria. The outputs are documented and quantified 'roadmaps' with specific visions, targets, challenges, strategies, and proposed investments in technology and policy interventions, with expected outputs, outcomes, and impacts mapped. Once final reports are reviewed, approved, and officially signed by the minister, a high-profile launch of the LMP findings and published reports is conducted, led by the minister, with news media and stakeholder participation. Through inclusive and broad stakeholder engagement, particularly with civil society, direct ministry leadership and capacity building, and high-level outreach,

the LMP process has been shown to lead directly to revised and targeted public budgets and new donor and private investment in livestock.

**Solution's alignment to the 'game changing and systemic solution' criteria:** This innovation is 'game changing' on a number of levels. By looking at the livestock sector at national level across a multitude of production systems, an LMP generates insights and strategic options and embeds them into an actionable roadmap to scale out investment decisions by public and private sectors. In Ethiopia, for instance, the investments engendered by LMPs have exceeded US\$100 million, which will have a substantial impact on its livestock sector, improving the lives of thousands and potentially millions of people. LMPs are actionable because experience shows that governments have taken strong ownership of the process and have engaged proactively, while private sector and civil society actors have emerged as important partners in the process. This scale and type of investment, with a focus on capacity and private-sector participation, will have long-term and sustainable outcomes on strategic decision making and transformative sector development.

**Existing evidence:** The LMP conducted in Ethiopia in 2016, with the best documented outcomes so far, has served as the basis for substantial new funding and projects for the country's livestock sector. The detailed plan in the LMP enabled the livestock ministry to receive priority over other sectors through a new World Bank-funded livestock development project, with total funding of US\$176 million, which is expected to significantly transform that industry in the country with the largest livestock population in Africa.<sup>33</sup> In addition, the LMP led to new donor livestock project financing of US\$75 million and new private-sector livestock investments of some US\$200 million.

**Current/likely political support:** At the national governments' invitation and request, ILRI has assisted Ethiopia, Tanzania, Rwanda, Uzbekistan, and the Indian state of Bihar to produce LMPs. The internationally recognised outcomes of those exercises have led to new requests by the governments of The Gambia, Kenya, and the Indian State of Odisha. In recognition of strong government demand and positive outcomes, BMGF, World Bank, FAO, and the African Development Bank have all provided significant financial support to these efforts in recognition of the high value of the approach, including recent new funding. At present, African Union Inter-African Bureau for Animal Resources is further supporting a process to assist ten African countries to develop LMP concept notes and convene investment workshops to drive donor and private-sector support.

**Contexts where this is well/not well suited:** There are no contexts for which this solution is not well suited, since these plans are tailored for each country's needs, opportunities, and setting.

## 24. Promote Women's Leadership in Food Systems

**The Solution:** By 2022, put in place a charter for all organisations over a certain size working in food systems to promote the leadership of women, with a scorecard clear targets of 50% women in leadership and decision-making levels across the food system (in government, private sector, civil society organisations, farmer organisations, and research organisations in food systems).

**Source(s) of the Solution:** The FSS Gender and Women's Empowerment Lever.

**Problem addressed within food systems:** Women represent on average 43% of the agricultural labour force globally and are essential change-agents to ensure the shift to more nutrition-promoting, efficient, and climate-resilient food systems. However, their socio-economic contributions and entrepreneurial potential often remain unrecognised and untapped. Women's voices are not often heard in processes related to food systems. Their leadership in food systems organisations and policies

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<sup>33</sup> <http://projects.worldbank.org/P159382?lang=en>

mirror those in other sectors, including politics. The concerns and issues of women farmers are barely heard at local, national, and global levels.

A major reason for this silence is that there are too few women in leadership positions to represent the interests of women across the food system. The lack of women's representation has negative consequences that are evident at various levels: in farmer organisations, in local, national, and global food companies, in government and national-level policy-making bodies, and even in international decision-making bodies on food systems. This has various consequences, including limited presence and voice of women in public affairs, which results in policies, investments, and legal frameworks that are less sensitive to their specific needs and constraints. While seeming to be gender-neutral, these frameworks may be detrimental to women, thus failing to achieve the intended development outcomes.

**How this solution will address that problem:** Ensuring that women have a greater voice is not only a matter of gender equality. Food systems transformation will require that women be in leadership positions and be part of decision making. To strengthen the participation of women in food systems initiatives and to provide avenues for inclusion of their skills and knowledge, women must be equally represented in food systems decision-making bodies. Governments, private sector, civil society, and producers and consumer organisations need to enforce gender mainstreaming in governance at local, regional, and national levels. Women's participation can be enhanced at various levels and in different sectors through the promotion of inclusive planning, decision-making, implementation, monitoring, and evaluation, including of climate change-related measures and initiatives. For example, governments should ensure the inclusion of women in ministries and in teams engaged in the development of National Adaptation Plans, Nationally Appropriate Mitigation Actions, and National Food Systems Investment Plans, and in local governments and other decision-making and implementation bodies. In research, women must be represented as researchers and research leaders. Recognising women's needs and priorities in the early stages of research and facilitating their engagement in political processes as well as in other contexts in which food systems are embedded, are important steps toward ensuring that women benefit from the results.

While some countries have provisions for the representation of women in constitutional bodies (usually 30%), the mechanisms for enforcement and accountability are not clear. Signing a charter that has clear guidelines and targets for women's leadership, with an annual scorecard, will provide much-needed accountability among the different actors in food systems.

**Solution's alignment to the 'game changing and systemic solution' criteria:** Gender and leadership charters exist in other sectors. For example, Australian Science Organisations have the Athena SWAN Charter, which is based on 10 key principles. By being part of Athena SWAN, institutions commit to a progressive charter and adopt the principles within their policies, practices, action plans, and culture.

**Existing evidence:** While there is no evidence specifically from companies and organisations working in food systems, evidence shows that Fortune 500 companies with representation of three or more women on their boards significantly outperformed those with low representation by 84% on return on sales, by 60% on return on invested capital, and by 46% on return on equity.<sup>34</sup>

**Current/likely political support:** SEWA, IFPRI, RECOTFC, FAO are associated with this solution.

## 25. Strengthen and Mainstream True Cost Accounting to Redefine Value in Food Systems

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<sup>34</sup> Catalyst, (2011). The Bottom Line: Corporate Performance and Women's Representation on Boards (2004-2008)



**The Solution:** This solution aims to strengthen and mainstream True Cost Accounting (TCA) so that policymakers, civil society, consumers, and businesses can redefine value and accelerate meaningful food systems transformations by making informed decisions. TCA is a tool for the systemic measurement and valuation of positive and negative environmental, social, health, and economic costs and benefits to facilitate sustainable choices by governments and market players. TCA is a holistic approach that allows decision-makers across the food system to have a complete picture. In particular, TCA makes the hidden costs and benefits of the food system visible in a qualitative, quantitative, and/or monetised way. TCA provides the understanding and information needed to internalise externalities, thereby enabling the transition to food systems that support planetary health and human well-being.

In the short term, governments and stakeholders of the UNFSS could greatly accelerate and mainstream TCA by fostering harmonised TCA principles, a global community of TCA practitioners, and a toolbox for policymakers and businesses interested in TCA.

**Source(s) of the Solution:** The true cost of food has received increasing attention over the past few years and has emerged as a central point in UNFSS discussions and is represented in several solutions across ATs, flagged as a core outcome in the integration process. Through the Scientific Group, a working group was established, guided by Sheryl Hendriks (co-lead of Scientific Group AT1) with three core analytical teams led by representatives of the Impact Institute, True Price, the Science Group, Tufts University, and WFP with a team of 16 international representatives covering aspects across the food system, including representatives from other ATs and FSS levers. The solution was discussed with the Global Alliance for the Future of Food, and participants agreed to contribute to developing the solution and form a taskforce to support this work through and beyond the Summit process.

This draws on various initiatives, reports, and publications on the topic and the experience of practitioners set out in [Scientific and Economic Foundations Report - The Economics of Ecosystems and Biodiversity \(teebweb.org\)](#), Natural and Social & Human Capital Protocols ([The Capitals Coalition](#)), [Growing Better, Food & Land Use Coalition](#), [The Dasgupta Review \(UK Treasury Department\)](#), [Applying the TEEBAgriFood Evaluation Framework](#), [Impact-Weighted Accounts \(Harvard Business School\)](#), [Principles of True pricing \(True Price Foundation\)](#), [Reconstructing the economy for the 21<sup>st</sup> century \(Impact Economy Foundation\)](#), [TCA Book](#) (advance embargoed copy available upon request), [TCA Accelerator Policy Landscape](#) (True Cost Accounting Accelerator), [TCA Inventory: A collection of methodologies, case studies, and valuation approaches](#) (True Cost Accounting Accelerator), [Prospects for the true cost accounting of food systems \(Baker, L. et al., Nature Food 2020\)](#).

**Problem addressed within food systems:** One major barrier to the transition to sustainable food systems is that the way food is valued in the economy currently ignores nature, health, and food security. This leads to unsustainable decisions by governments and market players. In particular, a fundamental reason why food systems are unsustainable is the fact that it is often in the best interests of actors in the food system to externalise environmental and social costs. The impacts of climate change, biodiversity loss, rising inequality, increases in mortality and morbidity, and the loss of food-cultures are typically borne not by private firms but rather by society at large. Due to these externalities, the prices of unsustainably produced food products are lower than those of sustainable food products, and businesses that externalise costs on society are typically more profitable than businesses that respect planetary and social boundaries. This leads to an erosion of the natural, social, and human capital that underpin society.

Hunger, malnutrition, and NCDs are costly externalities of the food system. Increasing the availability, affordability, safety, and accessibility of food requires a systemic approach that links health and nourishment to planetary boundaries. Current pre-Summit attention to inequality raises another question of who bears the cost of these externalities, as the poor in society have a disproportionate dependence on well-functioning ecosystems. The implications for the poor of any price adjustment to cover these costs and how costs related to making future food systems more sustainable will be

distributed across stakeholders in the system are centrally important. TCA approaches facilitate systems thinking by providing the framework to understand how food system policies and practices both impact and depend upon nature and people. This helps to ensure that siloed interventions, unintended consequences, and short-term solutions are avoided.

**How this solution will address that problem:** Applying TCA across food systems lays bare issues and priorities related to social justice and environmental sustainability that are currently invisible and therefore often ignored by decision-makers. [Baker et al \(2020\)](#) outlines a number of ways TCA can be used across the food system to make consumers aware of the environmental and social externalities embedded in the food they buy. Food companies can use these structured assessments to minimise negative impacts and enhance positive benefits across their value chains. Financial institutions use TCA for reporting, impact investment, and risk assessment. Farmers can use TCA to account for the costs and benefits of their agricultural practices. Governments can use TCA for policy, decision making, and policy impact assessments.

In addition, TCA enables specific system interventions such as true pricing, externality-weighted corporate taxation, or the incorporation of healthy diet baskets into living wages and poverty lines.

**Solution’s alignment to the ‘game changing and systemic solution’ criteria:**

*Impact potential at scale:* TCA is about transforming food systems to internalise positive and negative externalities. Since this is about shifting the market, policies, and the broader institutional factors that shape food system outcomes, it is scalable. TCA has important implications for widening GDP, integrating true costs and benefits into national accounting, redefining value in markets and through integrated corporate reporting, changing price structure, impact assessments at the farm level and beyond, linking policy objectives such as environmental sustainability and equity, and broadening investment criteria.

*Actionability:* TCA is immediately actionable. There are country applications by TEEBAgriFood, the Worldbank WAVES initiative, and applications of SEEA. Scores of business applications are documented by TEEBAgriFood, the Capitals Coalition, Impact Economy Foundation, VBA, True Price, and Harvard Impact Weighted Accounts. The TCA Community of Practice and Accelerator have been working to harmonise TCA frameworks since 2017, develop application guidance and tools, identify policy opportunities, hone communications, and support ‘proof of concept’ studies.

*Sustainability:* A growing number of people and organisations are picking up TCA approaches to design food systems that address climate, biodiversity, health, and inequality crises.

**Existing evidence:** There are several examples from the [TEEBAgriFood initiative](#). In India, TEEB has contributed to the uptake of Zero Budget Natural Farming in Andhra Pradesh. Overviews of successful business TCA studies are collated by [WBCSD](#), [Oxford University](#), and the [TCA Inventory of case studies](#).

**Current/likely political support:**

*Government support:* In a historic session this year, the UN Statistical Committee adopted the [Ecosystem Accounting](#) in the [System of Environmental Economic Accounting](#) (SEEA). Explicit support from a dozen countries, including populous and diverse countries such as China, India, and Indonesia, exists for TEEBAgriFood applications. A policy landscape assessment identified a strong interest from policymakers in TCA. Country-level studies provide proof of concept, including the TEEBAgriFood analysis contributing to the inclusion of agroforestry in the Indonesian five-year mid-term development plan. Several countries could champion TCA. For example, TCA aligns with the EU’s Farm to Fork strategy, emerging priorities for the US government, and Germany’s goal to transition to 30% organic production by 2030. The Netherlands has applied TCA to a typical ‘plate’ of food to provide guidance to consumers and co-funds a public-private partnership in True Pricing. Canada is developing an agri-food sustainability index. More broadly, TCA can support countries through their COVID-19

economic recovery, linking short-term investments to long-term social and environmental goals and targets (IEF).

*Business support:* Businesses are starting to implement TCA studies, with over 350 organisations now participating in the [Capitals Coalition](#) and 20 leading multinational businesses participating in WBCSDs [True Value of Food project](#). A series of interviews as part of the EU funded 'Transparent' project found businesses to have high expectations for the potential of natural capital accounting for decision-making. 227 banks have committed to steer their impact on people and planet as part of the [UNEP-FI Principles for Responsible Banking](#). A global coalition of banks, the Impact Institute, and the Harvard Impact Weighted Accounts Initiative are launching a TCA methodology for banks. A significant number of leading businesses also report their findings externally (e.g., SAM 2020). In Singapore, TCA-related disclosure requirements are being explored for companies to be listed on the Singapore Exchange.

*TCA Accelerator and Community of Practice:* A broad and diverse Community of Practice for TCA was formed in 2017 and created a TCA Accelerator in 2019 to strengthen and mainstream TCA. This represents an active and engaged coalition tackling frameworks, methodologies, and metrics, with broad reach, partners, linkages, and robust networks to carry this work forward. The Accelerator has developed a two-year work plan that includes a focus on communications, harmonisation, policy, and coalition building.

**Contexts where this is well/not well suited:** TCA is cross-cutting and adaptive; there is no particular context for which it is best suited. TCA assessments can focus on a specific product, practice, policy, or even an entire system or value chain. They may be looking forward or backwards or at changes over time, or comparing differences. They may focus on a business, a region, or even a country. They may be concerned with specific impacts like changes to farmer income or broad impacts like regional biodiversity. To realise the potential for systemic change, TCA information should be integrated in mainstream economic metrics at all levels: GDP, business profits, financial returns, and prices.

## 26. Integrate the Costs of Externalities into 'True Prices' for Food

**The Solution:** True Cost Accounting (TCA) is delivering evidence that the environmental, social, and health costs of the food system pose an existential threat to society, while at the same time, many people cannot afford the benefits of sufficient, let alone healthy, food (Baker et al., 2020). The root cause is that these costs and benefits are 'externalised': not included in market prices. As a result, sustainable and healthy food is unaffordable for many consumers and unprofitable to make for most businesses. The proposed solution to this problem is true pricing, the integration of externalities into prices. This makes sustainable and healthy food more affordable to consumers than unsustainable and unhealthy food. It also makes sustainable, healthy, and affordable food production more profitable to businesses than selling unsustainable, unhealthy, or unaffordable food.

Externalities are one of various market and governance failures around food. Economists have long recognised that the solution to externalities is internalisation in prices ([Pigou, 1920](#); [Laffont, 2017](#)). However, for a long time the science and technology did not exist to quantify, price, and account for the externalities of food products. Recent advances in, amongst others, digital analytical capacities have brought true pricing within reach ([Gemmill-Herren et al., 2021](#)). This solution proposes to consolidate 21<sup>st</sup>-century science and technology to enable policymakers, businesses, and consumers to realise true pricing. This requires establishing (i) a measurement standard to calculate true prices, (ii) an open global true price database with benchmarks for each food group and each country, (iii) making existing state-of-the-art (blockchain and 'Internet of Things' technology) accessible and inclusive to measure and trace true prices, and (iv) a science-based policy toolbox for governments to implement pragmatic, effective, and equitable true pricing policies.

**Source(s) of the Solution:** This idea emerges from the same working group and process described in Solution 25. This draws on numerous publications, including: [The Economics of Welfare \(Pigou, 1920\)](#), [Prospects for the true cost accounting of food systems \(Baker, Castilleja, De Groot Ruiz, Jones\)](#), [Principles for True Pricing \(True Price Foundation, 2020\)](#), [Price Volatility and Food Security \(HLPE, 2011\)](#), [The political economy of environmentally related taxes \(OECD, 2014\)](#), [The business case for true pricing \(True Price Foundation, Deloitte, EY, PwC, 2014\)](#), [TEEB for Agriculture and Food: Scientific and Economic Foundations \(2018\)](#), [True cost accounting for Food: Balancing the Scale \(Gemmill-Herren et al., forthcoming\)](#).

**Problem addressed within food systems:** True pricing aims to address the problem that environmental, social, and health costs and benefits of food are externalised ([TPF, 2020](#)). Due to these externalities, unhealthy and unsustainable food is cheaper than healthy and sustainable food. As a result, (i) healthy and sustainable diets are *less affordable* to consumers than unhealthy and unsustainable diets and (ii) selling affordable, healthy, and sustainable food is *not profitable* to businesses (or less profitable). Due to (i) and (ii), many people cannot afford sufficient food, let alone a healthy diet ([FAO, 2020](#)), the accumulation of the environmental costs of food production erodes natural capital, compromising the livelihoods of future generations ([Nature, 2019](#)), and consumption of unhealthy food leads to a loss of lives and quality of life with huge costs to the health system ([Global 2017 Diet Collaborators, 2019](#)). If we do not change those economic rules of the game that disincentivise healthy, sustainable, and affordable food, efforts by governments and business to feed the world within planetary boundaries will inevitably fail. Externalities are possibly the greatest barrier to sustainable food policies.

**How this solution will address that problem:** True pricing addresses the problem of externalities by internalising them. True pricing decreases the price of healthy and sustainable food and increases the price of unsustainable and unhealthy food. Healthy and sustainable diets become more affordable to consumers and more profitable to businesses. In the long term, governments can establish ‘*first-best*’ true pricing mechanisms, which are the most welfare-efficient and equitable ones that provide healthy food for all within planetary and social boundaries. Such mechanisms could include (i) the full internalisation of external costs, (ii) restoration of damages to nature, (iii) adherence to human rights across value chains, (iv) optimal price-stabilising subsidies on healthy and sustainable food financed by public savings on healthcare and environmental mitigation, (v) establishment of labour prices (living wages and income) that allow access to healthy and sustainable diets, and (vi) equitable redistribution of the collective benefits to the poorest.

Currently, there are still substantial technological and political constraints to implement first-best mechanisms ([OECD, 2014](#)). This requires, amongst others, designing science-based first-best mechanisms, building the technological infrastructure to collect and trace externalities along the value chain efficiently, modernising the implementation of fiscal systems, integrating true pricing into international trade agreements, and creating popular understanding and support for true pricing. Hence, in the short run, governments can adopt pragmatic ‘*second-best*’ true pricing policies that take these constraints into account. Second-best policies effectively incentivise sustainable, healthy, and affordable food without imposing large administrative burdens or complexities. Examples of such policies that create smart incentives with a ‘*double dividend*’ are the following:

- a. *Subsidise healthy and sustainable food products for consumers*, financed by *eliminating distorting or inefficient subsidies* or *through a carbon tax* on emissions by businesses.
- b. Stimulate true pricing through *public procurement*, prioritising foods with low external costs.
- c. Integrate true pricing in *risk and capital regulation* by central banks.

Market players can also use true pricing. Transparency about true prices can enable consumers to express their sustainable preferences by *selecting products with lower true prices*. Using true price information, *food companies can prevent external costs* by more sustainable production. Where

prevention is not possible, *producers and consumers can remediate external costs*: pay to restore damages to nature and people. These market-led pathways create endogenous market incentives for internalisation. Governments can stimulate this by facilitating or requiring transparency of true prices. There are also barriers to second-best policies and market-led true pricing approaches. There is no standard to calculate true prices, a lack of data, reliable accounting across value chains is costly, and there is little guidance for governments about second-best true pricing policies. Governments and UNFSS stakeholders can take away these barriers in the short run by establishing a measurement standard and open global database for true pricing, making existing technologies affordable and inclusive, and providing a toolbox for second-best pricing policies to policymakers.

**Solution's alignment to the 'game changing and systemic solution' criteria:**

*Impact potential at scale*: externalities exist across all food systems, at all stages of the food system, and in all locations. Applying true pricing across the system is necessary to address cross-boundary externalities.

*Actionability*: While many barriers still exist and a number of technological and analytical capacities still need to be developed, applying 'second-best' true pricing policies is possible in the short run.

*Sustainability*: True pricing creates collective benefits by changing the rules of the game. Once in place, there will be no turning back. The short-term interventions are modest and easy to maintain.

**Existing evidence**: There is a consensus amongst economists that pricing externalities is an efficient way to internalise them ([Laffont, 2017](#)). There is also empirical work that shows that environmental taxes are effective ([OECD, 2014](#)). In terms of behavioural effectiveness, a meta-study found that on average a 10% decrease in price increases consumption of healthful food by 13% ([Afhsin et al., 2017](#)). There is empirical evidence that revenue recycling could lead to majority support for environmental taxation ([McGrath et al., 2019](#)). Recent advances in science and technology, from environmental economics and LCA to blockchain and the Internet of Things, have made true pricing possible now ([Gemmill-Herren et al., 2021](#)). Actual cases of true pricing by market players have emerged in recent years. Various [food producers](#), [traders](#), and [farmers](#) have used it to make their production more sustainable and involve their customers in price implications. A small number of retailers have used it to provide [transparency](#) about the true price or even [charge it](#). A [certifier](#) uses true pricing to improve its value chain.

**Current/likely political support**: In general, there is wide support for pricing externalities, especially carbon. The UN Secretary General has urged states to adopt [carbon pricing](#). [CPLC](#) brings together 34 governments and 164 businesses to establish a global carbon price. [The Holy See](#) considers economic actions ethical only if the external costs are borne by those who incur them. Recently, various governments are exploring true pricing of food. At the EU level, various actors are interested in TCA. The Netherlands applied TCA to a typical "plate", and the Dutch Competition Authority allows [true pricing](#) as a criterion to justify sustainability collaborations. There is considerable market interest. A [Public-Private Partnership](#) of universities, banks, NGOs, and businesses is developing a methodology for true pricing in food. Also, NGOs use it (e.g., [Fairtrade International](#)). True pricing has been applied by organisations in countries including Colombia, Germany, Kenya, Mexico, Singapore, Uganda, the UK, and the US.

**Contexts where this is well/not well suited**: The approach is universally applicable. Nonetheless, which second-best true pricing mechanism is best suited will be country specific.

## Annexes

### Annex 1: Supporting information for land tenure and land rights solutions (Solutions 10-11)

More than 2.5 billion rural people around the world rely on land and natural resources (such as water, forests, and rangelands) for their livelihoods and well-being (Alden Wily 2019). Of this number, more than half are women. Women play important roles in rural communities; they are the backbone of agriculture and guardians of household food security. They often grow most of the crops for household consumption and are primarily responsible for preparing and processing food. In many settings they are almost exclusively responsible for the nutrition of their children. Women also handle livestock; gather food, fodder, and fuelwood; and manage the domestic water supply (FAO 1996).

Land is the literal bedrock of agricultural production (FAO 2011) and food availability: the type and diversity of food on offer are affected by food production systems reliant on land and water access ([HLPE 2017](#)). Smallholder farms continue to play a vital role in the supply of food (income) and perform a key role in giving poor and marginal groups access to their food requirements (income). The governance of tenure<sup>35</sup>—or the ways society manages access to, control over, and use of land and natural resources (Jansen 2020)—is therefore a fundamental pillar of any food system, in particular for low-income people. Even though national laws and international instruments often recognise and promote gender equality, women continue to lack access to and control over land, forests and fisheries as well as other important resources (FAO 2011; Clement et al. 2019; Ragasa, Aberman, and Alvarez Mingote 2019; Larson, Castellanos, and Jensen 2019; Agarwal 2018).

Barriers within food systems, which restrict access to healthy and affordable food, often result in nutrition inequities<sup>36</sup> for the vulnerable and marginalised: women and children; the poor, rural, and remote; minority and indigenous groups; and those in crisis and conflict areas ([Global Nutrition Report 2020](#)). Pre-pandemic, healthy diets were unaffordable for roughly three billion people ([SOFI 2020](#)); a dangerous mix of COVID-19, conflict and climate change may push 150 million into extreme poverty in 2021, [the first rise in extreme poverty in 20 years](#). To meet their goals, SDGs 2 and 10 must be supported by scalable interventions focused on women's land rights—a crucial enabler and foundational factor to many parts of food systems.

Advocacy for women's land rights is rooted in significant evidence of the benefits. Studies have shown a direct correlation between secure land rights for women and improvements in household food security. When women have access to farmland and income, adequate consumption becomes steadier, diets become more diverse, and children's health and nutrition improve (Meinzen-Dick et al. 2017; Larson, Castellanos, and Jensen 2019; Agarwal 1994; Doss 2006). In fact, when women have land, the prevalence of childhood stunting is reduced (Rehman, Ping, and Razzaq 2019). Finally, agricultural programs that focus on gender, women's empowerment, behaviour change, and nutrition more often result in improved nutritional outcomes (see Ragasa, Aberman, and Alvarez Mingote 2019 for an overview).

#### REFERENCES

ActionAid Kenya, ADECRU, Enda Pronat, Fórum Mulher, GROOTS Kenya, Oxfam in Malawi and LANDac (2018) Women's Land Rights in Africa (WLRA): scaling up impacts from the grassroots in

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<sup>35</sup> Land tenure systems range from informal to formal and can include customary, group, collective, leasehold, and freehold; See [Realizing Women's Rights to Land and Other Productive Resources](#) for a comprehensive overview.

<sup>36</sup> The [Global Nutrition Report 2020](#) provides a comprehensive overview of the links between food systems and health systems for nutrition equity.

Kenya, Malawi, Mozambique and Senegal. Synthesis report: Securing Women's Land Rights in Africa. LANDac, Utrecht.

Agarwal, B. 2001. "Participatory Exclusions, Community Forestry, and Gender: An Analysis for South Asia and a Conceptual Framework." *World Development* 29 (10): 1623–48.

Alden Wily, L. 2019. "Could Collective Title Become a New Norm?" *Land Journal* January/February 2019: 15-17.

Allendorf, K. 2007. "Do Women's Land Rights Promote Empowerment and Child Health in Nepal?" *World Development* 35 (11): 1975-1988.

Doss, C. 2006. "The Effects of Intrahousehold Property Ownership on Expenditure Patterns in Ghana." *J. AFR. ECON* 15(1): 149-180.

Food and Agriculture Organization and Save the Children Mozambique (2009) Children and women's rights to property and inheritance in Mozambique. Elements for an effective intervention strategy. <http://www.fao.org/3/al131e/al131e00.pdf>

Food and Agriculture Organization. 1996. Food for All. Final report of the World Food Summit held on 13-17 November, Rome, Italy.

Flintan, F. 2008. Women's Empowerment in Pastoral Societies. IUCN and World Initiative for Sustainable Pastoralism. IUCN Publications. <https://www.iucn.org/content/report-womens-empowermentpastoral-societies>. Accessed March 13, 2020.

Mello, D. 2014. "Collective Microenterprises and Rural Women's Economic Empowerment in Brazilian Amazonia." Ph.D. dissertation, University of Florida.

Menon, N., van der Meulen Rodgers, Y., and H. Nguyen. 2014. "Women's Land rights and Children's Human Capital in Vietnam." *World Development* 54: 18-31.

New Course. 2010. "Women, Natural Resource Management, and Poverty: A Review of Issues and Opportunities." <http://anewcourse.org/wp-content/uploads/2014/04/women-natural-resource-management-and-poverty-PEW.pdf>.

Rights and Resources Initiative. 2017. Power and Potential: A Comparative Analysis of National Laws and Regulations Concerning Women's Rights To Community Forests. Washington, D.C.: RRI.

Schmink, M., and M.A. Gómez-García. 2015. "Under the Canopy: Gender and Forests in Amazonia." Occasional Paper 121. Bogor, Indonesia: Center for International Forestry Research.

Steel, G., R. Santpoort, A. Mkandawire, C. Ntauazi, E. Hadji Faye and F. Githuku. Forthcoming. "The Land is ours: grassroots organisations' strategies in securing women's access, control and rights to land in rural communities in Kenya, Mozambique, Senegal and Malawi ". Special issue on community women's land rights in *Frontiers in Sustainable Food Systems*.

UN Women. 2020. Gender Equality: Women's Rights in Review 25 Years After Beijing. New York: UN Women. <https://www.unwomen.org/-/media/headquarters/attachments/sections/library/publications/2020/gender-equality-womens-rights-in-review-en.pdf?la=en&vs=934>

## Annex 2: Supporting information for the wasting reset solution (Solution 13)

The main thematic areas for change (i.e., working group areas), the current situation they face, and the vision to achieve by 2030

	Current situation	Vision for 2030
<b>Prevention</b>	<p>Prevention not prioritised with focus on treatment.</p> <p>Food systems contributing to inequity and high wasting burden each year.</p> <p>Poor links with stunting reduction efforts.</p> <p>Little investment and attention in maternal nutrition and health</p>	<p>Clear guidance on how to prevent wasting across the life cycle and with actions across the food system.</p> <p>Scale-up of programming for prevention of wasting, especially for small and nutritionally at-risk infants and children.</p> <p>Food systems working to increase resilience to wasting for vulnerable women and children.</p> <p>Identification and scale up of 'double duty' approaches for preventing undernutrition (actions that will target both risks of under- and over-nutrition, such as breastfeeding)</p>
<b>Financing</b>	<p>Short-term humanitarian funding for nutrition; identified needs woefully underfunded.</p> <p>Lack of guidance on standardised approaches to assess cost effectiveness</p>	<p>Financial commitments for sufficient scale up of prevention and treatment of wasting</p> <p>Flexibility to ensure seasonal surges are resourced and financed</p>
<b>Advocacy</b>	<p>Multiple initiatives &amp; groups</p> <p>Lack of leadership</p> <p>Lack of coordination</p> <p>Focus on scale up of treatment only</p> <p>Lack of inter-sectoral convergence</p>	<p>Coordinated action and leadership to focus attention on the prevention of wasting; world wasting day or week each year where wasting stakeholders (across sectors) are held to account</p> <p>Wasting indicator developed that all sectors need to measure/report against, and sufficient resources to measure it</p> <p>Cross-sectoral coordination and advocacy efforts for wasting</p>
<b>Technical programming</b>	<p>Poor coverage of treatment for wasting for the most 'at risk'</p> <p>Innovation is slow and piecemeal.</p> <p>Capacity constraints at country level to implement programming</p> <p>Focus on anthropometric deficit and recovery as the outcome (rather than functional outcomes like death, disease, development)</p>	<p>Reset of mindset to focus on outcomes (mortality, morbidity, growth, development)</p> <p>International steering group functioning that has oversight of wasting policy, research and developments (wasting hub)</p> <p>Coordinated aligned research agenda that speaks to evidence gaps and implementation guidance needs</p> <p>UNICEF to include wasting indicators (incidence, not just prevalence) as core annual indicators.</p>
<b>Policies and guidelines</b>	<p>Lack of evidence for 'what works' in different contexts to reduce wasting.</p> <p>Slow guideline revision process and insufficient support to guidance uptake at country level</p> <p>Lack of implementation guidance</p> <p>GAP on Child Wasting not going far enough</p> <p>WHO guidelines remain siloed along moderate and severe wasting (rather than spectrum of risk)</p>	<p>De-medicalisation of treatment for the vast majority of children who are lower risk, achieved by task shifting treatment to community health workers in primary health care</p> <p>Broader horizons on types of evidence captured beyond systematic reviews (e.g., country exemplar case studies, process evaluations accompany intervention trials)</p> <p>Dynamic production of implementation guidance connected to but not limited by WHO processes</p> <p>Investment in guideline uptake at country level</p>
<b>Products</b>	<p>High cost, limited competition, stifled innovation, mostly international producers</p> <p>Suspicion of private sector vested interests</p> <p>Inadequate consideration of demand creation</p>	<p>De-medicalisation of products</p> <p>Lower cost</p> <p>Wide variety of products</p> <p>Enhanced private sector engagement with multiple producers</p> <p>Innovation encouraged and facilitated</p> <p>Local production</p>



## Annex 3: Supporting information for vegetable consumption and production solution (Solution 19)

### Summary of additional actions on Supporting Increased Production and Consumption of Vegetables

We know on a broad scale the structural limitations to fruits and vegetables: Global and national challenges of increasing production and accessing quality growing material shared equitably; local issues of ensuring affordability and addressing perishability and enabling everyone everywhere to access fruits and vegetables; and social issues of valuing vegetables for their role in cuisines and for health. Food system actions to make fruits and vegetables more available, affordable, accessible and desirable through policy, push and pull mechanisms comprise various options working at macro (global and national) meso (institutional, city and community) and micro (household and individual) levels. Examples of actions from the review above are laid out in the table below.

#### Examples of pull, push and policy actions at different levels

	<b>Macro (global and national)</b>	<b>Meso (institutional, city and community)</b>	<b>Micro (household and individual)</b>
<b>Policy</b>	<ul style="list-style-type: none"> <li>➤ R&amp;D investment</li> <li>➤ Right to food legislation</li> <li>➤ Food safety regulation</li> </ul>	<ul style="list-style-type: none"> <li>➤ Zoning and marketing regulation</li> <li>➤ Prioritising F&amp;V in institutional food procurement plans</li> </ul>	<ul style="list-style-type: none"> <li>➤ Protected foraging rights</li> <li>➤ Land rights</li> </ul>
<b>Push</b>	<ul style="list-style-type: none"> <li>➤ Production subsidies</li> <li>➤ Efficiency through breeding and technology</li> <li>➤ Support to diverse alternative production paradigms</li> <li>➤ Infrastructure development</li> <li>➤ Fair finance access</li> </ul>	<ul style="list-style-type: none"> <li>➤ Quality F&amp;V planting material (formal and informal systems)</li> <li>➤ Pre- and post-harvest practices and packaging</li> <li>➤ Improving market access, shortening food supply chains</li> <li>➤ F&amp;V extension and training</li> <li>➤ Support to fresh food outlets</li> </ul>	<ul style="list-style-type: none"> <li>➤ Home &amp; community gardens</li> </ul>
<b>Pull</b>	<ul style="list-style-type: none"> <li>➤ Price subsidies</li> <li>➤ Social safety nets</li> <li>➤ Food-based dietary guidelines</li> </ul>	<ul style="list-style-type: none"> <li>➤ F&amp;V-rich institutional meals</li> <li>➤ Basic processing for preservation</li> <li>➤ Social marketing campaigns</li> <li>➤ Promotion of traditional F&amp;V</li> <li>➤ F&amp;V product placement in shops and canteens</li> </ul>	<ul style="list-style-type: none"> <li>➤ Nutrition literacy campaigns</li> <li>➤ School gardens and learning for shaping preferences</li> </ul>

These actions are likely to be foundational to creating food systems change towards enabling vegetable-rich diets. Each of these actions will not change diets when implemented alone, however; rather packages of actions need to address particular limitations to fruit and vegetable consumption. The game-changer actions defined above will create an ‘enabling environment’ allowing these to be actioned in the contexts where they are relevant, working towards enabling vegetable-rich food systems for healthy diets for all.

## Annex 4: Supporting information for the data consortium solution (Solution 22)

### Summary of Idea and Background Information

Achieving food systems transformation in service of the SDGs requires data-driven, integrated, and coherent decision-making and aligned action across all sectors. Numerous organisations have proposed purpose-built data dashboards for a specific topic - from agriculture to gender equity to micronutrients. Bringing all these together, this solution proposes to streamline the setup, development, and maintenance of data resources using common data infrastructure that can be configured for any topic.

Global food systems have countless stakeholders and moving parts, are temporally and spatially dynamic, and are very often unpredictable in nature. Characterising food systems requires both analyses of the state of specific indicators and outcomes, and the relationships between them – all of which shift as food systems evolve. Data from multiple sectors and subsectors, at local to international scales, are required. There have been improvements in food systems data in terms of availability, breadth, and quality but there are still significant data gaps, owing in part to frictions in collecting, curating, analysing, visualising, and sharing data. Researchers, policy makers, and decision-makers at all levels of food systems are impeded in their ability to design, development, implement, and monitor food systems interventions.

Common technological (the ‘operating system’) and institutional (common ‘rules’) infrastructure can directly address the significant data gaps and the friction in working with data. To be successful for multi-purpose, multi-stakeholder use, the technological functions must include discovery, aggregation, harmonisation, standardisation, translation, and encryption, with ‘application layers’ that enable data exploration, analysis, modelling, visualising, and forecasting. Data accessibility is not only a technological problem. Private organisations and some development partners are hesitant to share data, and understanding their needs is key; even where data are public or shared, many do not meet current standards for discoverability and interoperability and platform standards can facilitate and automate improvements.

### Members of the group that contributed to this solution:

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## Preliminary Use Cases

- 1. Private data registry to enable sharing:** Competitive organisations, whether for-profit or non-profit, are hesitant to share full datasets (for both technical and cultural reasons) but see the need to do so in service of the SDGS. Initially, a dataset registry activates a broad set of organisations to participate and signal intent in a low-risk way. Subsequently, a dataset exchange enables the subset of organisations who are ready to share their datasets to do so in a low-friction way. Cloud technology makes the dataset registry highly searchable and the dataset exchange safe.
- 2. Intelligent monitoring system for weather, agriculture, food systems, and food security:** Building off existing global standards (such as the Integrated Food Security Phase Classification (IPC) standards of chronic and acute hunger) and using advanced data tools (such as artificial intelligence and cloud-based tools) to provide more consistent, frequent, and comprehensive data analysis that learns from dependent relationships between weather, agriculture, food, and hunger.
- 3. Diet quality monitoring:** Encourage political support and the mobilisation of resources by increasing visibility of the nutrition situation of the most vulnerable, including women and children, measuring progress towards improving diet quality, and informing investments in evidence-based food systems and nutrition policies and programmes at national and regional levels. Diet quality monitoring will take a central role in raising awareness on the importance of healthy and diverse diets in the transformation of food systems.
- 4. Global Micronutrient Data Hub:** Bringing together organisations that collect, house, and use micronutrient data to align nomenclature, research roadmaps, and improve data interoperability to inform integrated actions and resources to improve the existence, access, and use of national and regional policies, programme coverage, and micronutrient intake and status data. These data are critical to identifying target population groups, scaling interventions, and monitoring progress addressing all forms of malnutrition. It will work to find innovative ways to address the micronutrient data gap by ensuring more status and intake data are generated; using new data search techniques and Artificial Intelligence (AI) to identify alternative data source, proxy indicators for micronutrient outcomes, and programme performance to measure impact and target populations at risk; and integrating models and AI to project the impact of food systems interventions to guide policy development. Working closely with health systems data sources and modelling tools will enable the projection of the combined impact of food- and health system interventions on micronutrient nutrition.
- 5. Data for Gender Transformative Food Systems Policies:** A one-stop-shop for gender indicators and sex-disaggregated data across the food system, including indicators on resources (e.g., land ownership), agency (e.g., decision-making over various domains), and achievements (e.g., health, nutrition, and other well-being indicators), as well as composite indicators like the Women's Empowerment in Agriculture Index (WEAI). Gender indicators and sex-disaggregated data are essential to develop key actions for targeting and to implement interventions aimed at closing current gender gaps, changing underlying social norms, and addressing structural causes of gender inequality in food systems. This will provide a go-to place for new, cutting-edge data collection/indicator development efforts so that data are immediately available to users that need them (e.g., the Women's Empowerment Metric for National Statistical Systems, which is currently under development in partnership with the 50x2030 initiative); provide the data to support the development of key actions for targeting and implementation of interventions aimed at closing current gender gaps, changing underlying social norms, and addressing structural causes of gender inequality in food systems.
- 6. Expanded and improved food security forecasting and monitoring:** The world does not have a singular source of information to provide real-time assessments of people facing acute food insecurity with the geographic scale to cover any country of concern, the ability to update forecasts frequently and consistently in near real-time, and with multi stakeholder consensus building. There is a globally accepted standard for food security analysis classification, the IPC. The

IPC is currently mostly used for humanitarian response and is largely unknown among development players. It has good potential to become a “common language” at the humanitarian-development nexus. The IPC provides a standardised analytical framework with an agreed set of core indicators. These can be refined, and a strong future information system can build on the IPC as the accepted standard methodology and classification and draw on all relevant existing work by other actors. Existing early warning systems have already proven their feasibility, and efforts are already underway to expand early warning and predictive capabilities.

## References cited

- 1 Capalbo SM, Antle JM, Seavert C. Next generation data systems and knowledge products to support agricultural producers and science-based policy decision making. *Agric Syst* 2017; **155**: 191–9.
- 2 Antle JM, Jones JW, Rosenzweig C. Next generation agricultural system models and knowledge products: Synthesis and strategy. *Agric Syst* 2017; **155**: 179–85.
- 3 Global Open Data for Agriculture and Nutrition (GODAN). <https://www.godan.info/aboutgodan> (accessed April 12, 2021).
- 4 Sayani S. Trust, Velocity and Inclusivity in Data for Sustainable Development. 2019; published online Jan 31. <https://www.nielsen.com/eu/en/insights/article/2019/perspectives-trust-velocity-and-inclusivity-in-data-for-sustainable-development/> (accessed April 12, 2021).
- 5 CIAT and IFPRI. CGIAR Big Data Coordination Platform Leveraging CGIAR data: Bringing big data to agriculture, and agriculture to big data. 2016; published online July. <https://cgspace.cgiar.org/bitstream/handle/10947/4450/2.%20Big%20Data%20platform%20CGIAR%20Resubmission.pdf?sequence=1>.
- 6 IFPRI. Global Food Security Portal. 2021. <http://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/134290/filename/134502.pdf> (accessed April 16, 2021).
- 7 World Bank. DataBank. <https://databank.worldbank.org/home.aspx> (accessed April 15, 2021).
- 8 FAO. Hand in Hand. <http://www.fao.org/hand-in-hand/en> (accessed April 15, 2021).
- 9 50x2030 Data-Smart Agriculture. Producing, Using, Innovating: How 50x2030 is closing the agricultural data gap. 2021 [https://www.50x2030.org/sites/default/files/resources/documents/2021-03/An%20Introduction%20to%20the%2050x2030%20Initiative\\_8March2021\\_clean\\_0.pdf](https://www.50x2030.org/sites/default/files/resources/documents/2021-03/An%20Introduction%20to%20the%2050x2030%20Initiative_8March2021_clean_0.pdf).
- 10 Fanzo J, Haddad L, McLaren R, *et al.* The Food Systems Dashboard is a new tool to inform better food policy. *Nature Food* 2020; **1**: 243–6.
- 11 National Information Platforms for Nutrition. Guidance Notes. NIPN. <http://www.nipn-nutrition-platforms.org/NIPN-Guidance-Notes> (accessed April 15, 2021).
- 12 Wilkinson MD, Dumontier M, Aalbersberg IJJ, *et al.* The FAIR Guiding Principles for scientific data management and stewardship. *Sci Data* 2016; **3**: 160018.
- 13 Research Data Alliance. Interdisciplinary research. rd-alliance.org. 2020; published online Oct 6. <https://www.rd-alliance.org/rda-disciplines/rda-interdisciplinary-research> (accessed April 15, 2021).
- 14 Dataverse. Dataset + File Management. Dataverse.org. <https://guides.dataverse.org/en/5.3/user/dataset-management.html> (accessed April 15, 2021).
- 15 The Open Data Institute. Guides. theodi.org. <https://theodi.org/knowledge-opinion/guides/> (accessed April 15, 2021).
- 16 Wikigender. <https://www.wikigender.org/> (accessed April 25, 2021).
- 17 McDonald GG, Costello C, Bone J, *et al.* Satellites can reveal global extent of forced labor in the world’s fishing fleet. *Proc Natl Acad Sci U S A* 2021; **118**. DOI:10.1073/pnas.2016238117.
- 18 Kroodsma DA, Mayorga J, Hochberg T, *et al.* Tracking the global footprint of fisheries. *Science* 2018; **359**: 904–8.

- 19 Dunn DC, Jablonicky C, Crespo GO, *et al.* Empowering high seas governance with satellite vessel tracking data. *Fish Fish* 2018; **19**: 729–39.
- 20 Cabral RB, Mayorga J, Clemence M, *et al.* Rapid and lasting gains from solving illegal fishing. *Nat Ecol Evol* 2018; **2**: 650–8.
- 21 Potapov P, Hansen MC, Laestadius L, *et al.* The last frontiers of wilderness: Tracking loss of intact forest landscapes from 2000 to 2013. *Sci Adv* 2017; **3**: e1600821.
- 22 Harris NL, Goldman E, Gabris C, *et al.* Using spatial statistics to identify emerging hot spots of forest loss. *Environ Res Lett* 2017; **12**: 024012.
- 23 Curtis PG, Slay CM, Harris NL, Tyukavina A, Hansen MC. Classifying drivers of global forest loss. *Science* 2018; **361**: 1108–11.
- 24 World Bank. World Development Report 2021: Data for Development. World Bank, 2021.
- 25 Brynjolfsson E, McElheran K. The Rapid Adoption of Data-Driven Decision-Making. *Am Econ Rev* 2016; **106**: 133–9.
- 26 Brownell KD, Roberto CA. Strategic science with policy impact. *Lancet* 2015; **385**: 2445–6.
- 27 Oliver K, Cairney P. The dos and don'ts of influencing policy: a systematic review of advice to academics. *Palgrave Communications* 2019; **5**: 1–11.
- 28 Lakerveld J, Woods C, Hebestreit A, *et al.* Advancing the evidence base for public policies impacting on dietary behaviour, physical activity and sedentary behaviour in Europe: The Policy Evaluation Network promoting a multidisciplinary approach. *Food Policy* 2020; **96**: 101873.
- 29 Just DR, Byrne AT. Evidence-based policy and food consumer behaviour: how empirical challenges shape the evidence. *Eur Rev Agric Econ* 2020; **47**: 348–70.
- 30 Becker AD, Grantz KH, Hegde ST, Bérubé S, Cummings DAT, Wesolowski A. Development and dissemination of infectious disease dynamic transmission models during the COVID-19 pandemic: what can we learn from other pathogens and how can we move forward? *Lancet Digit Health* 2021; **3**: e41–50.
- 31 McBryde ES, Meehan MT, Adegboye OA, *et al.* Role of modelling in COVID-19 policy development. *Paediatr Respir Rev* 2020; **35**: 57–60.
- 32 George B, Verschuere B, Wayenberg E, Zaki BL. A Guide to Benchmarking COVID-19 Performance Data. *Public Adm Rev* 2020; published online May 31. DOI:10.1111/puar.13255.
- 33 Bakalis S, Valdramidis VP, Argyropoulos D, *et al.* Perspectives from CO+RE: How COVID-19 changed our food systems and food security paradigms. *Curr Res Food Sci* 2020; **3**: 166–72.
- 34 Béné C. Resilience of local food systems and links to food security - A review of some important concepts in the context of COVID-19 and other shocks. *Food Secur* 2020;: 1–18.
- 35 Herrero M, Thornton P. What can COVID-19 teach us about responding to climate change? *Lancet Planet Health* 2020; **4**: e174.
- 36 Pomeranz JL, Wilde P, Huang Y, Micha R, Mozaffarian D. Legal and Administrative Feasibility of a Federal Junk Food and Sugar-Sweetened Beverage Tax to Improve Diet. *Am J Public Health* 2018; **108**: 203–9.