



**UN
Nutrition**

**UN-NUTRITION
JOURNAL**

**VOLUME 1:
Transforming nutrition**

ABOUT THE UN-Nutrition JOURNAL

The *UN-Nutrition Journal* is a peer-reviewed publication issued once a year by UN-Nutrition. It focuses on perceived knowledge gaps and emerging nutrition issues, informing the debate in ways that promote and facilitate action and help build a coherent global narrative. Each edition of the *UN-Nutrition Journal* collates and shares high-quality knowledge, insights and perspectives on a selected theme, including harmonized United Nations positions. Importantly, it gives voice and opens the academic publication space to researchers, programme managers, programme designers, implementers and hands-on field teams from low- and middle-income countries, giving them a platform for exchanging ideas on what works and how and for identifying innovative approaches that enable action.

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Abbreviations and acronyms

ACF	Action Against Hunger	GIFT	Global Individual Food consumption data Tool (FAO/WHO)
AFRO	African region (WHO)	GINA	Global database on the Implementation of Nutrition Action
AfDB	African Development Bank	GIZ	Gesellschaft für International Zusammenarbeit
AICR	American Institute for Cancer Research	GLOPAN	Global Panel on Agriculture and Food Systems for Nutrition
ATNI	Access to Nutrition Index	GNR	Global Nutrition Report
AUDA-NEPAD	African Union Development Agency-New Partnership for Africa's Development	GPE	Global Partner for Education
BCC	behaviour change communication	GTFN	Gender-Transformative Framework for Nutrition
BCG	Business Constituency Group	GusNIP	Gus Schumacher Nutrition Incentive Program
CAISAN	Interministerial Chamber for Food and Nutrition Security (Brazil)	HFSS	high in unhealthy fats, sugars and salt
CCAFS	CGIAR Research Programme on Climate Change, Agriculture and Food Security	HGSF	home-grown school feeding
CFS	Committee on World Food Security	HLPE	High-Level Panel of Experts on Food Security and Nutrition
CGF	Consumer Goods Forum	ICN2	Second International Conference on Nutrition
CGPAN	National Food and Nutrition Policy Coordination Unit (Brazil)	ICT	information and communications technology
CMAM	community-based management of acute malnutrition	IFAD	International Fund for Agricultural Development
CODA	conditional on Demand Assistance	IFBA	International Food and Beverage Alliance
CONSEA	National Food and Nutrition Security Council (Brazil)	IFC	International Finance Corporation
COP26	Twenty-sixth United Nations Climate Change Conference of the Parties	IFPRI	International Food Policy Research Institute
COVID-19	coronavirus disease 2019	IISD	International Institute of Sustainable Development
CSA	climate-smart agriculture	INAN	National Food and Nutrition Institute (Brazil)
CSAF	Council on Smallholder Finance	INSAE	Institut National de la Statistique et de l'Analyse Économique
CRS	Catholic Relief Services	IPCC	Intergovernmental Panel on Climate Change
CSO	civil-society organization	IQFC	individual quantitative food consumption
CWBP	Costed woreda-based planning (Ethiopia)	IT	information technology
EFSA	European Food Safety Authority	LMIC	low- and middle-income country
EGM	evidence gap map	MERCOSUR	Southern Common Market
EMRO	Eastern Mediterranean region (WHO)	MUAC	mid-upper-arm circumference
ENANI	Brazilian National Survey of Child Nutrition	N3F	Nutritious Foods Financing Facility
ERS	Economic Research Service	N4G	Nutrition for Growth
EURO	European region (WHO)	NAF	Nutrition Accountability Framework
FACT	Fortification Assessment Coverage Toolkit	NAP	National Adaptation Plan
FAO	Food and Agriculture Organization of the United Nations	NBCAL	Brazilian Code for Food Marketing for Infants
FBDGs	food-based dietary guidelines	NCD	non-communicable disease
FIA	Food Industry Asia	NDC	nationally determined contribution
FINI	Food Insecurity Nutrition Incentive	NDF	nutrient-dense food
FR_eSH	Food Reform for Sustainability and Health	NFC	near-field communication
G7	Group of Seven	NFSP	national food systems pathways
GAIN	Global Alliance for Improved Nutrition	NGO	non-governmental organization
GCNF	Global Child Nutrition Foundation	NIFA	National Institute of Food and Agriculture
GDP	gross domestic product	NJPPP	Nutrition Japan Public Private Platform
GHG	greenhouse gas	NNMR	neonatal mortality rate
		NP	national pathway

OECD	Organisation for Economic Co-operation and Development	USDHHS	United States Department of Health and Human Services
PAHO	Pan American Health Organization Region of the Americas (WHO)	WASH	water, sanitation and hygiene
PENSSAN	Brazilian Food Sovereignty and Security Research Network	WBA	World Benchmarking Alliance
PHC	primary health care	WBCSD	World Business Council for Sustainable Development
PNAN	National Food and Nutrition Policy (Brazil)	WCRFI	World Cancer Research Fund International
PNASI	National Integrated School Feeding Programme (Benin)	WFP	World Food Programme
PROTEJA	National Strategy for Prevention and Care of Childhood Obesity (Brazil)	WHA	World Health Assembly
PURE	Prospective Urban Rural Epidemiology	WHO	World Health Organization
RBP	Responsible Business Pledge for Better Nutrition	WIC	Special Supplemental Nutrition Program for Women, Infants, and Children
RPM	red and processed meat	WPRO	Western Pacific region (WHO)
SBCC	social behaviour change communication	XOF	West African CFA franc
SBN	SUN Business Network		
SDG	Sustainable Development Goal		
SEARO	South-East Asia region (WHO)		
SISAN	Food and Nutrition Security System (Brazil)		
SISVAN	Food and Nutrition Surveillance System (Brazil)		
SMART	specific, measurable, achievable, relevant and time-bound		
SME	small and medium-sized enterprise		
SNAP	Supplemental Nutrition Assistance Program		
SWOT	strengths, weaknesses, opportunities and threats		
SUN	Scaling Up Nutrition (Movement)		
SUS	Brazilian national health system		
TTM	Taiwan Technical Mission		
U5MR	under-five mortality rate		
UBS	basic health units (Brazil)		
UNCCD	United Nations Convention to Combat Desertification		
UNDESA	United Nations Department of Economic and Social Affairs		
UNDP	United Nations Development Programme		
UNFCCC	United Nations Framework Convention on Climate Change		
UNFSS	United Nations Food Systems Summit		
UNICEF	United Nations Children's Fund		
UNSCN	United Nations System Standing Committee on Nutrition		
US	United States		
USD	United States dollar		
USDA	United States Department of Agriculture		

Foreword

Dear *UN-Nutrition Journal* reader,

As Chair of UN-Nutrition, I am delighted to present the inaugural issue of our flagship publication, the *UN-Nutrition Journal*. Like all UN-Nutrition knowledge products, the *UN-Nutrition Journal* benefits from the individual strengths and comparative advantages of the members of its editorial board. For this first issue, the editorial board selected the theme *Transforming Nutrition*.

This theme sits at the crossroads of the three areas of collaboration stipulated in the newly published UN-Nutrition Strategy (2022–2030): i) coordinated United Nations strategic support for governments at all levels; ii) collective knowledge management; and iii) joint advocacy and communications.

In this inaugural issue, researchers, policymakers, programme implementers and United Nations staff have shared their original research and novel analysis, new tools, innovative ideas and mechanisms, as well as interesting insights into what it takes to transform nutrition. Addressing nutrition and environmental interlinkages is highlighted as a core transformative approach.

The theme was chosen amid multiple crises. The pressure of the COVID-19 pandemic on people's livelihoods, well-being, food security and nutritional status has started to ease, but it is far from over. The ongoing triple planetary crisis of climate change, biodiversity loss and pollution is daunting.

Adding to these challenges are the new and ongoing conflicts in Ethiopia, Syrian Arab Republic, Ukraine, Yemen and others. Ukraine, for instance, is one of the world's largest exporters of agricultural commodities. With export disruptions, prices are spiking. These conflicts are putting significant upward pressure on international food prices and exacerbating food insecurity, with negative impacts on the nutrition of billions of people around the world.

Against this backdrop, transformative measures must be urgently identified and promoted to ensure good nutrition and the right to adequate food. National governments must be supported in putting them in place at scale. Transforming nutrition is, therefore, not just a need, but a moral imperative. As a United Nations family, only together, in the spirit of "One UN for Nutrition", can we effectively help countries to address such enormous challenges.

NAOKO YAMAMOTO

Chair of UN-Nutrition

Assistant Director-General for Universal Health Coverage/Healthier Populations at WHO

EDITORIAL

The transformation of nutrition is still being neglected: The time to act is now

Good nutrition is indisputably critical to the health, well-being, economic growth and prosperity of individuals and communities. Access to a healthy diet is a fundamental human right. In addition, the consumption of healthy diets produced by sustainable food systems is a key part of the solution not only to malnutrition, but also the triple planetary crisis of climate change, biodiversity loss and pollution. Improved nutrition is, therefore, a critical element in achieving all of the Sustainable Development Goals (SDGs).

And yet, not a single country is free from malnutrition in any of its forms. In 2021, 22 percent of children under five experienced stunting, almost 7 percent experienced wasting, while nearly 6 percent were overweight (FAO, IFAD, UNICEF, WFP and WHO, 2022). Adding to the burden, the World Health Organization (WHO) estimates that more than 2 billion people suffer from micronutrient deficiency globally. Regrettably, past progress has been reversed and the world is moving backwards in its efforts to end hunger and malnutrition, with up to 828 million people facing hunger in 2021 (FAO, IFAD, UNICEF, WFP and WHO, 2022). A healthy diet is a core component of the solution to these alarming prevalence rates, but this is out of reach for almost 40 percent of the world population. Almost 3.1 billion people could not afford a healthy diet in 2020 – a 112 million increase from 2019 (FAO, IFAD, UNICEF, WFP and WHO, 2022).

With the 2030 deadline for achieving the SDGs fast approaching, the efforts made to date are proving insufficient in the face of the daunting challenges. We must transform this reality.

Transforming nutrition means improving the nutritional status of all people, everywhere and at all stages of life, so that they can live healthily and thrive. Equally, however, it means transforming the interlinked food, health, social protection and environment-related systems that determine nutrition. The transformation needs to ensure access to healthy diets for all, produced, distributed and consumed by sustainable practices, including the ways in which we trade and buy food and conduct business. Consequently, transforming nutrition

means making major fundamental changes in the scale and effectiveness of nutrition-sensitive and environmentally conscious policies and actions in multiple sectors, so that they generate co-benefits for people and planet.

The *UN-Nutrition Journal, Volume 1: Transforming Nutrition* recounts how countries are considering nutrition in their food system transformation pathways, developed in the context of the major global mobilization propelled by the United Nations Food Systems Summit. While many pathways mention nutrition-sensitive interventions and food-based dietary guidelines as entry points, there seems to be an overall lack of clear target setting. Governance for nutrition – arguably a vital component of transformation – appears to receive less attention. Unsurprisingly, in half of the pathways, nutrition and healthy diets are not yet clearly positioned as a core consideration. This has to change. Improved nutrition will be an explicit expected outcome of countries' journeys along their chosen paths.

This inaugural edition of the *UN-Nutrition Journal* also presents a robust accountability platform for monitoring nutrition actions based on common principles, methods and approaches and tracking progress on the nutrition commitments made at the 2021 Nutrition for Growth Summit in Tokyo: the Nutrition Accountability Framework (NAF). The transparency provided by the NAF is key to the accountability of duty-bearers, as well as the exchange of knowledge and peer-to-peer learning.

Interestingly, the nutrition and environmental nexus is raised in several articles, suggesting that this is an important issue that must be a priority area of research and action. The key message here is that succumbing to the triple planetary crisis is not inevitable. Promoting healthy diets from sustainable practices, including sustainable consumption, is a fundamental element of the solution. Various authors offer ideas on how to get there. Examples include using climate services to help prioritize nutrition-sensitive climate adaptation strategies; mobilizing the G20 countries to use their food-based dietary guidelines to reduce the consumption



of red and processed meat; and how a new generation of school food and nutrition programmes has great potential to transform nutrition with environmental co-benefits.

The availability and accessibility of foods that enable healthy and sustainable consumer choice are key. Some of our authors strongly advocate for territorial markets as an effective means of improving access to fresh, locally produced and nutritious foods. Others argue that transnational food and beverage companies and business organizations have a key role to play once good governance, accountability and mechanisms for managing conflicts of interest are in place.

The UN-Nutrition Journal aims to stir up the debate on transforming nutrition. Its articles do not necessarily reflect official United Nations positions or recommendations. They

STINEKE OENEMA, Editor in Chief

are contributions from independently minded experts from academia, government and United Nations agencies that aim to foster an enabling policy environment for effective action at scale and, consequently, results. Six articles present original research and new analysis. Other articles offer innovations and insights from a global and country perspective. This first volume of the UN-Nutrition Journal clearly shows that compelling, innovative tools, methodologies and insights are available or being actively explored at global and national level.

One message arises time and again: the time to join forces and act to transform nutrition is now.

Welcome to the *UN-Nutrition Journal, Volume 1: Transforming Nutrition*. We welcome your feedback and suggestions, which will help us to improve future editions.

DENISE C COITINHO DELMUÈ, Executive Editor

References

FAO, IFAD, UNICEF, WFP & WHO. 2022. *The State of Food Security and Nutrition in the World 2022. Repurposing food and agricultural policies to make healthy diets more affordable*. Rome: FAO.

ORIGINAL RESEARCH

Healthy diets and food in national food systems pathways: An exploratory review

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Keywords: healthy diets, food systems pathways, nutrition

Abstract

This exploratory review aims to make a novel contribution to the existing literature on healthy diets. It is complemented by the analysis of Pullar *et al.* (2022) on the same issue in this edition of *UN-Nutrition Journal*. Based on the guiding principles for sustainable healthy diets (FAO and WHO, 2019), it explores how the United Nations Food System Summit's (UNFSS) definition of healthy diets is used in national food systems pathways for shaping environmentally sustainable food systems, while taking into account the importance of culture, socioeconomics and food environments in enabling choices related to foods and diets. The authors used a food systems approach to assess the extent to which the national food systems pathways reviewed for this study incorporated healthy diets in a holistic way and whether they addressed different forms of malnutrition, such as undernutrition, as well as overweight, obesity and non-communicable diseases (NCDs).

Overall, the findings show that most of the countries took into account both the concept of nutrition and healthy diets when creating their pathways to sustainable food systems. However, it also reveals that only half of the countries had clearly positioned food at the core of nutrition/health, socioeconomic and environmental considerations. Similarly, only half cited malnutrition in all its forms, with even less

attention paid to micronutrient deficiencies and NCDs. Fewer than half of the countries included considerations on unhealthy diets and/or unhealthy foods.

The findings point to a number of recommendations that could be used to shape the next iterations of the national food systems pathways to ensure that healthy diets are available, affordable and accessible to all, especially to the most vulnerable. Recommendations include taking into account all forms of malnutrition and continuing the dialogue between food systems, food security and nutrition actors to better position diets at the core of nutrition/health, socioeconomic and environmental considerations. In addition, workplans should be accompanied by well-designed monitoring and evaluation frameworks to demonstrate results and strengthen accountability.

Introduction

The year 2021 was a watershed moment in aligning food systems and nutrition, with two key events in the form of the UN Food Systems Summit (UNFSS) and the Nutrition for Growth (N4G) Summit in Tokyo. In particular, as part of the UNFSS process, multi-stakeholder food systems dialogues were convened at the national level to co-create "game-changing solutions" to address interlinked challenges related to agriculture, environment, climate, poverty and nutrition.

Based on these national dialogues, countries developed national food systems pathways (NFSPs), with support from a broad range of stakeholders, to pave the way for the sustainable transformation of food systems.

At global level, five “action tracks” were established to gather scientific evidence from a diverse range of experts, while also reflecting priorities, experiences and lessons learned from multiple entities. Action track 1 to “ensure access to safe and nutritious food for all” focused on how to achieve Zero Hunger and improve levels of nutrition as part of Sustainable Development Goal (SDG) 2. Experts commonly agreed on a “healthy diet as health-promoting and disease-preventing. It provides adequacy without excess of nutrients and health-promoting substances from nutritious foods and avoids the consumption of health-harming substances” (Hendriks, Hugas and Neufled, 2021).

Healthy and sustainable diets were a key demand expressed by youth representatives and a priority highlighted in national dialogues (UNFSS, 2022). The Coalition of Action for Healthy Diets from Sustainable Food Systems for Children and All was announced in 2021 as an outcome of the UNFSS. It aims to ensure that healthy diets are sustainably produced and available, affordable and accessible to all, especially those most vulnerable to malnutrition and those living in vulnerable circumstances (WHO, 2021).

This analysis uses a number of the guiding principles of sustainable healthy diets (FAO and WHO, 2019), considering international nutrition recommendations, the environmental cost of food production and consumption, and the adaptability of diets to local social, cultural and economic contexts. It aims to provide a comparative perspective on common characteristics and gaps related to the concept of healthy diets across the NFSPs to inform policy actors engaged in food systems, agriculture and the food and nutrition sectors.

Methodology

The authors accessed the published documents through the [Food System Summit 2021 Dialogues Gateway](#) and reviewed 112 out of 115 national food system pathways in May 2022. Three NFSPs – Benin, Panama and the Russian Federation – were excluded from the review because the documents available were only outlines. Along with 83 national pathways in English, the analysis included a review of 14 national pathway documents in French, 13 in Spanish, 1 in Arabic and 1 in Portuguese. Native speakers reviewed the non-English-language documents using an agreed set of translated keywords. The authors prioritized the following 10 topics: nutrition, undernutrition, micronutrient deficiency, overweight/obesity, NCDs, diets, foods from a nutrition/health perspective, foods from a socioeconomic perspective, foods from an environmental perspective, and unhealthy diets/foods. The search was done manually using key words, as described in Table 1.

Table 1. List of keywords for each topic

	English	French	Spanish
1	Nutrition	Nutrition	Nutrición
2	Reference to malnutrition – undernutrition (stunting, wasting, underweight)	Malnutrition – sous-nutrition, dénutrition (retard de croissance, émaciation, insuffisance pondérale)	Malnutrición – desnutrición (desnutrición crónica/retraso del crecimiento, desnutrición aguda/emaciación, bajo peso)
3	Reference to malnutrition – micronutrient deficiency (anaemia, anaemia, iodine, vitamin A)	Carence en micronutriments (anémie, iode, vitamine A)	Deficiencia de micronutrientes (anemia, yodo, vitamina A)
4	Reference to malnutrition – over-nutrition, overweight/obesity	Suralimentation/surpoids/obésité	Sobrenutrición/sobrepeso/obesidad
5	Reference to malnutrition – NCD (non-communicable disease)	MNT (maladies non transmissibles)	ENT (enfermedades no transmisibles)
6	Reference to diets (such as healthy, balanced, diverse, for a particular population age group such as child, pregnant women, lactating women, etc.)	Régimes alimentaires (par exemple, sain, équilibré, diversifié, pour un groupe d'âge particulier tels que les enfants, les femmes enceintes, les femmes allaitantes, etc.)	Dieta (por ejemplo, saludable, balanceada, diversa, para determinada población edad-grupo, tales como niños, mujeres embarazadas, mujeres lactantes, etc.)
7	Reference to foods from a nutrition/health perspective (safe, nutritious, nutrient-rich, healthy etc.)	Aliments d'un point de vue de la nutrition/santé (sûr, nutritif, riche en nutriments, sain, etc.)	Alimentos desde una perspectiva de salud/nutrición (inocuos, nutritivos, ricos en nutrientes, saludables etc.)
8	Reference to foods from a socioeconomic perspective, (local, sufficiency, native, traditional, indigenous, affordable, etc.)	Aliments d'un point de vue socio-économique (local, autosuffisant, autochtone, local, traditionnel, indigène, abordable, etc.)	Alimentos desde una perspectiva socio-económica (local, autóctona, nativa, tradicional, indígena, asequible, etc.)
9	Reference to foods from an environmental perspective (organic, sustainable, diverse, etc.)	Aliments d'un point de vue environnemental (biologique, durable, diversifié, etc.)	Alimentos desde una perspectiva ambiental (orgánico, sostenible, diverso, etc.)
10	Reference to unhealthy diets/foods (sugar, fat/ trans fat, salt)	Mauvais régimes alimentaires et/ou aliments mauvais pour la santé (sucre, graisse/grasas trans, sel)	Dietas no saludables/alimentos (azúcar, grasas/ grasas trans, sal)

SOURCE: Authors' own elaboration.

For each topic, the authors used all agreed keywords to determine whether the topic was covered in the first place. For example, to ascertain whether and how the document covered the topic of healthy diets, the authors used the key word “diet” to identify all sections in the document where this word appeared. The authors were then able to assess how diets were defined in each of the sections (so not only, for example, in the introduction) by looking for other characteristics, such as “healthy”, “diverse”, “balanced”, or attributes specific to a population age group, such as “child”, “pregnant women” and/or “lactating women”. This also allowed the team to determine whether the topic of “unhealthy” diets was covered in the document.

A similar process was used with the key word “food”, primarily to establish a clear distinction from “food systems”. This allowed the identification of all sections in the document

where the word “food” appeared on its own. The authors were then able to assess what other characteristics were included to establish whether and how the nutrition/health, socioeconomic and environmental perspectives were covered in the document. For example, the authors considered that the document covered the nutrition/health perspective if the word “food” was accompanied by any of the characteristics included in Table 1, such as “healthy”, “safe” or “nutritious”. Similarly, the socioeconomic perspective was considered covered if the word “food” was accompanied by any of the characteristics included in Table 1, such as “local”, “indigenous” or “traditional”. Moreover, as the search was done manually, the authors were able to check for food certifications, such as fair certifications and organic seals. While time consuming, this thorough exploration allowed the authors to contextualize how the topic was integrated into each relevant section of the document, beyond a general problem statement in the introduction.

The authors validated this analysis by cross-checking the results with the work conducted by the Food and Agriculture Organization of the United Nations (FAO) Data Lab for Statistical Innovation, using tailored text-mining tools to extract, summarize and categorize information from the NFSPs. The FAO Data Lab is in the process of publishing dashboards covering all broad themes of the UNFSS, including healthy diets. In this regard, our analysis provided complementary insights into how the NFSPs incorporated nutrition, healthy diets and foods covering the dimensions of health, socioeconomic and environmental sustainability.

Limitations

The NFSPs show a high degree of variation in terms of government endorsement, stakeholder engagement, content length and completeness. The documents confirm a lack of consistency in the ways countries use definitions associated with malnutrition, diets and foods. In some instances, the authors had to use their judgment and consult among themselves to agree on the inclusion or exclusion of a given country. For example, a few countries did not use the word “diet”, but referred extensively to “healthy consumption”, showing a degree of alignment with the guiding principles of healthy diets. In this case, the authors included these countries in the “healthy diets” category. In contrast, a few countries used “healthy nutrition” without providing any further clarity and the authors decided to exclude them from the “healthy diets” category.

The examination of how key words were presented in the relevant statements allowed the team to cross-check results on “healthy diets” with the findings of the FAO Data Lab. The discrepancies were resolved by selecting fewer key words under “healthy diets” and ensuring that those words appeared

in the sections of the NFSPs linked to policy actions. It was very useful to have external validation to question the underlying assumptions related to the selection of the key words.

Findings

The 112 NFSPs reviewed show a good distribution between high-income (26), upper-middle-income (30), lower-middle-income (34) and low-income countries (22). Based on the analysis, 93 countries (83 percent) include attention to healthy diets in their NFSPs, but only 54 countries (48 percent), make reference to unhealthy diets or foods high in salt, sugar and/or fat as risk factors (also defined as unhealthy or ultra-processed foods in some documents). Out of all countries, 23 (20.5 percent) have clearly positioned foods at the core of health, socioeconomic and environmental perspectives and 18 of these are lower-middle-income countries.

The analysis found that out of 86 low and middle-income countries, 38 (44.2 percent) acknowledge the challenge of the double burden of malnutrition – the coexistence of undernutrition (that is, micronutrient deficiencies and childhood stunting and wasting) and overweight and obesity. Worldwide nutrition problems, such as micronutrient deficiencies, overweight and obesity, and NCDs, are mentioned by 43 (38.4 percent), 58 (51.8 percent) and 42 countries (37.5 percent), respectively, regardless of income-level grouping.

Overall, 13 countries (11.6 percent) were found to have comprehensively included all forms of malnutrition, healthy diets and looked-at foods from a nutrition/health, socioeconomic and environment perspective. These countries also mentioned unhealthy diets and/or foods.

Table 2. Countries that cover all 10 topics in a holistic way

Sub-regional grouping (no. of countries)	No. of countries	Countries
Sub-Saharan Africa (35)	5	Chad, Ghana, Kenya, Lesotho and Nigeria
Western Asia and North Africa (13)	2	Armenia and Oman
Latin America and the Caribbean (15)	2	El Salvador and Uruguay
East and South-east Asia (11)	0	
Central and Southern Asia (10)	0	
Oceania (12)	3	Nauru, Papua New Guinea and Samoa
North America and Europe (16)	2	United States of America and Hungary
Total	13	

SOURCE: Authors' own elaboration.

The analysis considers the NFSPs of Uruguay (high income), El Salvador (lower middle income), Chad (low income), Ghana (lower middle income) and Hungary (high income) to be good examples of pathways using a food systems approach. The pathways are organized around the main components of the food systems conceptual framework developed in 2017 by the High-Level Panel of Experts on Food Security and Nutrition, linking food systems, foods, healthy diets and nutrition outcomes (HLPE, 2017). They also connect food systems with health, education and social protection systems. Uruguay's NFSP, for example, considers all components of the food system, from the food supply chain, food environment and consumer behaviour to health, socioeconomic and environmental outcomes.

Moreover, food systems transformation is expressly linked to nutrition outcomes. Ghana's pathway states, for example, that "ecosystems are the productive base of food, and food produced must not only quench hunger but must also nourish bodies" (UNFSS, 2021c). Each section in this document highlights policy actions that take into consideration a nutrition perspective.

The NFSP of Hungary includes all topics with the exception of child undernutrition, as this is not a public health problem in the country. It provides an in-depth assessment of the current food system and nutritional status of the population and presents both short- and long-term tasks to achieve healthy and sustainable diets alongside different initiatives and policy regulations for all components of the food system.

For their pathways, these countries carried out an assessment of food systems and organized consultations with a wide range of actors and stakeholders engaged in food systems, food security and nutrition. In Chad, for example, the exercise of developing the NFSP helped improve participants' knowledge of food systems and sensitized them to the urgent need to act in a coordinated way (UNFSS, 2021a). The country, through the dialogue process, prioritized the need to create an enabling environment for all actors to play their role and assume their responsibilities.

All countries prepared a detailed workplan. El Salvador prioritized actions connected to existing public policies and current national strategies. Its plan clarified the roles from the institutional side, while promoting social participation in the implementation of actions. A well-structured monitoring and evaluation process was also included to ensure accountability (UNFSS, 2021b).

Conclusions

This exploratory review aims to make a novel contribution to the existing literature on healthy diets. Based on the FAO–WHO guiding principles for sustainable healthy diets (FAO and WHO,

2019), it explores how the UNFSS definition of a healthy diet is used in NFSPs for shaping environmentally sustainable food systems while taking into consideration the importance of culture, economics and food environments in enabling choices related to food and diets. The authors used a food systems lens to assess how the reviewed NFSPs considered this holistic approach to healthy diets against a backdrop of different forms of malnutrition. This paper complements the analysis by Pullar *et al.* (2022) in this edition of *UN-Nutrition Journal* and should be read in tandem.

This exploratory review revealed common strengths in terms of the inclusion of healthy diets in the NFSPs and good opportunities for concrete action in future. Overall, the findings showed that most of the countries took into account both the concepts of nutrition in general and healthy diets when creating their pathways to sustainable food systems.

On the flip side, the review revealed that only half of the countries have clearly positioned foods at the core of nutrition/health, socioeconomic and environmental considerations. Similarly, only half had reflected malnutrition in all its forms, with less attention paid to micronutrient deficiencies and NCDs. Fewer than half of the countries included considerations to address unhealthy diets and/or unhealthy foods.

When reviewing the NFSPs and validating the results with FAO Data Lab colleagues, the authors found that it was vital to agree on well-defined terminology and limit the number of key words for each selected topic.

Based on the findings of this study and good NFSP examples, a minimum set of recommendations to improve the NFSPs could include the following:

- National convenors and the food system actors involved should consider all forms of malnutrition relevant to their context, including undernutrition, micronutrient deficiency, overweight, obesity and NCDs.
- National convenors should continue to bridge the gap between food systems and nutrition by engaging all stakeholders involved in the design and implementation of nutrition-sensitive policies and programmes, to ensure that preventive strategies against malnutrition adequately consider food and dietary-related issues.
- National convenors and relevant actors in the Food Systems Summit Coalitions for Action should ensure that foods, as part of healthy diets, are positioned at the core of nutrition/health, socioeconomic and environmental considerations, in line with the FAO–WHO guiding principles for sustainable healthy diets (FAO and WHO, 2019).
- National convenors and relevant actors in the Food Systems Summit Coalitions for Action should ensure

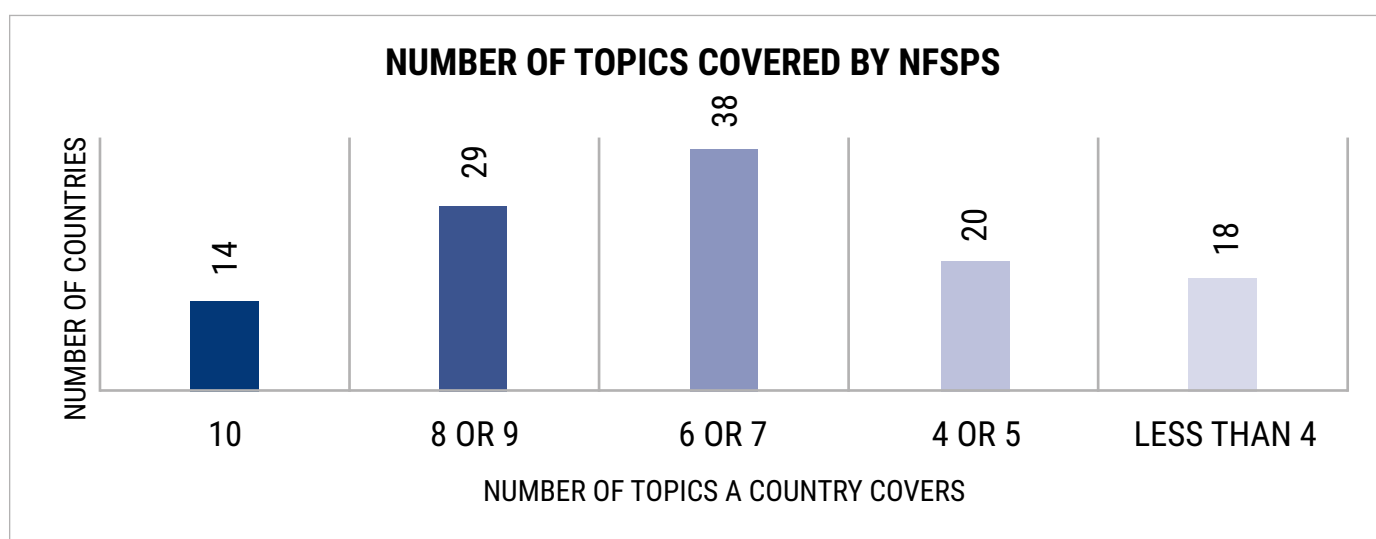
that well-designed monitoring and evaluation frameworks accompany detailed workplans to demonstrate results and strengthen accountability.

- The Food Systems Summit Coalitions for Actions that are analysing the NFSPs should be conscious of the different terminologies that have been used in the documents. We recommend fewer key words and a thorough analysis of the statements that include the selected key words. For example, “healthy food” is not the same as “healthy diet”. The former does not encapsulate a “healthy diet”, which

assumes the existence of a balanced and diverse range of safe and nutritious foods. For this reason, we have created separate categories to look at how “food” is presented in the NFSPs in addition to reviewing “healthy diets”.

- As the NFSPs are living documents, countries should link them to the development of national policies, programmes and investments that will translate the food systems pathways into concrete, costed and measurable action plans to ensure that healthy and sustainable diets are available, affordable and accessible to all.

Annex 1. List of countries by number of topics covered by their NFSPs



10	8 OR 9	6 OR 7	4 OR 5	LESS THAN 4
CHAD	BANGLADESH	ALGERIA	AZERBAIJAN	ALBANIA
EL SALVADOR	BOLIVIA (PLURINATIONAL STATE OF)	ANGOLA	BOTSWANA	CAMEROON
GHANA	BRAZIL	BAHAMAS	CHILE	CENTRAL AFRICAN REPUBLIC
KENYA	DOMINICAN REPUBLIC	BHUTAN	DEMOCRATIC REPUBLIC OF THE CONGO	CONGO
LESOTHO	EQUATORIAL GUINEA	BURKINA FASO	EGYPT	GABON
NAURU	FIJI	BURUNDI	GAMBIA (THE)	GEORGIA
NIGERIA	HUNGARY	CAMBODIA	GERMANY	ITALY
OMAN	KUWAIT	CHINA	IRELAND	JORDAN
PAPUA NEW GUINEA	LAO PEOPLE'S DEMOCRATIC REPUBLIC	COLOMBIA	JAPAN	KAZAKHSTAN
ARMENIA	MARSHALL ISLANDS	COSTA RICA	KYRGYZSTAN	LATVIA
SAMOA	MICRONESIA (FEDERATED STATES OF)	DENMARK	LIBERIA	MOZAMBIQUE
UNITED STATES OF AMERICA	MEXICO	ESWATINI	MAURITIUS	NIGER
URUGUAY	MONGOLIA	ETHIOPIA	SERBIA	QATAR
	NAMIBIA	FINLAND	SEYCHELLES	TONGA
	NEW ZEALAND	GUATEMALA	SIERRA LEONE	TÜRKIYE
	PAKISTAN	GUYANA	SOMALIA	UZBEKISTAN
	PERU	HAITI	SWITZERLAND	

10	8 OR 9	6 OR 7	4 OR 5	LESS THAN 4
	PHILIPPINES (THE)	HONDURAS	TUVALU	
	PALAU	INDIA		
	RWANDA	INDONESIA	UNITED ARAB EMIRATES	
	SRI LANKA	ISRAEL		
	SUDAN	KIRIBATI		
	TAJIKISTAN	MALAWI		
	TIMOR-LESTE	MALAYSIA		
	UNITED REPUBLIC OF TANZANIA	MAURITANIA		
	VANUATU	MYANMAR		
	ZIMBABWE	NEPAL		
		POLAND		
		REPUBLIC OF KOREA		
		SENEGAL		
		SOUTH AFRICA		
		SPAIN		
		SWEDEN		
		UGANDA		
		UKRAINE		
		UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND		

SOURCE: Authors' own elaboration.

References

- FAO & WHO.** 2019. *Sustainable healthy diets – Guiding principles*. Rome and Geneva, Switzerland. <https://www.fao.org/policy-support/tools-and-publications/resources-details/en/c/1329630/>
- Hendriks, S., Hugas, M. & Neufled, L.M.** 2021. *Healthy Diet: A definition for the United Nations Food Systems Summit 2021*. Bonn, Germany, Center for Development Research (ZEF) in cooperation with the Scientific Group for the United Nations Food System Summit 2021. <https://doi.org/10.48565/scfss2021-e072>
- HLPE (High Level Panel of Experts on Food Security and Nutrition).** 2017. *Nutrition and food systems*. Rome. <https://www.fao.org/3/i7846e/l7846E.pdf>
- Pullar, J., Mahy, L., Mora, A., Engesveen, K., Warren, C., De Regil, L. & Branca, F.** 2022. Nutrition-related outcomes of the United Nations Food Systems Summit country pathways. In: *UN-Nutrition Journal, Volume 1: Transforming Nutrition*. Rome, UN-Nutrition.
- UNFSS.** 2021a. *UNFSS Shaping Pathway: Chad*. New York. <https://summitdialogues.org/wp-content/uploads/2021/09/Feuille-de-Route-Nationale-du-Tchad-VPF-22.9.21.pdf>
- UNFSS.** 2021b. *UNFSS Shaping Pathway: El Salvador*. New York. <https://summitdialogues.org/wp-content/uploads/2021/11/SAS-Documento-Sistemas-Alimentarios-Sostenibles-El-Salvador-2021.-Noviembre.pdf>
- UNFSS.** 2021c. *UNFSS Shaping Pathway: Ghana*. New York. <https://summitdialogues.org/wp-content/uploads/2021/09/Pathways-for-Ghanas-Food-Systems-Transformation15-09-21.pdf>
- UNFSS.** 2022. *Food Systems Summit Dialogues: Member states dialogues synthesis – Report 4*. New York. <https://summitdialogues.org/wp-content/uploads/2022/03/Member-State-Dialogue-Synthesis-Report-4-March-2022-EN.pdf>
- WHO.** 2021. New coalitions announced at the UN Food Systems Summit to increase access to healthy diets from sustainable food systems. Press release, 23 September 2021. Geneva, Switzerland. <https://www.who.int/news/item/23-09-2021-new-coalitions-announced-at-the-un-food-systems-summit-to-increase-access-to-healthy-diets-from-sustainable-food-systems>

Nutrition-related outcomes of the United Nations Food Systems Summit country pathways

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Abstract

In 2021, the United Nations Food Systems Summit (UNFSS) was a catalytic global moment for food systems transformation. It shone a light on the transformative potential of food systems to advance countries' commitment to upholding the Rome Declaration and enacting its policy recommendations to end malnutrition in all its forms. This analysis evaluates the degree to which World Health Organization (WHO)-recommended nutrition policy actions have been included in countries' food system transformation pathways, the outcomes of the UNFSS national dialogues.

Of the 104 pathways published by February 2022, the most frequently included nutrition policy actions were nutrition-sensitive agriculture (n=86), awareness-raising initiatives (n=83), food safety (n=74) and healthy public procurement initiatives (n=68). Actions to address the affordability, accessibility and availability of foods high in unhealthy fats, sugars and salt (HFSS) were less common. Less than a quarter of pathways cited nutrition labelling, product reformulation, marketing restrictions or fiscal policies. Actions to achieve World Health Assembly (WHA) targets on breastfeeding, childhood stunting, obesity and non-communicable diseases (NCDs) were explicitly mentioned in fewer than a quarter of all pathways. While 73 pathways included plans for establishing multisectoral governance bodies for food systems transformation, just three included plans to manage conflicts of interest.

Many country pathways remain in draft format and continue to evolve. They provide a key framework for advancing progress towards the 2030 Sustainable Development Goals (SDGs) and ending malnutrition in all its forms. Achieving this requires the scaling up of nutrition policy action to address the availability, accessibility and affordability of foods that make up healthy dietary patterns, as well as the current oversupply of HFSS foods and beverages.

Introduction

The inaugural UNFSS in September 2021 was a key opportunity to bring global attention to our food systems. The Summit placed a global spotlight on the need and great potential to leverage the power of food systems to drive the recovery from COVID-19, achieve the 2030 Agenda and ensure a healthy, sustainable future for people and planet.

Convened by United Nations Secretary-General António Guterres as a "People's Summit", the UNFSS brought together Member States, United Nations agencies, civil-society organizations, researchers, Indigenous Peoples, youth and food producers around the world with a shared vision of catalysing transformative action to change the way the world consumes, produces and thinks about food. From the outset, health was a central pillar of this transformative vision (Guterres, 2019; Food Systems Summit Community, 2021).

In short, our global food systems are making us ill (WHO, 2021a). The COVID-19 pandemic has intensified all forms of malnutrition and served as a reminder of the interconnectedness of our own health and that of the planet. It has revealed the intrinsic weaknesses of unsustainable food systems, which have evolved to deliver calories for the masses and profit for the few. At the time of the UNFSS, more than 3 billion people could not afford a healthy diet, 2 billion had micronutrient deficiencies and 690 million were going hungry, while 678 million adults were living with obesity (WHO, 2021a; FAO, IFAD, UNICEF, WFP and WHO, 2021).

The burden of malnutrition is a violation of the human right to food and continues to drive health and social inequality. The unsustainable practices that define our food systems are also driving deforestation, biodiversity loss, the depletion of our oceans, the emergence of zoonotic diseases and antimicrobial resistance (WHO, 2021a; UNEP, 2021; Tubiello *et al.*, 2021). With food systems accounting for a third of global anthropogenic greenhouse gas emissions, their transformation is critical to limiting global warming to less than two degrees Celsius, in line with the Paris Agreement (IPCC, 2022).

Truly transformative, systemic, human rights-based action is required to reorient our food systems to deliver for the health of people, oceans, animals and soils, to protect the delicate planet that sustains us and to achieve the 2030 SDGs.

To catalyse this transformation, the UNFSS was informed by more than 900 independent, 550 national and 11 global dialogues involving 115 953 participants (Food Systems Summit Community, 2021). These dialogues aimed to spark ideas, connections and debate, raise consensus and stimulate game-changing solutions to drive impactful change. Dialogues and proceedings were shaped around five “action tracks”, each anchored by a United Nations agency:

- Action track 1: Ensuring access to safe and nutritious food for all, anchored by the Food and Agriculture Organization of the United Nations (FAO)
- Action track 2: Shifting to sustainable consumption patterns, anchored by WHO
- Action track 3: Boosting nature-positive production at scale, anchored by the United Nations Convention to Combat Desertification (UNCCD)
- Action track 4: Advancing equitable livelihoods, anchored by the International Fund for Agricultural Development (IFAD)
- Action track 5: Building resilience to vulnerabilities, shocks and stresses, anchored by the World Food Programme (WFP)

In its role as an anchor agency, WHO advocated for a new narrative that puts health at the centre of our food systems (WHO, 2021a). This narrative details the pathways through which food systems impact health, as well as the urgent need to act to combat drivers of ill health. The narrative was supported by a package of seven WHO Priority Food Systems for Health policy actions, which governments and city leaders were encouraged to enact (WHO, 2021b). These actions are a subset of the 60 policy recommendations referred to in the Second International Conference on Nutrition (ICN2) Framework for Action, which accompanies the Rome Declaration and guides the United Nations Decade of Action on Nutrition (2016-2025) (WHO and FAO, 2014; FAO and WHO, 2014).

The WHO priority actions are long-standing, proven, cost-effective, scalable and monitored actions that are already being implemented by a growing number of Member States. As of March 2022, this included 96 countries implementing public food procurement and service policies; 86 countries with a national tax on sugar-sweetened beverages; 26 countries with excise taxes on foods typically high in fats, sugars and/or salt, and fats and oils; 52 countries with restrictions on the marketing of food and non-alcoholic beverages to children; 42 countries with front-of-pack labelling initiatives; and 82 countries implementing food-product reformulation strategies (WHO, 2022a).

Along with the wider ICN2 recommendations, the WHO Priority Food Systems for Health policy actions support the achievement of the global WHA targets for nutrition (WHO, 2014) and NCDs (WHO, 2011). To accelerate progress on implementing the ICN2 recommendations, FAO and WHO jointly published the *Strengthening Nutrition Action* resource guide to support countries in translating the policies into concrete, SMART (specific, measurable, achievable, relevant and time-bound) commitments (FAO and WHO, 2019). These recommendations are designed to be implemented within holistic action plans that tackle the double burden of malnutrition. Some of them were championed by United Nations agencies and other actors involved in the UNFSS process, gaining support as game-changing solutions for food systems transformation.

At country level, national convenors led the UNFSS processes and dialogues and facilitated the translation of the outcomes into country pathways. Country pathways detail the roadmap for food systems transformation at national level to address Member States’ unique challenges, opportunities and needs (Food Systems Summit Community, 2021; UNFSS, 2022a).

This analysis aims to serve as a stock-take of how nutrition is incorporated into these country pathways, providing a benchmark for future action to ensure that they contribute effectively to ending malnutrition in all its forms.

Methods

Inclusion criteria

Published country pathways were sourced from the official UNFSS website. Documents were reviewed for their structure, as well as for nutrition content. All 110 pathway documents published before 31 January 2022 were reviewed. Those that detailed intentions, plans or proposals for food systems transformation were analysed. In cases where countries had published multiple iterations of their pathway, the most recent version was analysed. Those that only detailed intent to develop a pathway document were not included in the analysis. All pathways were translated into English using the Microsoft Office translation tool.

Nutrition parameters

The nutrition indicators included in the analysis are detailed in Table 1. The indicators reflect priority areas of action to end malnutrition in all its forms and to realize the right to food. These include the seven WHO Priority Food Systems for Health policy actions, as well as actions to progress global nutrition and NCD targets and other ICN2 recommendations, which rely upon food systems transformation and nutrition-sensitive actions to transform the agriculture, livestock and aquatic food sectors. This subset of ICN2 recommendations was chosen for its potential relevance to the work of the Coalition of Action on Healthy Diets from Sustainable Food Systems (WHO, 2022g), which emerged from the UNFSS.

Table 1. Indicators used for the pathway analysis

Parameter	Description
General nutrition	
The burden of malnutrition	Discusses the current burden of malnutrition faced by the country (including stunting, wasting, anaemia, micronutrient deficiencies, underweight, overweight, obesity)
Right to food	Makes reference to food system transformation as a mechanism to uphold/realize the right to food
Nutrition wordcount	A tally of the number of times the word nutrition/nutritious/nutritional was mentioned within the pathway
WHO Priority Food Systems for Health policy actions	
Marketing restriction	Efforts to regulate or restrict the advertising of HFSS food and beverages
Fortification	Efforts to increase the utilization and reach of fortification, the practice of adding extra vitamins and minerals to staple foods, as a means to increase nutrient intake and address micronutrient deficiencies
Product reformulation	Efforts to reformulate food and beverage products to lower the level of unhealthy fats, sugars and salt and improve the nutritional quality of the food supply
Fiscal policies	The taxation or subsidy of food and beverage products to create financial incentives for healthy dietary choices
Nutrition labelling	Develop, implement or strengthening nutrition labelling initiatives that provide clear and accurate nutritional information to help inform consumers to make healthier choices and encourage food companies to make positive changes
Healthy public food procurement	Develop and enforce public food procurement initiatives that include an explicit focus on health/ nutritional objectives and parameters. This indicator is an accumulative measure of healthy public procurement policies for: <ul style="list-style-type: none"> - school meal programmes - social protection programmes - other public institutions, such as government buildings and hospitals
Food safety	Efforts to enhance food safety measures to detect, monitor and respond to foodborne diseases
Global nutrition and NCD disease targets	
Nutrition targets	
Breastfeeding	Explicit objectives, actions or targets to protect, promote and support breastfeeding
Low birth weight	Explicit objectives, actions or targets to reduce the prevalence of low birth weight
Wasting	Explicit objectives, actions or targets to reduce the prevalence of childhood wasting
Stunting	Explicit objectives, actions or targets to reduce the prevalence of childhood stunting

Parameter	Description
Anaemia	Explicit objectives, actions or targets to reduce the prevalence of anaemia
Childhood obesity	Explicit objectives, actions or targets to reduce the prevalence of childhood obesity
NCD targets	
NCD targets	Explicit objectives, actions or targets to prevent or control NCDs (including type 2 diabetes, heart disease, cancer and chronic respiratory diseases)
Obesity	Explicit objectives, actions or targets to reduce the prevalence of obesity for any age group
Salt	Explicit objectives, actions or targets to reduce the level of salt/sodium in the food supply and reduce consumer intake
ICN2 Framework for Action recommendations	
Improving maternal nutrition	Efforts to improve the nutrition status of pregnant women and mothers in line with ICN2 recommendations 21, 25, 28, 36 and 38
Improving infant and young child feeding (IYCF)	Efforts to improve the nutrition status and diets of infants and young children in line with ICN2 recommendations 21, 25, 28, 37 and 39
Supplementation	Developing and implementing vitamin supplementation programmes in line with ICN2 recommendations 25, 42, 43, 47 and 48
Nutrition counselling	Delivering nutrition counselling services to improve dietary intake in line with ICN2 recommendations 25 and 38
Monitoring and evaluation	Implementing or strengthening monitoring and evaluation mechanisms to assess nutrition status, programme effectiveness and risk factors in line with ICN2 recommendation 58
Public awareness	Efforts to increase public awareness and understanding of healthy diets in line with ICN2 recommendations 19, 20 and 21
School environments	Efforts to improve school food environments such as school gardens, nutrition in the curriculum and school food standards (not including school meals, which are captured under a different indicator), in line with ICN2 recommendations 16 and 19
Regulation	Specific mention of strengthening regulation to protect health and nutrition by applying legal mechanisms to address nutrition in areas not covered by other domains, such as food and nutritional security laws, food environments law, gender-sensitive legislative reviews to improve nutrition and the regulation of the importation of HFSS foods, in line with ICN2 recommendations 15 and 53
Clean drinking water	Efforts to ensure or increase access to clean drinking water in line with ICN2 recommendation 51
Trade	Mention of amending trade rules and processes to promote of healthy diets in line with ICN2 recommendations 15 and 18
Nutrition capacity	Efforts to increase or strengthen the skilled nutrition workforce in line with ICN2 recommendation 20
Agriculture	
Nutrition-sensitive agriculture	Efforts to transform agriculture to boost the production of nutritious foods, such as fruits, vegetables and legumes, in line with ICN2 recommendation 8
Biofortification	Efforts to increase the use of biofortification in line with ICN2 recommendation 8
One Health	Efforts to implement or strengthen One Health approaches to address health threats in the animal, human and environmental interface. Includes efforts to reduce antibiotic use in livestock, improve veterinary care, improve animal welfare and reduce antimicrobial resistance, in line with ICN2 recommendations 8, 56 and 57
Blue food	Efforts to transform blue food systems with explicit mention of nutrition-related motivations, objectives, considerations or benefits, in line with ICN2 recommendation 8
Governance for nutrition	
Governance structure	Explicit mention of a planned or proposed food systems governance structure, or allocation of delivery duties, which include nutrition and health, in line with ICN2 recommendation 26
Conflict of interest	Explicit mention of efforts to safeguard food system governance structures and decision-making from conflicts of interest, in line with ICN2 recommendation 3

Parameter	Description
Policy integration	Explicit mention of the integration/ links with existing or planned national policies on nutrition and health, in line with ICN2 recommendation 26
Food-based dietary guidelines (FBDGs)	Efforts to develop or implement FBDGs, which guide national action, including linking multisectoral policy action to their implementation, in line with ICN2 recommendations 13 and 19

SOURCE: Authors' own elaboration.; UNFSS. 2022. Member State Dialogue Convenors and Pathways: Food Systems Summit Dialogues. New York. <https://summitdialogues.org/overview/member-state-food-systems-summit-dialogues/convenors/>

Data extraction and analysis

Each country pathway was analysed against the nutrition indicators in Table 1. Inclusion of the indicator, to any degree, was captured with a simple “yes/no” key. For the “general nutrition” indicators, any discussion of the malnutrition burden or right to food in the document, including in the background information, earned an affirmative score. All other indicators required mention as an objective, intended action, commitment or target in order to be counted. For example, mention of the rates of childhood stunting in the background information did not earn an affirmative score for “stunting”, unless an explicit objective, action or target to address stunting was also included. Countries were sorted according to income level (based on the 2022 World Bank Income Classifications, calculated using the World Bank Atlas Method) (World Bank Data Help Desk, n.d.) and WHO region (WHO, 2022b) within the analysis. Simple statistical analysis was applied to the resulting data, according to WHO region and country income group.

Quality control of the pathway analysis was conducted by an independent nutritionist, who analysed a random selection of 10 country pathways to ensure that the scoring of parameters corresponded 100 percent with those identified by the lead investigator.

Results

Pathway characteristics

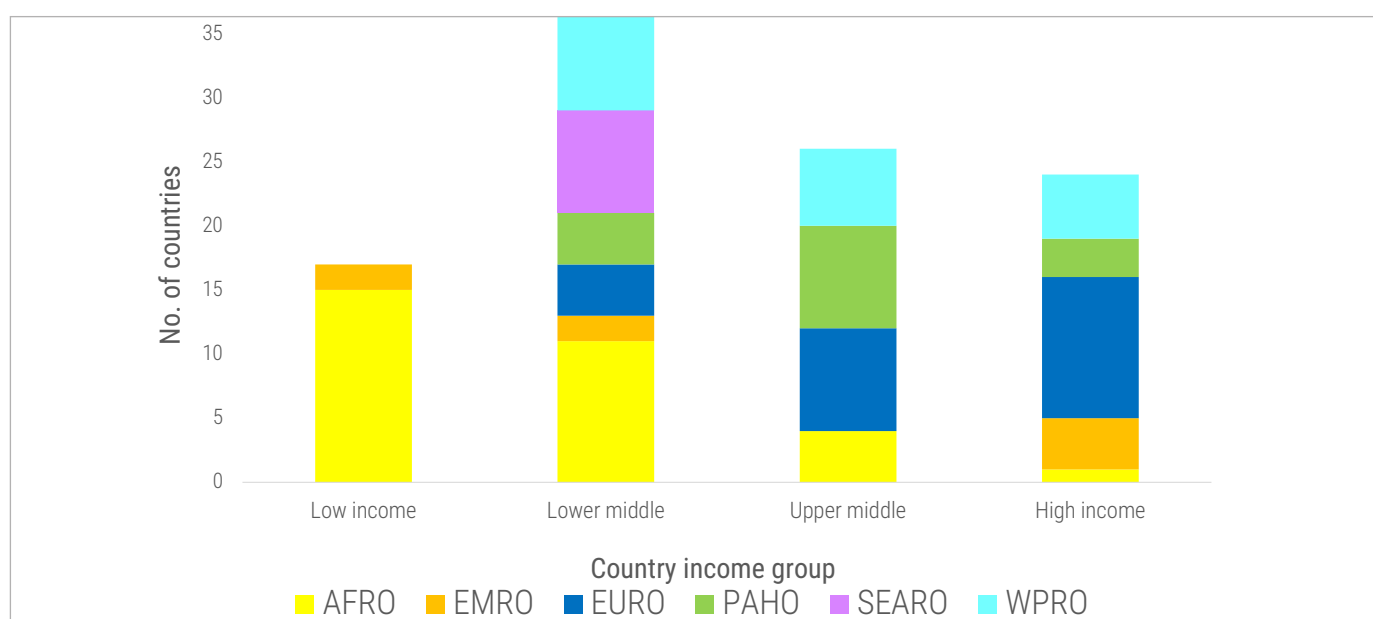
Of the 110 country pathways published prior to 31 January 2022 (UNFSS, 2022a), 104 met the inclusion criteria. The six excluded documents did not detail countries' intended transformation pathways, but were rather overviews of national dialogues and background documents stating countries' intentions to translate this information into a pathway.

Table 2 shows that the published pathways came from each WHO region, with just over half of all of the 194 WHO Member States having developed a food systems transformation pathway. Figure 1 shows how the countries represented a mix of income groups. The full analysis [can be found online](#).

Table 2. Countries included in the analysis by WHO region

WHO region	Country pathways analysed (n)	Percentage of WHO Member Countries represented (%)
African region (AFRO)	31	66
Eastern Mediterranean region (EMRO)	8	38
European region (EURO)	23	43
Region of the Americas (PAHO)	15	43
South-East Asia region (SEARO)	8	73
Western Pacific region (WPRO)	19	70
Total	104	54

SOURCE: Authors' own elaboration; UNFSS. 2022. Member State Dialogue Convenors and Pathways: Food Systems Summit Dialogues. New York. <https://summitdialogues.org/overview/member-state-food-systems-summit-dialogues/convenors/>

Figure 1. Analysed country pathways, by country income group

SOURCE: Authors' own elaboration.; UNFSS. 2022. Member State Dialogue Convenors and Pathways: Food Systems Summit Dialogues. New York. <https://summitdialogues.org/overview/member-state-food-systems-summit-dialogues/convenors/>

There was no set template for the analysed pathways, which varied greatly in their length, detail, areas of focus and structure. Almost half of all pathways were clearly marked as draft documents.

Inclusion of nutrition

Of the analysed pathways, 68 (65 percent) discussed the current burden of malnutrition. A total of 24 (23 percent) emphasized the right to food as a key objective and pillar of food systems transformation.

The number of times the word "nutrition" was included in

country pathways varied greatly. Three country pathways excluded the use of "nutrition", 38 included it 1–10 times, 29 included it 11–20 times, 20 included it 21–40 times, 9 included it 40–70 times and six mentioned it more than 90 times.

WHO priority food systems for health policy actions

Table 3 shows inclusion of the WHO Priority Food Systems for Health policy actions (n=104). "Healthy public food procurement and service policies" is a composite score of pathways including nutrition-sensitive social protection (42 percent), school meals (50 percent) and/or other public procurement policy initiatives (27 percent).

Table 3. Inclusion of WHO Priority Food Systems for Health policy actions in country pathways

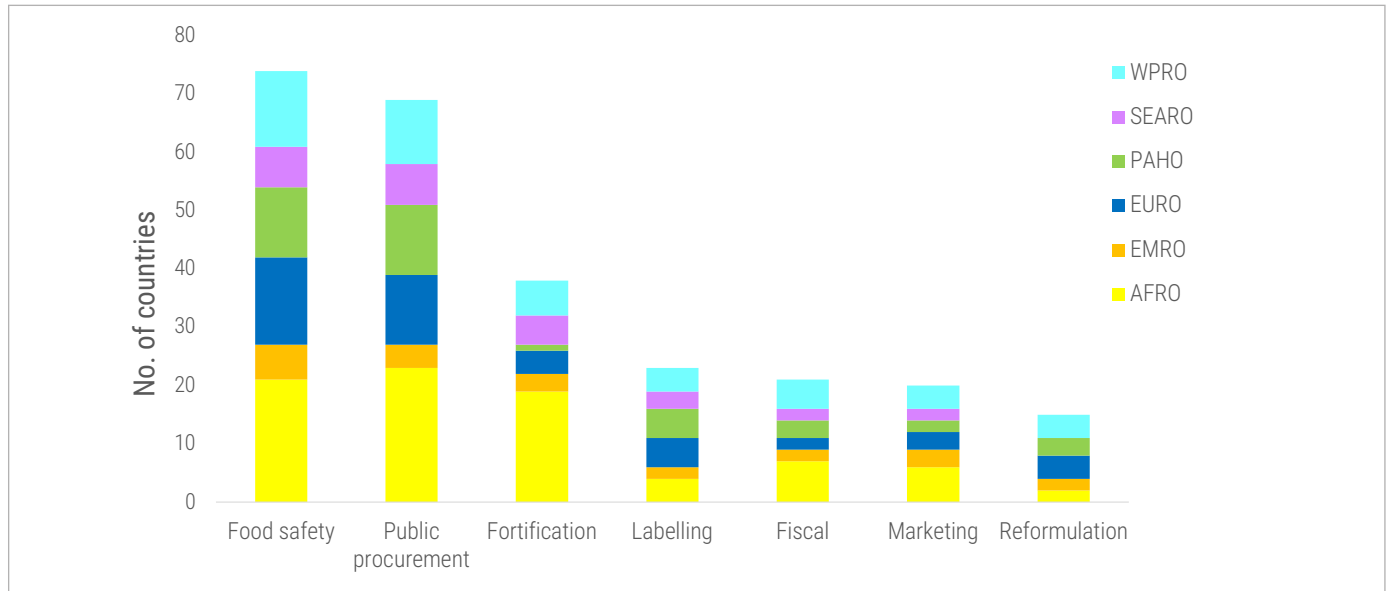
Priority policy action	Number of country pathways	Percentage of country pathways (%)
Food safety	74	71
Healthy public food procurement and service policies	69	66
Food fortification	38	37
Nutrition labelling	23	22
Fiscal policies for health and sustainable diets	21	20
Regulation of marketing of foods and non-alcoholic beverages	20	19
Food and beverage product reformulation	15	14

SOURCE: Authors' own elaboration.; UNFSS. 2022. Member State Dialogue Convenors and Pathways: Food Systems Summit Dialogues. New York. <https://summitdialogues.org/overview/member-state-food-systems-summit-dialogues/convenors/>

Overall, nine countries (9 percent) included none of the priority policy actions, while 95 (91 percent) included at least one. Figure 2 shows the type of priority policy action

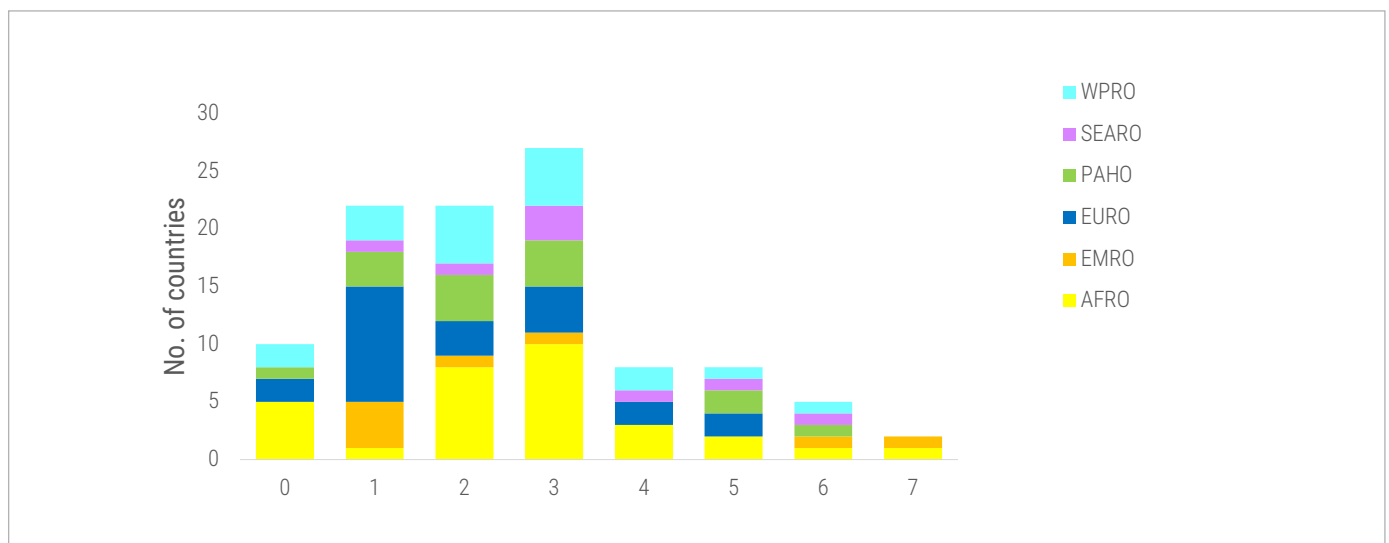
included by region. Figure 3 shows the number of priority policy actions included by WHO region. Figure 4 shows the number of actions by country income group.

Figure 2. Type of WHO priority policy action included in country pathways, by WHO region



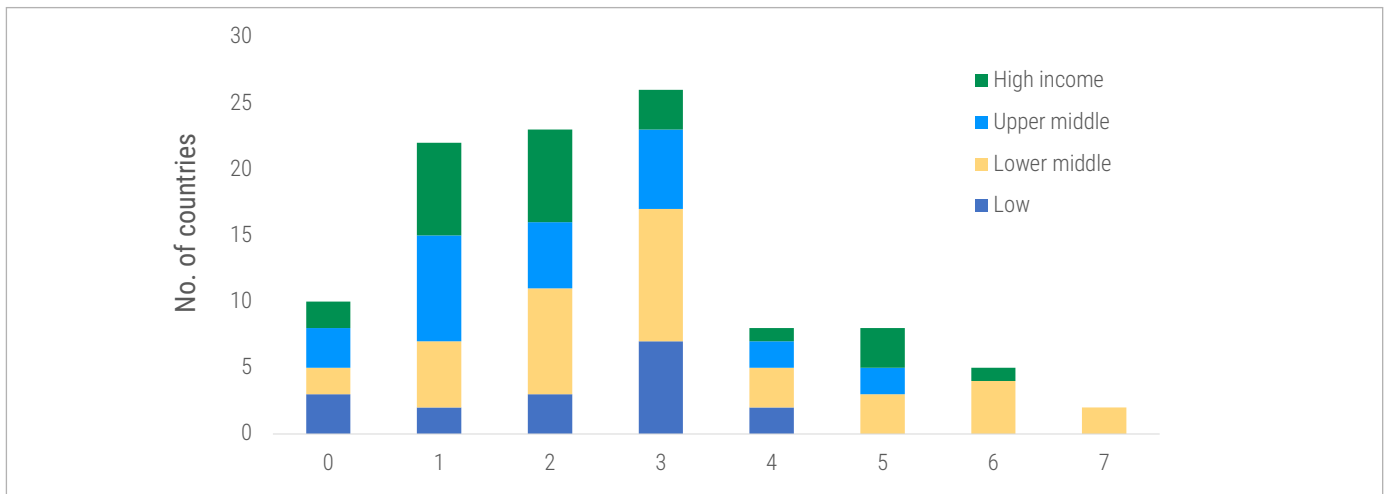
SOURCE: Authors' own elaboration.; UNFSS. 2022. Member State Dialogue Convenors and Pathways: Food Systems Summit Dialogues. New York. <https://summitdialogues.org/overview/member-state-food-systems-summit-dialogues/convenors/>

Figure 3. Number of WHO priority policy actions included in country pathways, by WHO region



SOURCE: Authors' own elaboration.; UNFSS. 2022. Member State Dialogue Convenors and Pathways: Food Systems Summit Dialogues. New York. <https://summitdialogues.org/overview/member-state-food-systems-summit-dialogues/convenors/>

Figure 4. Number of WHO priority policy actions included in country pathways, by country income group



SOURCE: Authors' own elaboration.; UNFSS. 2022. Member State Dialogue Convenors and Pathways: Food Systems Summit Dialogues. New York. <https://summitdialogues.org/overview/member-state-food-systems-summit-dialogues/convenors/>

Global WHA nutrition and NCD targets

Table 4 shows that specific objectives, actions and indicators in support of the global nutrition and NCD targets were not commonly integrated into country pathways. Overall, more than half of all country pathways did not refer to any of these global targets (n=55,

53 percent). Interestingly, measures to reduce salt intake were commonly included as intended actions (such as reformulation, nutrition standards and regulation), while other global targets were typically included as specific goals and monitoring objectives within the pathways rather than detailed actions to achieve those targets.

Table 4. Inclusion of global nutrition and NCD targets within country pathways

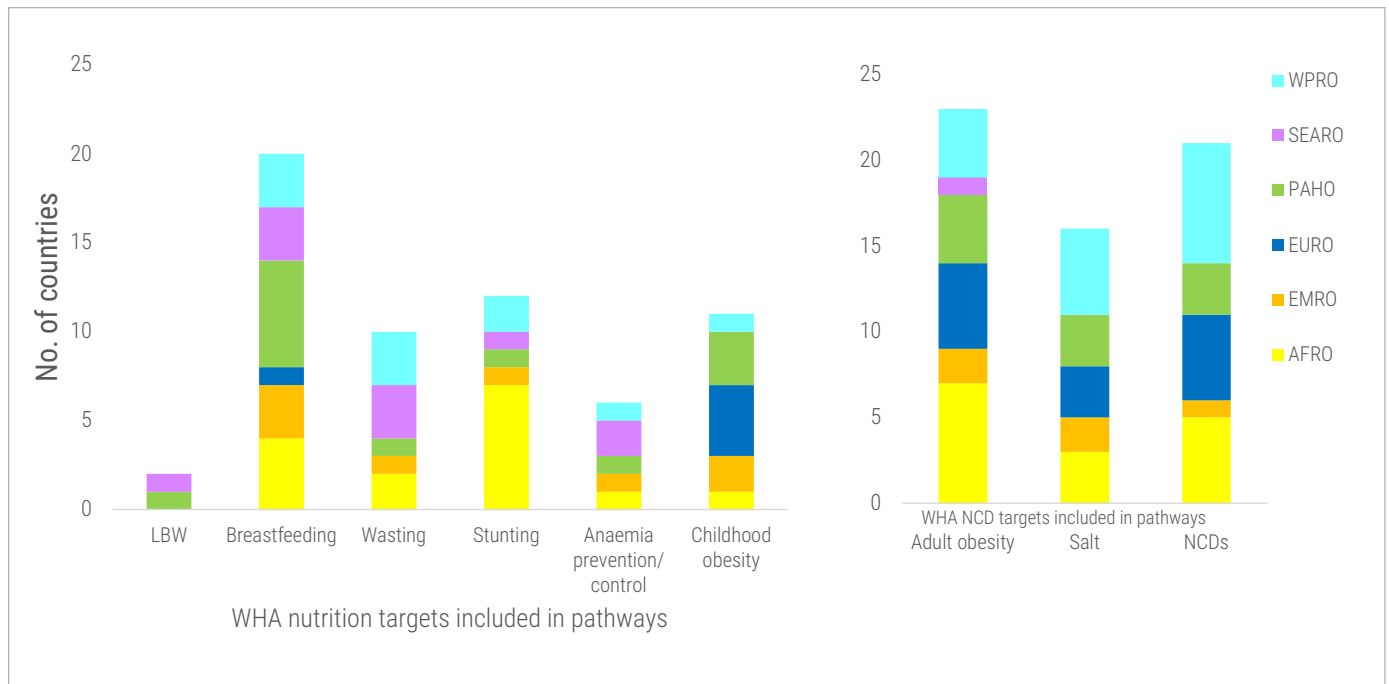
Target	Number of country pathways	Percentage of country pathways (%)
NUTRITION	35	34
Low birth weight	2	2
Breastfeeding	20	19
Childhood wasting	10	10
Childhood stunting	12	12
Childhood obesity	11	11
Anaemia	6	6
NCD	35	34
Obesity	23	22
Salt	16	15
NCDs	21	20

SOURCE: Authors' own elaboration.; UNFSS. 2022. Member State Dialogue Convenors and Pathways: Food Systems Summit Dialogues. New York. <https://summitdialogues.org/overview/member-state-food-systems-summit-dialogues/convenors/>

Figure 5 shows which global targets are referred to in country pathways by region. Figure 6 shows the number of global targets referred to by region and Figure 7 displays

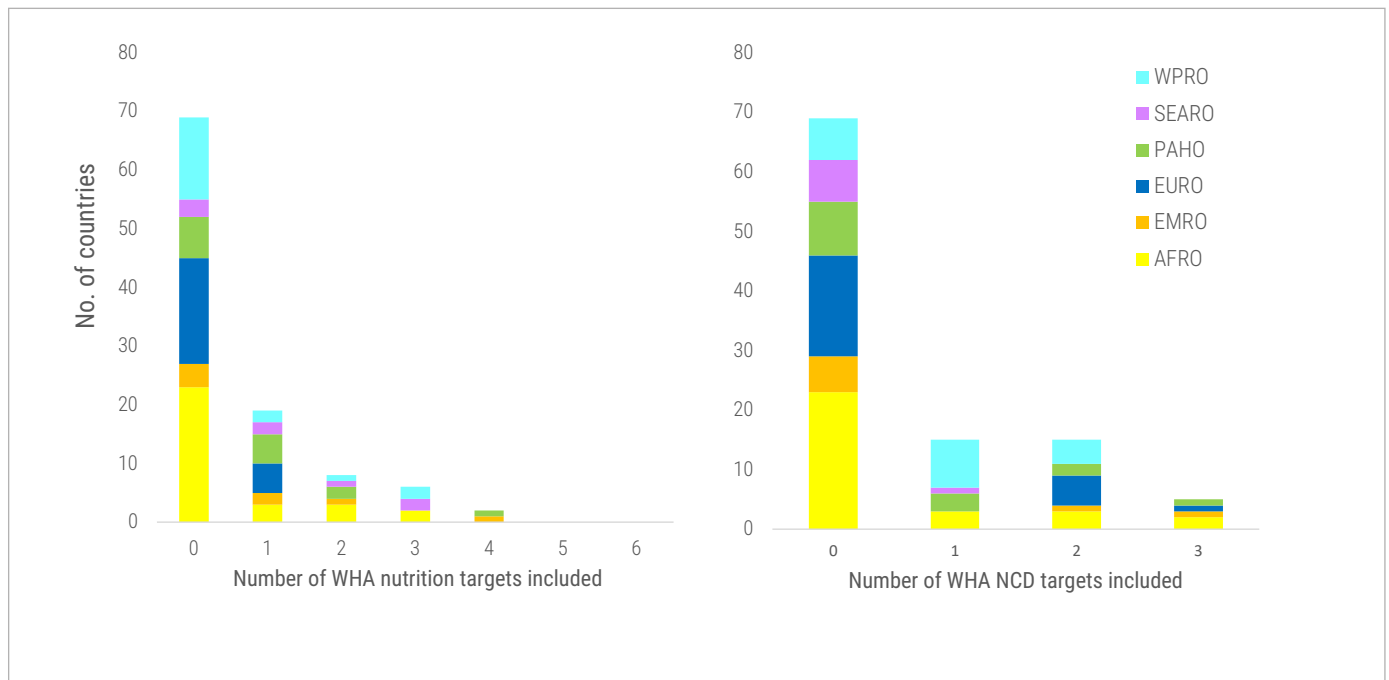
this by country income level. No country pathway made reference to all six global nutrition targets; five included all three diet-related global NCD targets.

Figure 5. Types of global nutrition and NCD target included in pathways, by WHO region



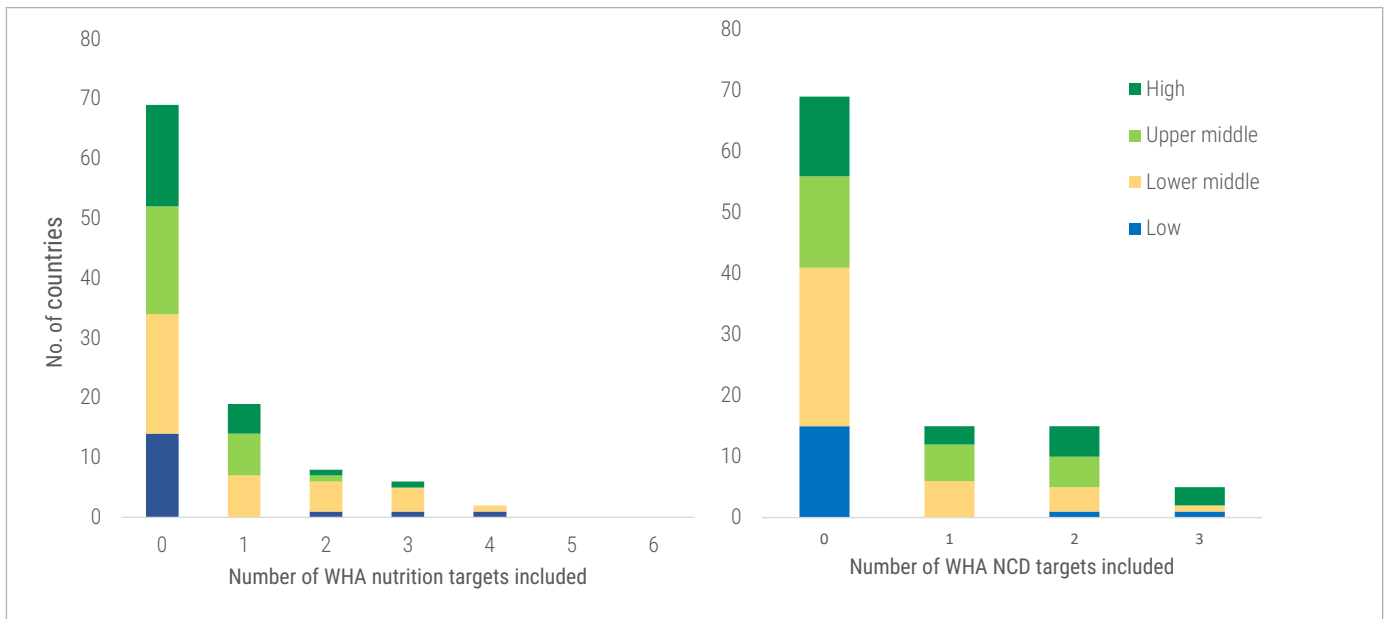
SOURCE: UNFSS. 2022. Member State Dialogue Convenors and Pathways: Food Systems Summit Dialogues. New York. <https://summitdialogues.org/overview/member-state-food-systems-summit-dialogues/convenors/>

Figure 6. Number of global nutrition and NCD targets included in pathways, by WHO region



SOURCE: UNFSS. 2022. Member State Dialogue Convenors and Pathways: Food Systems Summit Dialogues. New York. <https://summitdialogues.org/overview/member-state-food-systems-summit-dialogues/convenors/>

Figure 7. Global nutrition and NCD targets included in pathways by country income level



SOURCE: UNFSS. 2022. Member State Dialogue Convenors and Pathways: Food Systems Summit Dialogues. New York. <https://summitdialogues.org/overview/member-state-food-systems-summit-dialogues/convenors/>

ICN2 Framework for Action policy recommendations

The incorporation of policy recommendations from the ICN2 Framework for Action varied widely within country pathways, as can be seen in Table 5. Nutrition-sensitive agriculture and raising public awareness of healthy diets and nutrition were the most commonly featured nutrition parameters, each appearing in more than 80 percent of country pathways. While using regulatory and legal measures to deliver healthy diets featured in fewer than a quarter of all pathways, half of all Americas region (PAHO) pathways included it. Maternal and infant and young child nutrition policy actions were less commonly included, featuring in a third of all pathways, half of these in the African region (AFRO). Elements of actions to support a One Health approach featured in 24 pathways

(23 percent), 14 (54 percent) of which were from European region (EURO) Member States.

When it came to governance for nutrition, the majority of pathways incorporated a reference to the existing or intended establishment of a multisectoral governance structure to guide and implement food systems transformation, including nutrition and/or health actors (73 pathways, 70 percent). To address power imbalances, which can exacerbate inequalities, food systems policy development should be free from real or perceived conflicts of interest (WHO, 2021a). Yet, only three pathways noted the importance of managing conflicts of interest within food systems governance.

Table 5. Incorporation of ICN2 Framework for Action policy recommendations into country pathways

Parameter	Number of country pathways	Percentage of country pathways (%)
Improving maternal nutrition	38	37
Improving infant and young child feeding (IYCF)	35	34
Supplementation	9	9
Nutrition counselling	7	7
Monitoring and evaluation	31	30
Public awareness	83	80
School environments	55	53
Regulation	23	22
Clean drinking water	33	32
Trade	13	13
Nutrition capacity	9	9
Agriculture		
Nutrition-sensitive agriculture	86	83
Biofortification	21	20
One Health	24	23
Blue food	25	24
Governance for nutrition		
Governance structure	73	70
Conflicts of interest	3	3
Policy integration	70	67
Food-based dietary guidelines	31	30

SOURCE: Authors; UNFSS. 2022. Member State Dialogue Convenors and Pathways: Food Systems Summit Dialogues. New York. <https://summitdialogues.org/overview/member-state-food-systems-summit-dialogues/convenors/>

Discussion

Key findings

Analysis of the first set of country pathways emanating from the UNFSS shows the inclusion of nutrition policy actions. The key actions selected for inclusion by countries are to increase the availability and knowledge of foods that comprise a healthy dietary pattern. This includes nutrition-sensitive agricultural production, raising public awareness of healthy diets, improving food safety and harnessing the purchasing power of healthy public procurement policies. These findings support those of the Member State dialogues synthesis report (UNFSS, 2021a), as well as those of the FAO exploratory review of food systems pathways (Fracassi, 2022).

They also mirror previous nutrition policy reviews that show close ties between nutrition and agriculture and highlight positive media campaigns as one of the most commonly prioritized nutrition policy actions (WHO, 2018). However, ending malnutrition in all its forms requires a solid package of interventions across food systems to simultaneously increase the availability, accessibility and affordability of healthy, sustainably produced diets while reducing that of HFSS foods and beverages.

Currently, food systems remain largely unregulated, with no more than 26 countries implementing an excise taxes on HFSS foods, for instance (WHO, 2022a; White *et al.*, 2020). Consumption of HFSS foods and beverages is directly associated with obesity and diet-related NCDs, which today

cause more deaths than undernutrition (WHO, 2021c; Afshin *et al.*, 2019). Thus, many of our food systems, which are driven by profitability and high sales volumes of processed HFSS foods and beverages, are a leading determinant of ill health globally (Afshin *et al.*, 2019; White *et al.*, 2020). The most rapid rates of increase in sales can be seen in lower-middle-income countries, which simultaneously show the fastest rates of increase in obesity (FAO and WHO, 2019; Popkin, Corvalan and Grummer-Strawn, 2020; Moodie *et al.*, 2021).

Worryingly, the low level of action to address the high availability, affordability, accessibility and marketing of HFSS foods and beverages detailed in country pathways suggests that these trends are set to continue. Truly transformative action to address these risks requires a coherent package of holistic policy actions, such as that promoted by WHO and other stakeholders, as well as strong governance for nutrition (FAO and WHO, 2019; Committee on World Food Security, 2021; UNFSS, 2021b). Given the commercial determinants of obesity and NCDs (WHO, 2021d) and the vast power and influence that “big food” has wielded over past agendas (White *et al.*, 2020; WHO, 2021d; Kickbusch, Allen and Franz, 2016; Tempels, Verweij and Blok, 2017; Lauber, Rutter and Gilmore, 2021; Harris, Nisbett and Gillespie, 2022; Russ *et al.*, 2022), the safeguarding of food systems governance and nutrition agendas at the global and country level is essential. The very few mentions of managing and preventing conflicts of interest were, therefore, a finding of concern in country pathways.

The variation in the focus and content of country pathways reflects both the unique country contexts and the specialties of the stakeholders that led the pathway development process. A review of the national convenors (UNFSS, 2022a) suggests that, for the majority of countries, the process was led by ministries of agriculture, and this is evident in the high level of consideration given to nutrition-sensitive agriculture within the pathways.

Country and regional food system contexts and malnutrition priorities also shape the inclusion of nutrition policy action within the pathways. For example, the finding that just 6 percent of pathways from the African region include a focus on reformulation could reflect the region’s relatively recent surge in reliance on processed food, as well as the market structure, which shows many small and medium-sized enterprises producing HFSS foods, adding to the complexity of policy implementation and monitoring (Reardon *et al.*, 2021).

The multisectoral benefits of nutrition policies can be an argument for their inclusion. For example, the incorporation of high levels of food safety actions may reflect trade

requirements and the economic profitability resulting from safe food production, while the educational benefits of school meal programmes and essential humanitarian considerations of nutrition-sensitive social protection programmes are likely reflected in the high inclusion rates of public procurement policies.

The number of countries incorporating global nutrition/NCD targets was too low to draw conclusions on the relationship between their inclusion and the prevalence of malnutrition experienced by states. For example, the South-East Asia region (SEARO) showed the greatest prevalence of anaemia (WHO, 2022c) and the highest proportion of pathways including anaemia prevention/control strategies (25 percent), though this corresponded to just two country pathways. Likewise, EMRO and PAHO showed the highest levels of childhood obesity (WHO, 2022c), as well as the highest proportions of countries including this in pathways (25 percent and 20 percent, respectively), though this corresponded to just two and four countries, respectively.

It is important to note that despite the low number of explicit mentions of global WHA targets and ICN2 recommendations, two-thirds of countries did highlight the integration of existing health and nutrition policies. This is a positive sign of policy integration at national level and suggests that while specific initiatives, such as those to address breastfeeding and obesity, might not have been captured in the analysis, they might be active at country level. This is evident in pathways that incorporate policies and laws on universal health coverage, as well as the dedicated allocation of funding to implement them, though they did not explicitly outline the actions involved.

However, the stronger integration of the health, social protection and food systems agenda through the incorporation of priority actions, as well as the global nutrition and NCD targets, should remain a priority as pathways continue to develop and evolve (UNSDG, 2020). The importance of such actions to Member States was apparent in the Nutrition for Growth Commitments (Global Nutrition Report, 2022) and the Seventy-fifth World Health Assembly, which saw the endorsement of the Global Strategy for Food Safety (WHO, 2022d), the acceleration plan on obesity (WHA 75, 2022a), the implementation roadmap to accelerate action on NCDs (WHO, 2022e) and strengthened guidance on upholding the International Code of Marketing Breast-milk Substitutes (WHA 75, 2022b).

It is also of note that nearly a quarter of countries highlighted the importance of and their intention to uphold the right to food. This focus was often accompanied by

plans to strengthen regulatory and legal mechanisms to ensure access to healthy diets, which hold great promise. Noteworthy are the food laws taking shape in the PAHO region, which could hold even greater potential if implemented as a regional strategy or framework.

Limitations

While the current analysis explores a wide range of potential nutrition actions, the use of a simple indicator to identify their presence in pathways does not provide insights into the quality of the included actions themselves (relevance, feasibility and political readiness, their SMART-ness or comprehensiveness, their potential to transform food systems, etc.).

For example, an affirmative score for the inclusion of breastfeeding may indicate a simple goal of raising awareness of the importance of breastfeeding, as opposed to the in-depth application of legal and regulatory mechanisms that could transform first food systems to promote, protect and support breastfeeding. Likewise, a simple “included” score for FBDGs does not capture the diversity of how FBDGs were incorporated into pathways from simple guides for public awareness to guidelines for comprehensive, multisectoral policy action in order to address malnutrition.

Despite quality control efforts, the manual analysis also introduces the risk of subjectivity and error to results. The analysis is also limited to what was included in country pathways and, for example, did not investigate the content of the reports of the global (UNFSS, 2022b), national (UNFSS, 2021c) or independent dialogues (UNFSS, 2021d) to assess coherence and alignment. It did not analyse the pathways on the presence of the game-changing solutions put forward by the UNFSS Action Tracks, which captured the inputs of many stakeholders (UNFSS, 2021e).

The wealth of commitments by countries to take tangible action towards healthy diets within their existing nutrition policy documents are unlikely to be reflected in great detail in national food systems pathways. For example, while just 16 countries included actions to address salt/sodium in their pathways, the sodium country score card reveals that 51, 45 and 5 countries are implementing voluntary, mandatory or multiple mandatory measures, respectively, to reduce sodium, while a further 67 countries have made commitments to do so in their national policies, strategies or plans (WHO, 2022f).

Existing nutrition policy actions may also not be included, as they are already implemented at country level, so were not included as new or game-changing solutions. Nutrition and

NCD global targets may also not be incorporated, despite active in-country initiatives, as they are viewed as health, rather than food systems priorities, reflecting traditional working silos, which can hinder systemic and collaborative food systems transformation. This analysis is restricted in its scope to assessing the content of food systems pathways, though analysis of other country and global initiatives to progress the WHO-recommended nutrition policy actions provides further insights into the logistical, financial and political challenges and barriers faced in their implementation.

It is important to note that this analysis is also limited in its sole focus on nutrition policy action. The WHO food systems narrative (WHO, 2021a), UNFSS processes and resulting coalitions, such as the Coalition of Action for Healthy Diets from Sustainable Food Systems, have confirmed the inextricable nature of nutrition and environmental sustainability and the need to drive forward action that progresses these agendas in harmony for the health of people and planet.

Conclusions

These initial country pathways offer a springboard for action that could be greatly enriched with the broader, more systematic inclusion of nutrition actions to strengthen the transformative potential of food systems for health. Such actions can serve to advance multiple complementary agendas, including the 2030 Agenda, as well as regional tools and initiatives, such as the African Union’s Continental Accountability Nutrition Scorecard or the Small Island Developing States Global Action Plan on Food Security and Nutrition.

Many pathways remain in draft format and are intended to be living documents that continue to evolve. This holds promise for initiatives such as the Coalition of Action on Healthy Diets from Sustainable Food Systems to work with countries in fostering pathways to apply a systems approach. Despite most country pathways making reference to integrating existing policy action, a systems approach is needed to enact this and drive forward effective whole-of-government action. A systems approach aims to address the underlying drivers of malnutrition, working across the food supply, food environments and the valuing of food to increase the production and consumption of healthy diets, while reducing the production and consumption of HFSS foods and beverages.

In many country contexts, effective application of a systems approach requires institutional change to overcome traditional silos and ensure broad representation of government sectors within the

country pathway development and implementation processes. Though such change takes time, bringing together ministries of health, agriculture, trade, finance, foreign affairs and education in an effective manner is essential to capturing the broad food system determinants and enacting the type of cross-cutting, game-changing solutions that can guide healthy, sustainable transformation.

With the repercussions of COVID-19 and ongoing conflicts exacerbating the state of malnutrition and just eight years to achieve SDG 2 and end malnutrition in all its forms, there is a pressing need to act. As Agnes Kalibata, the United Nations Secretary-General's Special Envoy to the 2021 UNFSS, said, "the true legacy of the Summit ... will depend on national governments turning promises into policies and concrete actions" (Kalibata, 2022).

References

- Afshin, A., Sur, P.J., Fay, K.A., Cornaby, L., Ferrara, G., Salama, J.S. et al.** 2019. Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *The Lancet*, 393(10184): 1958–1972. <https://pubmed.ncbi.nlm.nih.gov/30954305/>
- Committee on World Food Security.** 2021. *CFS Voluntary Guidelines on Food Systems and Nutrition*. Rome. <https://www.fao.org/cfs/vgfsn/en/>
- FAO & WHO (World Health Organization).** 2014. *Second International Conference on Nutrition: Rome Declaration on Nutrition*. Rome. <https://www.fao.org/3/ml542e/ml542e.pdf>
- FAO & WHO.** 2019. *Strengthening nutrition action: a resource guide for countries based on the policy recommendations of the Second International Conference on Nutrition (ICN2)*. Geneva, Switzerland: WHO. <https://apps.who.int/iris/handle/10665/274739>
- FAO, IFAD (International Fund for Agricultural Development), UNICEF (United Nations Children's Fund), WFP (World Food Programme) & WHO.** 2021. *The State of Food Security and Nutrition in the World 2021*. Rome, FAO. <https://www.fao.org/publications/sofi/2021/en/>
- Fracassi, P., Sangmin, S. & D'Angeli, R.** 2022. Healthy diets and food in national food systems pathways: An exploratory review. In: *UN-Nutrition Journal, Volume 1: Transforming Nutrition*. Rome, UN-Nutrition.
- Food Systems Summit Community.** 2021. *Food Systems Summit Compendium*. New York, United Nations. <https://foodsystems.community/food-systems-summit-compendium/>
- Global Nutrition Report.** 2022. Global Nutrition Report – N4G Commitment Tracker [online]. Cited 30 July 2022. <https://globalnutritionreport.org/resources/nutrition-growth-commitment-tracking/>
- Guterres, A.** 2019. Secretary-General's message on World Food Day. Statement, 16 October 2019. New York: United Nations. <https://www.un.org/sg/en/content/sg/statement/2019-10-16/secretary-generals-message-world-food-day-scroll-down-for-french-version>
- Harris, J., Nisbett, N. & Gillespie, S.** 2022. Conflict of Interest in Nutrition: Where's the Power? Comment on "Towards Preventing and Managing Conflict of Interest in Nutrition Policy? An Analysis of Submissions to a Consultation on a Draft WHO Tool". *International Journal of Health Policy and Management*, 11(3): 391–393. <https://www.ifpri.org/publication/conflict-interest-nutrition-wheres-power-comment-%E2%80%9Ctowards-preventing-and-managing>
- IPCC (Intergovernmental Panel on Climate Change).** 2022. *Climate Change 2022: Impacts, Adaptation and Vulnerability. IPCC Sixth Assessment Report*. Geneva, Switzerland. <https://www.ipcc.ch/report/ar6/wg2/>
- Kalibata, A.** 2022. Why 2022 must be the year governments serve up a food systems revolution. *On Euractiv*, 23 December 2021. <https://www.euractiv.com/section/agriculture-food/opinion/why-2022-must-be-the-year-governments-serve-up-a-food-systems-revolution/>
- Kickbusch, I., Allen, L. & Franz, C.** The commercial determinants of health. *The Lancet Global Health*, 4(12): e895–e896. [https://www.thelancet.com/journals/langlo/article/PIIS2214-109X\(16\)30217-0/fulltext](https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(16)30217-0/fulltext)
- Lauber, K., Rutter, H. & Gilmore, A.B.** Big food and the World Health Organization: a qualitative study of industry attempts to influence global-level non-communicable disease policy. *BMJ Global Health*, 6(5): e005216. <https://pubmed.ncbi.nlm.nih.gov/34117011/>

- Moodie, R., Bennett, E., Kwong, E.J.L., Santos, T.M., Pratiwi, L., Williams, J. & Baker, P.** 2021. Ultra-Processed Profits: The Political Economy of Countering the Global Spread of Ultra-Processed Foods – A Synthesis Review on the Market and Political Practices of Transnational Food Corporations and Strategic Public Health Responses. *International Journal of Health Policy and Management*, 10(12): 968–982. <https://pubmed.ncbi.nlm.nih.gov/34124866/>
- Popkin, B.M., Corvalan, C. & Grummer-Strawn, L.M.** 2020. Dynamics of the double burden of malnutrition and the changing nutrition reality. *The Lancet*, 395(10217): 65–74. <https://pubmed.ncbi.nlm.nih.gov/31852602/>
- Reardon, T., Tschirley, D., Liverpool-Tasie, L.S.O., Awokuse, T., Fanzo, J., Minten, B. et al.** 2021. The processed food revolution in African food systems and the double burden of malnutrition. *Global Food Security*, 28: 100466. <https://www.sciencedirect.com/science/article/pii/S2211912420301206>
- Russ, K., Baker, P., Kang, M. & McCoy, D.** 2022. Corporate Lobbying On Us Positions Toward The World Health Organization: Evidence Of Intensification And Cross-Industry Coordination. *Global Health Governance*, XVII(1). <https://blogs.shu.edu/ghg/files/2022/05/Spring-2022-Issue.pdf>
- Tempels, T., Verweij, M. & Blok, V.** 2017. Big Food's Ambivalence: Seeking Profit and Responsibility for Health. *American Journal of Public Health*, 107(3): 402–406. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5296687/>
- Tubiello, F.N., Rosenzweig, C., Conchedda, G., Karl, K., Gütschow, J., Xueyao, P. et al.** 2021. Greenhouse gas emissions from food systems: building the evidence base. *Environmental Research Letters*, 16(6): 065007. <https://iopscience.iop.org/article/10.1088/1748-9326/ac018e>
- UNEP (United Nations Environment Programme).** 2021. *Rethinking Food Systems*. Nairobi. <https://www.unep.org/news-and-stories/story/rethinking-food-systems>.
- UNFSS (United Nations Food Systems Summit).** 2021a. *Member State Dialogues Synthesis – Report 4*. New York.
- UNFSS.** 2021b. *Policy Brief: Governance of Food Systems Transformation*. New York. <https://ecoagriculture.org/publication/governance-of-food-systems-transformation/>
- UNFSS.** 2021c. *Member State Dialogues Synthesis, Report 3*. New York. <https://summitdialogues.org/wp-content/uploads/2021/09/UN-Food-Systems-Summit-Dialogues-Synthesis-Report-3-Full-Text.pdf>
- UNFSS.** 2021d. *Synthesis of Independent Dialogues: Interim Report 1*. New York. https://summitdialogues.org/wp-content/uploads/2021/04/April-Interim-Synthesis-Report_FSS-Independent-Dialogues_.pdf
- UNFSS.** 2021e. UNFSS Documentation – Actions Tracks: Game-Changing and Systemic Solutions, Waves 1 & 2 [online]. New York. Cited 30 July 2022. <https://www.un.org/en/food-systems-summit/documentation>
- UNFSS.** 2022a. Member State Dialogue Convenors and Pathways: Food Systems Summit Dialogues [online]. New York. Cited 30 July 2022. <https://summitdialogues.org/overview/member-state-food-systems-summit-dialogues/convenors/>
- UNFSS.** 2022b. *The UN Food Systems Summit: Global Dialogues, Summary Report*. New York. <https://www.un.org/en/food-systems-summit/news/latest-update-un-food-systems-summit-dialogues>
- UNSDG (United Nations Sustainable Development Group).** 2020. *Policy Brief: The Impact of COVID-19 on Food Security and Nutrition*. New York. <https://unsdg.un.org/resources/policy-brief-impact-covid-19-food-security-and-nutrition>
- WHA (World Health Assembly) 75.** 2022a. Annex 12: Acceleration plan to support member states in implementing the recommendations for the prevention and management of obesity over the life course background. In: *Follow-up to the political declaration of the third high-level meeting of the General Assembly on the prevention and control of non-communicable diseases*. Geneva, Switzerland, WHO. https://apps.who.int/gb/ebwha/pdf_files/WHA75/A75_10Add8-en.pdf
- WHA 75.** 2022b. *Seventy-fifth World Health Assembly, Agenda Item 18.1: Maternal, infant and young child nutrition*. Geneva, Switzerland: WHO. [https://apps.who.int/gb/ebwha/pdf_files/WHA75/A75\(21\)-en.pdf](https://apps.who.int/gb/ebwha/pdf_files/WHA75/A75(21)-en.pdf)
- White, M., Aguirre, E., Finegood, D.T., Holmes, C., Sacks, G. & Smith, R.** 2020. What role should the commercial food system play in promoting health through better diet? *BMJ*, 368: m545. <https://pubmed.ncbi.nlm.nih.gov/32184211/>
- WHO.** 2011. *NCD Global Monitoring Framework*. Geneva, Switzerland. <https://www.who.int/publications/i/item/ncd-surveillance-global-monitoring-framework>

- WHO.** 2014. *Global nutrition targets 2025: policy brief series*. Geneva, Switzerland. <https://www.who.int/publications/i/item/WHO-NMH-NHD-14.2>
- WHO.** 2018. *Global nutrition policy review 2016-2017: country progress in creating enabling policy environments for promoting healthy diets and nutrition*. Geneva, Switzerland. <https://www.who.int/publications/i/item/9789241514873>
- WHO.** 2021a. *Food systems delivering better health: executive summary*. Geneva, Switzerland. <https://www.who.int/publications/i/item/9789240031814>
- WHO.** 2021b. *Food systems for health: information brief*. Geneva, Switzerland. <https://www.who.int/publications/i/item/9789240035263>
- WHO.** 2021c. *World Health Statistics 2021: Monitoring Health for the SDGs*. Geneva, Switzerland. <https://apps.who.int/iris/bitstream/handle/10665/342703/9789240027053-eng.pdf>
- WHO.** 2021d. Commercial determinants of health. Factsheet [online], 5 November 2021. Geneva, Switzerland. <https://www.who.int/news-room/fact-sheets/detail/commercial-determinants-of-health>
- WHO.** 2022a. *Global database on the Implementation of Nutrition Action (GINA)* [online]. Cited 26 June 2022. Geneva, Switzerland. <https://extranet.who.int/nutrition/gina/en/about>
- WHO.** 2022b. *Countries* [online]. Cited 26 June 2022. Geneva, Switzerland. <https://www.who.int/countries>
- WHO.** 2022c. World Health Statistics [online]. Geneva, Switzerland. Cited 30 July 2022. <https://www.who.int/data/gho/publications/world-health-statistics>
- WHO.** 2022d. *Draft WHO Global Strategy for Food Safety 2022-2030*. Geneva, Switzerland. <https://www.who.int/publications/m/item/draft-who-global-strategy-for-food-safety-2022-2030>
- WHO.** 2022e. World Health Assembly approves a global implementation roadmap to accelerate action on noncommunicable diseases (NCDs) [online]. Press release, 28 May 2022. Geneva, Switzerland. [https://www.who.int/news-room/feature-stories/detail/world-health-assembly-approves-a-global-implementation-roadmap-to-accelerate-action-on-noncommunicable-diseases-\(ncds\)](https://www.who.int/news-room/feature-stories/detail/world-health-assembly-approves-a-global-implementation-roadmap-to-accelerate-action-on-noncommunicable-diseases-(ncds))
- WHO.** 2022f. *Sodium Country Score Card: Global database on the Implementation of Nutrition Action (GINA)* [online database]. Cited 26 June 2022. <https://extranet.who.int/nutrition/gina/en/scorecard/sodium>
- WHO.** 2022g. The Coalition of Action on Healthy Diets from Sustainable Food Systems for Children and All (HDSFS) [online]. Cited 28 June 2022. Geneva, Switzerland. <https://www.who.int/initiatives/food-systems-for-health/the-coalition-of-action-on-healthy-diets-from-sustainable-food-systems-for-children-and-all>
- WHO & FAO.** 2014. *Second International Conference on Nutrition (ICN2): Framework for Action*. Rome, FAO. <https://www.fao.org/policy-support/tools-and-publications/resources-details/en/c/422096/>
- World Bank Data Help Desk.** n.d. *World Bank Country and Lending Groups* [online database]. Cited 26 June 2022. Washington, DC. <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups>

Unveiling the potential of mapping territorial markets to contribute to healthy diets and nutrition

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Keywords: territorial markets, healthy and diversified diets, nutrition-sensitive interventions, synthetic indicators, food accessibility, food availability

Abstract

Territorial markets are at the heart of local food systems, especially in low-income settings. They are crucial not only to securing market access for smallholder farmers, but also to safeguarding food security and nutrition in the territories in question. The aim of this research is to unveil the potential of territorial markets to ensure access to healthy diets and better nutrition. The authors collected and analysed data on retailers and consumers from 19 territorial markets in Burkina Faso, Malawi and Rwanda, following Food and Agriculture Organization of the United Nations (FAO) methodology for mapping territorial markets. Two synthetic indicators were developed to facilitate the interpretation of findings. These indicators are effective tools that can help identify those markets where the supply of specific food groups should be strengthened and those more relevant to ensuring consumers' access to healthy and diversified diets. Evidence from the three countries confirms that these markets play a critical role in guaranteeing the availability and accessibility of fresh and seasonal food for local consumers on a day-to-day basis and can act, therefore, as major drivers in influencing consumers' dietary patterns.

Introduction

Having access to nutritious, adequate, culturally appropriate and safe food is a fundamental human right. Nevertheless,

nearly 2.3 billion people in the world still don't have access to adequate food, while the high costs of healthy diets put them out of reach for around 3 billion people (FAO, IFAD, UNICEF, WFP and WHO, 2021).

Healthy diets are often defined by dietary goals, such as nutrient adequacy or the desirable intake of specific food groups (FAO and WHO, 2019). However, diets are more than just the sum of nutrients and foods consumed (FAO and WHO, 2019). A growing number of studies have shown the importance of food systems in influencing individual dietary patterns (FAO, 2019). To improve diets, nutritious and diversified food has to be available, accessible, affordable and desirable to consumers (FAO, IFAD, UNICEF, WFP and WHO, 2021; HLPE, 2017).

In a food systems context, food environments can be considered the interface between consumers and the food supply chain. They are defined as the physical places where supply and demand meet, but also in terms of the availability, variety, price and quality of foods that can be found in all types of food outlets¹, services and institutional settings where people procure and consume food (UNSCN, 2016).

Territorial markets² are at the heart of local food systems, especially in low-income settings. Research and information on territorial markets confirm that they are crucial not only to securing market access for smallholder farmers, but also to safeguarding

¹ Such as supermarkets, small retail outlets, wet markets, street food stalls, coffee shops, tea houses, school canteens and restaurants.

² The Committee on World Food Security (CFS, 2016) defines "territorial markets" as markets that are embedded in the local, national and regional food systems and characterized by certain criteria, as explained in the mapping of territorial market methodology published by FAO (2022a).

food security and nutrition in the territories in question (CFS, 2016; FAO, 2015). Territorial markets also play a critical role in ensuring day-to-day access to fresh and seasonal food, such as vegetables, fruits, meat and fish (FAO, 2016; FAO and INRA, 2016).

However, data and information on these markets and their relevance to consumer diets and nutrition are still very limited, resulting in policies and investments that address malnutrition without considering how the markets and their improvement are critical to achieving dietary goals (CFS, 2016; FAO, 2022a). The characterization of territorial markets would help address existing evidence gaps related to food availability and other factors that may influence consumers' decision-making on food purchases and consumption. Using a harmonized methodological approach to collecting and analysing such data would permit comparisons between contexts and over time.

This study aims to start filling this knowledge gap by presenting data from 19 markets mapped in three countries in sub-Saharan Africa – Burkina Faso, Malawi and Rwanda. This information is crucial to developing informed recommendations for policymakers and implementing market-oriented interventions to increase the availability, accessibility, affordability and desirability of nutritious and diverse foods.

Methodology

Data collection for this study followed a structured methodology developed by FAO in 2021 (and revised in 2022) for the mapping of territorial markets (FAO, 2022a). This is an innovative tool that enables the collection of reliable and comparable data on territorial markets, so as to unveil their potential to contribute to healthy and diversified consumer diets. The FAO methodology was implemented in steps:

0. Preparatory work³ and identification of key local partners to support data collection.
1. Adaptation of questionnaires to the local context.
2. A validation workshop to agree and validate the data collection plan and the questionnaires for data collection with all relevant actors and stakeholders.
3. Training of enumerators.
4. First phase of data collection, consisting of preliminary market analysis, which seeks, after market selection, to collect information on "the market profile"⁴. This information is essential in order to identify a representative sample of retailers to be interviewed in the second phase. While the sample of retailers is designed to represent the overall distribution of the market, the sample of consumers is randomly selected, as it is not possible to predefine the overall distribution of consumers against selected variables.

5. Second phase of data collection, implementation of the retailer survey and the consumer survey⁵ – adapted to local contexts.
6. Data processing and analysis (including cross-analysis of retailer and consumer data, expansion of data from the retailers survey, overall distribution of consumers against the main variables and the calculation of the five synthetic indicators). For more information, please see FAO (2022a).
7. Reporting for the sharing of results with relevant actors and stakeholders, comparison of markets and the eventual identification of entry points for specific interventions at market level.
8. Final validation workshop for the final report with all relevant actors and stakeholders.

The data-collection process was implemented as follows:

- Burkina Faso – between July and August 2021, in partnership with the Association pour la recherche et la formation agroécologique;
- Malawi – between August and September 2021, in partnership with the Malawi Confederation of Chambers of Commerce and Industry and the Consumers Association of Malawi;
- Rwanda – between October and December 2021, in partnership with the Rwanda Chamber of commerce and services.

After the statistical data analysis, which included the analysis of specific variables, as well as the cross-analysis of variables identified in the questionnaires and the calculation of the synthetic indicators (as per step 6 of the methodology), the findings were shared in a virtual meeting with partners and national and local institutions for their approval and adoption.

Results

Preliminary market analysis

Table 1 shows the findings of the preliminary market analysis in the three countries, while Figure 1 shows where the mapped markets are located. All of the selected markets operate at least once a week, but mostly daily. Six markets in three regions were mapped in Burkina Faso (Boucle du Mouhoun, Centre-Ouest and Hauts-Bassins). A representative sample of 210 retailers was established for the retailer survey, while a total of 210 consumers were randomly selected for the consumer survey. Six markets were mapped in Malawi (in the Mzimba and Nkhata Bay districts), with a total of 423 retailers and 1 054 consumers selected for data collection. In Rwanda, six of the seven markets chosen were located in the Northern Province, while one was in the capital, Kigali. The representative survey samples comprised 300 retailers and 307 consumers.

³ The preparatory work is intended to lay the groundwork for the rest of the process. In this step, the lead organization/institution should: i) clearly define the target area/territory for the mapping exercise; ii) conduct a desk review of existing documentation on territorial markets; and iii) define the markets to be retained to carry out the mapping of territorial markets.

⁴ For example, name, GPS coordinates, market frequency and total number of retailers, as well as information on the overall distribution of retailers within the markets (such as sex, age and type of food groups sold).

⁵ The retailer survey was composed of 42 questions and administered to a representative sample of food retailers. It aimed to collect information on product supply and product demand, infrastructure and basic services supporting the market.

⁶ The consumer survey was composed of 22 questions and administered to a non-probabilistic sample of consumers. Information was gathered on consumers' general profile (for example, sex, age, household dimensions and living area) and on their consumption and purchasing patterns.

Table 5. Preliminary market analysis

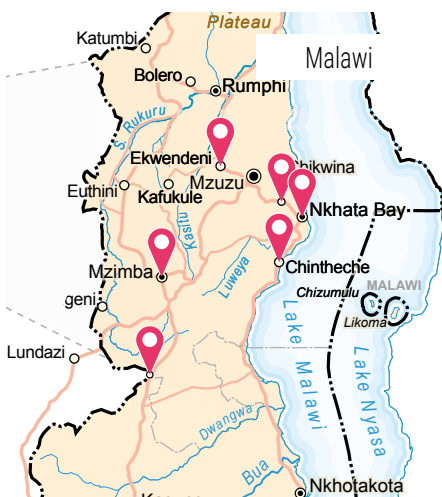
Region/ district	Market name	Market frequency	Average no. of retailers selling at the market	No. of retailers sampled	No. of consumers sampled
BURKINA FASO					
Boucle du Mouhoun	Grand marché de Dédougou	Daily	2 500	35	35
	Marché de Tcheriba	Weekly	400	35	35
Centre-Ouest	Marché de Tenado	Daily	150	35	35
	Marché de Zamo	Twice weekly	400	35	35
Hauts-Bassins	Marché de Houndé	Daily	450	35	35
	Marché de N'dorola	Weekly	980	35	35
MALAWI					
Mzimba	Chintheche market	Daily	700	67	165
	Mpamba market	Daily	500	72	155
	Nkhata Bay Boma market	Daily	500	80	197
Nkhata Bay	Ekwendeni market	Daily	120	69	187
	Jenda market	Daily	350	67	177
	Mzimba Boma market	Daily	800	68	173
RWANDA					
Kigali City/Gasabo	Mulindi market	Twice weekly	40	12	28
Northern Region/Rulindo	Base market	Other	400	34	32
	Buyoga market	Weekly	250	60	75
	Gasiza market	Twice weekly	255	33	26
	Kiyanza market	Weekly	95	49	32
	Rusine market	Twice weekly	580	57	52
	Shyorongi market	Twice weekly	200	55	62

SOURCE: Authors' elaboration of collected data.

Figure 1. Localization of selected territorial markets



SOURCE: Adapted from Map No. 4230 Rev.1 UNITED NATIONS, August 2018. Department of Field Support, Geographical Information Section.



SOURCE: Adapted from FAO. 2022. Territorial markets – Malawi. In: *FAO Hand-in-Hand Initiative*. Rome. Cited 4 April 2022. data.apps.fao.org/catalog/dataset/territorial-markets-malawi.



SOURCE: Adapted from Map No. 3717 Rev. 11.1 UNITED NATIONS, September 2018. Department of Field Support, Geographical Information Section.

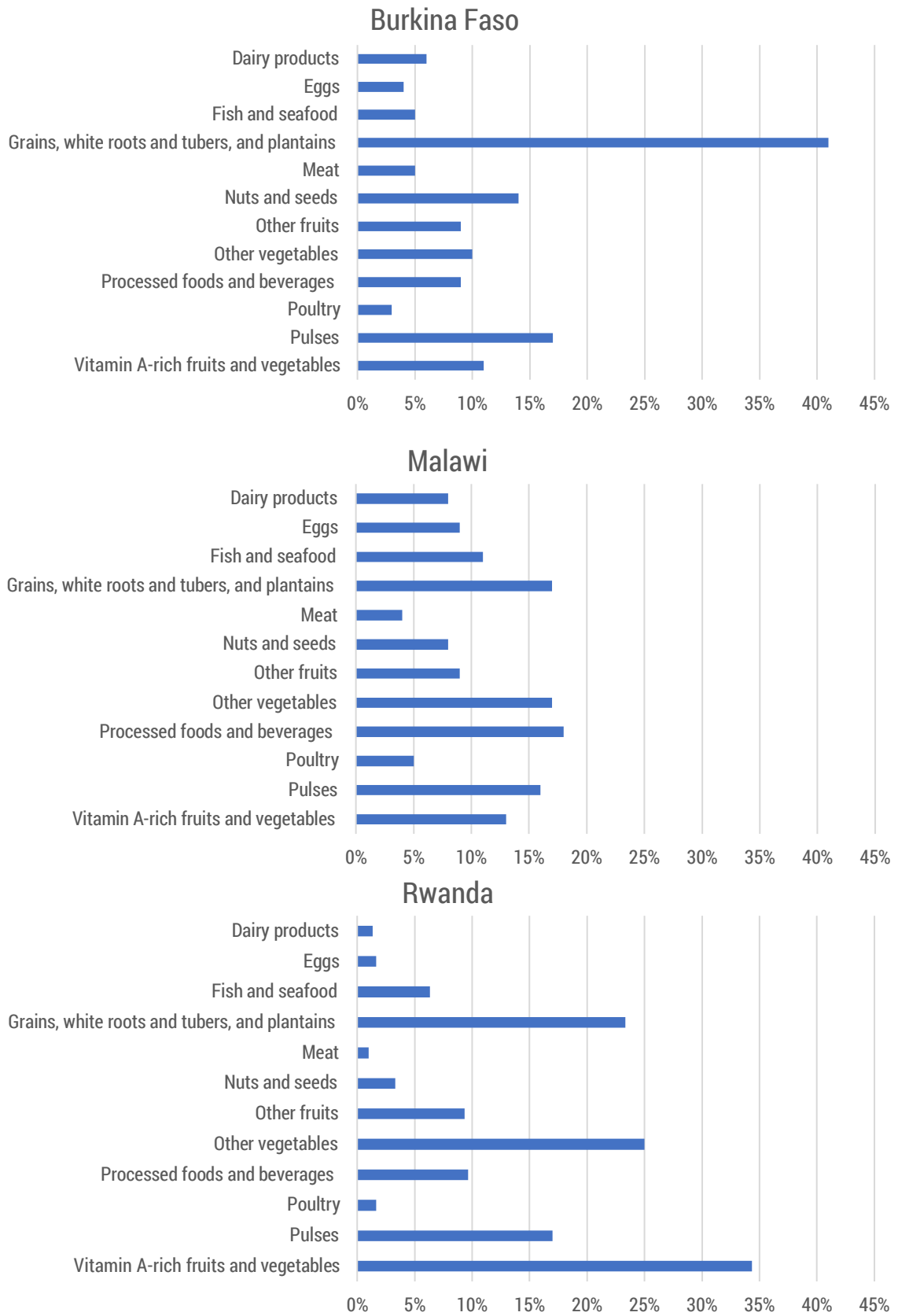
Availability and diversity of offering

As shown in Figure 2, in Burkina Faso, “grains, white roots and tubers, and plantains” was the food group most frequently offered on the market (41 percent), followed by “pulses” (27 percent) and “nuts and seeds” (25 percent). When it came to animal products, 7 percent of food retailers sold “dairy products”, 5 percent sold “fish and seafood” and “meat”, and “poultry” was offered by fewer than 3 percent. In Malawi, the products most frequently offered by food retailers were “processed foods and beverages”⁷ (18 percent), followed by “grains, white roots and tubers, and plantains” and “other vegetables” (both

offered by 17 percent of retailers). Among animal protein source foods, “Fish and seafood” were most frequently offered (11 percent), while “meat” and “poultry” were the food groups least offered by retailers. In Rwanda, “vitamin A-rich fruits and vegetables” were offered by 34 percent of retailers, followed by “other vegetables” and “grains, white roots and tubers, and plantains”. “Fish and seafood” were offered by 6 percent of retailers, while “eggs”, “poultry”, “dairy products” and “meat” were each offered by fewer than 2 percent. Table 2 lists examples of the varieties sold on the market for each food group, as reported by the retailers selling them.

⁷ The food group “processed foods and beverages” includes both industrial processed foods and beverages, as well as artisanal processed foods and beverages (for example, sweets, such as cakes, cookies and deep-fried foods, such as fried cassava, potatoes or sweet potato, fried chicken, pork or beef).

Figure 2. Percentage of retailers offering each food group, by country



SOURCE: Authors' elaboration of collected data.

Table 2. Examples of food products available in selected markets, by food group⁸ and country

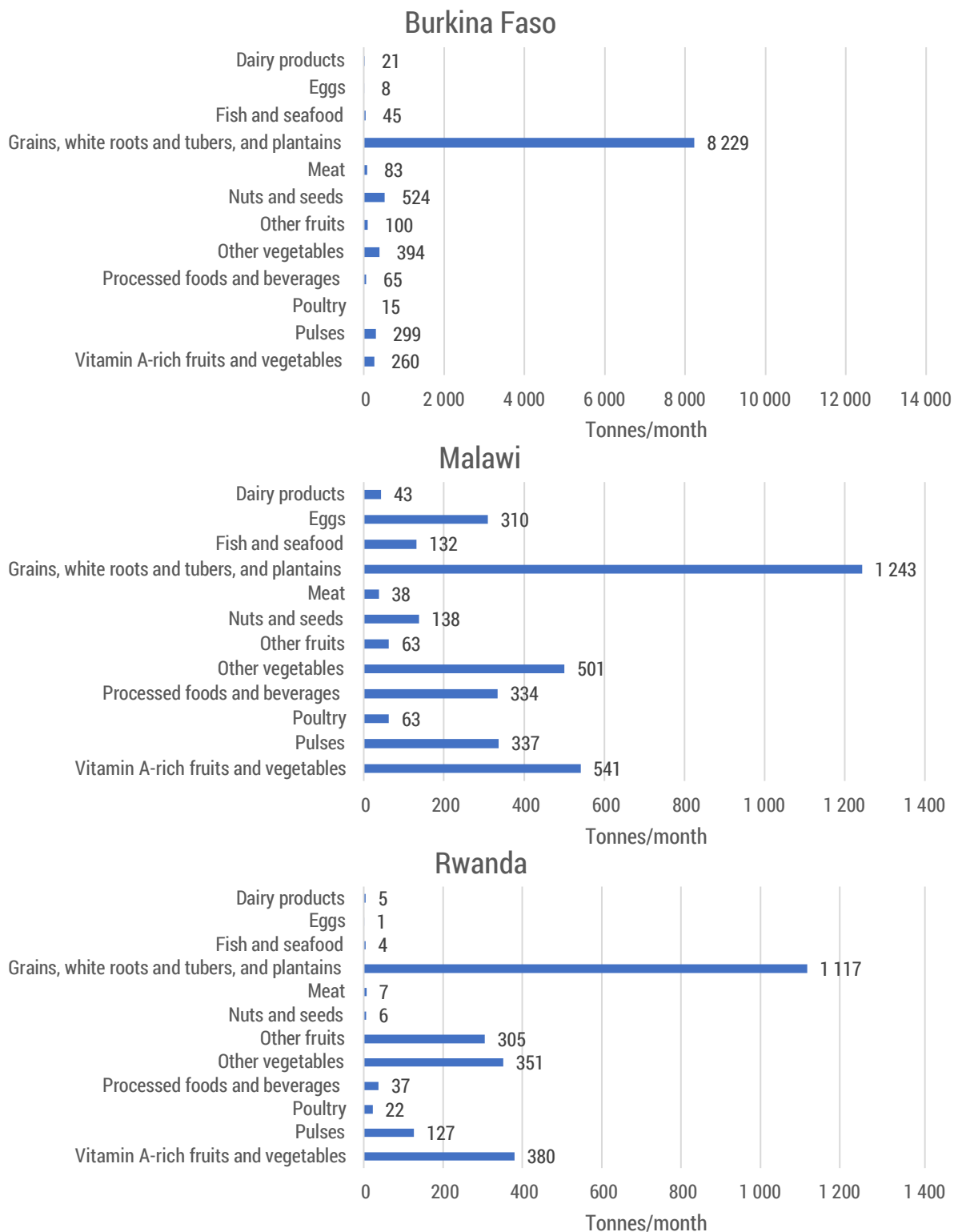
Food group	Food products offered by retailers		
	Burkina Faso	Malawi	Rwanda
Dairy products	Fresh milk, condensed milk, yogurt, gapal, sour milk, milk cream, degué (traditional beverage)	Fresh milk, sour milk, yogurt, custard (dessert), milk powder, dairy drinks	Fresh milk, cream
Eggs	Chicken eggs, guinea fowl eggs	Chicken eggs	Chicken eggs
Fish and seafood	Mackerel fish, carp, sardines, catfish, silure	Usipa (small sardine-like fish), tilapia, masuhunju, blue fish, micheni, mlamba, mbuna	Tilapia, catfish, mad fish
Grains, white roots and tubers, and plantains	Maize, millet, rice, sorghum, potatoes, yams, sweet potatoes, manioc (or cassava), plantain	Maize (or corn), millet, rice, ugali wa sembe (ufa), Irish potato, white-fresh sweet potato, orange sweet potatoes, pasta, sorghum, tam, cassava, green bananas, plantains	Irish potatoes, plantains, wheat, maize, rice, sorghum, yams, cassava, sweet potatoes
Meat	Sheep meat, goat meat, beef meat, pork meat, donkey meat	Pork, beef (cow), goat	Beef, goat meat
Nuts and seeds	Peanut, Sesame, Shea nut, Groundnut	Groundnuts	Peanut, sunflower seeds
Other fruits	Banana, avocado, lemon, pineapple, watermelon, tangelo, guava, oranges	Avocado, jackfruit, guava, watermelon, banana, pineapple, apple, baobab, lemon, oranges	Oranges, lemons, pineapples, avocados, bananas, watermelons, mandarins, apples
Other vegetables	Onions, tomatoes, eggplants, courgettes, chillies, peppers, cabbages, okra, baobab leaves, mushrooms, cucumber,	Cabbage, tomato, eggplant, sweet pepper, cucumber	Onions, tomatoes, eggplants, beets, cabbage, bell pepper, fresh peas, fresh beans, cassava leaves
Processed foods and beverages	Fruit juices, spaghetti, oil, cookies, bread, tea, sugar, sweets, soft drink, tomato paw, soumbala, shea butter, peanut butter, beer, red sorghum (dolo)	Industrially processed products: soft and fizzy drinks, energy drinks, biscuits, chips, candies, processed fruits juices, lollipops, soya pieces	Industrially processed foods and beverages: juice, alcoholic drinks, sodas
		Artisanal processed foods: traditional cakes (chimimina), mandasi, donuts, pancakes, fried sweet potatoes, french fries, fried cassava, fried plantains, roasted nuts, popcorn, deep fried pork, kombucha, fruitcake, chocolate eclairs, cooked fresh nuts, roasted beef kebab, roasted fresh corn, traditional oven scones, rice samoosa	Artisanal processed foods and beverages: none
Poultry	Chicken, guinea fowl	Chicken	Chicken
Pulses	Beans, peas, lentils, soy, cowpea	Green beans, white beans, kidney (red) beans, lentils, sugar beans, cowpeas, black bean (mzaza), green peas (sawawa), black eye beans (samba), soybeans, pigeon peas	Peas, beans
Vitamin A-rich fruits and vegetables	Spinach leaves, eggplant leaves, sorrel leaves, squash, papaya, mango, carrots	Mustard greens, groundnuts leaves, sweet potato leaves, pumpkin leaves, chinese vegetables, and other dark green leafy vegetables, papaya, mango, carrots, passion fruit	Passion fruit, mango, carrot, spinach, tamarillo, papaya, amaranth

SOURCE: Authors' elaboration of collected data.

⁸ Food group defined in accordance with FAO (2021).

The food group with the highest volumes of sales in all three countries, was, by far, “Grains, white roots and tubers, and plantains”, followed by fruits and vegetables, while animal-source food products (poultry, eggs, meat, dairy products, fish and seafood) were, in general, the products with the lowest sales volume (Figure 3).

Figure 3. Estimated total sales volume in a typical month for each food group, by country



SOURCE: Authors' elaboration of collected data.

Consumption patterns

Dietary diversity is one essential dimension of diet quality, especially with regard to the micronutrient adequacy of diets (FAO, 2021). To fully understand the

contribution of territorial markets to the consumption of diversified diets, the team recorded the food groups consumed by respondents in the 24 hours prior to the survey (Table 3).

Table 3. Consumption of each food group in the 24 hours prior to the survey (percentage of consumers), by country

Food groups	Burkina Faso	Malawi	Rwanda
Dairy products	28%	45%	14%
Eggs	18%	20%	13%
Fish and seafood	64%	57%	32%
Grains, white roots and tubers, and plantains	100%	89%	94%
Meat	38%	25%	14%
Nuts and seeds	38%	23%	13%
Other fruits	17%	45%	22%
Other vegetables	90%	59%	40%
Processed foods and beverages	50%	60%	23%
Poultry	5%	14%	0%
Pulses	20%	25%	22%
Vitamin A-rich fruits and vegetables	92%	57%	71%

SOURCE: Authors' elaboration of collected data.

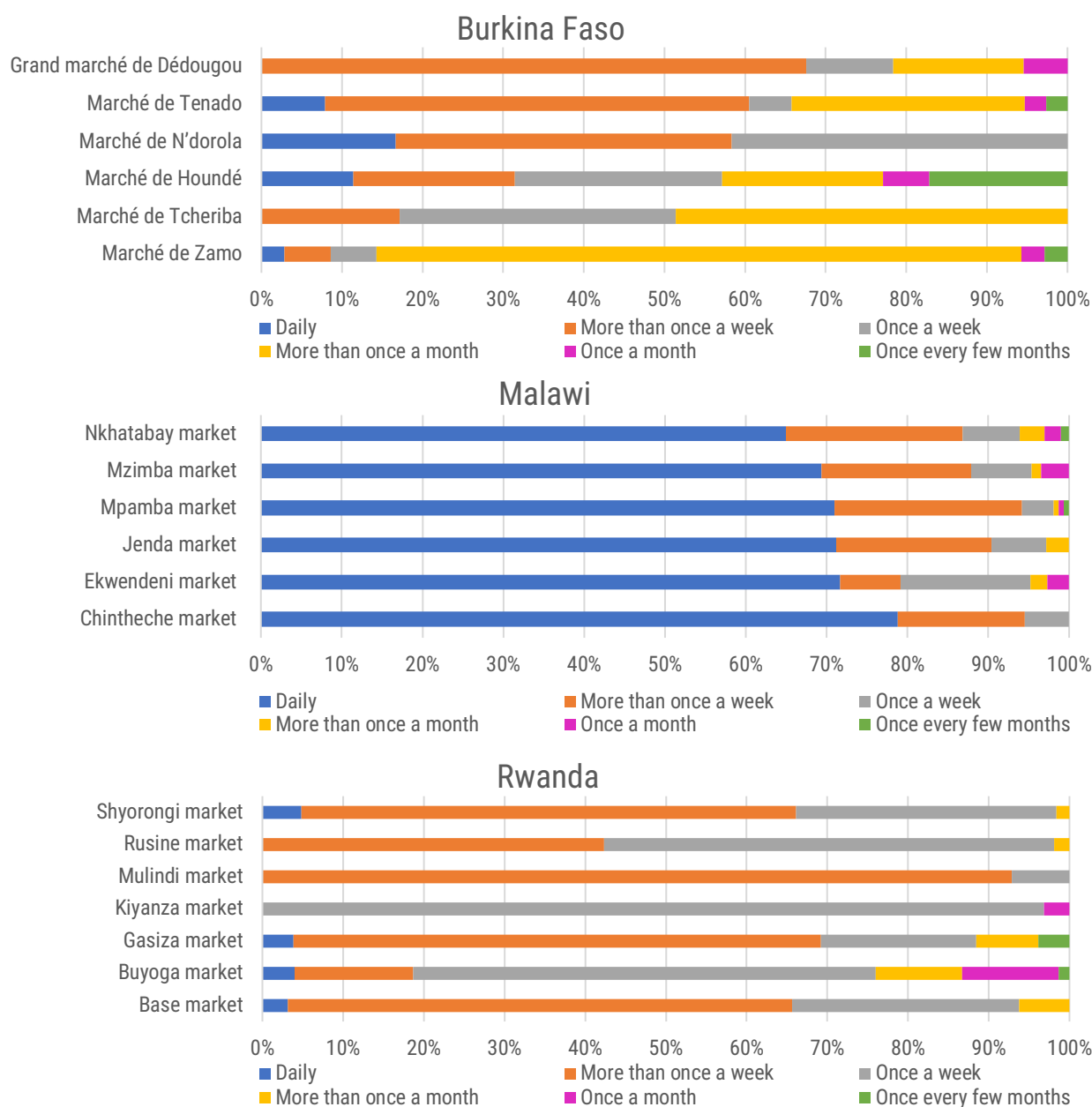
In Burkina Faso, Malawi and Rwanda, food consumption was dominated by "grains, white roots, tubers and plantains", with 100 percent, 89 percent and 95 percent of respondents, respectively, stating that they had consumed this food group the previous day. In Burkina Faso, the majority had consumed "vitamin A-rich fruits and vegetables", "other vegetables" and "fish and seafood", while the percentage that had eaten "processed foods and beverages" was 50 percent. In Malawi "processed foods and beverages" was the second food group in terms of consumption (60 percent), followed by "other vegetables", "fish and seafood" and "vitamin A-rich

fruits and vegetables" (over 50 percent). In Rwanda, 73 percent had consumed "vitamin A-rich fruits and vegetables" and "pulses". "Fish and seafood" (33 percent) was the most consumed animal protein source. "Poultry" was cited as the least consumed food group.

Frequency of market visits and frequency of purchase

The importance of territorial markets in guaranteeing food access can be seen in the frequency with which consumers shop there. Figure 4 shows the shopping frequencies of each of the mapped markets.

Figure 4. Estimated total sales volume in a typical month for each food group, by country

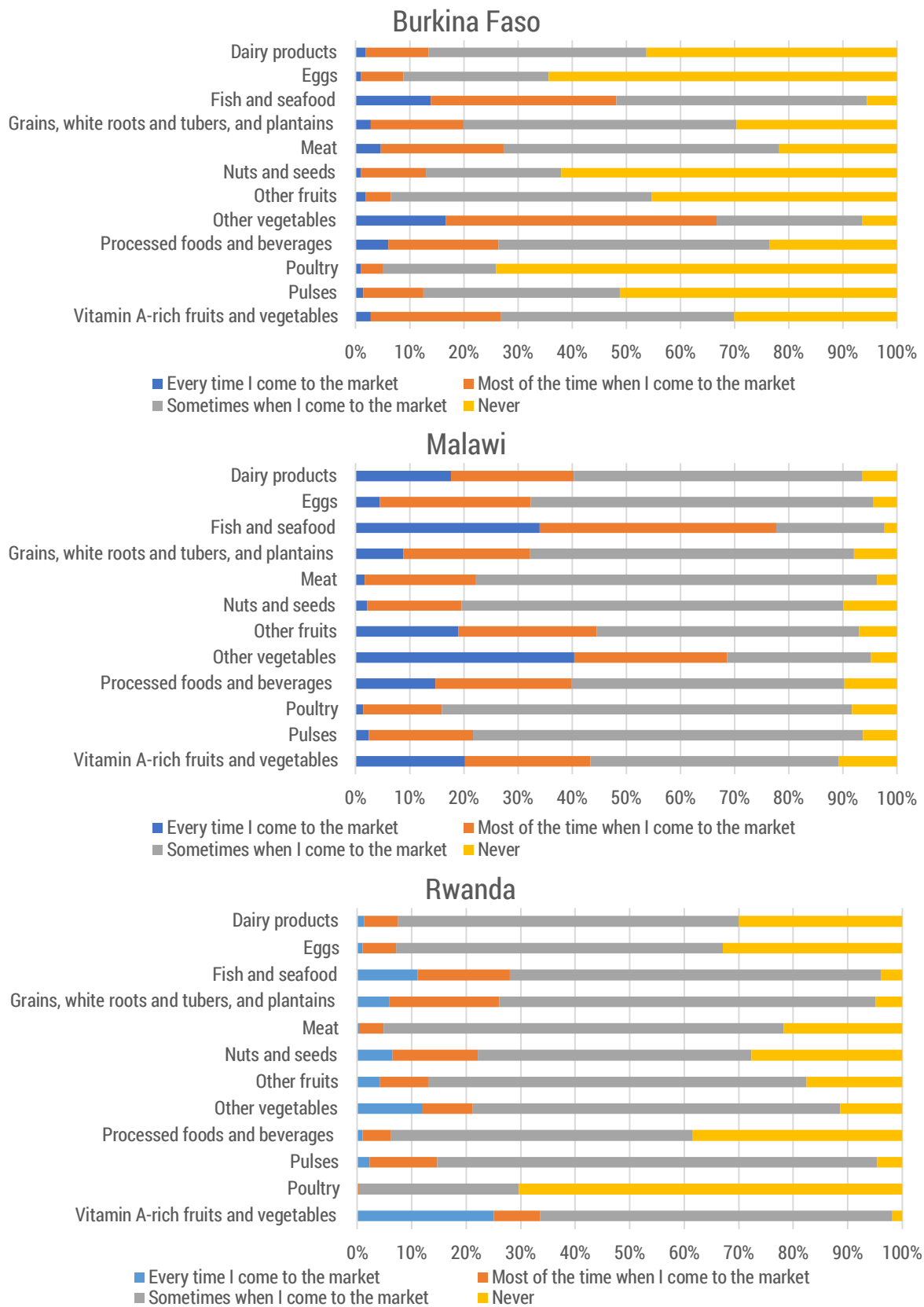


SOURCE: Authors' elaboration of collected data.

In Burkina Faso, not all markets recur with the same frequency. However, the share of consumers visiting the markets more than once a week exceeded 30 percent for all markets. In Malawi, all of the selected markets occur on a daily base and the percentage of consumers shopping daily exceeded 60 percent in all six territorial markets. In Rwanda, where most of the mapped markets are held twice a week, consumers mostly said they visited these markets “more than once a week”.

The authors further investigated consumers’ purchasing frequency for each food group (Figure 5). Interestingly, there were similar purchase patterns in all three countries. Indeed, products such as vegetables (both “vitamin A-rich vegetables” and “other vegetables”) and “fish and seafood” showed the highest purchase frequency, while the percentage of consumers who frequently purchased “grains, white roots, tubers and plantains” ranged from 20 percent to 30 percent. Other animal products, such as “eggs” and “meat” and especially “poultry”, were the least frequently purchased food groups in most cases.

Figure 5. Purchasing frequency, by food group and market



SOURCE: Authors' elaboration of collected data.

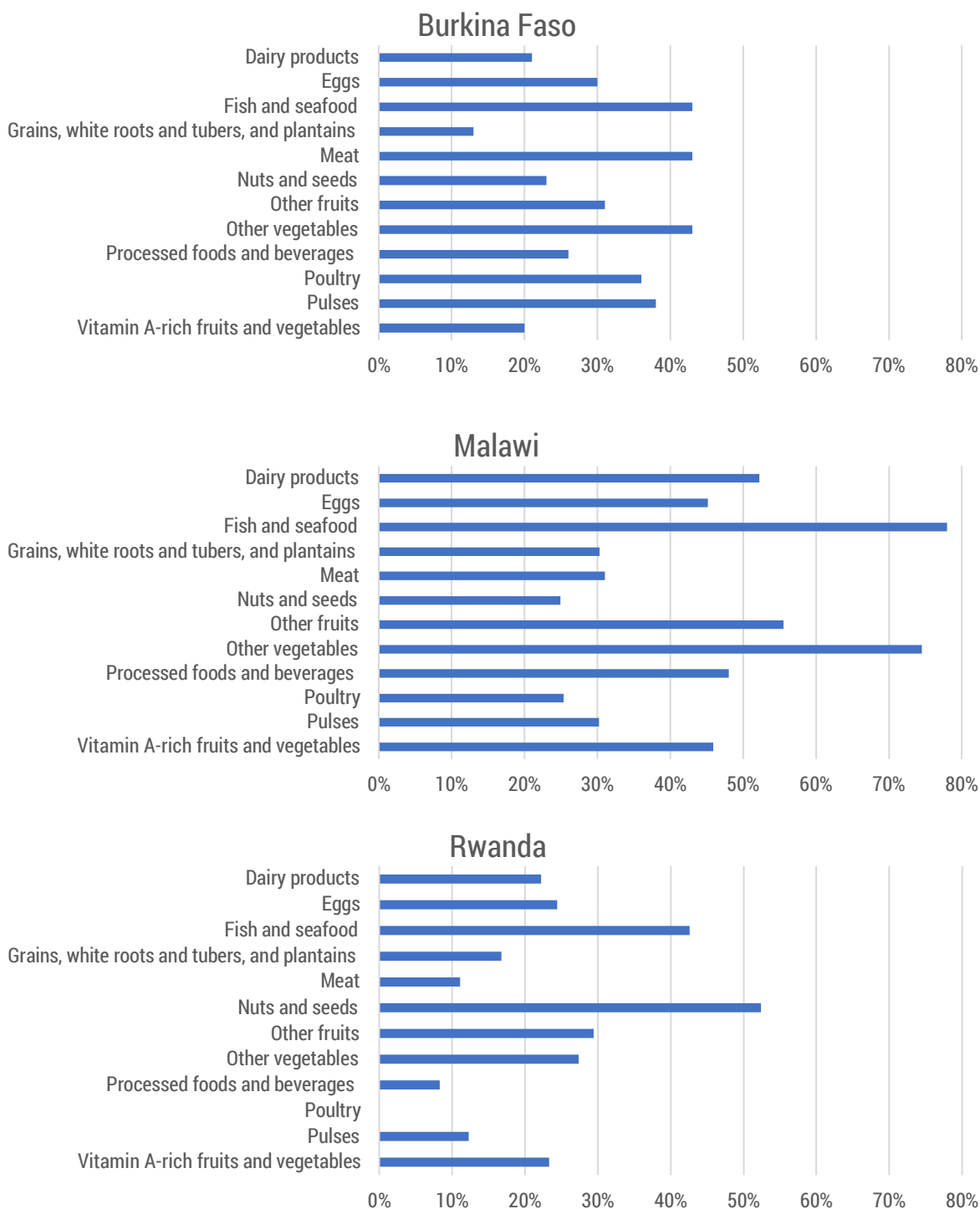
Consumers’ diets and territorial markets

The contribution of territorial markets to consumers’ diets can be measured using two indicators:⁹

- 1) The **minimum contribution of territorial markets to day-to-day food consumption** estimates how much of the food

consumed by consumers in the 24 hours prior to the survey was purchased in the mapped markets¹⁰ (Figure 6). The data from the three countries confirm the important role of territorial markets as food supply outlets, especially for fresh foods, such as vegetables, fruits and fish.

Figure 6. Minimum contribution of territorial markets to day-to-day food consumption, by food group



SOURCE: Authors’ elaboration of collected data.

⁹ Both indicators were calculated as the minimum contribution of markets to diets, as only consumers visiting the market more than twice a week were taken into account, so as to include only consumers that were almost entirely reliant on the mapped markets for their food purchases. In reality, these markets also contribute to the diets of those consumers visiting markets less frequently. However, as these consumers are not included, both indicators show the minimum contribution of markets to diets.

¹⁰ The minimum contribution of territorial markets to day-to-day food consumption is calculated as the average share (percentage) of consumers reporting that they had consumed food products the day before, reporting that they buy the food products every time or most of the time they go to the market, and reporting that they visit the market at least twice a week, divided by the total number of consumers who consumed the product.

Interestingly, in Burkina Faso and Rwanda, the contribution of territorial markets to day-to-day food consumption was lower than in Malawi.

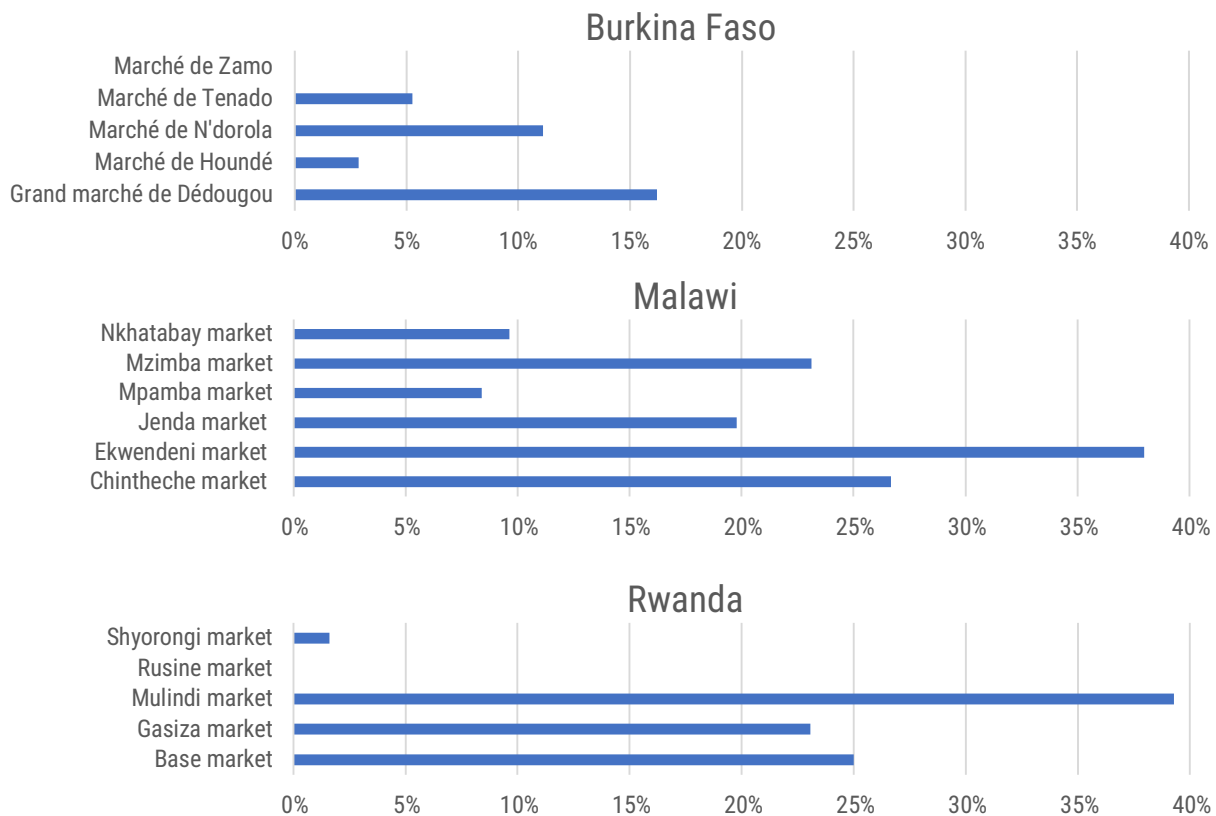
- In the markets of Burkina Faso, the contribution of "other vegetables" was quite high (43 percent), while for animal products ("fish and seafood" and "meat"), it was more than 40 percent, meaning that more than 40 percent of the consumers of these products were likely to have purchased them in those territorial markets. The corresponding figure for starchy staples was low (11 percent).
- In Malawi, the figure exceeded 20 percent for all food groups and reached almost 80 percent for "fish and seafood" and for "other vegetables". It also surpassed 50 percent for "other fruits" and "dairy products".
- In Rwanda, the contribution of territorial markets to day-to-day food consumption exceeded 40 percent only for "nuts and seeds" and "fish and seafood". Notably, in this case, territorial markets seemed not to contribute to people's daily consumption of "poultry".

day-to-day purchase of a healthy food basket estimates the number of consumers who rely solely on the mapped markets to purchase a "healthy food basket" including at least one source of carbohydrates, one source of protein and one of fruits or vegetables.¹¹ When interpreting this indicator, one should bear in mind that not all consumers purchase (and consume) a healthy food basket. Furthermore, it is not so common for consumers to purchase their entire food basket only in one food outlet. Therefore, in some cases, values could be low, especially in the absence of similar evidence from other types of food outlet (such as grocery stores or supermarkets) with which to compare scores.

Markets in Malawi showed the highest values (equal to or higher than 20 percent for four markets), followed by Rwanda (three markets exceeding 20 percent) and Burkina Faso (no market exceeding 20 percent) (Figure 7). Two markets (Marché de Zamo in Burkina Faso and Rusine market in Rwanda) showed a value of zero, meaning that none of the interviewed consumers relied entirely on these markets for their day-to-day purchases of a healthy food basket, so visited the market sporadically to buy only certain food products.

2) The minimum contribution of territorial markets to the

Figure 7. Minimum contribution of territorial markets to the day-to-day purchase of a healthy food basket, by market¹²



SOURCE: Authors' elaboration of collected data.

¹¹ The minimum contribution of territorial markets to the day-to-day purchase of a healthy food basket is calculated based on the share (percentage) of consumers who say they have purchased at least five different food groups (out of which a source of carbohydrates, a source of protein and a source of vitamins and fibers (fruits and vegetables) every time or most of the time they come to the markets and report visiting the market more than twice a week. This indicator was calculated only for markets that take place at least twice a week.

¹² This indicator was calculated only for markets that took place at least twice a week.

Synthetic indicators

To facilitate the understanding of all data and information collected, different synthetic indicators¹³ were built to measure market performance with regard to the inclusion of women, the business environment, producer-consumer linkages, the diversity of the offering and their contribution to healthy and a diversified diet. While the first three indicators focus more on the socioeconomic aspects of territorial markets, the last two focus on the relevance of territorial markets to consumers' diets and nutrition, and are presented here. As it is crucial to conduct a baseline analysis at the beginning of a project, these synthetic indicators are useful tools that allow an impact evaluation during project implementation by setting measurable activities and outcomes.

The **Food Diversity Indicator**¹⁴ (Figure 8) shows the diversity of the food offering in each territorial market and, hence, the level of consumers' exposure to diverse foods. The construction of this indicator was guided by the research of Pingali and Ricketts (2014). Remarkably, 15 out of 19 score higher than 0.6 for product diversification on a scale of 0 to 1 (see footnote), while only two markets (the Grand marché de Dédougou in Burkina Faso and Mulindi market in Rwanda) score less than 0.4, supporting the thesis that territorial markets are critical in ensuring accessibility and exposure to a wide variety of food to consumers. At country level, Malawi

scores higher than Burkina Faso and Rwanda (which score similarly) when it comes to food diversity in markets.

The **minimum day-to-day contribution to healthy and diversified diets indicator**¹⁵ (Figure 9) measures the contribution of territorial markets in ensuring consumers' access to healthy and diversified diets. The construction of this indicator was guided by the findings of Gómez and Ricketts (2013) and compiled by taking the simple arithmetic mean of the two consumers' diets indicators. It was calculated only for markets that took place at least twice a week and aims to highlight the differences between markets in the three countries.

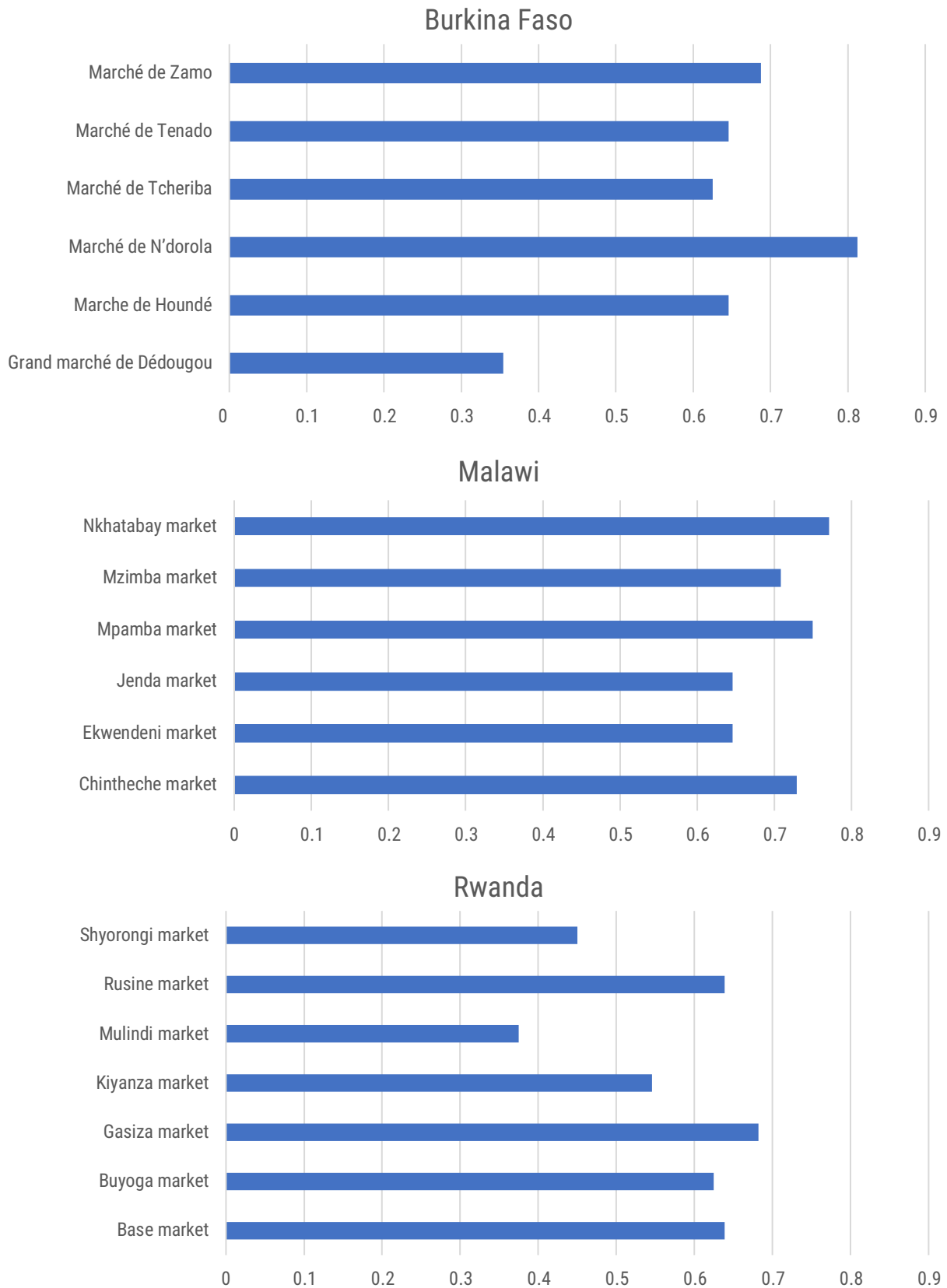
Dédougou market in Burkina Faso makes the most significant contribution to consumers diets (at 0.23 on a scale of 0 to 1, please see footnote); the others score between 0.1 and 0.2, indicating that these markets have some relevance in ensuring consumer access to healthy and diversified diets. The one exception is Zamo market in Burkina Faso, whose lower score suggests that it plays a less significant role. In Malawi, the mapped markets seem to make a consistent and homogeneous contribution, with scores exceeding 0.25 and as high as 0.42 (Ekwendeni market). Rwanda saw some markets contribute far more than others; Rusine scores lowest at 0.04, while Base market scores highest, at almost 0.4.

¹³ A synthetic indicator is a composite measure that mathematically combines several pieces of information into one single measure, allowing comparisons and the evaluation of multidimensional phenomena.

¹⁴ The Food Diversity Indicator is expressed as a value between 0 and 1, where 0 shows the least food diversity – that is, none of the food groups is offered at the market – and 1 shows the most food diversity – that is, four or more varieties available for each food group.

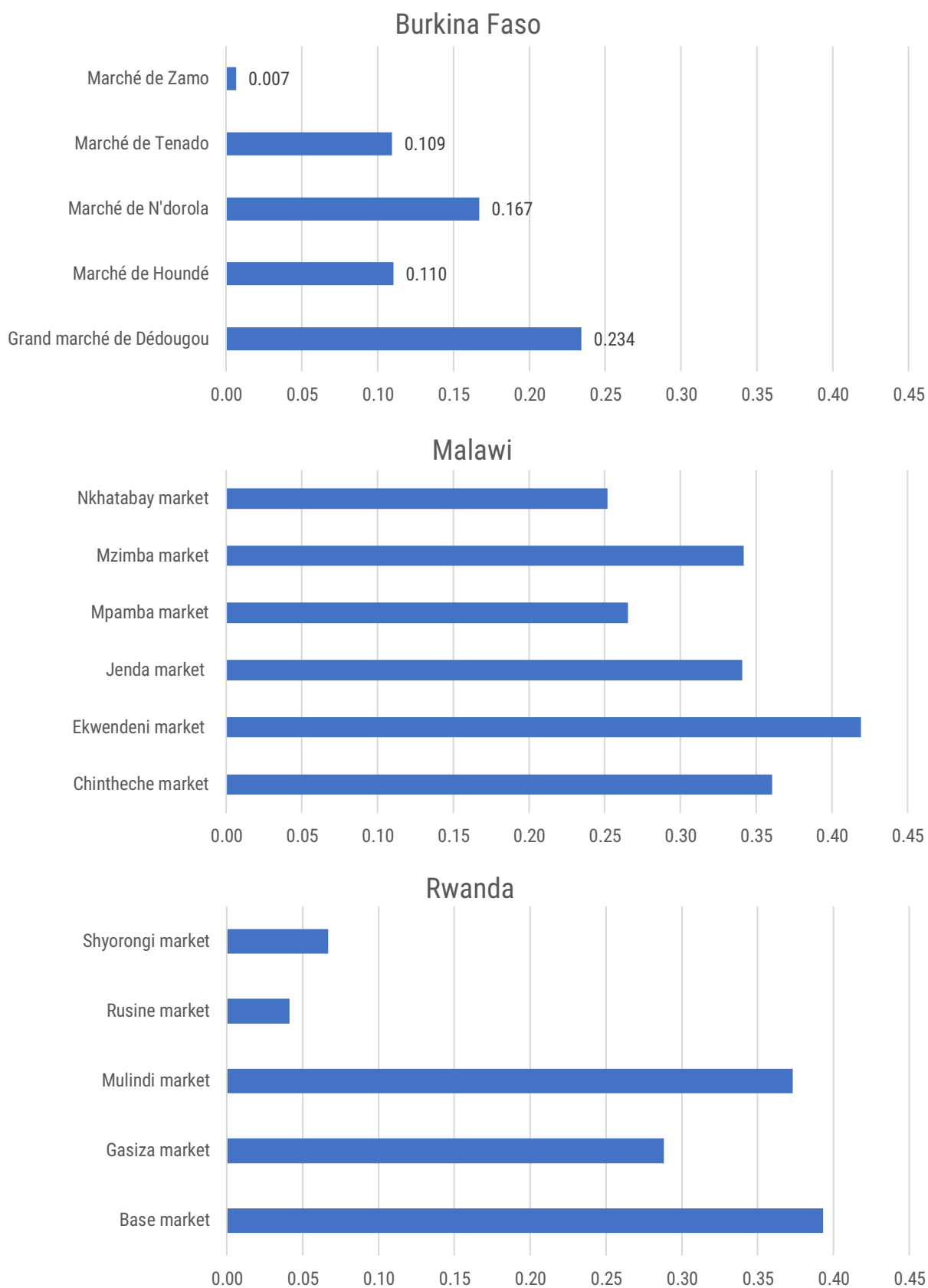
¹⁵ The minimum day-to-day contribution to healthy and diversified diets indicator is calculated by considering the share of consumers that rely on territorial markets for their day-to-day consumption of specific food groups (Figure 6) and the share of consumers that relying on territorial markets for the day-to-day purchase of a healthy food basket (Figure 7). This indicator was calculated only for markets that take place at least twice a week. Its value ranges from 0 to 1; the closer the value is to 1, the higher the contribution of that market to ensuring day-to-day access to healthy and diversified consumer diets.

Figure 8. Food Diversity Indicator, by market



SOURCE: Authors' elaboration of collected data.

Figure 9. Minimum day-to-day contribution to healthy and diversified diets indicator, by market¹⁶



SOURCE: Authors' elaboration of collected data.

¹⁶ This indicator was calculated only for markets taking place at least twice a week.

Discussion and conclusions

Using the FAO methodology for mapping territorial markets (FAO, 2022a), this study collected data and information on 19 territorial markets in Burkina Faso, Malawi and Rwanda.

The aim of the research was to unleash the potential of territorial markets in promoting healthy diets and better nutrition in the areas in question, as territorial markets are crucial food supply centres for local communities and, thus, critical in influencing consumers' dietary patterns (CSF, 2016; Gómez and Ricketts, 2013). Evidence from the three counties confirmed the published evidence in several respects.

First, the importance of territorial markets as key food supply outlets for local consumers was evident in the frequency with which consumers visited these markets (Figure 4), in the frequency with which they purchased the food offered (Figure 5) and in the monthly volumes of food sold in such markets, especially fresh food and staple crops (Figure 3). Where consumers' ability to preserve food at home is limited, for example, by a lack of adequate facilities such as refrigerators, markets are an important means of sourcing fresh and seasonal food, such as vegetables, fruit, meat and fish on a daily basis (FAO, 2016). Even in subsistence-oriented rural settings, markets allow producers to sell their agriculture produce and buy what they need, thereby contributing significantly to farm household diets (Sibhatu *et al.*, 2015).

In line with a study by Mensah *et al.* (2021), the results of this research show that plant-based products (mostly vegetables and fruits) were not only more frequently offered and sold than animal-based products (Figures 2 and 3), but were also more frequently bought and consumed (Figure 5 and Table 2), probably due to differences in terms of affordability and social perception (Mensah *et al.*, 2021). Fish and seafood was the most purchased and consumed animal-source product in all the three countries. Besides being landlocked countries, all three have artisanal and traditional fishery sectors in rivers and lakes, aquaculture and fish imports. This makes fish available and accessible to local consumers (FAO, 2022b; 2022c; 2022d), as it does over large parts of sub-Saharan Africa, where fish is a mainstay of people's diets, being cheaper than meat (Béné and Heck, 2005; Bodiguel, Toppe and Wallemacq, 2014; Tran *et al.*, 2019).

Moreover, as dietary diversity is an essential dimension of diet quality, especially with regard to the micronutrient adequacy of diets (FAO, 2021), the diversity of the products

offered in territorial markets is considered one of the most important aspects when mapping these markets (FAO, 2022a; Pingali and Ricketts, 2014). Through the application of the Food Diversity Indicator (Figure 8), it was possible to capture the critical role of territorial markets in ensuring the availability of an array of foods to local consumers. Indeed, seeking information on the number of diverse food items available at market level for each food group can facilitate the identification of strengths and gaps in territorial market performance.

For instance, the data for this study clearly underscored the role of markets as essential suppliers of a large variety of foods, especially fresh foods, both plant and animal-based. Nonetheless, infrastructural and technological gaps reported in territorial markets (data not shown) limit the preservation of perishable foods and negatively affect not only the safety and desirability of these foods, but also their availability in terms of quantity and of diversity (Chan, 2014). The same goes for fresh animal products such as meat, fish and poultry; a lack of proper facilities to preserve their shelf-life contributes to the low volumes sold and limits the scaling up of retailer businesses. Given the evidence of the value of territorial markets in terms of the quantity, quality and diversity of the food they offer, therefore, it is clear that interventions to improve the functioning of these markets – such as investing in market infrastructure and safer processing and packaging techniques that seek to preserve perishable products (fruit, vegetables, meat or fish), in particular – have the potential to increase the availability and affordability of safe, nutritious and diverse food and, thus, act on the main drivers of consumers' food purchases.

Another important aspect to be considered when mapping territorial markets is their contribution to healthy and diversified diets (FAO, 2022a). To quantify this contribution and to facilitate the interpretation of the data, the team calculated a minimum day-to-day contribution to healthy and diversified diets synthetic indicator (Figure 9). The idea behind this indicator, which mainly shows the difference between markets in a country, is to provide valuable information at territorial level and to demonstrate the central role of territorial markets in ensuring food security and nutrition.

A number other than zero already means that these markets are essential in providing access to healthy and diversified food for a certain proportion of the population. Worth mentioning, too, is that the estimated values were mathematically calculated to represent the minimum contribution, meaning that, in reality, the contribution of these markets to ensuring access to healthy and diversified diets is likely to be higher.

The calculation did not take into account consumers visiting the market less frequently than twice a week, who may also buy larger quantities in a single trip. Moreover, the contribution may vary during the wet or dry seasons.

Naturally, the differences between markets could be ascertained not only by the availability, affordability, desirability and diversity of food on sale, but also by consumers' habits, attitudes and dietary preferences. These indicators, therefore, should not be considered individually when evaluating overall market performance, as other aspects and dynamics, such as market gender inclusivity and the business environment, need to be taken into account.

In conclusion, the mapping of territorial markets and the resulting synthetic indicators can be considered an innovative approach to better understanding how food systems influence consumers' diets and in planning measurable, nutrition-sensitive interventions that go

beyond the individual level and target the food environment, specifically, the food retailing environment. On the one hand, it facilitates the gathering of information on both the demand (consumption and purchasing patterns) and supply sides of the food environment and evaluation of the impact. On the other, it enables the identification of effective strategies and entry points for actions to improve the supply of specific products that are essential to ensuring consumers' access to healthy and diversified diets (fresh food products).

Market-based nutrition interventions should focus on investments aimed at revitalizing and boosting territorial markets and the food system actors operating in them – food retailers, food processors and food manufacturers. This has the potential to catalyse a shift in territorial markets – and consequently food systems – towards the provision of safer, more nutritious and diversified food, thus contributing to the food security and nutrition of the local communities they supply.

References

- Béné, C. & Heck, S.** 2005. Fish and food security in Africa. *NAGA, WorldFish Center Quarterly*, 28(3 & 4): 8–13. https://dlc.dlib.indiana.edu/dlc/bitstream/handle/10535/2485/article_01_2834.pdf
- Bodiguel, C., Toppe, J. & Wallemacq, F.** 2014. *Fish for life: nutrition and development in Eastern Africa and Western Indian Ocean*. Rome, FAO. <https://www.fao.org/3/az080e/az080e.pdf>
- CFS (Committee on World Food Security).** 2016. Connecting smallholders to markets. Policy recommendations. Rome. <https://www.fao.org/3/bq853e/bq853e.pdf>
- Chan, M.** 2014. Food safety must accompany food and nutrition security. *The Lancet*, 9958(384): 1910–1911. [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(14\)62037-7/fulltext?rss%3Dyes=](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(14)62037-7/fulltext?rss%3Dyes=)
- FAO.** 2015. *Food outlook: Biannual report on global food markets*. Rome. <https://www.fao.org/markets-and-trade/publications/detail/en/c/1455240/>
- FAO.** 2016. *Influencing food environments for healthy diets*. Rome. <https://www.fao.org/3/i6484e/i6484e.pdf>
- FAO.** 2019. *The State of Food Security and Nutrition in the World 2019: Safeguarding Against economic slowdowns and downturns*. Rome. <https://www.fao.org/3/ca5162en/ca5162en.pdf>
- FAO.** 2021. *Minimum dietary diversity for women. An updated guide to measurement: from collection to action*. Rome. <https://www.fao.org/documents/card/en/c/cb3434en>
- FAO.** 2022a. *Mapping of territorial markets: Methodology and guidelines for participatory data collection. Second edition*. Rome. <https://www.fao.org/3/cb9484en/cb9484en.pdf>
- FAO.** 2022b. Fishery and Aquaculture Country Profiles: Burkina Faso. Country Profile Fact Sheet [online]. Rome. Cited 27 July 2022. <https://www.fao.org/fishery/en/facp/bfa?lang=fr>
- FAO.** 2022c. Fishery and Aquaculture Country Profiles: Malawi. Country Profile Fact Sheet [online]. Rome. Cited 27 July 2022. <https://www.fao.org/fishery/en/facp/mwi?lang=en>
- FAO.** 2022d. Fishery and Aquaculture Country Profiles: Rwanda. Country Profile Fact Sheet [online]. Rome. Cited 27 July 2022. <https://www.fao.org/fishery/en/facp/rwa?lang=fr>

- FAO, IFAD (International Fund for Agricultural Development), UNICEF (United Nations Children's Fund), WFP (World Food Organization) & WHO (World Health Organization).** 2021. *The State of Food Security and Nutrition in the World 2021. Transforming food systems for food security, improved nutrition and affordable healthy diets for all.* Rome, FAO.
<https://www.fao.org/publications/sofi/2022/en/>
- FAO & INRA (Institut national de la recherche agronomique).** 2016. *Innovative markets for sustainable agriculture: How innovations in market institutions encourage sustainable agriculture in developing countries.* Rome.
www.fao.org/3/i5907e/i5907e.pdf
- FAO & WHO.** 2019. *Sustainable healthy diets: Guiding principles.* Rome and Geneva, Switzerland.
<https://www.who.int/publications/i/item/9789241516648>
- Gómez, M.I. & Ricketts, K.D.** 2013. Food value chain transformations in developing countries: Selected hypotheses on nutritional implications. *Food Policy*, 42: 139–150.
<https://www.sciencedirect.com/science/article/abs/pii/S0306919213000766>
- HLPE (High Level Panel of Experts on Food Security and Nutrition).** 2017. *Nutrition and food systems.* Rome.
<https://www.fao.org/policy-support/tools-and-publications/resources-details/en/c/1155796/>
- Mensah, D.O., Nunes, A.R., Bockarie, T., Lillywhite, R. & Oyebode, O.** 2021. Meat, fruit, and vegetable consumption in sub-Saharan Africa: a systematic review and meta-regression analysis. *Nutrition Reviews*, 79(6): 651–692.
<https://pubmed.ncbi.nlm.nih.gov/32556305/>
- Pingali, P.L. & Ricketts, K.D.** 2014. Mainstreaming nutrition metrics in household surveys – toward a multidisciplinary convergence of data systems. *Annals of the New York Academy of Sciences*, 1331(1): 249–257.
<https://pubmed.ncbi.nlm.nih.gov/25407161/>
- Sibhatu, K.T., Krishna, V.V. & Qaim, M.** 2015. Production diversity and dietary diversity in smallholder farm households. *Proceedings of the National Academy of Sciences*, 112(34): 10657–10662.
<https://www.pnas.org/doi/10.1073/pnas.1510982112>
- Tran, N., Chu, L., Chan, C.Y., Genschick, S., Phillips, M.J. & Kefi, A.S.** 2019. Fish supply and demand for food security in Sub-Saharan Africa: An analysis of the Zambian fish sector. *Marine Policy*, 99: 343–350.
<https://www.sciencedirect.com/science/article/pii/S0308597X18303798>
- UNSCN (United Nations System Standing Committee on Nutrition).** 2016. *Impact Assessment of Policies to Support Healthy Food Environments and Healthy Diets: Implementing the Framework for Action of the Second International Conference on Nutrition.* Rome.
<https://www.unscn.org/uploads/web/news/document/DiscPaper3-EN-WEB.pdf>

The role of climate services in transforming nutrition

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Key words: food systems, climate services, climate variability, climate change, climate adaptation

Abstract

In this paper, we adopt a food systems approach to identifying ways in which climate adaptation strategies can be made more nutrition sensitive. We then examine the ways in which climate services can be leveraged to transform nutrition by supporting strategies across food systems aimed at improving diets and reducing the burdens of malnutrition. Climate services can help inform the prioritization of nutrition-sensitive climate adaptation strategies by helping to identify spatial and seasonal risk, long-term trends, and sub-seasonal and year-to-year changes in climate-related risk that have the potential to impact food systems, diets and nutrition outcomes, as well as the Sustainable Development Goals (SDGs).

Introduction

The food we consume and the way it is produced have significant implications for the health of people and the planet. Food production accounts for around one-third of all greenhouse gas emissions and 70 percent of fresh water use and is the largest

contributor to biodiversity loss globally (Crippa *et al.*, 2021; Willett *et al.*, 2019). At the same time, seasonality and climate variability – which include year-on-year variations in climate, over seasons to decades, as well as extreme weather events and longer-term climate trends (that is, climate change) – have the potential to disrupt food production, as well as broader food systems and the actors within them.

Moreover, global warming is causing an increase in the frequency and severity of extreme events such as droughts, floods and heat waves (IPCC, 2021). On the one hand, such events can negatively affect the quantity and quality of food to which populations have access and, on the other, the diets people consume can negatively impact the environment, disrupting the earth's systems (Willett *et al.*, 2019). Thus, food systems have an important role to play in both climate change adaptation and mitigation, both of which have implications for malnutrition (undernutrition, overweight/obesity and diet-related non-communicable diseases, or NCDs), as well as many of the SDGs.

Climate variability disproportionately affects the most marginalized populations, including poorer communities (Pacillo

et al., 2020a; 2020b; Atwoli *et al.*, 2021). The populations most at risk of negative impacts from climate variability are also most at risk of poor-quality diets and malnutrition. Many of the world's food insecure and malnourished are smallholder farmers in low- and middle-income countries (LMICs). However, migration to urban settings is increasing rapidly, including among farmers trying to diversify their incomes (Perez-Escamilla *et al.*, 2018). Lower-income populations in both rural and urban settings are experiencing a high prevalence of food insecurity, and high levels of undernutrition are often seen alongside the increasingly high prevalence of overweight/obesity and its associated risk factors, such as hypertension and diabetes (Perez-Escamilla *et al.*, 2018).

Climate variability, including extreme events, can influence nutrition in various ways, exacerbating the already high global burden of poor-quality diets and malnutrition. In this paper, we describe ways in which climate change adaptation strategies can be made more nutrition-sensitive. In doing so, we seek opportunities to transform nutrition by improving diets and nutrition and helping to address the SDGs. Climate services, defined here as “the generation, provision, and contextualization of information and knowledge from climate research with the view to informing decision-making related to adaptation to climate variability” (Vaughan and Dessai 2014), are increasingly sought as an opportunity to minimize climate risk to agriculture (Hansen *et al.*, 2022; Vaughan *et al.*, 2019). Here, we examine the ways in which climate services can be used to support strategies across food systems aimed at improving diets and reducing the burdens of malnutrition.

Climate, diets and nutrition pathways

To depict the ways in which climate variability and change can affect diets and nutrition across food systems, we adapted the conceptual food systems diagram from the 2017 High-Level Panel of Experts on Food Security and Nutrition (HLPE) report on nutrition and food systems (HLPE, 2017). The food systems conceptual framework includes food systems drivers (such as globalization and trade, income growth and distribution, urbanization, population growth and migration, politics and leadership, sociocultural context, and climate variability and change), as well as the food supply chain, which includes food production systems and input supply, storage and distribution, processing and packaging, and retail and marketing (HLPE, 2017; Fanzo *et al.*, 2020).

These drivers and supply chains then influence the foods that are available and affordable in the food environments with which individuals interface, the properties of the products and vendors within them, and the food-related messaging that people receive (HLPE, 2017; Fanzo *et al.*, 2020). Individual factors, such as

economic status, information and knowledge, preferences and situational factors (such as home and work environments, mobility, location and time) then influence the foods that people acquire from their food environments, leading to diet and nutrition, as well as social, economic and environmental outcomes (HLPE, 2017; Fanzo *et al.*, 2020).

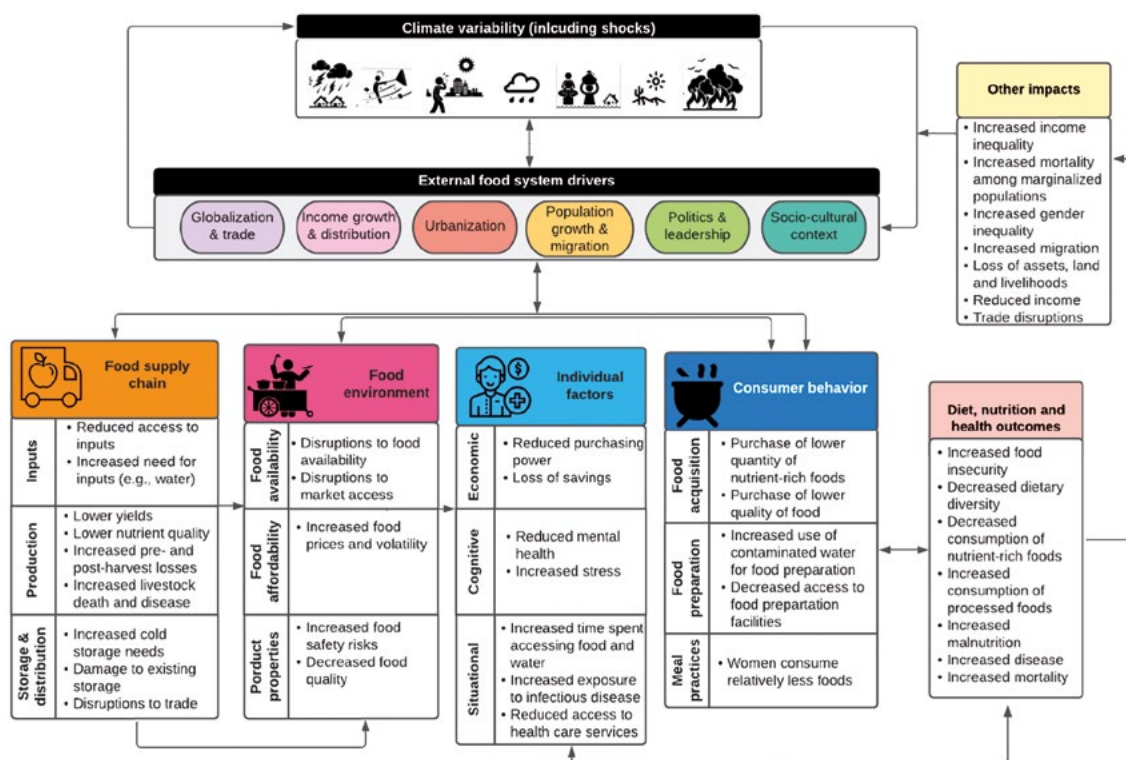
Figure 1 provides an overview of the ways in which climate variability can affect the food supply chain (for example, food production), the food environment (for example, food availability, affordability, acceptability and safety), individual factors (such as assets, income and empowerment), consumer behaviour, diet and nutrition outcomes. It also depicts the health and social and economic impacts associated with climate variability, with a focus on low-income households, such as smallholder farmers and the urban poor in LMICs.

Climate variability (including extreme events) and climate trends can disrupt all of the aforementioned elements of the food system at various times, with negative implications for diets, nutrition and the broader SDGs. However, many of these pathways are conceptual, as rigorous evidence directly linking climate signals to food environments, diets and nutrition outcomes is limited. Most of the evidence to date focuses on the impacts of climate variability and extreme events on the productivity of staple crops (Davis *et al.*, 2021).

Supporting nutrition-sensitive climate adaptation

Identifying food systems-wide climate adaptation solutions is critical to reducing the risk of poor-quality diets and malnutrition among marginalized populations that are at higher risk of negative repercussions related to climate variability and change. However, climate adaptation approaches to date have mainly focused on the farm level, emphasizing the quantity of food produced. We believe that there are ways in which climate adaptation can be more nutrition-sensitive across food systems as a whole.

Table 1 provides an overview of the entry and exit points for nutrition, building on previous work in the context of climate adaptation (Choufani *et al.*, 2017; Fanzo *et al.*, 2018). Several potential strategies could be adopted to support nutrition entering food systems and to reduce its exit in the context of climate adaptation. We outline the strategies that could be used to counteract the climate disruptions to food systems in Table 2. They include strategies aimed at increasing the production of nutrient-rich foods (see Box 1), increasing and stabilizing income, increasing the availability, affordability, acceptability and safety of nutritious foods, decreasing disease risk and increasing access to health services, and empowering women.

Figure 1. The pathways by which climate can influence the multiple forms of malnutrition


SOURCE: Adapted from HLPE (High-Level Panel of Experts on Food Security and Nutrition). 2017. *Nutrition and food systems*. Rome. <https://www.fao.org/3/i7846e/i7846E.pdf>

Box 1. Strategies for increasing the production of nutrient-rich foods in the context of climate adaptation

Increasing the production of nutrient-rich foods and diversifying production will promote nutrition while increasing the resilience of farms to climate variability (Fanzo *et al.*, 2018; FAO, 2016). It can also help to increase the supply of nutrient-rich foods that are available and affordable in urban settings. Providing incentives for resilient species and cultivars/breeds of crops and animals that are a win-win-win from a climate resilience, productivity and nutrition perspective would probably also increase their uptake.

However, for this to be possible, a repository of the resilient species and cultivar/breeds is needed, along with their specific attributes from a climate resilience, adaptation and nutrition perspective, as well as their cultural appropriateness. Collections of crops do exist (Peres *et al.*, 2016; Bioversity International and CIAT, n.d.), but including information about the nutritional content of these crops as well as their cultural acceptability would further contribute to these repositories, allowing for the timely identification of specific varieties that could be grown or bred in specific geographical areas, and under which climatic conditions, to meet the nutritional needs of the population. Currently, such a repository does not exist. However, the Government of India has recently begun promoting 35 crop varieties that are climate resilient, while also considering their nutritional value (PIB Delhi, 2021). Moreover, several biofortified crops are considered “win-win-win” crops from a climate resilience, productivity and nutrition perspective (HarvestPlus, 2021).

Table 1. Entry and exit points for nutrition in the connect of climate adaptation

Climate-related food system problem	Climate drivers	Climate adaptation approaches*	Potential unintended consequences	Entry points for nutrition	Exit points for nutrition
Decreased soil quality	Drought, floods, heavy rainfall, storms, sea level rise	Mixed farming systems; nitrogen-fixing leguminous trees and pastures; integrated soil fertility management; spreading crop residues; agroforestry, green manuring, nitrogen-fixing cover crops, integrated nutrient management to improve soil fertility; reduced or no till, crop rotations	Ensuring adequate fertilizer use (amounts and balance of plant nutrients applied)	Mixed farming systems can increase diet diversity; increased legume production and cover crops that can be used for consumption; increased income can result in purchasing more diverse diets	
Water scarcity	Seasonality, drought, floods leading to water contamination, storms, fires, heat waves, changes in rainfall and temperature characteristics	Supplemental irrigation; water harvesting; crop choice (drought resistant varieties); improve soil water storage ability.	Trade-off related to potential for increased water footprint	Increased water for production of fruits and vegetables can help increase their availability year-round; increased access to water for livestock can increase animal source foods availability in times of drought and water scarcity	Potentially increased risk of malaria; potentially increased risk of chemicals entering the food supply if irrigation water is contaminated
Altered productivity and increased crop failure and livestock/fishery deaths Altered nutrient content of crop/livestock/fish products Increased pests (insects, pathogens, fungi and weeds) during production	Seasonality, drought, floods, heavy rainfall, storms, fires, heat/cold waves, salt intrusion, changes in rainfall, temperature and humidity characteristics, increased ocean temperature and sea-level rise	Livelihood diversification; diversification of production; social protections; improved seeds; improved crop, breed and species choice (drought resistant; heat resistant; salinity resistant; pest resistant); mixed livestock-crop(-tree) systems; improved amount, type, timing and placement of fertilizer; changes in timing and location of fishing; crop protection (for example, cover crops, barriers such as bird netting; protection of animals during weather events; integrated pest management (including improved weeding); use of pesticides; mangrove restoration to buffer coastal communities from storm surge	Ensuring that agrochemicals are applied appropriately; carbon footprint associated with increased livestock production	Choice of more nutrient-rich crops; biofortification; production of ASFs in mixed systems; increased diversity of production; reduction in aflatoxin in the food supply (including in animal feed -- and animal products) due to improved pest management systems; increased income can result in purchasing more diverse diets	Some drought-resistant crops (such as cassava) are nutrient poor and high in contaminants (such as cyanide)
Increased transmission of zoonotic diseases (animal to animal)	Seasonality, floods, heavy rainfall, changes in temperature characteristics	Livestock vaccines, insecticides that kill the infected vectors	Over-spraying could have negative implications for human and environmental health	Controlling transmission would lead to more nutrient-rich ASF available in the food supply given that fewer animals would be slaughtered; it would also reduce food safety risks in food supply	

Climate-related food system problem	Climate drivers	Climate adaptation approaches*	Potential unintended consequences	Entry points for nutrition	Exit points for nutrition
Inadequate post-harvest drying, storage and processing techniques	Floods, heavy rainfall, changes in temperature and humidity characteristics, seasonality	Improved drying of grains and legumes prior to storage; improved storage practices (such as airtight containers, cold storage) and infrastructure; chemical treatment; increased preservation of food through food processing	Over-use of chemical treatment could have negative implication for human and environmental health; High carbon footprint of cold storage.	Improved drying can reduce aflatoxin in food supply; increased processing can increase access to nutritious foods across seasons; Improving storage could help decrease food safety risk and food loss	Increased processing could lead to higher quantities of unhealthy fat, sugar and salt, and in nutrient-poor foods.
Disruptions to transportation, distribution and trade	Seasonality, floods, heavy rainfall, storms, fires, heat waves, sea level rise	Improve infrastructure, including roads, warehouses, wholesale markets, etc. establish strong farm networks	Increased transportation could lead to increased carbon footprint associated with transportation	Improving transportation, distribution and trade could decrease food safety risk and food loss throughout value chain; increase market access and increase the availability and acceptability (e.g. appearance) of food	Increased access to processed foods even in rural communities.
Increased exposure to enteric pathogens and increased outbreaks and transmission of infectious, vector- and water-borne disease and microbiological agents	Seasonality, drought, floods, storms, changes in rainfall, temperature and humidity characteristics	Increase physical access to health services; social protections for out-of-pocket payments; infrastructure; vaccination; bed nets; insecticides that kill the infected mosquito population	Increased costs to health sector and reassignment of current budgets	Decreased diarrheal disease and enteric infections; increased absorption of nutrients; decreased risk of vector and water borne diseases; decreased food safety risk	
Increased salinity and run-off and sewage contaminants in water supply	Drought, floods, heavy rainfall, storms, changes in rainfall characteristics	Improved water and sanitation; storm water management systems; surveillance programmes for blood pressure; practices to reduce soil erosion	Reduction in wetlands and associated biodiversity	Decreased diarrheal disease and enteric infections; increased absorption of nutrients; decreased hypertension; decreased food safety risk	
Increased workload and energy expenditure of women	Seasonality, drought, floods, heavy rainfall, storms, fires, heat/cold waves	Social protections; equitable distribution of tasks among women and men; empowered decision-making; support mechanisms for caring for children	Increased time spent in childcare that would be empowering (and contribute to sustainable adaptation strategies) for women requires a redistribution of labour roles and responsibilities among women and men in the household	Reduction in time spent getting water, etc.; increased time spent caring for children; improved decision-making ability related to food and health; reductions in illness; reduction in mortality	

* NOTE: Climate adaptation strategies informed by Ajani *et al.*, 2013; Fao, 2016; Fanzo *et al.*, 2018.

SOURCE: Adapted from Fanzo, J., Davis, C., McLaren, R. & Choufani, J. 2018. The effect of climate change across food systems: Implications for nutrition outcomes. *Global Food Security*, 18: 12–19. <https://www.sciencedirect.com/science/article/abs/pii/S2211912418300063>

Table 2. Potential strategies to support nutrition-sensitive climate adaptation

Food system outcome	Potential strategies
Increased production of nutrient-rich foods	Promotion of production diversification and improved crop, species or variety choice
	Increased access to extension services to better inform crop, species or variety choice, production practices and mixed-farming systems
	Promotion and incentives for win-win-win (productivity, nutritional quality and climate resilient) crops (such as specific biofortified crops)
	Increased access to water harvesting materials/equipment
	Increased access to credit
	Expansion of index-based insurance
	Subsidies/incentives for new varieties of seed and breeds that are resilient to climate variability and extreme events
	Increased shelter for animals
Increased income	Provide support programmes for livelihood diversification, including vocational training
	Expand access to free education
	Cash transfers
Improved food safety	Adoption of integrated pest management strategies
	Vaccination of livestock
	Maintenance of adequate stockpiles of vaccines by the county veterinary department to facilitate strategic prevention and control programmes
	Improve on farm storage
	Provide training on food preservation techniques (such as primary processing)
	Increased access to extension services that expand to post harvest, storage and primary processing with a particular focus on aflatoxin control
	Investment in cold storage across the value chain
	Investment in renewable energy and power infrastructure
Increased availability, affordability and acceptability of nutrient-rich foods	Behaviour change communication related to value-chain approaches to reduce aflatoxin (such as drying, storage, etc.)
	Create farming networks to increase market access
	Investment in road, port and market infrastructure in both rural and urban areas
	Expand social protections including unconditional cash transfers and supplemental food allowances
	Expand school meal programmes
	Expand access to affordable fortified foods
	Promote the use of nutrient-rich foods (including nutritious wild and indigenous crops, biofortified foods, ASF, etc.)
	Adopt fiscal policies to increase the price of energy-dense, nutrient poor foods and to reduce the price of nutrient-rich foods

Food system outcome	Potential strategies
Reduced disease risk	Programmes to support culinary skills and improved cooking methods
	Incentives to purchase clean and efficient cookstoves
	Improved vector control (strategic spraying of insecticides)
	Increased access to affordable bed nets
	Universal health coverage (particularly for vulnerable populations)
	Investment in health system infrastructure
	Increased access to source-based water treatment and household water treatment
	Increased public investment in water and sanitation infrastructure
	Behaviour change communication related to better hygiene and sanitation and best practices to reduce the risk of infection and disease
	Strengthening health services by increasing healthcare facilities, supplies and staff
Improved women's empowerment	Increased access to water harvesting materials/equipment
	Incentives to purchase clean and efficient cookstoves
	Increased climate services reach and uptake among women
	Provide women with skills to implement appropriate adaptation techniques
	Increase access to social protection mechanisms for women

SOURCE: Authors' own elaboration.

Climate services to inform the prioritization of nutrition-sensitive climate adaptation strategies

The aim of climate services is to provide people and organizations with timely, tailored climate-related knowledge and information that prevents climate-related losses and protects lives, livelihoods and assets (Vaughan and Dessai, 2014). Climate services have the potential to help inform the prioritization of nutrition-sensitive climate adaptation strategies based on spatial and seasonal risk, as well as to identify trends and sub-seasonal and year-to-year changes in risk (Thomson and Mason, 2018).

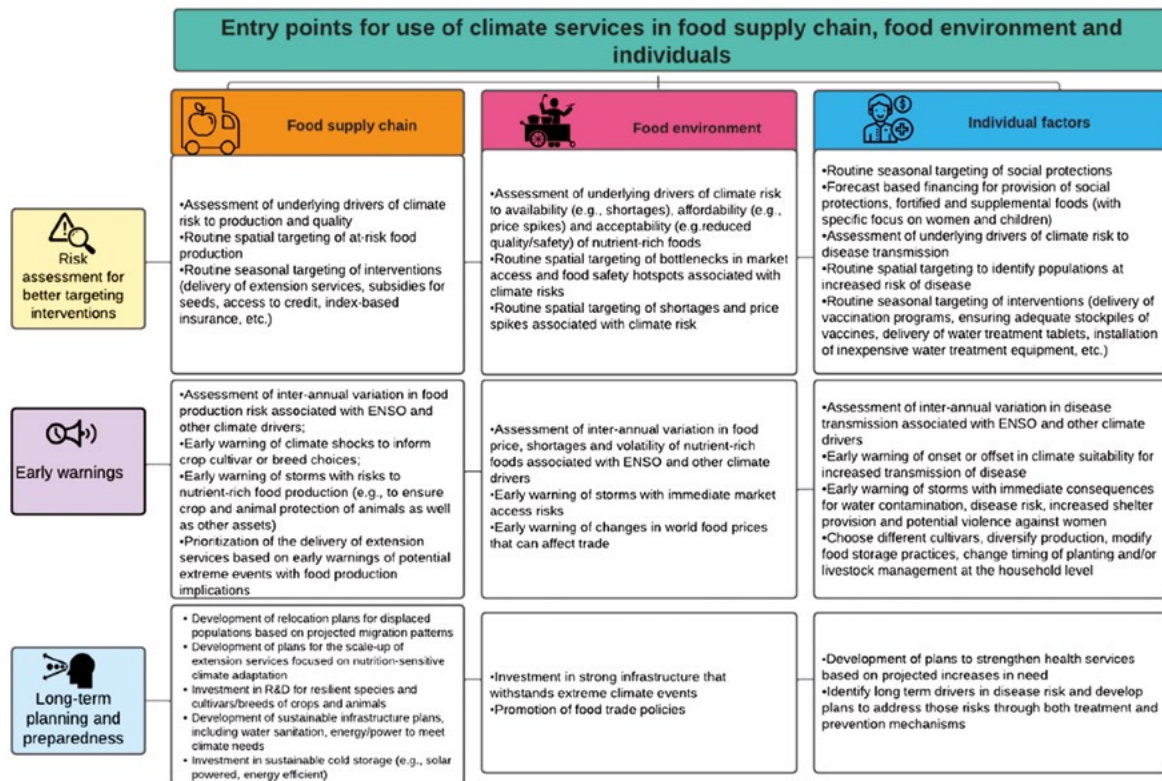
Historical, current and forecast climate information provides numerous opportunities to better characterize and prevent climatic risks in bad years and to identify new opportunities to maximize benefits in good years. Although the use of climate services has been increasing within the agricultural sector over time (Hansen *et al.*, 2022; Nissan, Simmons and Downs, 2022), they have been underused across food systems as a whole, including by the nutrition and health communities.

By using climate services for intervention planning and prioritization, resources can be delegated to the regions and to those people most at risk of climate-related food systems shocks that have the potential to impact diet and nutrition outcomes in various ways. We build on the work of Thomson and Mason (2018) to identify entry points for climate services to support nutrition-sensitive climate adaptation.

Figure 2 provides an overview of the ways in which climate services could be used to inform the prioritization of nutrition-sensitive climate adaptation that could support the production of nutrient-rich foods, increase the availability, affordability, acceptability and safety of nutritious food, reduce disease risk and access to health services, and improve women's empowerment and time use.

The three main ways in which climate services can be used are for: i) risk assessment for the better targeting of interventions, ii) early warnings and iii) long-term planning and preparedness. Climate services can be used in the short term to respond to immediate programming and

Figure 2. Entry points for using climate services to support nutrition-sensitive climate adaptation



SOURCE: Authors' own elaboration.

intervention needs, but also to inform investment in long-term planning, such as the strengthening of infrastructure in health, education and extension services. While most of these strategies are focused on the integration of climate services into policies and programming, household-level responses (such as changing cultivars, shifting the timing of planting, etc.) also have the potential to improve diet and nutrition outcomes.

Many evidential gaps remain with regard to the impact of climate services on food systems outcomes, but there is evidence to suggest that they have led to better agricultural and food security outcomes (Dobardzic *et al.*, 2019; IISD, 2019; Hansen *et al.*, 2022). Globally, investment in climate service products has resulted in better planning and anticipatory actions, leading to reductions in food shortfalls (Dobardzic *et al.*, 2019).

While there is limited information on the impact of climate services on malnutrition, a few studies have focused on the impacts of agriculture-targeted climate services on dietary diversity, including actions that can be taken at the

household level. One study in Namibia, which used propensity score matching (including the assessment of potential confounders) to compare households with access to climate information and those without, found that households receiving climate information had more diverse diets and higher food expenditure and engaged in more adaptive strategies (Gitonga, Visser and Mulwa, 2020). There were no differences in food security observed between households that had access to climate information and those that did not, but the authors suggest that this could be due to the government's distribution of food relief to protect against food shortages (Gitonga, Visser and Mulwa, 2020).

A drought early warning system in Uganda, meanwhile, was associated with a 23.7 percent reduction in food insecurity and a 30 percent increase in household dietary diversity among those receiving climate services (Akwango *et al.*, 2017). These impacts were attributed to the increased diversification of production and the growing of drought-tolerant varieties, among other things (Akwango *et al.*, 2017). Moreover, another study examining the impact of climate services on agriculture in Rwanda found that households that received

seasonal climate forecasts had higher dietary diversity scores than those who did not (Birachi *et al.*, 2020). These impacts were attributed to better land management, crop varieties, the timing of planting and livestock management, among other things (Birachi *et al.*, 2020). Targeted climate services that focus more specifically on improving diets and nutrition outcomes have the potential to lead to even greater improvements in nutrition outcomes.

Given the increased susceptibility of women to the negative repercussions of climate variability, it is critical to ensure that the climate adaptation strategies and climate services developed are responsive to their needs. Information and communication technology (ICT) can be used to bridge gaps in access to weather and climate information, particularly among marginalized populations. Despite their potential, women's current access is limited; men tend to have higher ownership rates than women of communication devices such as radios and mobile phones (GSMA, 2020). Although radios provide opportunities for shared listening for all members of a household, women can have limited ability to listen to radio programmes due to their household and childcare responsibilities (Archer, 2003; Poulsen *et al.*, 2015; Tall *et al.*, 2015; Venkatasubramanian *et al.*, 2014; West, Daly and Yanda, 2018).

Implications for policy and programming

To increase the uptake of climate services, many countries need to increase the capacity of their national meteorological institutes to develop underlying data, tailored products and dissemination pathways. Without increased investment in infrastructure and in building the necessary human capacity to make effective use of climate services, their impact will be limited.

Furthermore, the identified interventions require stakeholders from a variety of sectors, including the private sector, non-governmental organizations and governments, to increase their familiarity with climate services and their entry points and to subsequently incorporate them into their programme and policy planning. Members of the nutrition community need to work closely with meteorological institutes to improve the development and implementation of tailored climate information and services (Nissan, Simmons and Downs, 2022).

For example, in Vietnam the National Institute of Nutrition was receiving climate information, but the format in which the information was provided made it difficult to act on (Singh, Huynh and Downs, 2020). Working together to identify the information needed, when and on what spatial

scale, etc., will help to improve the design and strengthen the uptake and impact of climate services to inform nutrition programming (Nissan, Simmons and Downs, 2022).

In addition to the increased capacity required in the meteorological institutes of many countries, there is also a need to increase capacity to deliver nutrition-sensitive climate adaptation strategies. Without a boost to healthcare facilities, supplies and staff, as well as to the reach of extension agents, there will be limited scaling up of these strategies. There are already significant demands on the time of health services personnel and extension agents in many LMICs and adding more responsibilities without increasing the workforce will put further strain on existing personnel.

Moreover, strengthening infrastructure (roads, markets, electricity, etc.) will also be key in terms of increasing the uptake of the identified strategies and prioritizing them based on climate services. As mobile technology is likely to be an important delivery platform for early warnings and alerts, particularly for difficult-to-access populations, ensuring that mobile service networks are strengthened in rural areas will also help to facilitate the uptake of climate services.

Climate services will only have a significant impact on diet and nutrition outcomes, as well as the SDGs more broadly, if they reach the appropriate end users. To increase the likelihood that they benefit the most marginalized populations, end users should be involved in their co-production to ensure that services reflect users' needs and preferences and increase users' ability to respond to the information provided in an impactful way. This is particularly important for climate services that target households directly. Engaging with these populations in a participatory way can help to ensure that climate services are used to promote healthy diets and nutrition across food systems as a whole.

Despite a critical need for climate services, many of the people who are most vulnerable to climate variability and shocks often cannot access practical information (McOmber *et al.*, 2013), including the rural and urban poor and women. The climate information needs of men and women differ depending on labour roles and service areas, seniority, ethnicity and other socioeconomic factors. To provide the most beneficial and equitable interventions, it is necessary to understand the social norms that influence the resources and decisions under male and female control (Huyer, 2006; Nath, 2006). It is also important to develop ICT-based communication channels appropriate and tailored to women's needs (Gumucio *et al.*, 2019). Collaboration

with local partners and organizations conscious of gender norms will help in designing socially aware climate services (Cornwall, 2016).

Conclusions

Seasonality, climate variability (including extreme events) and long-term climate trends all affect food systems in various ways that have implications for diets and malnutrition, as well as many of the SDGs. We have

identified nutrition-sensitive climate adaptation strategies aimed at addressing the ways in which climate disrupts food systems, along with ways in which climate services could be used to prioritize those strategies based on risk. We argue that capitalizing on climate information and services tailored to the needs of marginalized populations, to better inform response strategies to climate disruptions across food systems, has the potential to help transform nutrition by reducing the burdens of malnutrition and promoting sustainable development.

References

- Akwango, D., Obaa, B.B., Turyahabwe, N., Baguma, Y. & Egeru, A.** 2017. Effect of drought early warning system on household food security in Karamoja subregion, Uganda. *Agriculture & Food Security*, 6(1): 43. <https://doi.org/10.1186/s40066-017-0120-x>
- Archer, E.R.** 2003. Identifying underserved end-user groups in the provision of climate information. *Bulletin of the American Meteorological Society*, 84(11): 1525-1532. <https://www.jstor.org/stable/26216904>
- Atwoli, L., Baqui, A.H., Benfield, T., Bosurgi, R., Godlee, F., Hancocks, S. et al.** 2021. Call for emergency action to limit global temperature increases, restore biodiversity, and protect health: Wealthy nations must do much more, much faster. *The Lancet*, 398(10304): 939-941. [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(21\)01915-2/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(21)01915-2/fulltext)
- Biodiversity International & CIAT (International Center for Tropical Agriculture).** n.d. Crop Conservation & Use [online]. Rome. Cited 30 July 2022. <https://ciat.cgiar.org/what-we-do/crop-conservation-and-use/>
- Birachi, E., Hansen, J.W., Radeny, M., Mutua, M., Mbugua, M.W., Munyangeri, Y. et al.** 2020. *Rwanda Climate Services for Agriculture: Evaluation of farmers' awareness, use and impacts*. Working Paper no. 304. Wageningen, The Netherlands, CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). <https://ccafs.cgiar.org/resources/publications/Rwanda-climate-services-agriculture-evaluation-farmers-awareness-use>
- Choufani, J., Davis, C., McLaren, R. & Fanzo, J.** 2017. *Climate change and variability: What are the risks for nutrition, diets, and food systems?* Washington, DC, International Food Policy Research Institute. <https://www.ifpri.org/publication/climate-change-and-variability-what-are-risks-nutrition-diets-and-food-systems>
- Cornwall, A.** 2016. Women's empowerment: What works? *Journal of International Development*, 28(3): 342-359. <https://onlinelibrary.wiley.com/doi/full/10.1002/jid.3210>
- Crippa, M., Solazzo, E., Guizzardi, D., Monforti-Ferrario, F., Tubiello, F.N. & Leip, A.J.N.F.** 2021. Food systems are responsible for a third of global anthropogenic GHG emissions. *Nature Food*, 2(3): 198-209. <https://www.nature.com/articles/s43016-021-00225-9>
- Davis, K.F., Downs, S. & Gephart, J.A.** 2021. Towards food supply chain resilience to environmental shocks. *Nature Food*, 2(1): 54-65.
- Dobardzic, S., Dengel, C.G., Gomes, A.M., Hansen, J., Bernardi, M., Fujisawa, M. et al.** 2019. *2019 State of Climate Services: Agriculture and Food Security*. Rome, World Food Programme. <https://www.wfp.org/publications/2019-state-climate-services-agriculture-and-food-security>
- Fanzo, J., Davis, C., McLaren, R. & Choufani, J.** 2018. The effect of climate change across food systems: Implications for nutrition outcomes. *Global Food Security*, 18: 12-19. <https://www.sciencedirect.com/science/article/abs/pii/S2211912418300063>
- Fanzo, J., Haddad, L., McLaren, R., Marshall, Q., Davis, C., Herforth, A. et al.** 2020. The Food Systems Dashboard is a new tool to inform better food policy. *Nature Food*, 1(5): 243-246. <https://doi.org/10.1038/s43016-020-0077-y>
- FAO.** 2016. *The state of food and agriculture: Climate change, agriculture and food security*. Rome. <https://www.fao.org/publications/sofa/2016/en/>
- Gitonga, Z.M., Visser, M. & Mulwa, C.** 2020. Can climate information salvage livelihoods in arid and semiarid lands? An evaluation of access, use and impact in Namibia. *World Development Perspectives*, 20: 100239. <https://www.sciencedirect.com/science/article/pii/S245229292030059X>

- GSMA (GSM Association).** 2020. *Connected Women: The mobile Gender Gap Report*. London. <https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2020/05/GSMA-The-Mobile-Gender-Gap-Report-2020.pdf>
- Gumucio, T., Hansen, J., Huyer, S. & van Huysen, T.** 2019. Gender-responsive rural climate services: a review of the literature. *Climate and Development*, 12(3): 241–254. <https://www.tandfonline.com/doi/full/10.1080/17565529.2019.1613216>
- Hansen, J., List, G., Downs, S., Carr, E., Diro, R., Baethgen, W. et al.** 2022. Impact pathways of climate services to SDG 2 (“Zero Hunger”): A synthesis of the evidence. *Climate Risk Management*, 35: 100399. <https://www.sciencedirect.com/science/article/pii/S2212096322000067>
- HarvestPlus.** 2021. *Biofortification: The Evidence*. Washington, DC. https://www.harvestplus.org/wp-content/uploads/2021/12/Biofortification_The-Evidence.pdf
- HLPE (High-Level Panel of Experts on Food Security and Nutrition).** 2017. *Nutrition and food systems*. Rome. <https://www.fao.org/3/i7846e/i7846E.pdf>
- Huyer, S.** 2006. Understanding gender equality and women's empowerment in the knowledge society. In: N. Hafkin & S. Huyer (eds.) *Cyberella or Cinderella? Empowering women in the knowledge society*. Bloomfield, CT, Kumarian Press, pp. 15–47.
- IISD (International Institute of Sustainable Development).** 2019. WMO's First State of Climate Services Report Focuses on Agriculture and Food Security. *SDG Knowledge Hub*, 10 December 2019. Winnipeg, MB, Canada. <https://sdg.iisd.org/news/wmos-first-state-of-climate-services-report-focuses-on-agriculture-and-food-security/>
- IPCC (Intergovernmental Panel on Climate Change).** 2021. *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Geneva, Switzerland. <https://www.ipcc.ch/report/ar6/wg1/>
- McOmber, C., Panikowski, A., McKune, S., Bartels, W. & Russo, S.** 2013. *Investigating Climate information services through a gendered lens*. Working Paper no. 42. Copenhagen, CCAFS. <https://gender.cgiar.org/publications-data/investigating-climate-information-services-through-gendered-lens>
- Nath, V.** 2006. How can ICTs positively influence the lives of disadvantaged women groups: Working towards the optimum ICT-impact model. In: N. Hafkin & S. Huyer (eds.) *Cyberella or Cinderella? Empowering women in the knowledge society*. Bloomfield, CT, Kumarian Press, pp. 191–206.
- Nissan, H., Simmons, W. & Downs, S.M.** 2022. Building climate-sensitive nutrition programmes. *Bulletin of the World Health Organization*, 100(1): 70–77. <https://doi.org/10.2471/BLT.21.285589>
- Pacillo, G., Nguyen Viet, C., Hafianti, S., Abanokova, K., Dang, H.A., Achicanoy Estrella, H.A. & Läderach, P.** 2020a. *Who bears the burden of climate variability? A comparative analysis of the impact of weather conditions on inequality in Vietnam and Indonesia*. Paris, Agence Française de Développement. <https://www.afd.fr/en/ressources/climate-weather-inequality-vietnam-indonesia>
- Pacillo, G., Nguyen Viet, C., Hafianti, S., Abanokova, K., Dang, H.A., Achicanoy Estrella, H.A. & Läderach, P.** 2020b. *Climate Variability and Inequality: Comparing the Experiences of Indonesia and Vietnam*. Paris, Agence Française de Développement. <https://www.afd.fr/en/climate-variability-inequality-indonesia-vietnam-poggi>
- Peres, S.** 2016. Saving the gene pool for the future: Seed banks as archives. *Studies in History And Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences*, 55: 96–104. <https://www.sciencedirect.com/science/article/pii/S1369848615001284>
- Perez-Escamilla, R., Bermudez, O., Buccini, G.S., Kumanyika, S., Lutter, C.K., Monsivais, P. & Victora, C.** 2018. Nutrition disparities and the global burden of malnutrition. *BMJ*, 361: k2252. <https://www.bmj.com/content/361/bmj.k2252>
- PIB Delhi.** 2021. PM to dedicate to the nation 35 crop varieties with special traits on 28th September [online]. Press release, 27 September 2021. New Delhi, Prime Minister's Office, Press Information Bureau. <https://pib.gov.in/PressReleasePage.aspx?PRID=1758664>
- Poulsen, E., Sakho, M., McKune, S., Russo, S. & Ndiaye, O.** 2015. *Exploring synergies between health and climate services: Assessing the feasibility of providing climate information to women farmers through health posts in Kaffrine, Senegal*. Working Paper No. 131. Copenhagen, CCAFS. <https://ccafs.cgiar.org/resources/publications/exploring-synergies-between-health-and-climate-services-assessing>

- Singh, P., Huynh, T. & Downs, S.** 2020. *Nutrition landscape and climate in Vietnam: Identifying climate service entry points*. Working Paper No. 371. Copenhagen, CCAFS.
<https://cgspace.cgiar.org/bitstream/handle/10568/109083/WP%20VN%20Nutrition%20Aug%202020.pdf>
- Tall, A., Kaur, H., Hansen, J. & Halperin, M.** 2015. *Malawi Summary of Baseline Studies: Country Report for the GFCS Adaptation Program in Africa*. Working Paper No. 123. Copenhagen, CCAFS.
- Thomson, M.C. & Mason, S.J. (eds.).** 2018. *Climate information for public health action*. London, Routledge.
<http://www.tandfebooks.com/doi/view/10.4324/9781315115603>
- Vaughan, C. & Dessai, S.** 2014. Climate services for society: origins, institutional arrangements, and design elements for an evaluation framework. *Wiley Interdisciplinary Reviews: Climate Change*, 5(5): 587–603. <https://pubmed.ncbi.nlm.nih.gov/25798197/>
- Vaughan, C., Hansen, J., Roudier, P., Watkiss, P. & Carr, E.** 2019. Evaluating agricultural weather and climate services in Africa: Evidence, methodology, and a learning agenda. *WIREs Climate Change*, 10(4): e586.
<https://wires.onlinelibrary.wiley.com/doi/full/10.1002/wcc.586>
- Venkatasubramanian, K., Tall, A., Hansen, J. & Aggarwal, P.** 2014. Assessment of India's integrated agrometeorological advisory service from a farmer perspective. Working Paper No. 54. Copenhagen, CCAFS. <https://cgspace.cgiar.org/handle/10568/43733>
- West, J.J., Daly, M. & Yanda, P.** 2018. *Evaluating User Satisfaction with Climate Services in Tanzania 2014-2016: Summary Report to the Global Framework for Climate Services Adaptation Programme in Africa*. Oslo, CICERO.
- Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S. et al.** 2019. Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. *The Lancet*, 393(10170): 447–492.
<https://pubmed.ncbi.nlm.nih.gov/30660336/>

How have global businesses pledged to transform nutrition and food systems

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Keywords: accountability, business, food systems, healthy and sustainable diets, nutrition, voluntary commitments and pledges

Abstract

Transnational food and beverage companies and business organizations have resources to influence and reach billions of people around the world to promote safe and healthy high-quality diets within resilient, equitable and sustainable food systems. The Business Constituency Group (BCG) represents six global business groups, namely, the Consumer Goods Forum (CGF), the International Food and Beverage Alliance (IFBA), Food Industry Asia (FIA), the Nutrition Japan Public Private Platform (NJPPP), the Scaling Up Nutrition (SUN) Business Network (SBN), and the World Business Council for Sustainable Development (WBCSD). The BCG members were encouraged to make voluntary commitments at the 2021 Tokyo Nutrition for Growth (N4G) Summit to support the Responsible Business Pledge for Better Nutrition.

For this paper, we examined publicly available evidence to assess and summarize BCG member pledges and evaluate 21 BCG participant food and beverage firms and pledges. We compared BCG members' Tokyo N4G Summit commitments with expert recommendations, examined 21 BCG firm performance scores based on Access to Nutrition Index (ATNI) and World Benchmarking Alliance (WBA) scores, and explored accountability processes to assess and report on implementation progress. We ascertained that only three BCG members (IFBA, SBN and WBCSD) had publicly posted their Tokyo N4G Summit commitments,

only five of the 21 participating firms had made pledges and breastmilk substitute manufacturers had made no commitments at all. Firms underperformed when it came to overall, product formulation and responsible marketing scores. We concluded that the BCG members and participant firms should step up their pledges, strengthen their commitments and enhance transparency and accountability processes to meet the Responsible Business Pledge for Better Nutrition.

Introduction

In 2021, two global nutrition summits were convened to discuss how diverse food system actors could collaborate to transform local, national, regional and global food systems and dietary patterns amid a changing climate (United Nations, 2021a). These summits were part of a "once-in-a-lifetime opportunity" to harness resources to transform food systems and improve the nutritional health of populations (Branca *et al.*, 2019).

The United Nations Food Systems Summit was held in New York City on 23 September and the Nutrition for Growth (N4G) Summit was held in Tokyo on 6–7 December 2021. A joint statement outlined the proposed processes, engagement guidelines and summit outcomes (United Nations, 2021a). The summits aspired to mobilize the participation of nutrition and food systems at the midpoint of the United Nations Decade on Action for Nutrition (2016–25) and accelerate action to achieve the 17 Sustainable Development Goals by 2030.

The Tokyo N4G Summit was designed as a voluntary nutrition pledge summit for food system actors (including governments, United Nations agencies, international organizations, the Scaling Up Nutrition (SUN) movement, philanthropies, development banks, civil-society organizations (CSOs), academic and research institutions, and businesses) to collectively “transform health systems and food systems to deliver better health, nutrition, and diets for the most vulnerable and end malnutrition in all its forms” (United Nations, 2021a, p.4). It promoted priorities for health, diet, food systems and resilience along with cross-cutting themes to generate financing and enhance accountability (N4G, 2021a).

Transnational food and beverage firms and business organizations have resources to influence and reach billions of people worldwide to promote safe and healthy high-quality diets within resilient, equitable and sustainable food systems. The Business Constituency Group (BCG) was launched as a “collective effort by business to support N4G” to identify and accelerate business actions to “tackle all forms of malnutrition,” promote “better nutrition as part of sustainable food systems” and drive new investments (WBCSD, 2021). The six BCG members are the Consumer Goods Forum (CGF), International Food and Beverage Alliance (IFBA), Food Industry Asia (FIA), Nutrition Japan Public Private Platform (NJPPP), SUN Business Network (SBN), and the World Business Council for Sustainable Development (WBCSD) (WBCSD, 2021).

BCG membership expects a firm, alliance or business coalition to develop and maintain its pledges according to guidelines in the Responsible Business Pledge for Better Nutrition (RBP) (N4G, 2020), the N4G Commitment-making Guide (N4G, 2021a), the Principles of Engagement (N4G, 2021b) and the Global Nutrition Report’s Nutrition Accountability Framework (NAF). The N4G Principles of Engagement were developed to align with the 10 SUN Principles of Engagement (N4G, 2021b) and the RBP. The N4G Principles of Engagement state that commitments should be transparent, SMART (specific, measurable, achievable, relevant and time-bound), significant, evidence based and established by governments through participatory processes, and that “breast-milk substitutes manufacturers need to commit to an action plan to achieve full compliance with the International Code of Marketing of Breast-milk Substitutes (the Code) by 2030 both in policy and practice” (N4G, 2021a).

In the RBP, the “framework for private-sector commitments”, private-sector pledges are organized into seven commitment areas: nutrition-smart agriculture, product (re)formulation

and innovation, business innovation, responsible marketing, healthy eating promotion, workforce nutrition, and financing and investment. The RBP commitment areas are varied to ensure that the pledges are aligned with firms’ core business (N4G, 2020) and to encourage commitment by allowing for flexibility in pledging (WBCSD, IFBA and The Food Foundation, 2021). The NAF is described as “the world’s first independent and comprehensive platform for registering smart nutrition commitments and monitoring nutrition actions” (Development Initiatives, 2021a, p.11).

The Tokyo 2021 Nutrition for Growth Compact (N4G, 2021c) summarized the commitments made at the Tokyo N4G Summit. A total of 396 new nutrition commitments were made by 181 stakeholders in 78 countries. The NAF encourages accountability for translating commitments into action. Fifty-one of the 396 commitments (28 percent) and 92 commitment goals were made by 26 private-sector businesses from 8 countries. Of the 26 businesses, 19 were food and beverage firms and the remaining 7 were non-food businesses (N4G, 2021c) (see Supplemental Table 1).

Purpose

The purpose of this paper is to describe the nutrition commitments that global food and beverage businesses pledged at the Tokyo N4G Summit to transform nutrition and food systems. To this end, the team examined publicly available evidence to assess and summarize the six BCG member pledges and evaluate 21 BCG participant food and beverage firms and pledges. We compared BCG members’ Tokyo N4G Summit commitments with expert recommendations, examined 21 BCG participant firm business performance scores based on Access to Nutrition Index (ATNI) and World Benchmarking Alliance (WBA) scores, and explored accountability processes to assess and report on progress on implementing the N4G commitments.

Methods

Data collection and analysis took place between 15 January and 20 March 2022. Evidence sources were published between January 2016 and March 2022. Publicly available sources included: the Tokyo Compact (N4G, 2021c), the Zero Hunger Private-Sector Pledge (GAIN, 2021) and the websites of the six BCG members, ATNI, WBA and the United Nations Global Compact (2022). To supplement and triangulate the evidence, we contacted key informants (n=5) via email and LinkedIn, as well as agrifood and beverage firms (n = 3) through their website portals. Three of the five individual key

informants and one of the three firms responded to our queries during the assessment period. Global Nutrition Report staff said that the commitment-exploring tool of the NAF would be launched publicly later in 2022 and was not active at the time of our search (C. Martineau, Development Initiatives, personal communication, 2022).

We also selected 21 BCG participant food and beverage firms to evaluate further. Firms were selected if they were i) a member of at least one BCG group (Table 2), ii) working in multiple countries and iii) monitored by the ATNI and/or WBA performance scores (Table 3). We then summarized whether the BCG participant firm made a company-specific Tokyo N4G Summit pledge that was confirmed in the Tokyo Compact and/or had made other voluntary food system pledges (Table 2).

From the seven RBP areas, we analysed commitments for i) product (re)formulation and innovation and ii) responsible food and beverage marketing. Thereafter, we used the ATNI Global Indexes (ATNI, 2016; 2018; 2021) and the WBA (2021) Food and Agriculture Benchmark report to collate the performance scores for the 21 BCG participant firms selected (Table 3). Lastly, we explored how the commitments would be tracked in the NAF (Hoffman, D. *et al.*, 2022).

Results

Table 1 summarizes the BCG member pledges and shows that of the six BCG members, only three (IBFA, SBN and WBCSD) publicly posted a Tokyo N4G Summit commitment. No specific public pledges were made by the remaining three members (CGF, FIA and NJPPP) in the Tokyo Compact.

Table 1. BCG member pledges at the Tokyo N4G Summit

BCG members	Pledge description
CGF ≈ 400 members	No pledge
FIA ≈ 50	No pledge documented
IFBA = 11 members	<p>Global sodium reduction commitment: 2025 and 2030</p> <p>"Each IFBA member individually commits to the sodium reduction targets across key categories that collectively comprise at least seventy-five percent (75%) of the total sales volume of the company's relevant product portfolio. Within each committed category, ninety percent (90%) of the aggregated sales volume of the member's products will comply with the set category targets by 2025. For the 2030 targets, the aggregate compliance threshold will be seventy-five percent (75%) to account for the market dynamics associated with a longer timeline. The 2030 targets will be reevaluated in 2025."</p> <p>Enhanced global policy for responsible marketing</p> <p>"IFBA's Global Policy is in line with the aims of the 2010 WHO Set of Recommendations on the Marketing of Foods and Non-alcoholic Beverages to Children and provides minimum criteria for advertising and marketing communications directed to children under 13 years that are paid for, or controlled by, IFBA companies in every country where they market their products.</p> <ul style="list-style-type: none"> - Policy goes into effect 1 January 2022 for all IFBA member companies globally - Individual member companies may maintain or adopt specific policies that go beyond IFBA policy - IFBA will conduct third party monitoring to demonstrate compliance with this policy. - IFBA members commit either to: <ul style="list-style-type: none"> - Only advertise products to children under the age of 13 years that meet common nutrition criteria which are based on accepted science-based dietary guidance. - Not to advertise their products at all to children under the age of 13 years."
NJPPP ≈ 20	No pledge documented
SBN = 25 members	<p>"By the end of 2025, SUN will:</p> <ul style="list-style-type: none"> - Recruit over 3,000 small and medium enterprises (SMEs) across Africa, Asia, and Latin America by the end of 2024. - Engage SMEs to sign the N4G Responsible Business Pledge. - Support multi-stakeholder capacity building of SMEs to provide safe nutritious food. - Support each national SBN to pledge national sustainability action plans that consider long-term engagement of local private-sector (especially SMEs) for nutrition."
WBCSD* ≈ 200	<p>"FReSH Commitment 1</p> <ul style="list-style-type: none"> - Prioritize agrobiodiversity - Preserve macronutrients and micronutrients in foods and enhance fortification - Encourage healthy eating habits and food environments <p>FReSH Commitment 2</p> <ul style="list-style-type: none"> - Increase biofortified crop quantity - Increase nutritious and diverse plant-based foods - Promote plant-forward diets ("where animal sourced food consumption exceeds current dietary recommendations)."

SOURCE: Nutrition for Growth Tokyo Compact. 2021. *Tokyo Compact on Global Nutrition for Growth Annex: Commitments*. Tokyo. <https://nutritionforgrowth.org/wp-content/uploads/2021/12/Tokyo-Compact-on-Global-N4G-Annex-Dec-14.pdf>

NOTE: *WBCSD's FReSH commitments were not included in the Tokyo Compact, but posted online. WBCSD. 2021. *What is business committing at the Nutrition for Growth Summit 2021?* Chêne-Bougeries, Switzerland. <https://www.wbcd.org/Programs/Food-and-Nature/News/What-is-business-committing-at-the-Nutrition-for-Growth-Summit-2021>

The IFBA committed to global sodium reduction targets in product lines and responsible marketing (N4G, 2021c). The IFBA's Responsible Marketing N4G commitments were described as "minimum criteria" and limited to "child-directed" advertising and marketing communications to children under 13 years of age. SBN committed, with partners, to raising the profile and strengthening the capacities of small and medium-sized enterprises (SMEs) in nutrition and to advancing nutrition-smart agriculture, business-model innovation and workforce nutrition (N4G, 2021c). WBCSD members made six commitments under the Food Reform for Sustainability and Health (FReSH) project, "aligned" with the RBP in the areas of nutrition-smart agriculture, reformulation and promoting healthy eating (Holdorf, 2021).

While the CGF itself did not make a specific commitment, CGF members that made commitments will be supported by the forum. The CGF will "work to drive engagement of our members around the RBP and encourage them to report via the [NAF] accountability mechanism" (S. Bligh, CGF, 2022, personal communication).

Several of the world's largest transnational agrifood and beverage businesses participate in one or more of the six BCG member groups. Table 2 shows the collaborations and number of pledges made by selected BCG participant firms (n=21) in relation to the Global Compact, Zero Hunger Pledge and Tokyo N4G Summit. Of the 21 participant firms reviewed, only five (Ajinomoto, Cargill, Compass Group, DSM and Unilever) made a nutrition commitment at the Tokyo N4G Summit (Tables 1 and 2).

Table 2. Selection of BCG participant firms (n=21) by affiliation and pledge

BCG participant firm	CGF ≅ 400	FIA ≅ 50	IFBA = 11	NJPPP ≅ 20	SBN = 25	WBCSD ≅ 200 FReSH	UNGC 14,000+	Zero Hunger private- sector pledge = 43	N4G business pledge in Tokyo?
	BCG member affiliations						Signatory or pledge		
Abbott Lab.	No	Yes	No	No	No	Yes	No	No	No
Ajinomoto, Co., Inc.	Yes	No	No	Yes	Yes	No	Yes	Yes	Yes
Cargill	Yes	No	No	No	No	Yes	Yes	No	Yes
Coca-Cola Company	Yes	Yes	Yes	No	No	No	Yes	No	No
Compass Group	No	No	No	No	No	Yes	No	No	Yes
Danone	Yes	Yes	Yes	No	No	Yes	Yes	No	No
DSM	No	Yes	No	Yes	No	Yes	Yes	No	Yes
Ferrero Int.	Yes	Yes	Yes	No	No	No	Yes	No	No
FrieslandCampina	Yes	Yes	No	No	No	No	No	No	No
General Mills Inc.	Yes	Yes	Yes	No	No	No	Yes	No	No
Grupo Bimbo	Yes	No	Yes	No	No	No	Yes	No	No
Kellogg Company	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No
Kraft Heinz	Yes	No	No	No	No	No	Yes	No	No
Mars, Inc.	Yes	Yes	Yes	No	Yes	No	Yes	No	No
McDonalds Corp.	No	Yes	No	No	No	Yes	No	No	No
Mondalez Int.	Yes	Yes	Yes	No	No	No	Yes	No	No
Nestlé, SA	Yes	Yes	Yes	No	No	Yes	Yes	No	No
Pepsico, Inc.	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No
Reckitt	Yes	No	No	No	No	Yes	Yes	No	No
Unilever	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Walmart	Yes	No	No	No	No	Yes	Yes	No	No
Total 21	17	13	11	2	5	11	16	3	5

SOURCE: GAIN (Global Alliance for Improved Nutrition). 2021. *Zero Hunger Private Sector Pledge*. Geneva, Switzerland. <https://www.gainhealth.org/partnerships/zero-hunger-private-sector-pledge>.
 United Nations Global Compact. 2022. Who we are. In: United Nations Global Compact [online]. New York. Cited 22 July 2022. <https://www.unglobalcompact.org/what-is-gc/participants> (a signatory if the headquarters and/or any subsidiary are described as "active").
 WBCSD. 2022. Our members. In: WBCSD [online]. Geneva, Switzerland. Cited 22 July 2022. <https://www.wbcd.org/Overview/Our-members>.
 WBA. 2022. *World Benchmarking Alliance Food and Agriculture Benchmark Report 2021*. Amsterdam, The Netherlands and London. <https://www.worldbenchmarkingalliance.org/publication/food-agriculture/companies/>.

NOTE: Businesses were selected if they are a member of at least one BCG group, working in multiple countries and monitored by ATNI and/or WBA (Table 3). Yes = Grey.

The results showed that few of the largest global food and beverage firms and important business sectors made Tokyo N4G Summit pledges. Omissions included major global food retailers and restaurant firms (such as Walmart and

McDonalds Corporation). Moreover, none of six breastmilk substitute manufacturers (Abbott, Danone, FrieslandCampina, Kraft-Heinz, Nestlé SA and Reckitt) among the 21 selected firms made a Tokyo N4G pledge (Tables 2 and 3).

We also examined the available performance scores for the 21 BCG participant firms, based on the ATNI Global Indexes and WBA Food and Agricultural scores. We evaluated performance according to ATNI for (i) overall ranking, ii) product formulation, iii) responsible marketing and iv) breastmilk substitute marketing

score. The WBA score reflects a combined measure of governance, environment, nutrition and social inclusion (WBA, 2021) (Table 3). For more information on how the ATNI and WBA scores are calculated and/or have changed over time, please see ATNI (2016; 2018; 2021) and WBA (2021).

Table 3. BCG participant firms (n=21) by ATNI ranking (2016–2021) and WBA food and agriculture performance score (2021)

BCG participant firm	Total ATNI overall ranking (0–10) Red < 6; Blue 6 to < 8; Green 8–10			Total WBA score (0–100) Food and agricultural benchmark 2 000 most influential companies Red < 60; Blue 60 to < 80; Green 80–100
	2016	2018	2021	
Abbott Laboratories	n/a	n/a	n/a	No score
Marketing of breastmilk substitutes	7% (5 of 6)	33% (3 of 6)	28% (5 of 7)	
Ajinomoto Co., Inc.	1.7	2.4	3.0	29.8
Product formulation	1.1	0.9/4.1	2.6	
Responsible marketing	1.3	0.7/2.5	2.2	
Cargill	n/a	n/a	n/a	32.2
The Coca-Cola Company	2.4	3.0	3.4	47.5
Product formulation	1.1	1.1	2.4	
Responsible marketing	3.3	5.4	4.8	
Compass Group	n/a	n/a	n/a	31.5
Danone	4.9	6.3	5.8	63.6
Product formulation	5.3	6.7	7.3	
Responsible marketing	8.5	9.2	6.5	
Marketing of breastmilk substitutes	31% (2 of 6)	33% (1 of 6)	68% (1 of 7)	
DSM	n/a	n/a	n/a	43.5
Ferrero International	2.6	3.2	2.9	38.7
Product formulation	2.8	3.3	3.5	
Responsible marketing	5.5	5.7	5.0	
FrieslandCampina	2.8	6.0	6.0	43.4
Product formulation	5.8	7.8	6.8	
Responsible marketing	2.9	7.7	7.9	
Marketing of breastmilk substitutes	24% (3 of 6)	0% (4 of 6)	21% (6 of 7)	
General Mills Inc.	2.5	2.3	3.1	41.8
Product formulation	2.3	2.6	3.8	
Responsible marketing	6.4	2.4	3.6	

BCG participant firm	Total ATNI overall ranking (0–10) Red < 6; Blue 6 to < 8; Green 8–10			Total WBA score (0–100) Food and agricultural benchmark 2 000 most influential companies Red < 60; Blue 60 to < 80; Green 80–100
	ATNI product formulation score ATNI responsible marketing score			
Grupo Bimbo	3.6	5.0	4.2	39.4
Product formulation	4.9	5.2	5.0	
Responsible marketing	3.6	3.3	3.0	
Kellogg Company	2.5	5.0	4.3	50.1
Product formulation	2.8	3.8	3.4	
Responsible marketing	4.9	5.2	4.4	
Kraft Heinz	n/a	0.0	0.9	35.9
Product formulation	n/a	0.2	3.3	
Responsible marketing	n/a	2.5	2.5	
Marketing of breastmilk substitutes	Heinz 17% (4 of 6)	0% (6 of 6)	38% (3 of 7)	
Mars, Incorporated	3.8	5.6	4.8	38.6
Product formulation	4.2	4.5	5.5	
Responsible marketing	6.4	9.5	7.4	
McDonald's Corporation	n/a	n/a	n/a	33.1
Mondelez International	4.3	5.9	4.3	39.9
Product formulation	4.5	6.1	4.5	
Responsible marketing	6.1	6.8	5.0	
Nestlé SA	5.9	6.8	6.7	68.5
Product formulation	6.4	8.0	7.1	
Responsible marketing	7.4	8.1	7.3	
Marketing of breastmilk substitutes	36% (1 of 6)	33% (2 of 6)	57% (2 of 7)	
PepsiCo, Inc.	3.6	5.2	5.2	54.5
Product formulation	4.4	5.6	4.1	
Responsible marketing	7.1	5.0	4.4	
Reckitt	n/a	n/a	n/a	No score
Marketing of breastmilk substitutes	5% (6 of 6)	0% (5 of 6)	32% (4 of 7)	
Unilever	6.4	6.7	6.3	71.7
Product formulation	8.4	7.8	5.7	
Responsible marketing	7.7	6.1	6.8	
Walmart	n/a	n/a	n/a	39.0

SOURCE: Authors' own elaboration. ATNI and WBA.

NOTE: ATNI (breastmilk substitute) score is measured on a different scale to product formulation and responsible marketing. Green = 80-100% of possible score (high); yellow = 60-79% of possible score (middle); red <60% of possible score (low). Out of a possible 186 items that could have been scored in Table 3, 26 were classified as "not scored" or "not applicable" (n/a) as they were not assessed by the ATNI or WBA reports (186-26 = 160 items).

Nearly 80 percent of the business performance scores in Table 3 (78.75 percent or 126 out of 160 items) were classified as “low” and depicted in red. The classifications were based on a summary of ATNI (2016–21) and WBA (2021) scores across different performance categories. All the 21 businesses received at least one “low” score. Notably, for 13 of the 21 businesses (62 percent) evaluated in this analysis (Abbott Laboratories, Ajinomoto Cargill, Coca-Cola, Compass, DSM, Ferrero International, Grupo Bimbo, Kellogg Company, Kraft Heinz, McDonalds, Reckitt and Walmart), all of the scored items were classified as “low”. An additional five businesses (FreislandCampina, General Mills, Mars, Mondalez International and PepsiCo) scored “low” in the majority of their items. Therefore, of the 21 businesses selected, 86 percent had “low” scores in the majority of nutrition-related business performance items evaluated.

Table 3 shows that 40 items had better performance scores, as indicated by the yellow (n= 34) or “middle” (60-79 percent of the possible score) and green or “high” (n=6) boxes (80-100 percent of the possible score). Thirty-four (21.25 percent) of the performance scores were in the “middle”. Only six items (3.75 percent) of the 160 were classified as “high”. We used wider classification categories and more generous cut-off points (for example, 80-90 percent of the total instead of a narrower 90-100 percent to indicate a “high”) to show greater visual variety in the results of the 21 businesses.

The BCG members and participant firms agreed to post their Tokyo N4G Summit pledges to the NAF. This is the global accountability framework for developing, registering and publishing commitments, reviewing whether commitments are SMART, and reporting, reviewing and publishing actions to encourage further action (Development Initiatives, 2021b) The NAF shares the transparency, monitoring and accountability aims of other independent nutrition, food system and business mechanisms (such as ATNI, WBA and the Accountability Pact (Garton *et al.*, 2022)).

Discussion and conclusions

Based on this review of Tokyo N4G Summit commitments and business performance, we concluded that the six BCGs (Table 1) and participating firms should increase their number of pledges, strengthen their commitments and enhance their transparency and accountability processes to meet the Responsible Business Plan for Better Nutrition.

Increase pledges

Table 1 shows that only three of the six BCG members made a nutrition commitment for the Tokyo N4G Summit.

Hundreds of transnational food and beverage firms participate in at least one of the BCG member groups. According to the Tokyo Compact, 26 businesses posted a pledge. A small subset of the approximately 200 members of the WBCSD and 400 members of the CGF made a Tokyo N4G Summit commitment.

Only five of the 21 BCG participating firms made a Tokyo N4G pledge (Table 2). Significant gaps are evident in the lack of pledges by global restaurant and food retailers. Moreover, not one of the six breastmilk substitute manufacturing companies evaluated by ATNI made a Tokyo N4G Summit commitment (Table 3). In light of excessive breastmilk substitute marketing violations (WHO and UNICEF, 2022) and the fact that the N4G Principles of Engagement state that breastmilk substitute manufactures must reach full Code compliance by 2030, there are serious transparency and accountability gaps if the breastmilk substitute manufactures are failing to make pledges in the first place.

Strengthen commitments

We compared BCG member and BCG participating firm commitments with the recommendations of expert bodies. This analysis found that the 2021 Tokyo N4G Summit pledges received to date were conservative and failed to meet expert recommendations (for example, the World Health Organization (WHO) set of recommendations on the marketing of foods and non-alcoholic beverages to children). These findings echo past findings, whereby transnational food and beverage firms had made conservative and readily achievable pledges (Mozaffarian, 2014).

Moreover, BCG participants underperformed based on ATNI and WBA scores (Table 3). Eighteen of the 21 participating firms (86 percent) received low performance scores in the majority of the items evaluated (Table 3). The strong proportion of low ATNI and WBA scores suggests that current business practices by BCG food and beverage firms can be improved substantially.

The IFBA (a BCG member) committed to sodium reduction targets and to enhancing its global policy for responsible marketing (Table 1). While this was an improvement on current practices and SMART, the IFBA sodium reduction pledge did not put a target on the extent of the sodium reduction or prioritize the kinds of product that would be reformulated. Rather, it said 75 percent of sales volumes as a proportion of the total portfolio would be subject to a (voluntary and unspecified) sodium reduction. Opportunities to reduce sodium in the global food supply will be missed. In addition, the sodium reduction targets were not tied to WHO (2012b; 2021) or government recommendations.

Furthermore, in the context of IFBA's responsible marketing pledge (IFBA, 2020b), we recommend that the policy language be clarified to meet marketing recommendations in line with the WHO implementation framework for the marketing of food and beverages to children (WHO 2012a). The scope of IFBA's marketing pledge should include "all marketing and communication" strategies. The age range to protect all children should be extended to 18 years and/or as defined by the Member State in question (not limited to 13 years of age). The IFBA notes that it will conduct third-party monitoring. To that end, we suggest that it share information on its marketing policies and practices with ATNI and other independent evaluators to further enhance transparency.

The SBN pledges were not focused on product formulation or innovation or the responsible marketing commitment categories of the RBP. Therefore, we did not evaluate further. The WBCSD/FReSH commitments were broad and touched on RBP commitment areas, including product (re) formulation and marketing (the food environment). It is possible that WBCSD will follow a model like that of the CGF to support the commitments of its members.

The CGF has an opportunity to make strong, new sustainability and nutrition commitments. Its membership includes food retailers and four global coalitions (the Collaboration for Healthier Lives, the Global Food Safety Initiative, Plastic Waste and the Sustainable Supply Chain Initiative) (CGF, 2022). Actions under each of these CGF coalitions could be combined and monitored with the NAF and/or other independent evaluations.

Enhance accountability

Past N4G pledges have not always been met. The 2021 Global Nutrition Report found that progress on all voluntary commitment goals from past 2013 and 2017 N4G Summits was less than planned, with only 16 percent of total commitments reached and 38 percent on course overall (Development Initiatives, 2021a). Specific to past N4G business commitments, only 12 percent were reached, 21 percent were characterized as "on course" from 2013 and "no business commitment goal made in 2017 had been reached or [was] on course". Response rates from businesses were lower (33 percent) than from other categories, including CSOs (80 percent) and donors (79 percent) (Development Initiatives, 2021a). This calls for greater accountability.

The NAF builds on the valuable idea that it makes sense to share commitments transparently and acknowledge positive moves to distinguish businesses taking aggressive steps forward from those that are not (WBCSD, IFBA and

The Food Foundation, 2021). Enhanced transparency and monitoring can fuel "healthy competition" among members and incentivize learning and improvement (ATNI, 2021; WBA, 2021). The NAF looks poised to provide additional assessment, monitoring and publication capacity to enhance food and nutrition system transparency and accountability, as there are few independent evaluations on the effectiveness of voluntary food system governance initiatives (Fanzo *et al.*, 2021; Kraak, 2022).

From an outsider's perspective, we are less clear on the timeline the NAF would use and what enforcement mechanisms are in place when pledge performance against targets is lacking. We were unable to determine whether the NAF specifies cut-off points, exclusion criteria or a process for exclusion because of poor or marginal performance. What incentives or disincentives has the NAF established (in addition to "publish action") for BCG members, participating firms or other businesses to improve performance? Civil-society watchdog organizations and scholar activists may need to use reputational accountability strategies, such as "naming and shaming" (Taebi and Safari, 2017), to publicly disclose underperforming BCG members or firms. There is now an opportunity to clarify and communicate proactively how BCG and the new NAF define and address unexpected consequences when members or participating firms do not meet their time-bound Tokyo N4G Summit commitments.

Future research could examine the language or phrasing of the pledges, categories of food and beverage products that will be reformulated, nutrition standards used, marketing strategies that will be addressed or excluded, and whether transnational food and beverage business pledges will vary by country or be applied to all business practices. There is a need for independent groups to monitor and evaluate progress on different pledges over time and determine whether these pledges support the transition and transformation to healthy diets and a more sustainable food system. Data from the International Baby Food Action Network can be used to document and monitor performance and Code violations of breastmilk substitute manufacturers, for instance. To complement the NAF, the Accountability Pact platform (Garton *et al.*, 2022) is in place to monitor and communicate actions for the Tokyo N4G Summit.

A strength is that this is the first paper to have conducted a rapid evaluation of the BCG members, explored the BCG's N4G commitments, compared these commitments with expert-recommended performance scores and considered the accountability processes from an outsider's perspective. Limitations include the fact that the timeline from the December 2021 Tokyo N4G Summit to spring

2022 was short. Because it was difficult to confirm pledges outside of those in the Tokyo Compact, we may have missed pledges. Commitments can be registered with the NAF on an ongoing basis (Development Initiatives, 2021b). It is possible that additional businesses may have met the selection criteria to be included in Tables 2 and 3. In future, it should be feasible to monitor commitments using the NAF and better understand how the NAF works. The authors take responsibility for any errors.

In conclusion, this paper examined evidence to assess and summarize BCG member voluntary commitments and evaluate 21 food and beverage BCG participating firms and pledges. We compared select BCG members' Tokyo N4G Summit commitments with expert recommendations, examined business performance scores based on the ATNI and WBA scores and explored accountability processes to assess and report on progress on implementing N4G commitments.

We found that only three of the six BCG member groups, five of the 21 BCG participating firms and none of the six breastmilk substitute manufacturers had publicly posted a Tokyo N4G Summit commitment. There were gaps in the types of business making pledges and the alignment of these pledges with expert recommendations. BCG participating firms underperformed when it came to meeting overall, product formulation and responsible marketing scores. We concluded that the BCG should increase its number of pledges, make more ambitious time-bound pledges and public commitments, and enhance accountability processes.

The Tokyo N4G Summit encouraged food system actors "to mobilize ambitious and wide-reaching multistakeholder commitments to transform food systems and health systems to deliver nutrition gains" (N4G, 2021b). This paper documents how voluntary nutrition pledges made by business organizations and transnational agrifood and business firms at the Tokyo N4G Summit were unambitious and failed meet this "once-in-a-lifetime" opportunity to transform nutrition and food systems.

Supplemental table 1. Private-sector business pledges made at the Tokyo N4G Summit

Food businesses Tokyo N4G Summit	Non-food businesses Tokyo N4G Summit
Ajinomoto Co. Inc. (Japan)	Meal-plus Corporation (Japan)
Cargill, Inc. (United States of America)	Access To Nutrition Initiative (ATNI) Investor Signatory Group (Netherlands)
Compass Group (United Kingdom of Great Britain and Northern Ireland)	Eat Well Global (United States of America)
Euglena Co., Ltd. (Japan)	Food at Google (United States of America)
Griffith Foods (United States of America)	Kao Corporation (Japan)
Food Hayashibara Co. Ltd (Japan)	Nippon Biodiesel Fuel Co. Ltd (Japan)
IKEA of Sweden (Sweden)	Taiyo Yuka (Japan)
Food and Beverage Alliance (Switzerland)	
KAGOME CO., LTD (Japan)	Other
The NISSIN FOODS Group (Japan)	**SUN Business Network (SBN) (United Kingdom of Great Britain and Northern Ireland) found under CSO commitments at the Tokyo Summit
Food Olam International (Singapore)	
Food PT Indofood Sukses Makmur Tbk (Indonesia)	
Quorn Foods (United Kingdom of Great Britain and Northern Ireland)	
Royal DSM (Netherlands)	
SHiDAX CONTRACT FOOD SERVICE CORPORARTION (Japan)	
Unilever (United Kingdom of Great Britain and Northern Ireland)	

SOURCE: N4G. 2021. *Tokyo Compact on Global Nutrition for Growth Annex: Commitments*. Tokyo. <https://nutritionforgrowth.org/wp-content/uploads/2021/12/Tokyo-Compact-on-Global-N4G-Annex-Dec-14.pdf>

References

- ATNI (Access to Nutrition Foundation).** 2016. *Access to Nutrition Index: Global Index 2016*. Utrecht, The Netherlands. https://healthequity.globalpolicysolutions.org/wp-content/uploads/2016/12/atni-global-index-2016_2.pdf
- ATNI.** 2018. *Access to Nutrition Index: Global Index 2018*. Utrecht, The Netherlands. <https://accesstonutrition.org/index/global-index-2018/>
- ATNI.** 2021. *Access to Nutrition Index: Global Index 2021*. Utrecht, The Netherlands. <https://accesstonutrition.org/index/global-index-2021/>
- Branca, F., Lartey, A., Oenema, S., Aguayo, V., Stordalen, G.A., Richardson, R., Arvelo, M. & Afshin, A.** 2019. Transforming the food system to fight non-communicable diseases. *BMJ*, 365(Suppl1): l296. <https://pubmed.ncbi.nlm.nih.gov/30692128/>
- CGF (Consumer Goods Forum).** 2022. Who we are [website]. Levallois-Perret, France and Tokyo. Cited 22 July 2022. <https://www.theconsumergoodsforum.com/who-we-are/overview/>
- Development Initiatives.** 2021a. *2021 Global Nutrition Report: The state of global nutrition*. Bristol, UK, Development Initiatives. <https://globalnutritionreport.org>
- Development Initiatives.** 2021b. *2021 Global Nutrition Report: The Nutrition Accountability Framework*. Bristol, UK, Development Initiatives. <https://globalnutritionreport.org/resources/nafl/>
- Fanzo, J., Haddad, L., Schneider, K.R., Béné, C., Covic, N.M., Guarin, A. et al.** 2021. Viewpoint: Rigorous monitoring is necessary to guide food system transformation in the countdown to the 2030 global goals. *Food Policy*, 104: 102163. <https://doi.org/10.1016/j.foodpol.2021.102163>
- FAO & WHO (World Health Organization)** (2020) *United Nations Decade of Action on Nutrition, 2016–2025: Mid-term review of the UN Decade of Action on Nutrition – Foresight paper*. Rome. <https://www.unscn.org/en/topics/un-decade-of-action-on-nutrition?idnews=2038>
- Garton, K., Kraak, V., Fanzo, J., Sacks, G., Vandevijvere, S., Haddad, L. et al.** 2022. A collective call to strengthen monitoring and evaluation efforts to support healthy and sustainable food systems: “The Accountability Pact”. *Public Health Nutrition*, 22 May 16:1–5. <https://pubmed.ncbi.nlm.nih.gov/35570707/>
- GAIN (Global Alliance for Improved Nutrition).** 2021. *Zero Hunger Private Sector Pledge*. Geneva, Switzerland. <https://www.gainhealth.org/partnerships/zero-hunger-private-sector-pledge>
- International Baby Food Action Network.** 2022. *International Code of Marketing of Breastmilk Substitutes*. Geneva, Switzerland. <https://www.ibfan.org/international-code/>
- IFBA (International Food and Beverage Alliance).** 2021a. *International Food & Beverage Alliance Global Sodium Reduction Commitment: 2025 & 2030*. Geneva, Switzerland. <https://ifballiance.org/publications/ifba-global-sodium-reduction-commitment/?wpdmml=2669&refresh=61b5ed6586b661639312741>
- IFBA.** 2021b. *International Food & Beverage Alliance Global Responsible Marketing Commitments*. Geneva, Switzerland. <https://ifballiance.org/publications/responsible-marketing-commitments/>
- IFBA.** 2022. About us [website]. Geneva, Switzerland. Cited 22 July 2022. <https://ifballiance.org/about-us/>
- Hoffman, D., Zanelo, G., Mozaffarian, D. & Micha, R.** 2022. Enhancing nutrition action through accountability and transparency. In: *UN-Nutrition Journal, Volume 1: Transforming Nutrition*. Rome, UN-Nutrition.
- Holdorf, D.** 2021. Businesses are partnering to tackle malnutrition for healthy people and a healthy planet. *WBCSD Insights* [online], 7 December 2021. <https://www.cbcsd.cz/businesses-are-partnering-to-tackle-malnutrition-for-healthy-people-and-a-healthy-planet/>
- Kraak, V.I.** 2022. Advice for food systems governance actors to decide whether and how to engage with the agri-food and beverage industry to address malnutrition within the context of healthy and sustainable food systems comment on “Challenges to Establish Effective Public-Private Partnerships to Address Malnutrition in All Its Forms.” *International Journal of Health Policy and Management*, 11(3): 401–406.

<https://pubmed.ncbi.nlm.nih.gov/34273934/>

Mozaffarian, D. 2014. The Healthy Weight Commitment Foundation trillion calorie pledge. Lessons from a marketing ploy? *American Journal of Preventative Medicine*, 47(4): e9–e10. <https://doi.org/10.1016/j.amepre.2014.07.029>

N4G (Nutrition for Growth). 2020. *Tokyo 2021 Nutrition for Growth Summit Responsible Business Pledge for Better Nutrition*. Tokyo. https://docs.wbcsd.org/2021/01/Responsible-Business-Nutrition-Pledge_May-2020.pdf

N4G. 2021a. *Commitment-Making Guide*. Tokyo. https://nutritionforgrowth.org/wp-content/uploads/2021/04/CommitmentGuide_4.27.21.pdf

N4G. 2021b. *N4G Principles of Engagement*. Tokyo. <https://nutritionforgrowth.org/wp-content/uploads/2021/09/N4G-Principles-of-Engagement.pdf>

N4G. 2021c. *Tokyo Compact on Global Nutrition for Growth Annex: Commitments*. Tokyo. https://nutritionforgrowth.org/wp-content/uploads/2021/12/Tokyo-Compact-on-Global-N4G_Annex_Dec-14.pdf

NJPPP (Nutrition Japan Public Private Platform). 2022. About Nutrition Japan Public Private Platform [website]. Tokyo. Cited 22 July 2022. <http://njppp.jp/en/>

SBN (SUN Business Network). 2021. SBN Pledges at the Tokyo Nutrition for Growth Summit [online], 11 May 2020. Tokyo. <https://sunbusinessnetwork.org/sbn-pledges-at-the-tokyo-nutrition-for-growth-summit/>

Taebi, B. & Safari, A. 2017. On Effectiveness and Legitimacy of ‘Shaming’ as a Strategy for Combatting Climate Change. *Science and Engineering Ethics*, 23: 1289–1306. <https://doi.org/10.1007/s11948-017-9909-z>

United Nations. 2021a. *Tokyo Nutrition for Growth (NG4) Summit & UN Food Systems Summit*. Joint Statement. Tokyo. https://nutritionforgrowth.org/wp-content/uploads/2021/09/N4G_UN_FoodSysSummit_9.23.pdf

United Nations Global Compact. 2022. Who we are [online]. New York. Cited 22 July 2022. <https://www.unglobalcompact.org/what-is-gc/participants>

WBA (World Benchmarking Alliance). 2021. *World Benchmarking Alliance Food and Agriculture Benchmark Report 2021*. Amsterdam, The Netherlands and London. <https://www.worldbenchmarkingalliance.org/publication/food-agriculture/>

WBCSD (World Business Council for Sustainable Development). 2021. *What is business committing at the Nutrition for Growth Summit 2021?* Chêne-Bougeries, Switzerland. <https://www.wbcsd.org/Programs/Food-and-Nature/News/What-is-business-committing-at-the-Nutrition-for-Growth-Summit-2021>

WBCSD. 2022. Our members [website]. Geneva, Switzerland. Cited 22 July 2022. <https://www.wbcsd.org/Overview/Our-members>

WBCSD, IFBA (International Food and Beverage Alliance) & The Food Foundation. 2021. Responsible Business Pledge for Better Nutrition: Business commits to tackling malnutrition [online webinar], 6 December 2021. Tokyo. <https://events.wbcsd.org/virtual-meetings/tokyo-nutrition-for-growth-summit-2021/>

WHO (World Health Organization). 2012a. *A framework for implementing the set of recommendations on the marketing of foods and non-alcoholic beverages to children*. Geneva, Switzerland. <https://apps.who.int/iris/handle/10665/80148>

WHO. 2012b. *Guideline: sodium intake for adults and children*. Geneva, Switzerland. <https://www.who.int/publications/i/item/9789241504836>

WHO. 2012c. *Set of recommendations on the marketing of foods and non-alcoholic beverages to children*. Geneva, Switzerland. <https://www.who.int/publications/i/item/9789241500210>

WHO. 2021. *Global sodium benchmarks for different food categories*. Geneva, Switzerland. <https://www.who.int/publications/i/item/9789240025097>

WHO & UNICEF (United Nations Children's Fund). 2022. *How the marketing of formula milk influences our decisions on infant feeding*. Geneva, Switzerland and New York. <https://www.who.int/teams/maternal-newborn-child-adolescent-health-and-ageing/formula-milk-industry>

How the G20 leaders could transform nutrition by updating and harmonizing food-based dietary guidelines

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Keywords: food-based dietary guidelines, government policies, planetary health diet, red and processed meats, sustainable food systems

Abstract

The G20 is an intergovernmental and multilateral platform comprised of 19 countries and the European Union, which connects prosperous high-income and emerging middle-income countries worldwide. The G20 process could prioritize food systems to address climate change challenges. For this paper, the research team reviewed the G20 countries' recommendations in national food-based dietary guidelines (FBDGs) for red and processed meat (RPM) compared with available per capita consumption data and expert-recommended targets to promote healthy and sustainable food systems. The results reveal that Indonesia, India and Saudi Arabia have the least red meat available for consumption (less than 10 kilograms (kg) per person per year). Other G20 countries exceed the recommended red meat target of less than or equal to 26 kg per person per year. Sixteen G20 countries have translated their national guidelines into FBDG food graphics for the public. Twelve G20 countries recommend that people limit their RPM daily or weekly to

reduce cancer and heart disease risks. Australia, France, Italy, Mexico and the United Kingdom of Great Britain and Northern Ireland align RPM targets with recommendations to limit cooked red meat intake to three or fewer servings (350-500 grams) a week. Six G20 countries (Brazil, Canada, Germany, India, Italy and the United Kingdom of Great Britain and Northern Ireland) recommend minimally processed, plant-rich food choices or environmentally sustainable dietary patterns. The G20 meetings in Indonesia (2022), India (2023) and Brazil (2024) should prioritize and harmonize healthy and sustainable food system policies with international trade policies to mitigate climate change effects and manage sustainability trade-offs.

"The G20 are some of the biggest economies on the planet – what they do will make or break the world's ability to tackle the climate crisis. They must listen to the voices of their people, especially their future generations, who will inherit the consequences of actions – or inactions – of G20 leaders."

UNDP and Oxford University (2021b)

Introduction

Transforming food systems is a priority for the United Nations, as stated in the Decade of Action on Nutrition (2016–2025), 2015 Paris Agreement, Sustainable Development Goals (SDGs), 2030 Agenda and the 2022 United Nations Food System and Nutrition for Growth Summits (Loken and DeClerck, 2020; UNDESA, 2022). Expert reports have advised national governments to ensure that their citizens adopt healthy and sustainable dietary patterns comprising nutrient-dense, plant-based foods in order to feed 10 billion people worldwide by 2050 while mitigating climate change effects. However, the actions needed will differ by region and context (IPCC, 2022; Willett *et al.*, 2019).

There are many co-benefits of adopting a sustainable dietary pattern (IPCC, 2022). Large-scale industrial beef production has a substantial environmental and climate footprint compared with plant-rich diets, as measured by greenhouse gas (GHG) emissions, which drive adverse climate change effects (Loken and DeClerck, 2020; Parlasca and Qaim, 2022; Swinburn *et al.*, 2019; Willett *et al.*, 2019). Restricting meat is controversial, and governments must balance many sustainability concerns (namely, environmental, economic, human health and animal welfare) with trade policies (Parlasca and Qaim, 2022).

The G20 is a multilateral platform, made up of 19 countries and the European Union, which connects the most prosperous high-income and emerging middle-income economies worldwide. The G20 members address global economic and security challenges by coordinating trade, health and climate action policies (G20 Indonesia 2022, 2022). The G20 countries account for more than 80 percent of the world's gross domestic product (GDP), 75 percent of international trade and 60 percent of the world's population (G20 Indonesia 2022, 2022). The G20 members also include the G7 (Canada, France, Germany, Italy, Japan, the United Kingdom of Great Britain and Northern Ireland and the United States of America).

The G20 process and annual meetings are important international decision-making platforms for governments to promote sustainable and resilient food systems, including the harmonization of RPM reduction and replacement policies with FBDGs. National FBDGs are science-based messages about healthy eating to prevent all forms of malnutrition and keep people well-nourished and healthy (FAO, 2022). They establish a basis for developing food and nutrition, health and agricultural policies and nutrition education programmes to foster healthy eating habits. National FBDGs advise individuals and populations about foods, food groups and dietary patterns to provide the

required nutrients to promote health to the general public and address each country's nutritional challenges, such as preventing undernutrition and diet-related chronic diseases (FAO, 2022). There is limited research comparing the G20 countries' RPM recommendations in national FBDGs and food graphics with expert-recommended targets.

Purpose

For this paper, the research team conducted an evidence review of published and grey literature and analysed the G20 countries' national FBDGs and food graphics for RPM compared with expert-recommended targets to promote healthy and sustainable diets. We used a G20 lens to build upon the findings of recent published papers and reports that had examined the FBDGs and food system policies for the G20 countries. We also synthesized relevant evidence to suggest actions for the G20 leaders to prioritize healthy and sustainable diets and food system policies.

First, we describe the global expert recommendations for healthy and sustainable diets for people and planet. Second, we describe the results of an evidence review that includes: i) profiling the G20 countries' beef production for export revenue, domestic beef consumption and G20 support for a climate-smart pledge; ii) examining and synthesizing published evidence for the G20 countries' FBDGs and sustainable diets; iii) examining the Food and Agriculture Organization of the United Nations (FAO) database for the G20 countries' FBDG guidelines and food graphics for RPM reduction and sustainable diet recommendations compared with expert-recommended targets; and iv) analysing how the media frame RPM policies in selected G20 countries. We conclude with suggestions as to how the G20 leaders could prioritize and harmonize healthy and sustainable diet, food system and international trade policies to mitigate climate change effects.

Global expert recommendations for a healthy and sustainable diet for people and planet

In 2015, the International Agency for Research on Cancer conducted a systematic review for the World Health Organization (WHO), concluding that red meat was a probable carcinogen and that processed meats were carcinogenic to humans (Bouvard *et al.*, 2015). In 2018, the World Cancer Research Fund International (WCRFI) and the American Institute for Cancer Research (AICR) reported strong evidence that RPM intake caused colorectal cancer (WCRFI and AICR, 2018).

WCRFI and AICR (2018) define red meat as mammalian muscle meat (that is, beef, veal, pork, lamb, mutton, horse and goat), usually consumed cooked, and define processed meat as meat transformed by salting, curing, fermentation, smoking, drying and/or adding chemical preservatives (sodium and nitrates) to enhance flavour or improve preservation. Dietary RPM sources are high in saturated fat, sodium, heme and additives associated with increased risks of non-communicable diseases (NCDs), especially colorectal cancer and cardiovascular disease (WCRFI and AICR, 2018).

A 2021 systematic evidence review and meta-analysis of 13 cohort studies with more than 1.4 million people showed an 18 percent rise in the risk of heart disease for each 50 g per day increase in intake of processed meats and a 9 percent rise in heart disease risk for each 50 g per day increase in intake of unprocessed red meat (Papier *et al.*, 2021). A large multi-ethnic prospective study conducted in 21 low-, middle- and high-income countries confirmed that processed meat was associated with cardiovascular mortality (Iqbal *et al.*, 2021).

Figure 1 shows the global expert recommendations for eating RPM to support a healthy and sustainable diet based on the WCRFI and AICR (2018) and EAT-Lancet reports (DeBries and Willett, 2021; EAT Forum, 2022a; Willett *et al.*, 2019). Both reports encourage people to select daily meals that consist of minimally processed, nutrient-rich plant foods that include whole grains, vegetables, fruits and pulses or legumes (such as beans and lentils). The EAT Forum (2022a) recommends one serving of cooked lean red meat weekly. WCRFI and AICR (2018, p. 29) recommend that people “eat little, if any processed meats, and limit their intake of cooked red meat to a total of three servings (350-500 grams or 12-18 ounces) weekly”, which translates into less than or equal to 26 kg, or less than 58 pounds, of red meat per person per year. Parlasca and Qaim (2022) suggest that high-income country populations should further reduce red meat to less than or equal to 20 kg per person per year.

The world faces a global syndemic, characterized by three concurrent pandemics of obesity, undernutrition and climate change, challenging the health of humans, the environment and the planet (Swinburn *et al.*, 2019). The EAT-Lancet Commission (Willett *et al.*, 2019) and the Lancet Commission on the Global Syndemic (Swinburn *et al.*, 2019) inspired a new paradigm and language for policymakers, businesses and the public to adopt a planetary health diet to support sustainable food systems. The Global Syndemic Commission recommended that governments incorporate sustainability principles into national FBDGs and incentivize

new business models that benefited the health of people while promoting economic prosperity (Swinburn *et al.*, 2019). The EAT-Lancet Commission recommended that economically affluent countries adopt a planetary health diet (Loken and DeClerck, 2020; Willett *et al.*, 2019).

A minimally processed diet includes fruits, vegetables, grains, legumes and meats modified by washing, cleaning and removing inedible or unwanted parts, grinding, refrigeration, pasteurization, fermentation, freezing, vacuum-packaging, baking and microwaving, either commercially or at home, to not substantially change the nutritional content (Harvard T.H. Chan School of Public Health, 2022).

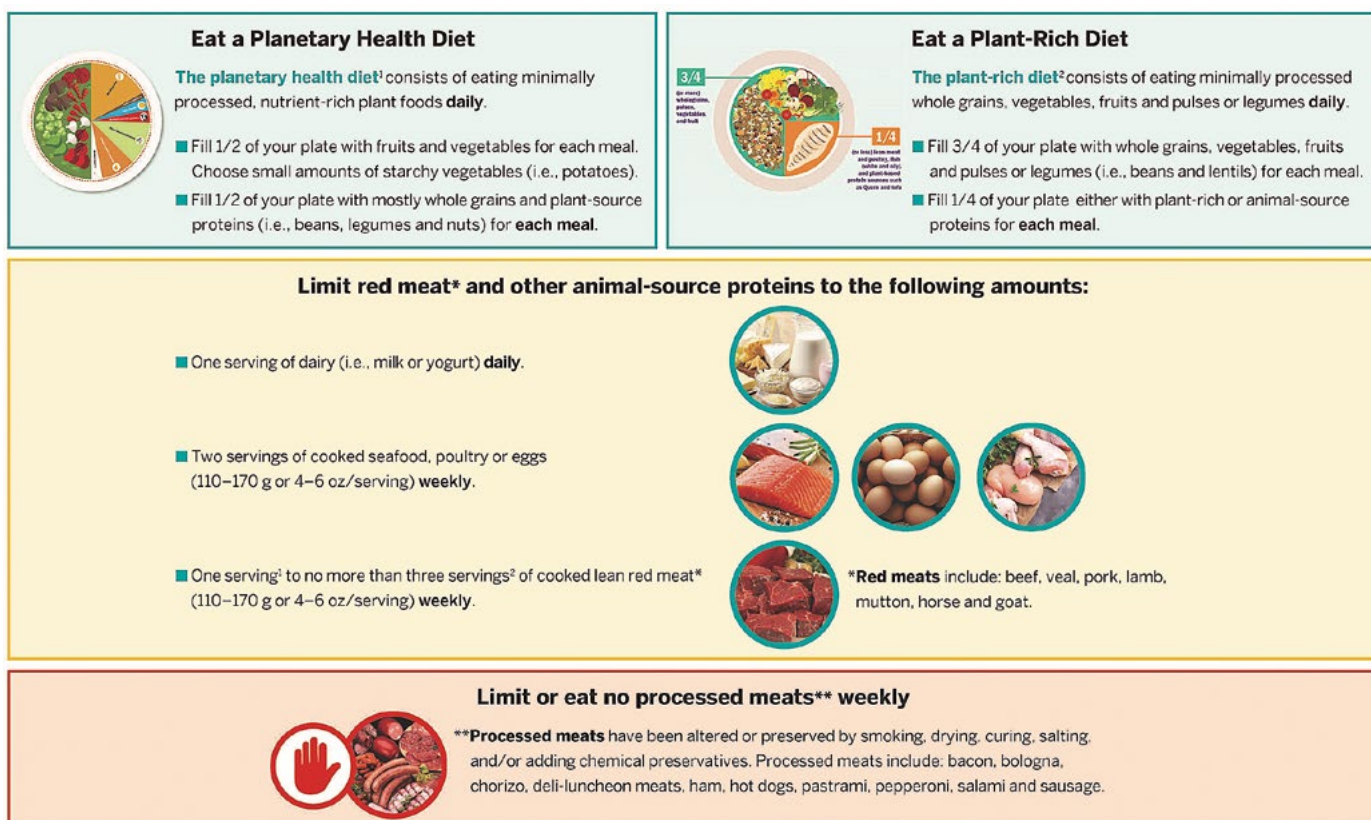
A planetary health diet recommends that people eat more minimally processed, plant-rich foods including whole grains, fruits and vegetables, legumes and nuts and fish, modest amounts of animal-source proteins, and limited amounts of unsaturated plant oils and added sugars (EAT Forum, 2022a). A planetary health diet recommends a dietary shift to reduce unhealthy foods, such as red meat, by at least 50 percent, with a recommended daily combined intake of 14 g (in a range that suggests total meat consumption of no more than 28 g per day), with variations according to region (Willett *et al.*, 2019).

A plant-rich, healthy, flexitarian diet encourages people to reduce, not eliminate, red meat and other animal-source products. Governments can support people, farmers and businesses by promoting healthy flexitarian FBDG messages and creating market demand for smaller portion sizes of high-quality, sustainably produced livestock to achieve healthy people and planet (Hicks, Knowles and Farouk, 2018).

Red meat production, export trade and red and processed meat intake for the G20 countries

Food production and food waste contribute about 20–30 percent of the GHG emissions that drive climate change (Willett *et al.*, 2019). Large-scale animal agriculture for meat and dairy production is associated with inefficient resource use, adverse environmental impacts and biodiversity loss (Loken and DeClerck, 2020; Swinburn *et al.*, 2019; Willett *et al.*, 2019). In economically affluent and emerging economies, many people overconsume RPM, which increases NCD risks, produces methane and requires high land use (Binns *et al.*, 2021; Loken and DeClerck, 2020; Swinburn *et al.*, 2019). Table 1 summarizes the G20 countries' GDP (2020), red meat available for human consumption (kg per capita per year) (2018), bovine meat exports (2019) and support for the COP26 Methane Reduction Pledge (2021).

Figure 1. Global expert recommendations for RPM to support a healthy and sustainable diet



SOURCE: Debries, S. and Willett, W. 2021. *Sustainable Diets*. Deerfield, IL and Cambridge, MA, The Gaples Institute and Harvard T.H. Chan School of Public Health. Cited 18 July 2022. <https://www.gaplesinstitute.org/sustainable-diets/>

EAT Forum. 2022a. *The Planetary Health Diet*. Oslo. Cited 18 July 2022. <https://eatforum.org/learn-and-discover/the-planetary-health-diet/>

Willett, W., Rockström, J., Loken, B. et al. 2019. Food in the Anthropocene: the EAT-Lancet Commission on healthy diets from sustainable food systems. *The Lancet*, 393 (10170): 447–492. [https://doi.org/10.1016/S0140-6736\(18\)31788-4](https://doi.org/10.1016/S0140-6736(18)31788-4)

WCRF and AICR. 2018. *Continuous Update Project. Recommendations and public health and policy implications*. London. <https://www.wcrf.org/wp-content/uploads/2021/01/Recommendations.pdf>

Table 1. G20 country GDP, red meat available for human consumption, bovine meat exports and support for the COP26 Methane Reduction Pledge

Country	GDP December 2020 ¹ USD billions	Red meat available for human consumption, 2018 ^{2,3} (kg/person/year)*, **	Bovine meat exports (2019) ⁴ USD billions	G20 leader endorsed the COP26 Methane Reduction Pledge (2021) ⁵
Argentina	383	51.0	803 548 107	Yes
Australia	1 331	48.4	2 731 371 966	No
Brazil	1 445	38.5	915 089 684	Yes
Canada	1 644	36.4	1 770 889 434	Yes
China	14 723	37.4	189 003	No
European Union	15 276	n/a	n/a	Yes
France	2 630	54.6**	961 899 524	Yes
Germany	3 846	57.4**	1 128 804 904	Yes
India	2 623	1.1	62 265 540	No
Indonesia	1 058	3.4	n/a	Yes
Italy	1 886	54.3**	434 854 407	Yes
Japan	4 975	23.6	131 483 290	Yes
Republic of Korea	1 631	41.7	2 625 950	Yes
Mexico	1 076	23.8	1 216 534 821	Yes
Russian Federation	1 484	31.3	4 003 126	No
Saudi Arabia	700	8.6	51 724	Yes
South Africa	302	18.1	66 134 956	No
Spain***	1 281	45.2**	684 014 417	Yes
Türkiye	720	14.1	1 048 615	No
United Kingdom of Great Britain and Northern Ireland	2 708	32.4	494 065 121	Yes
United States of America	20 937	50.1	3 493 416 197	Yes

* WCRFI and AICR recommendation is to limit intake of cooked red meat to three servings of 350-500 grams (g) weekly or 54 g daily or a maximum of 26 kg per person per year.

** Meat consumption data are for all meat, including chicken and other white meat sources. For all other countries includes only red meat sources (pork, beef and veal and sheep meat).

*** Spain is an invited permanent guest of the G20.

High per person red meat intake (2018) that exceeds the WCRFI and AICR recommended target of 26 kg per person per year. G20 leaders did not endorse the COP26 Methane Reduction Pledge (2021).

Low per person red meat intake (2018) below the WCRFI and AICR recommended target of 26 kg per person per year.

SOURCE: ¹Trading Economics. GDP: G20 [online database]. 2022. Cited 18 July 2022.

<https://tradingeconomics.com/country-list/gdp?continent=g20>

² OECD (Organisation for Economic Cooperation and Development). 2021b. Meat Consumption [online]. Paris, OECD-FAO Agricultural Outlook.

<https://data.oecd.org/agroutput/meat-consumption.htm>

³ Statista Research Department. 2021. Per Capita Meat Consumption in European Countries 2015-2022 [online database]. New York. Cited 18 July 2022.

<https://www.statista.com/forecasts/679528/per-capita-meat-consumption-european-union-eu>

⁴ Observatory of Economic Complexity. Bovine Meat. Meat of bovine animals, fresh or chilled. 2019-2020. Cited 18 July 2022.

<https://oec.world/en/profile/hs/bovine-meat>

⁵ Climate & Clean Air Coalition. 2022. Global Methane Pledge: Fast action on methane to keep a 1.5° C future within reach. Washington, DC. Cited 18 July 2022

<https://www.globalmethanepledge.org/>

One study showed that the global increase in RPM trade contributed to an increase in diet-related NCDs, although the attributable burden of diet-related NCDs varied significantly from country to country (Chung, Li and Liu, 2021). The study also identified exporting countries responsible for increasing the diet-related NCD risks for importing countries.

Population and income growth are two important drivers of red meat consumption (Parlasca and Qaim, 2022). In 2018, the mean global intake of processed meat was 17 g per day, the mean global unprocessed red meat intake was 51 g per person per day, and a quarter of the world's population across 17 countries consumed at least one serving of red meat (100 g) daily (Miller *et al.*, 2022). RPM intake was highest among affluent populations in several G20 countries (Russian Federation, Germany, Brazil, China, South Africa and the United Kingdom of Great Britain and Northern Ireland) (Miller *et al.*, 2022).

Three G20 countries (Indonesia, India and Saudi Arabia) have the least red meat available for human consumption (less than 10 kilograms (kg) per person per year), while the other G20 countries have far more (on average 38.3 kg per capita per year) (Statista Research Department, 2021). This finding may be related to the sociocultural influences of national diets. In 2021, Brazil posted the largest export volume of beef cattle and veal in million tonnes; the United States of America, Australia and New Zealand ranked second, third and sixth, respectively (OECD, 2021a; 2021b). Argentina, the European Union (27 countries), Türkiye and the United States of America had the highest meat production in 2019 (OECD, 2021a). Brazil, China, the European Union and the United States of America are forecast to produce 60 percent of all global red meat by 2029 (OECD, 2021a; 2021b; 2021c).

Table 1 shows that six G20 members (Australia, China, India, Russian Federation, South Africa and Türkiye) have not yet endorsed the COP26 Global Methane Reduction Pledge to reduce GHG emissions associated with large-scale, industrialized beef and dairy production by 30 percent to decrease global warming to 1.5 to 2 degrees Celsius by 2030 (Climate & Clean Air Coalition, 2022). Australia has the highest red meat availability (48.4 kg per person per year) and has RPM reduction targets in its 2013 FBDG recommendations, but had not endorsed the COP26 Methane Reduction Pledge as of July 2022.

Based on an in-depth review of current evidence, most countries advise populations to reduce beef to expert-recommended targets. Most countries have also failed to encourage minimally processed, plant-based foods or dietary patterns aligned with the EAT-Lancet Commission report (Springmann *et al.* 2020). High-, middle- and low-income countries exceed the dietary recommendations in the 2019 EAT-Lancet Commission Report (Binns *et al.*, 2021; Leme *et al.*, 2021; Springmann *et al.*, 2020). The reduction of RPM consumption in high-income countries could substantially promote human and planetary health (Sun *et al.*, 2022). Kovacs *et al.* (2021) compared the national FBDG carbon footprints of seven countries and found that the United States of America's FBDGs had the highest, some 1.2 times greater than that of the Netherlands, 1.5 times that of Germany and 5.2 times that of India. If the global population followed current G20 consumption patterns, only India and Indonesia would have patterns aligned with planetary health boundaries (Loken and DeClerck, 2020).

Analysis of the G20 countries' food-based dietary guidelines recommendations for red and processed meat reduction and sustainable diets

National government agencies and ministries in many countries have developed technical documents that describe FBDG recommendations for health professionals and policymakers that have been translated into FBDG food graphics for the public (Bechthold *et al.*, 2018; Herforth, 2019). We analysed evidence of the G20 countries' national FBDGs for RPM compared with expert-recommended targets to promote healthy and sustainable diets and food systems. We reviewed the FAO database for the G20 countries and the primary references for each country's national FBDGs and graphic versions. We also analysed secondary evidentiary sources published in English and available on the FAO website (as of 2022). The FBDGs identified ranged from Japan (2000) to the United States of America (2020). The European Union was excluded, as only all-meat consumption data were available, except for three countries (France, Germany and Italy), which are G7 and G20 members.

Figure 2 shows the graphic FBDG versions for 16 G20 countries. Brazil, Italy and the European Union have no official food graphic versions. Figure 3 shows a global map of the G20 countries' FBDGs across the six FAO regions. Russian Federation is in the process of developing national dietary guidelines.

Figure 2. Graphic FBDGs for 16 of the G20 countries



SOURCE: Adapted from FAO. 2022. *Food-based dietary guidelines*. Cited 20 February 2022. Rome. <https://www.fao.org/nutrition/nutrition-education/food-dietary-guidelines/en/>

Figure 3. Global map of the graphic FBDGs for the G20 countries



- The G7 country members include: Canada, France, Germany, Italy, Japan, United Kingdom and the United States. The European Union is an additional participant.
- The G20 country members include: Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Republic of Korea, Mexico, Russia, Saudi Arabia, South Africa, Turkey, the United Kingdom, and the United States. Spain is invited as a permanent guest. The European Union is an additional participant.
- Brazil, Italy, Russia and the European Union do not have official graphic FBDG for the public (FAO, 2022).
- The European Union has 27 member countries including France, Germany and Italy that are also G7 and G20 members.

SOURCE: Adapted from FAO. 2022. *Food-based dietary guidelines*. Cited 20 February 2022. Rome. <https://www.fao.org/nutrition/nutrition-education/food-dietary-guidelines/en/>

G20 country recommendations to reduce RPM in diets

Table 2 summarizes the findings with regard to G20 national FBDG recommendations to reduce or limit RPM intake and to adopt minimally processed dietary patterns. It shows that 12 G20 countries recommend limiting or avoiding processed meats and/or limiting meat intake daily or weekly. Five have RPM reduction targets aligned with the WCRFI and AICR 2018 recommendations to eat little, if any, processed meats and limit cooked red meat to three servings or less of 350–500 g weekly. China, Germany and South Africa recommended RPM reduction targets within 100 g of the recommended targets. Argentina, Indonesia, Japan,

the Republic of Korea and the United States of America lack specific RPM reduction targets.

Seven G20 countries consumed less than 26 kg per person in 2018. Of the G20 members exceeding that amount, Argentina, the Republic of Korea and the United States of America lacked specific red meat reduction targets (Table 1). The United States of America and Australia recommend that people eat lean or low-fat meats rather than processed meats. The collective results from Tables 1 and 2 show that the top G20 bovine meat-exporting countries, apart from Mexico, lack strong RPM targets in their national FBDG recommendations.

Table 2. G20 national FBDGs – recommendations to reduce RPM intake and adopt a minimally processed, plant-rich dietary pattern

Country	Most recent national FBDGs (year) FBDG food graphic for the public (year)	Recommendations to reduce or replace RPM in dietary patterns (year) Specific meat-related recommendations WCRFI and AICR expert-recommended target = limit cooked red meat to three portions of 350-500 g weekly or 54 g per day	Explicit recommendations to eat minimally processed, plant-based foods and/or adopt environmentally sustainable dietary patterns Specific recommendations
Argentina	Guías alimentarias para la población Argentina (2016) Gráfica de Alimentación Saludable (2016) <i>Expected to be updated 2022–25</i>	None. - Consume 130 g meat daily with a 7 percent fat content.	No explicit recommendation to limit other processed foods or to increase consumption of minimally processed, plant-based foods. No explicit recommendation to adopt environmentally sustainable dietary patterns.
Australia	Australian Dietary Guidelines (2013) Aboriginal and Torres Strait Islander Guide to Healthy Eating (2015) <i>Expected to be updated 2024–25</i>	Limit foods high in saturated fat, such as processed meats. - A maximum of 455 g weekly (one 65 g serving per day) of lean meat is recommended for Australian adults. - Processed and cured meats are high in salt and fat, not recommended as a substitute for unprocessed meat.	No explicit recommendation to limit other processed foods or increase consumption of minimally processed, plant-based foods. Choose foods for health and sustainability and eat seasonally. - Choose dietary patterns that align with the dietary guidelines to support health and reduce the environmental impact of food. - Eat fruits and vegetables that are in-season to reduce environmental pressure on the food system. - Alternatives to animal foods include nuts, seeds, legumes, beans and tofu. These foods increase dietary variety and can provide a valuable, affordable source of protein and other nutrients found in meats; and are important for those who follow vegetarian or vegan dietary patterns.

Country	Most recent national FBDGs (year) FBDG food graphic for the public (year)	Recommendations to reduce or replace RPM in dietary patterns (year) Specific meat-related recommendations WCRFI and AICR expert-recommended target = limit cooked red meat to three portions of 350-500 g weekly or 54 g per day	Explicit recommendations to eat minimally processed, plant-based foods and/or adopt environmentally sustainable dietary patterns Specific recommendations
Brazil	Dietary Guidelines for the Brazilian Population (2015) <i>No FBDG food graphic is available</i>	Limit the use of processed foods, including meat that is salted, smoked or cured. - Avoid ultra-processed foods, including pre-prepared meat dishes and products derived from meat and animal fat. - Restrict red meat to one-third of your meals and give priority to lean cuts and grilled or roasted preparation.	Make natural or minimally processed foods the basis of your diet. - Natural or minimally processed foods, in great variety, and mainly of plant origin, are the basis for diets that are nutritionally balanced, delicious, culturally appropriate and supportive of socially and environmentally sustainable food systems. - Limit consumption of processed foods and avoid ultra-processed food consumption.
Canada	Canada's Dietary Guidelines (2019) Eat Well. Live Well Plate Model (2019)	Highly processed products, including processed meats, should not be consumed regularly.	Among protein foods, consume plant-based more often, in addition to regular consumption of vegetables, fruits and whole grains. - Eating patterns that incorporate animal-based foods should emphasize more plant-based foods and utilize animal-based foods that are low in saturated fat, such as lean red meat and low-fat yogurts. No explicit recommendation to adopt environmentally sustainable dietary patterns.
China	Chinese Dietary Guidelines (2016) Chinese Food Guide Plate (2016) Chinese Food Guide Pagoda (2016) Chinese Food Guide Abacus (2016)	Smoked and cured meats should be avoided. - Lean meats should be chosen over fatty meats. - Weekly intake target for poultry and red meat: 280-525 g (40-75 g per day).	No explicit recommendation to limit other processed foods or increase consumption of minimally processed, plant-based foods. No explicit recommendation to adopt environmentally sustainable dietary patterns.
European Union*	Not applicable	Not applicable.	Not applicable.

Country	Most recent national FBDGs (year) FBDG food graphic for the public (year)	Recommendations to reduce or replace RPM in dietary patterns (year) Specific meat-related recommendations WCRFI and AICR expert-recommended target = limit cooked red meat to three portions of 350-500 g weekly or 54 g per day	Explicit recommendations to eat minimally processed, plant-based foods and/or adopt environmentally sustainable dietary patterns Specific recommendations
France	The French National Nutrition and Health Programme's Dietary Guidelines (2019) For a More Balanced Lifestyle, Start With ... (2019)	Limit the consumption of meats, while favouring poultry and limiting red meats (pork, beef, veal, mutton, lamb and offal) to 500 g per week. Limit processed meat consumption to 150 g per week.	Limit the consumption of sweetened beverages, fatty, sweet, salty and ultra-processed foods and the consumption of products with a Nutri-Score of D or E. For a balanced lifestyle, start with more fruits and vegetables and pulses and fewer RPMs. No explicit recommendation to adopt environmentally sustainable dietary patterns.
Germany	Ten Guidelines of the German Nutrition Society for a Wholesome Diet (2017) Nutrition Circle from the German Nutrition Society (2017) <i>Expected to be updated 2023–25</i>	None. - If you eat meat, you should not consume more than 300 to 600 g per week.	Choose mainly plant-based foods. No explicit recommendation to adopt environmentally sustainable dietary patterns.
India	Dietary Guidelines for Indians - A Manual (2011) Food Guide Pyramid (2011)	Moderate the use of animal foods. - Moderate the use of animal foods containing high fat, saturated fatty acids and cholesterol. - Limit/avoid organ meats.	Minimize the use of processed foods rich in salt, sugar and fats. No explicit recommendation to adopt environmentally sustainable dietary patterns. - Eat fish more frequently, prefer it to meat and poultry; and limit or avoid organ meats.
Indonesia	Balanced Nutrition Guidelines (2014) Healthy Eating Plate (2014) <i>Piring Makanku, Porsi Sekali Makan</i> Balanced Nutrition Rounded Pyramid (2014) <i>Tumpeng Gizi Seimbang</i>	Eat high-protein foods (animal or vegetable sources).	No explicit recommendation to limit other processed foods or increase consumption of minimally processed, plant-based foods. No explicit recommendation to adopt environmentally sustainable dietary patterns.
Italy	Dietary Guidelines for Healthy Eating – Revision (2018) Linee Guida per una Sana Alimentazione (2018) <i>No FBDG food graphic is available</i>	Select poultry or legumes over red meat. - 1–3 servings lean meat per week (1 serving = 100 g). - 1 serving red meat per week recommended.	Eat more fruits and vegetables, whole grains and legumes - Increase consumption of plant foods while avoiding those with a large environmental impact for growth (such as those grown overseas). Select a sustainable diet. - Avoid processed meat and limit red meat consumption, opting for poultry, plant proteins or sustainably sourced fish instead.

Country	Most recent national FBDGs (year) FBDG food graphic for the public (year)	Recommendations to reduce or replace RPM in dietary patterns (year) Specific meat-related recommendations WCRFI and AICR expert-recommended target = limit cooked red meat to three portions of 350-500 g weekly or 54 g per day	Explicit recommendations to eat minimally processed, plant-based foods and/or adopt environmentally sustainable dietary patterns Specific recommendations
Japan	Dietary Guidelines for Japanese (2000) Food Guide Spinning Top (2010)	None - Eat 3-5 servings of meat and fish dishes per day.	No explicit recommendation to limit other processed foods or increase consumption of minimally processed, plant-based foods. No explicit recommendation to adopt environmentally sustainable dietary patterns.
Republic of Korea	General Dietary Guidelines for Koreans (2015) Korean Food Balance Wheels (2015)	None.	No explicit recommendation to limit other processed foods or increase consumption of minimally processed, plant-based foods. No explicit recommendation to adopt environmentally sustainable dietary patterns.
Mexico	Dietary and Physical Activity Guidelines in the Context of Overweight and Obesity in the Mexican Population (2015) El Plato del Bien Comer (2019)	Limit red meat intake to 500 g per person per week (< 300 g per person per week is even better) and, of this, as little as possible in processed form, such as salted or cured sausages. - Red meat contains saturated fat and, therefore, recommended to frequently choose foods with low saturated fat content, such as lean meat, and avoid consumption of fatty meat cuts (such as ground beef, ribs, chorizo, bacon and sausages).	No explicit recommendation to limit other processed foods or increase consumption of minimally processed, plant-based foods. No explicit recommendation to adopt environmentally sustainable dietary patterns.
Russian Federation	No national FBDG is available** <i>No FBDG food graphic is available</i>	Not available	Not available
Saudi Arabia	Dietary Guidelines for Saudis (2012) The Healthy Food Palm (2012)	None. - Have lean meats and meat alternatives, such as lentils, beans, chickpeas and fava beans. - Eat 2–3 servings of meat per day (1 serving = 60–90 g red meat, chicken or fish; ½ cup cooked legumes).	No explicit recommendation to limit other processed foods or increase consumption of minimally processed, plant-based foods. No explicit recommendation to adopt environmentally sustainable dietary patterns.

Country	Most recent national FBDGs (year) FBDG food graphic for the public (year)	Recommendations to reduce or replace RPM in dietary patterns (year) Specific meat-related recommendations WCRFI and AICR expert-recommended target = limit cooked red meat to three portions of 350-500 g weekly or 54 g per day	Explicit recommendations to eat minimally processed, plant-based foods and/or adopt environmentally sustainable dietary patterns Specific recommendations
South Africa	FBDGs for South Africa (2013) The South African Food Guide (2013)	Choose lean cuts of meats rather than sausages and processed meats. - Polonies, viennas, sausage meat, frankfurters, salami and bacon are high in fat and salt, so they should not be eaten too often. - Trimming excess fat and reducing fat used during preparation recommended to reduce fat intake from meat. - Maximum of 560 g per week (80-90g per day) of red meat should be consumed.	No explicit recommendation to limit other processed foods or increase consumption of minimally processed, plant-based foods. No explicit recommendation to adopt environmentally sustainable dietary patterns.
Türkiye	Turkey Dietary Guidelines (2016) Eat Healthy, Move for Health Plate Model (2016)	Consumption of processed meats should be limited due to high saturated fat content. - Recommend that half to a third of 60 g per day of total meat and poultry intake for adults come from red meat.	No explicit recommendation to limit other processed foods or increase consumption of minimally processed, plant-based foods. No explicit recommendation to adopt environmentally sustainable dietary patterns.
United Kingdom of Great Britain and Northern Ireland	Public Health England: Government Dietary Recommendations (2016) Eatwell Guide (2016)	Eat less RPM. - Reduce intake of RPM to ≤ 70 g per day or ≤ 490 g weekly.	Eat more beans and pulses and two sources of sustainably sourced fish weekly (one of which is oily). Eat less RPM. No explicit recommendation to adopt environmentally sustainable dietary patterns.
United States of America	Dietary Guidelines for Americans 2020–2025 (2020) MyPlate (2020)	Most intake of meats and poultry should be lean or low-fat in fresh, canned or frozen form versus processed meats (such as hot dogs, ham, sausages and luncheon meats). - For a 2,000-calorie diet, meat, poultry and egg intake is 26-ounce equivalents (737 g) per week. - Vary your protein routine.	No explicit recommendation to limit other processed foods or increase consumption of minimally processed, plant-based foods. No explicit recommendation to adopt environmentally sustainable dietary patterns.

NOTE: *A review conducted by the European Food Safety Authority (2010) found that, given the differences in dietary habits, traditions, nutrient imbalances and diet-related public health challenges between European Union countries, it was not feasible to create one set of FBDGs for the entire bloc (EFSA Panel on Dietetic Products, Nutrition and Allergies, 2010). Instead, they should be developed and implemented by country or region. The New Nordic Nutrition Guidelines (Bechthold et al., 2018) are collective dietary guidelines for the five countries in the Nordic region (Denmark, Finland, Iceland, Norway and Sweden). These guidelines encourage more calories from plant foods and fewer from meat; more foods from the sea and lakes; and more foods from the wild countryside. These countries have more recently issued specific FBDGs with environmental sustainability targets (WHO Regional Office for Europe, 2021a).

** National FBDGs for Russian Federation are being developed (E.A. Smirnova, personal communication, 2022). For a full list of the G20 countries' FBDGs, please see Annex 1.

G20 country recommendations for minimally processed, plant-rich, sustainable diets

Table 2 shows that six G20 countries (Brazil, Canada, Germany, India, Italy and the United Kingdom of Great Britain and Northern Ireland) recommend minimally processed, plant-rich food choices or environmentally sustainable dietary patterns. India's FBDGs recommend limiting processed foods, Germany's advocate increasing plant-based foods, Italy's recommend eating a more sustainable diet and the UK's Eatwell Guide advises eating more beans and pulses and two sources of sustainably sourced fish weekly. Brazil and Canada provide comprehensive recommendations on adopting minimally processed, plant-rich dietary patterns to improve health and environmental sustainability. These findings concur with other analyses showing that Brazil, Canada, Germany and several non-G20 European countries provide climate-smart FBDG recommendations (Bechthold *et al.*, 2018; Brink *et al.*, 2019; Clifford Astbury *et al.*, 2021; Herforth *et al.*, 2019; Loken and DeClerck, 2020).

Media framing of G20 red and processed meat policies

There is evidence to suggest that many factors predict consumers' RPM and unprocessed ruminant meat preferences, including higher incomes, urbanization, economic and social globalization, culture, meal attractiveness and affordability (Milford *et al.*, 2019). The mass media also influence policies by framing politically viable and feasible issues that will be accepted by food producers, retailers, policymakers and the public (Henderson and Hilton, 2018).

Clare, Maani and Milner (2022) examined how RPM messages were framed by six organizations representing the UK meat industry, identifying four distinct frames: "still open for debate", "most people have no need to worry", "keep eating meat to be healthy" and "no need to cut down to be green". Sievert *et al.* (2022) described the media framing messages for RPM policies in Australia, New Zealand, the United Kingdom of Great Britain and Northern Ireland and the United States of America and found a highly polarized debate between pro- and anti-meat reduction food system actors. Sievert *et al.* (2022) recommended more nuanced and context-dependent messages to address the health and environmental harms of RPM in diets. Yet, nuanced messages are unlikely to change how the public and policymakers view RPM reduction policies or to challenge the policy inertia brought about by a powerful global coalition of meat industry stakeholders that collectively perpetuate high domestic and international market supply and demand for beef products (Howard *et al.*, 2021; Lazarus, McDermid

and Jacquet, 2021).

The current media landscape that reports on RPM reduction and replacement policies, including strategies to promote plant-based alternative protein products, presents many challenges. RPM and animal livestock producers face a competitive marketplace with plant-based animal product manufacturers that promote thousands of highly processed, plant-based and future cell-cultured or lab-grown meat, chicken and seafood products, many containing excessive sugars, sodium and fats that are not aligned with national FBDG recommendations (Kraak, 2022).

Many alternative protein products are engineered by wealthy Silicon Valley investors (Sexton, 2020) and leading manufacturers and marketed through a web of transnational "protein industry" actors that dominate the global marketplace (Howard *et al.*, 2021). Traditional meat manufacturers and retailers are also marketing alternative plant-based protein products in high- and middle-income country markets (Howard *et al.*, 2021; Kraak, 2022; Sexton, 2020). There are currently no expert recommendations for the safe and healthy intake of highly processed plant-based meat analogues that may contribute to obesity and diet-related NCD risks (WHO Regional Office for Europe, 2021b). Governments must update national dietary guidelines to develop recommendations and ensure that industry meets healthy reformulation targets for these novel products (Kraak, 2022; WHO Regional Office for Europe, 2021b).

Red and processed reduction or replacement strategies to support healthy diets and sustainable food systems

RPM reduction and replacement policies should address the production, processing, marketing and consumption of minimally processed plant-rich dietary patterns that emphasize high-quality animal and plant foods and healthy alternative protein products made from plant sources or cell-cultured meat products in place of traditional meat products. These policies have been opposed by powerful industry actors that market RPM products widely to consumers and lobby policymakers to support their interests (Sievert *et al.*, 2021; Swinburn *et al.*, 2019). Developing and implementing coordinated RPM reduction and replacement policies will address policy inertia to reverse the obesity and diet-related NCD burden in countries in the context of the global syndemic (Swinburn *et al.*, 2019).

Examples of RPM reduction and replacement policies include: i) updating national FBDGs to align with RPM targets; ii) reducing RPM products served in public institutions that align with revised school meal standards for children; iii)

taxing RPM products and redirecting red meat subsidies to increase the production of fruits and vegetables, legumes, nuts and healthy alternative protein products; and iv) implementing media campaigns that promote healthy and sustainable diets (Wilde *et al.*, 2019; WHO Regional Office for Europe, 2021a). Many current strategies used in different settings include reducing portions to standard serving sizes of sustainably produced meats, redesigning menus and recipes with plant-rich, alternative proteins, menu labelling and point-of-sale prompting to communicate the benefits of plant-rich products (Bianchi *et al.*, 2018; Blondin *et al.*, 2022; Stiles, Collins and Beck, 2022).

The G20 leaders could prioritize policies across the food, agriculture, nutrition, public health, land-use and international trade sectors to reduce the exportation, marketing and consumption of RPM to protect the health of people and the planet (Chung, Li and Liu, 2021; Kim *et al.*, 2020; Sun *et al.*, 2022). This recommendation aligns with the sixth IPCC (2022) summary report, which encouraged policymakers to promote demand-side strategies to shift to balanced, sustainable healthy diets.

Many G20 countries face geopolitical challenges and lack adequate resources to update national FBDGs on a frequent basis with the best available evidence. The G20 is an opportunity to address human and planetary health and to effectively manage the sustainability trade-offs associated with meat production and consumption (Parlasca and Qaim, 2022). The national academies of the G7 and G20 countries could publish joint statements to advise leaders to update national FBDGs to reflect expert recommendations for healthy and sustainable dietary patterns and assess the trade-offs for harmonizing complex international trade and food system policies to mitigate climate change (German National Academy of Sciences, 2022).

The G20 process and meeting in Indonesia (2022) will address COVID-19 mitigation through the global health architecture, sustainable energy transition and digital transformation (G20 Indonesia 2022, 2022). Despite competing geopolitical issues, the G20 process and meetings scheduled in India (2023) and Brazil (2024) could prioritize healthy and sustainable food systems that align with the 2015 Paris Agreement and 2030 Agenda.

The 2024 G20 meeting in Brazil could prioritize harmonizing RPM reduction policies with international trade, human health, protecting ecosystems and promoting sustainable food systems. Brazil is the world's largest beef cattle exporter, to 152 importing countries, earning more than USD 5.4 billion dollars annually, with 70-80 percent of Amazon deforestation

attributable to beef production (Zu Ermgassen *et al.*, 2020). The United States of America is the second-largest importer of Brazilian beef, making its government and American consumers complicit in the destruction of Brazil's rainforest due to lucrative cattle ranching (McCoy and Ledur, 2022). Brazil's export policies do not align with the domestic FBDG recommendation of minimally processed, plant-rich dietary patterns. While it is a politically sensitive issue, the global trade of live cattle and red meat could be framed as a deforestation commodity produced by a large-scale network of beef stakeholders that has detrimental impacts on the environment and health of importing countries (Chung, Li and Liu, 2021; McCoy and Ledur, 2022; Zu Ermgassen *et al.*, 2020).

Municipal actions may influence national policies. Several cities in eight G20 countries (Seoul, Tokyo, Paris, Milan, London, Guadalajara, Toronto, New York City and Los Angeles) have pledged to align their food procurement policies with the planetary health diet and shift municipal food systems away from unsustainable practices by 2030 (EAT Forum, 2022b). Public support for diverse coalitions could persuade the G20 leaders to harmonize national FBDGs with RPM policies to address undernutrition, diet-related NCDs and climate action. Mobilizing youth to use media advocacy and digital activism (de Moor *et al.*, 2021) could encourage the six G20 members that have not endorsed the 2021 Global Methane Reduction Pledge (Table 1).

Agrifood and beverage industry businesses should substantially improve their GHG emissions reporting, corporate protein disclosures and climate mitigation commitments to support the 2015 Paris Commitment and 2030 Agenda (Lazarus, McDermid and Jacquet, 2021; World Wildlife Fund, 2022). Food service providers could use marketing-mix and choice-architecture strategies to promote affordable, convenient and minimally processed plant-rich, nutrient-dense, ready-to-eat meals that support a healthy flexitarian dietary pattern (Culinary Institute of America and Harvard T.H. Chan School of Public Health, 2021; Stiles, Collins and Beck, 2022). Future research could examine multi-setting, multi-sector strategies to promote healthy, equitable and sustainable diets and food systems. Lastly, the United Nations Development Programme (UNDP) and Oxford University could include RPM reduction and replacement policies in future Climate Vote Surveys to inform climate-smart actions (UNDP and Oxford University, 2021a; 2021b).

Conclusions

The G20 leaders have an opportunity to transform nutrition by updating and harmonizing national FBDGs with

comprehensive RPM reduction and replacement policies to support climate-smart sustainable food systems. The G20 process could mitigate the health and environmental effects of climate change and reduce NCD risks while managing sustainability trade-offs. This paper shows that many G20 countries have recommended that people limit or avoid eating RPM or limit total red meat intake through national FBDGs.

This paper further finds that five countries have RPM targets aligned with global expert recommendations. Brazil and Canada have national FBDGs that explicitly

recommend adopting minimally processed, plant-rich dietary patterns to promote health and environmental sustainability. While it examined RPM recommendations within the context of healthy and sustainable diets, future research should carefully consider each country's food system opportunities and challenges to achieve healthy and sustainable dietary targets. The G20 process and meetings in Indonesia (2022), India (2023) and Brazil (2024) could assist by prioritizing and harmonizing sustainable food system policies with international trade policies to mitigate climate change while managing sustainability trade-offs.

ANNEX 1: G20 NATIONAL FOOD-BASED DIETARY GUIDELINES

ARGENTINA

Ministry of Health of Argentina. 2016. *Guías alimentarias para la población Argentina*. Buenos Aires.
<https://bancos.salud.gob.ar/recurso/guias-alimentarias-para-la-poblacion-argentina>

AUSTRALIA

Australian Government. 2013. *The Australian Dietary Guidelines*. Canberra, Department of Health.
<https://www.health.gov.au/resources/publications/the-australian-dietary-guideline>

Australian Government. 2015. *Aboriginal and Torres Strait Islander Guide to Healthy Eating*. Canberra, Department of Health.
https://www.eatforhealth.gov.au/sites/default/files/content/The%20Guidelines/final_igthe_a3_poster_-_lr.pdf

Australian Government National Health and Medical Research Council. 2022. *Review of the 2013 Australian Dietary Guidelines*. Canberra.
<https://www.nhmrc.gov.au/health-advice/nutrition/australian-dietary-guidelines-review/about-the-review>

BRAZIL

Ministry of Health of Brazil. 2015. *Dietary Guidelines for the Brazilian Population*. Brasilia.
http://bvsmms.saude.gov.br/bvs/publicacoes/dietary_guidelines_brazilian_population.pdf

CANADA

Health Canada. 2019. *Canada's food guide. Food guide snapshot*. Ottawa.
<https://food-guide.canada.ca/en/food-guide-snapshot/>

Health Canada. 2019. *Canada's Dietary Guidelines for Health Professionals and Policy Makers*. Ottawa.
<https://food-guide.canada.ca/en/guidelines/>

CHINA

Chinese Nutrition Society. 2016. *Chinese Dietary Guidelines*. Beijing.
<http://en.cnsoc.org/yqui/pdf/web/viewer.html?file=http%3a%2f%2fen.cnsoc.org%2fpdfLI%2f221901202.html>

FRANCE

FAO. 2021. *Food-based Dietary Guidelines – France*. Rome.
<https://www.fao.org/nutrition/education/food-dietary-guidelines/regions/countries/france/en/>

Santé Publique France. 2019. *For a more balanced lifestyle, start with...* English version. Saint-Maurice, France.
<https://www.santepubliquefrance.fr/determinants-de-sante/nutrition-et-activite-physique/documents/affiche/pour-un-mode-de-vie-plus-equilibre-commencez-par-augmenter-aller-vers-reduire>

Santé Publique France. 2019. *Report: Recommendations concerning diet, physical activity and sedentary behavior for adults.* English version. Saint-Maurice, France.

Santé Publique France. 2019. *Recommandations relatives à l'alimentation, à l'activité physique et à la sédentarité pour les adultes.* Saint-Maurice, France.

<https://www.santepubliquefrance.fr/determinants-de-sante/nutrition-et-activite-physique/documents/rapport-synthese/recommandations-relatives-a-l-alimentation-a-l-activite-physique-et-a-la-sedentarite-pour-les-adultes>

GERMANY

FAO. 2021. *Food-based Dietary Guidelines – Germany.* Rome.

<https://www.fao.org/nutrition/education/food-dietary-guidelines/regions/countries/germany/en/#:~:text=Germany%20uses%20the%20nutrition%20circle,eggs%3B%20and%20fats%20and%20oils>

Deutsche Gesellschaft für Ernährung. n.d. *10 Guidelines of the German Nutrition Society (DGE) for a Wholesome Diet.* Bonn, Germany.

<https://www.dge.de/ernaehrungspraxis/vollwertige-ernaehrung/10-regeln-der-dge/en/>

* Germany's FBDGs are expected to be updated in 2022–24.

INDIA

National Institute of Nutrition. 2011. *Dietary Guidelines for Indians – A Manual.* Hyderabad, India.

<https://www.nin.res.in/downloads/DietaryGuidelinesforNINwebsite.pdf>

INDONESIA

FAO. n.d. *Food-based Dietary Guidelines – Indonesia.* Rome.

<https://www.fao.org/nutrition/education/food-dietary-guidelines/regions/countries/indonesia/en/>

Nutriziouz. 2022. *Diet Guidelines.* Indonesia.

<https://www.nutriziouz.com/diet-guidelines/>

ITALY

FAO. 2018. *Food-based Dietary Guidelines – Italy.* Rome.

<https://www.fao.org/nutrition/education/food-dietary-guidelines/regions/countries/italy/en/>

Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria. 2018. *Linee guida per una sana alimentazione 2018.* Rome.

<https://www.crea.gov.it/web/alimenti-e-nutrizione/-/linee-guida-per-una-sana-alimentazione-2018>

Rossi, L., Canani, S.B., Censi, L., Gennaro, L., Leclercq, C., Scognamiglio, U., Sette, S. & Ghiselli, A. 2022. The 2018 revision of Italian Dietary Guidelines: development process, novelties, main recommendations, and policy implications. *Frontiers in Nutrition*, 9: 861526.

<https://doi.org/10.3389/fnut.2022.861526>

JAPAN

FAO. 2000. *Food-based Dietary Guidelines – Japan.* Rome.

<https://www.fao.org/nutrition/education/food-based-dietary-guidelines/regions/countries/japan/en/>

The Japan Dietetic Association. n.d. *Japanese Health and Nutrition Information: Dietary Guidelines.* Tokyo.

<https://www.dietitian.or.jp/english/health/>

Ministry of Health, Labour and Welfare. 2010. *About the "Dietary Balance Guide".* Tokyo.

<https://www.mhlw.go.jp/bunya/kenkou/eiyou-syokuji.html>

REPUBLIC OF KOREA

Ministry of Health and Welfare, Ministry of Agriculture, Food and Rural Affairs, Ministry of Food and Drug Safety. n.d. *9 General Dietary Guidelines for Koreans.* Seoul.

<https://onav.fr/wp-content/uploads/2021/01/General-Dietary-Guidelines-for-Koreans.pdf>

MEXICO

Government of Mexico. 2015. *Dietary and Physical Activity Guidelines in the Context of Overweight and Obesity in the Mexican Population*. Mexico City.

https://www.anmm.org.mx/publicaciones/CANivANM150/L29_ANM_Guias_alimentarias.pdf

Government of Mexico. 2019. *El Plato del Bien Comer*. Mexico City.

<https://www.gob.mx/siap/articulos/el-plato-del-bien-comer>

RUSSIAN FEDERATION

There are currently no official national FBDGs or graphic versions. National FBDGs are being developed.

SAUDI ARABIA

Saudi Ministry of Health General Directorate of Nutrition. 2012. *Dietary Guidelines for Saudis*. Riyadh.

https://www.moh.gov.sa/en/Ministry/MediaCenter/Publications/Documents/final_english_الكتاب_العلمي_إنجليزي.pdf

SOUTH AFRICA

Health Department of South Africa. 2013. *Food-based dietary guidelines for South Africa*. Kimberley, South Africa.

<https://www.fao.org/3/as842e/as842e.pdf>

Western Cape Government. 2012. *South African Food-Based Dietary Guidelines 2012*. Cape Town, South Africa.

<https://www.westerncape.gov.za/westerncape-on-wellness/south-african-food-based-dietary-guidelines-2012>

TÜRKIYE

Ministry of Health of Türkiye. 2016. *Turkey Dietary Guidelines*. Ankara.

<https://dosyasb.saglik.gov.tr/Eklenti/10922,17ocaktuberingilizcepdf.pdf?0>

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND (2016)

Public Health England. 2016. *Government Dietary Recommendations. Government recommendations for energy and nutrients for males and females aged 1 – 18 years and 19+ years*. London.

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/618167/government_dietary_recommendations.pdf

Public Health England. 2016. *From Plate to Guide: What, why and how for the Eatwell model*. London.

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/579388/eatwell_model_guide_report.pdf

UNITED STATES OF AMERICA

US Department of Agriculture and Department of Health and Human Services. *Dietary Guidelines for Americans 2020-2025*. Ninth edition. Washington, DC.

https://www.dietaryguidelines.gov/sites/default/files/2020-12/Dietary_Guidelines_for_Americans_2020-2025.pdf

US Department of Agriculture. 2020. My Plate [online]. Washington, DC. Cited 20 February 2022.

<https://www.myplate.gov>

EUROPEAN UNION

Three countries are members of the G7, G20 and European Union: France, Germany and Italy.

Bechthold, A., Boeing, H., Tetens, I., Schwingshackl, L. & Nöthlings, U. 2018. Perspective: Food-based dietary guidelines in Europe-Scientific concepts, current status, and perspectives. *Advances in Nutrition*, 9(5): 544–560.

<https://doi.org/10.1093/advances/nmy033>

EFSA (European Food Safety Authority) Panel on Dietetic Products, Nutrition and Allergies. 2010. Scientific opinion on establishing food-based dietary guidelines. *EFSA Journal*, 8(30): 1460.

<https://doi.org/10.2903/j.efsa.2010.1460>

WHO (World Health Organization) Regional Office for Europe. 2021. *Healthy and Sustainable Diets: Report of an Expert Meeting on healthy and sustainable diets*. Copenhagen.

<https://apps.who.int/iris/bitstream/handle/10665/344940/WHO-EURO-2021-3148-42906-59870-eng.pdf>

References

- Bechthold, A., Boeing, H., Tetens, I., Schwingshackl, L. & Nöthlings, U.** 2018. Perspective: food-based dietary guidelines in Europe. Scientific concepts, current status, and perspectives. *Advances in Nutrition*, 9(5): 544–560. <https://doi.org/10.1093/advances/nmy033>
- Bianchi, F., Garnett, E., Dorsel, C., Aveyard, P. & Jebb, S.A.** 2018. Restructuring physical micro-environments to reduce the demand for meat: a systematic review and qualitative comparative analysis. *Lancet Planet Health*, 2: e384–e397. [https://doi.org/10.1016/S2542-5196\(18\)30188-8](https://doi.org/10.1016/S2542-5196(18)30188-8)
- Binns, C.W., Lee, M.K., Maycock, B., Tornheim, L.E., Nanishi, K. & Duong, D.T.T.** 2021. Climate change, food supply, and dietary guidelines. *Annual Review of Public Health*, 42: 233–255. <https://doi.org/10.1146/annurev-publhealth-012420-105044>
- Blondin, S., Attwood, S., Vennard, D. & Mayneris, V.** 2022. *Environmental Messages Promote Plant-Based Food Choices: An Online Restaurant Menu Study*. Working Paper. Washington, DC, World Resources Institute. <https://doi.org/10.46830/wriwp.20.00137>
- Bouvard, V., Loomis, D., Guyton, K.Z., Grosse, Y., El Ghissassi, F., Benbrahim-Tallaa, L., Guha, N., Mattock, H. & Straif, K.** 2015. Carcinogenicity of consumption of red and processed meat. *The Lancet Oncology*, 16(16): 1599–1600. [https://doi.org/10.1016/S1470-2045\(15\)00444-1](https://doi.org/10.1016/S1470-2045(15)00444-1)
- Brink, E., van Rossum, C., Postma-Smeets, A., Stafleu, A., Wolvers, D., Van Dooren, C., Toxopeus, I., Buurma-Rethens, E., Guerts, M. & Ocké, M.** 2019. Development of healthy and sustainable food-based dietary guidelines for the Netherlands. *Public Health Nutrition*, 22(13): 2419–2435. <https://doi.org/10.1017/S1368980019001435>
- Chung, M.G., Li, Y. & Liu, J.** 2021. Global red and processed meat trade and non-communicable diseases. *BMJ Global Health*, 6(11): e006394. <http://dx.doi.org/10.1136/bmjgh-2021-006394>
- Clare, K., Maani, N. & Milner, J.** 2022. Meat, money and messaging: how the environmental and health harms of red and processed meat consumption are framed by the meat industry. *Food Policy*, 109: 102234. <https://doi.org/10.1016/j.foodpol.2022.102234>
- Clifford Astbury, C., Aguirre, E., Cullerton, K., Monsivais, P. & Penney, T.L.** 2021. How supportive is the global food supply of food-based dietary guidelines? A descriptive time series analysis of food supply alignment from 1961 to 2013. *SSM Population Health*, 15: 100866. <https://doi.org/10.1016/j.ssmph.2021.100866>
- Climate & Clean Air Coalition.** 2022. Global Methane Pledge: Fast action on methane to keep a 1.5° C future within reach [online]. Paris. Cited 23 February 2022. <https://www.globalmethanepledge.org/>
- Culinary Institute of America & Harvard T.H. Chan School of Public Health.** 2021. *Menus of Change: The Business of Healthy, Sustainable, Delicious Food Choices* [online]. New York and Cambridge, MA. Cited 21 July 2022. <https://www.menusofchange.org/>
- Debries, S. & Willett, W.** 2021. *Sustainable Diets* [online]. The Gaples Institute and Harvard T.H. Chan School of Public Health. Deerfield, IL and Cambridge, MA. Cited 2 February 2022. <https://www.gaplesinstitute.org/sustainable-diets/>
- De Moor, J., De Vydt, M., Uba, K. & Wahlström, M.** 2021. New kids on the block: taking stock of the recent cycle of climate activism. *Social Movement Studies* 20(5): 619–625. <https://doi.org/10.1080/14742837.2020.1836617>
- EAT Forum.** 2022a. *The Planetary Health Diet* [online]. Oslo. Cited 2 February 2022. <https://eatforum.org/learn-and-discover/the-planetary-health-diet/>
- EAT Forum.** 2022b. *C40 Good Food Cities Declaration* [online]. Oslo. Cited 25 May 2022. <https://eatforum.org/learn-and-discover/c40-good-food-cities-declaration/>
- EFSA (European Food Safety Authority) Panel on Dietetic Products, Nutrition and Allergies.** 2010. Scientific opinion on establishing food-based dietary guidelines. *EFSA Journal*, 8(30): 1460. <https://doi.org/10.2903/j.efsa.2010.1460>
- FAO.** 2022. *Food-based dietary guidelines*. Rome. Cited 20 February 2022. <https://www.fao.org/nutrition/nutrition-education/food-dietary-guidelines/en/>
- German National Academy of Sciences.** 2022. G7 and G20 policy advice. Halle (Saale), Germany. Cited 18 July 2022. <https://www.leopoldina.org/en/international/g7-and-g20-policy-advice/>
- G20 Indonesia 2022.** 2022. *About the G20* [online]. Jakarta. Cited 18 July 2022. <https://g20.org/about-the-g20/#:~:text=The%20members%20of%20the%20G20,invited%20as%20a%20permanent%20guest>

- G20 Indonesia 2022.** 2022. *G20 Presidency of Indonesia: Recover Together, Recover Stronger*. Jakarta. Cited 2 February 2022. <https://g20.org/>
- Harvard T.H. Chan School of Public Health.** 2022. The Nutrition Source: Processed foods and health [online]. Cited 18 July 2022. <https://www.hsph.harvard.edu/nutritionsource/processed-foods/>
- Henderson, L. & Hilton, S.** 2018. The media and public health: where next for critical analysis? *Critical Public Health*, 28(4): 373–376. <https://doi.org/10.1080/09581596.2018.1482663>
- Herforth, A., Arimond, M., Álvarez-Sánchez, C., Coates, J., Christianson, K. & Muehlhoff, E.** 2019. A global review of food-based dietary guidelines. *Advances in Nutrition*, 10(4): 590–605. <https://doi.org/10.1093/advances/nmz055>
- Hicks, T.M., Knowles, S.O. & Farouk, M.M.** 2018. Global provisioning of red meat for flexitarian diets. *Frontiers in Nutrition*, 5: 50. <https://doi.org/10.3389/fnut.2018.00050>
- Howard, P.H., Ajena, F., Yamaoka, M. & Clarke, A.** 2021. “Protein” industry convergence and Its implications for resilient and equitable food systems. *Frontiers in Sustainable Food Systems*, 5:684181 1–15. <https://doi.org/10.3389/fsufs.2021.684181>
- IPCC (Intergovernmental Panel on Climate Change).** 2022. *Climate Change 2022: Mitigation of Climate Change Summary for Policymakers*. Working Group III contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Geneva, Switzerland. https://report.ipcc.ch/ar6wg3/pdf/IPCC_AR6_WGIII_SummaryForPolicymakers.pdf
- Iqbal, R., Dehghan, M., Mente, A., Rangarajan, S., Wielgosz, A., Avezum, A. et al.** 2021. Associations of unprocessed and processed meat intake with mortality and cardiovascular disease in 21 countries [Prospective Urban Rural Epidemiology (PURE) Study]: a prospective cohort study. *American Journal of Clinical Nutrition*, 114: 1049–1058. <https://doi.org/10.1093/ajcn/nqaa448>
- Kim, B.F., Santo, R.E., Scatterday, A.P., Fry, J.P., Synk, C.M., Cebon, S.R. et al.** 2020. Country-specific dietary shifts to mitigate climate and water crises. *Global Environmental Change*, 62: 101926. <https://doi.org/10.1016/j.gloenvcha.2019.05.010>
- Kovacs, B., Miller, L., Heller, M.C. & Rose, D.** 2021. The carbon footprint of dietary guidelines around the world: a seven country modeling study. *Nutrition Journal*, 20: 15. <https://doi.org/10.1186/s12937-021-00669-6>
- Kraak, V.** 2022. Perspective: Unpacking the wicked challenges for alternative proteins in the United States: Can highly processed plant-based and cell-cultured food and beverage products support healthy and sustainable diets and food systems? *Advances in Nutrition*, 13(1): 38–47. <https://doi.org/10.1093/advances/nmab113>
- Lazarus, O., McDermid, S. & Jacquet, J.** 2021. The climate responsibilities of industrial meat and dairy producers. *Climate Change*, 165: 30. <https://doi.org/10.1007/s10584-021-03047-7>
- Leme, A.C.B., Hou, S., Fisberg, R.M., Fisberg, M. & Haines, J.** 2021. Adherence to food-based dietary guidelines: a systemic review of high-income and low- and middle-income countries. *Nutrients*, 13(3): 1038. <https://doi.org/10.3390/nu13031038>
- Loken, B. & DeClerck, F.** 2020. *Diets for a Better Future: Rebooting and Reimagining Healthy and Sustainable Food Systems in the G20*. Oslo: Eat Forum. https://eatforum.org/content/uploads/2020/07/Diets-for-a-Better-Future_G20_National-Dietary-Guidelines.pdf
- McCoy, T. & Ledur, J.** 2022. The Amazon, undone. Devouring the rainforest. *Washington Post*, 29 April 2022. <https://www.washingtonpost.com/world/interactive/2022/amazon-beef-deforestation-brazil/>
- Milford, A.B., Le Mouél, C., Bodirsky, B.L. & Rolinski, S.** 2019. Drivers of meat consumption. *Appetite*, 141: 104313. <https://doi.org/10.1016/j.appet.2019.06.005>
- Miller, V., Reedy, J., Cudhea, F., Zhang, J., Shi, P., Erndt-Marino, J. et al.** 2022. Global, regional, and national consumption of animal-source foods between 1990 and 2018: findings from the Global Dietary Database. *The Lancet Planet Health*, 6(3): e243–e256. [https://doi.org/10.1016/S2542-5196\(21\)00352-1](https://doi.org/10.1016/S2542-5196(21)00352-1)
- OECD (Organisation for Economic Cooperation and Development).** 2021a. *OECD-FAO Agricultural Outlook 2020-2029: Meat*. Paris, OECD iLibrary. Cited 18 July 2022. <https://www.oecd-ilibrary.org/sites/29248f46-en/index.html?itemId=/content/component/29248f46-en>

- OECD.** 2021b. Meat Consumption [online database]. OECD-FAO Agricultural Outlook. Paris. Cited 18 July 2022. <https://data.oecd.org/agroutput/meat-consumption.htm>
- OECD.** 2021c. Bovine Meat Exporters and Importers Trade by Country [online database]. Paris. Cited 18 July 2022. <https://oec.world/en/profile/hs92/bovine-meat>
- Papier, K., Knuppel, A., Syam, N., Jebb, S.A. & Key, T.J.** 2021. Meat consumption and risk of ischemic heart disease: a systematic review and meta-analysis. *Critical Reviews in Food Science and Nutrition*: 1–12. <https://doi.org/10.1080/10408398.2021.1949575>
- Parlasca, M.C. & Qaim, M.** 2022. Meat consumption and sustainability. *Annual Review of Resource Economics*, 14: 6.1–6.25. <https://doi.org/10.1146/annurev-resource-111820-032340>
- Sexton, A.E.** 2020. Food as software: place, protein, and feeding the world Silicon Valley-style. *Economic Geography*, 96(5): 449–469. <https://doi.org/10.1080/00130095.2020.1834382>
- Sievert, K., Lawrence, M., Parker, C. & Baker, P.** 2021. Understanding the political challenge of red and processed meat reduction for healthy and sustainable food systems: a narrative review of the literature. *International Journal of Health Policy and Management*, 10: 793–808. <http://dx.doi.org/10.34172/ijhpm.2020.238>
- Sievert, K., Lawrence, M., Parker, C., Russell, C.A. & Baker, P.** 2022. Who has a beef with reducing red and processed meat consumption? A media framing analysis. *Public Health Nutrition*, 25(3): 578–590. <https://dx.doi.org/10.1017/S1368980021004092>
- Springmann, M., Spajic, L., Clark, M.A., Poore, J., Herforth, A., Webb, P., Rayner, M. & Scarborough, P.** 2020. The healthiness and sustainability of national and global food based dietary guidelines: modelling study. *BMJ*, 370: m2322. <https://doi.org/10.1136/bmj.m2322>
- Statista Research Department.** 2021. Per Capita Meat Consumption in European Countries 2015–2022 [online database]. New York. Cited 18 July 2022. <https://www.statista.com/forecasts/679528/per-capita-meat-consumption-european-union-eu>
- Stiles, G., Collins, J. & Beck, K.L.** 2022. Effectiveness of strategies to decrease animal-sourced protein and/or increase plant-sourced protein in foodservice settings: a systematic literature review. *Journal of the Academy of Nutrition and Dietetics*, 122(5): 1013–1048. <https://doi.org/10.1016/j.jand.2021.12.010>
- Sun, Z., Scherer, L., Tukker, A., Spawn-Lee, S.A., Bruckner, M., Gibbs, H.K. & Behrens, P.** 2022. Dietary change in high-income nations alone can lead to substantial double climate dividend. *Nature Food*, 3: 29–37. <https://doi.org/10.1038/s43016-021-00431-5>
- Swinburn, B., Kraak, V., Allender, S., Atkins, V.J., Baker, P.I., Bogard, J.R. et al.** 2019. The global syndemic of obesity, undernutrition, and climate change: The Lancet Commission report. *The Lancet*, 393(10173): 791–846. [http://dx.doi.org/10.1016/S0140-6736\(18\)32822-8](http://dx.doi.org/10.1016/S0140-6736(18)32822-8)
- Trading Economics.** 2022. GDP: G20 [online database]. New York. Cited 18 July 2022. <https://tradingeconomics.com/country-list/gdp?continent=g20>
- UNDESA (United Nations Department of Economic and Social Affairs).** 2022. *Sustainable Development: The 17 Goals* [online]. New York. Cited 18 July 2022. <https://sdgs.un.org/goals>
- UNDP (United Nations Development Programme) & Oxford University.** 2021a. *Peoples' Climate Vote: Results*. New York and Oxford, UK. <https://www.undp.org/publications/peoples-climate-vote>
- UNDP & Oxford University.** 2021b. *The G20 Peoples' Climate Vote*. New York and Oxford, UK. <https://www.undp.org/publications/g20-peoples-climate-vote-2021>
- Wilde, P., Pomeranz, J.L., Lizewski, L.J., Ruan, M., Mozaffarian, D. & Zhang, F.F.** 2019. Legal feasibility of US government policies to reduce cancer risk by reducing intake of processed meat. *The Milbank Quarterly*, 97(2): 420–448. <https://doi.org/10.1111/1468-0009.12385>
- Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S. et al.** 2019. Food in the Anthropocene: the EAT-Lancet Commission on healthy diets from sustainable food systems. *The Lancet*, 393(10170): 447–492. [https://doi.org/10.1016/S0140-6736\(18\)31788-4](https://doi.org/10.1016/S0140-6736(18)31788-4)

WCRFI (World Cancer Research Fund International) & AICR (American Institute for Cancer Research). 2018. *Continuous Update Project. Recommendations and public health and policy implications.* London and Arlington, VA.

<https://www.wcrf.org/wp-content/uploads/2021/01/Recommendations.pdf>

WHO (World Health Organization) Regional Office for Europe. 2021a. *Healthy and Sustainable Diets Report of an Expert Meeting on healthy and sustainable diets.* Copenhagen.

<https://apps.who.int/iris/bitstream/handle/10665/344940/WHO-EURO-2021-3148-42906-59870-eng.pdf>

WHO Regional Office for Europe. 2021b. *Plant-based diets and their impact on health, sustainability and the environment. A review of the evidence.* Copenhagen, WHO European Office for the Prevention and Control of Noncommunicable Diseases.

<https://apps.who.int/iris/bitstream/handle/10665/349086/WHO-EURO-2021-4007-43766-61591-eng.pdf?sequence=1&isAllowed=y>

World Wildlife Fund. 2022. *The Journey to Corporate Protein Disclosure.* Gland, Switzerland.

<https://www.wwf.org.uk/sites/default/files/2022-03/Protein-Disclosure-Guide.pdf>

Zu Ermgassen, E.K.H.J., Godar, J., Lathuillière, M.J., Löfgren, P., Gardner, T., Vasconcelos, A. & Meyfroidt, P. 2020. The origin, supply chain, and deforestation risk of Brazil's beef exports. *Proceedings of the National Academy of Sciences of the United States of America*, 15(117) 31770–31779. <https://doi.org/10.1073/pnas.2003270117>



GLOBAL INNOVATIONS

Enhancing nutrition action through accountability and transparency

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Poor diet and malnutrition in all its forms are among the greatest global health, equity and societal challenges of our time. It is estimated that 11 million adults die each year from diet-related diseases (GNR, 2021). Around 150 million children are stunted and 45 million are wasted thanks to both chronic and acute undernutrition during the first five years of life (GNR, 2021). At the same time, overweight and obesity afflict 2.2 billion adults and 38.9 million children under five years of age around the globe (GNR, 2021).

This double burden of malnutrition – the coexistence of undernutrition and diet-related chronic diseases – is the top cause of poor health in the world, especially in low- and middle-income countries (Popkin, Corvalan and Grummer-Strawn, 2020). Moreover, the double burden is most prevalent in the poorest regions of the world, such as sub-Saharan Africa and southeast Asia and the Pacific (Popkin, Corvalan and Grummer-Strawn, 2020).

National governments, multilateral organizations and the leaders of the Group of Seven (G7) industrialized nations have called for more action, stronger governance and greater accountability in addressing these nutritional challenges to achieve Sustainable Development Goal 2 (SDG 2, Zero Hunger), SDG 3 (good health and well-being) and the global nutrition targets set by the World Health Assembly (see, for example, G7, 2021; Nutrition for Growth Summit, n.d.). With

the worsening impacts of poor diet and climate change, the need for more nutritious, equitable, resilient and sustainable food and health systems has never been more urgent.

The current challenges facing countries with high rates of food insecurity will increase even further as the ongoing war in Ukraine drives up food and fuel prices and threatens humanitarian aid to the most vulnerable. At the same time, rates of obesity, diabetes and other diet-related diseases continue to rise in every nation in the world. This decade must be a turning point for all stakeholders that can have an impact on nutrition – including, but not limited to, governments, international and multilateral organizations, philanthropic organizations, the private sector and civil-society actors – to drive action and collaboration to win the fight against poor diet and malnutrition.

Born of the first Nutrition for Growth (N4G) Summit in 2013, the Global Nutrition Report (GNR) has been tracking the progress made by countries and other key actors around the world on meeting the N4G commitments to improve nutrition (GNR, n.d.). To support the shared goals of ending poor diet and malnutrition in all its forms, the GNR has built on its existing tools to create a robust accountability platform to monitor nutrition actions based on common principles, methods and approaches: the Nutrition Accountability Framework (NAF) (Micha, Karageorgou and

Figure 1. The NAF: A global accountability framework for nutrition action

SOURCE: Micha, R., Karageorgou, D. & Wu, J. 2021. About the Nutrition Accountability Framework. In: *Global Nutrition Report*. Bristol, UK: Development Initiatives. <https://globalnutritionreport.org/resources/naf/about/>

Wu, 2021). The NAF will become the primary global public resource for tracking progress on nutrition commitments. The transparency provided by the NAF creates a continuous learning process that enables stakeholders to identify, refine and steer priority nutrition actions to address changing needs at national, regional and global level.

The need for SMART (specific, measurable, achievable, relevant and time-bound) commitments has long been recognized as essential (GNR, 2017). However, clear criteria for assessing the SMARTness of nutrition commitments have been missing. The NAF addresses these gaps by defining common principles for monitoring, while also ensuring that nutrition commitments are SMART. The full cycle of the NAF includes (1) formulating and registering SMART commitments, (2) reporting on progress annually, and (3) planning and taking further action where needed (Figure 1).

The NAF was launched in September 2021 as the formal accountability mechanism for the Tokyo Nutrition for Growth Summit that took place in December 2021. This is the first time that accountability for nutrition commitments was prioritized, and the NAF facilitated the formulation and registration of SMART N4G commitments. At the Summit, the NAF recorded 396 new nutrition commitments made by 181 stakeholders from 78 countries (Nutrition for Growth Summit, 2021).

How the NAF helps to strengthen accountability

A fundamental principle of working with a wide range of stakeholders is to ensure that the process and reporting system is transparent and that members are accountable for the data provided and reported. Endorsed by key stakeholders – the government of Japan, the Scaling Up Nutrition (SUN) Movement, the World Health Organization, the United Nations Children’s Fund, the United States Agency for International Development and others – the NAF is designed to ensure that a transparent accountability system is in place.

With commitment data available online and visible to pledgers and the public, alongside a unified approach to registration, the dissemination of commitments and progress increases the general understanding of accountability among stakeholders. Thus, the NAF bolsters accountability by creating an enabling environment in which stakeholders have a common language and can cooperate to address malnutrition around the globe by holding each other to account. What’s more, the fact that all NAF data are managed by the GNR Independent Expert Group, in line with the NAF values of transparency and excellence, increases trust in the data.

On the topic of data, the NAF also builds trust among stakeholders by asking all commitment makers to use the NAF to encourage transparency in the nutrition community across sectors and beyond Nutrition for Growth. The Dalai Lama once said that “a lack of transparency results in distrust and a deep sense of insecurity” (Nelson, 2012). The NAF’s fundamental principle of transparency aims to help build trust among different stakeholders across sectors.

How to improve accountability and transparency in nutrition actions

To address the complex issue of malnutrition in all its forms, a transparent, consistent and systematic approach to stakeholder accountability is essential. To date, there has been lack of global accountability for most nutrition actions, including programmes, investments and interventions, be they led by governments, the private sector or civil-society actors. There has also been insufficient cross-stakeholder communication and trust.

To address this, action is needed to promote accountability on a broader scale and improve information-sharing and trust among stakeholders. By recording nutrition commitments and establishing common principles for monitoring global nutrition accountability, the NAF aims to become the primary public resource for tracking progress on nutrition commitments (GNR, n.d.).

The NAF allows diverse stakeholders, including national governments, civil society and the private sector, to make SMART, public commitments to address nutrition. Transparency allows stakeholders and the public to understand how the NAF is built and the extent to which stakeholders are addressing nutrition issues. Through the NAF, key gaps in knowledge can be identified and action to close such gaps can become possible through shared knowledge and integrated reporting by all who follow it. As presented above, the NAF is designed to support stakeholders in defining and shaping commitment goals in a transparent, consistent and systematic manner (Figure 1). The NAF is also a key component in addressing malnutrition in all its forms by identifying shortfalls in action and knowledge on best practices or approaches to reducing the prevalence of the double burden of malnutrition.

For example, the weaknesses and vulnerabilities of global food systems have been widely exposed by the COVID-19 pandemic and the war in Ukraine, including supply-chain problems, reduced production, the transport of food within and across borders, and the strong interlinkages of diet-related diseases and poor outcomes from the pandemic. Yet, as witnessed during the pandemic, food aid and vaccines against COVID-19 were distributed in an unequal manner, both between and within nations, exacerbating existing inequalities in health and disease. These gaps are not always obvious at the start of a crisis, but can become more predictable once data are available. The NAF has the potential to provide such critical data, enabling stakeholders to be prepared.

This renders the NAF an even more timely and essential tool that has the potential to encourage and promote communication by creating a space for stakeholders to access data that can be used for communication and cooperation across the many sectors of the food, nutrition and health communities. Moreover, the NAF has immense potential to support stakeholders working across food systems in providing coherent and transparent goals that can be used to better understand how potential disruptions may impact nutrition. Using the NAF will then allow for reporting and monitoring of these actions to address both undernutrition and diet-related diseases (Micha, Karageorgou and Wu, 2021).

Conclusions

To achieve the SDGs, Member Nations and diverse national and multinational stakeholders must address poor diets and malnutrition in all its forms. Success requires specific goals, transparency and accountability. The NAF provides an open, consistent approach to stakeholder accountability, incorporating SMART commitments, annual reporting on progress, and further actions and planning. This platform has enormous potential to support stakeholders working in different sectors in creating innovations and disruptions to achieve a nutritious, equitable and sustainable food system.

References

- G7.** 2021. *Carbis Bay G7 Summit Communique: Our Shared Agenda for Global Action to Build Back Better*. Cornwall, UK. <https://www.consilium.europa.eu/media/50361/carbis-bay-g7-summit-communique.pdf>
- Global Nutrition Report.** 2017. *Nourishing the SDGs*. Bristol, UK, Development Initiatives. <https://globalnutritionreport.org/reports/2017-global-nutrition-report/>
- Global Nutrition Report.** 2021. *The state of global nutrition*. Bristol, UK, Development Initiatives. <https://globalnutritionreport.org/reports/2021-global-nutrition-report/>
- Global Nutrition Report.** n.d. About the Global Nutrition Report. In: *Global Nutrition Report*. Bristol, UK, Development Initiatives. Cited 24 May 2022. <https://globalnutritionreport.org/about/>
- Micha, R., Wu, J. & Karageorgu, D.** 2021. The Nutrition Action Classification System. In: *Global Nutrition Report*. Bristol, UK, Development Initiatives. Cited 24 May 2022. <https://globalnutritionreport.org/resources/naf/classification-system/>
- Micha, R., Karageorgou, D. & Wu, J.** 2021. About the Nutrition Accountability Framework. In: *Global Nutrition Report*. Bristol, UK, Development Initiatives. Cited 24 May 2022. <https://globalnutritionreport.org/resources/naf/about/>
- Nelson, D.** 2012. Dalai Lama: What do I really fear? Being eaten by sharks. *The Telegraph*, 13 May 2012. <https://www.telegraph.co.uk/news/worldnews/asia/ibet/9261750/Dalai-Lama-What-do-I-really-fear-Being-eaten-by-sharks.html>
- Nutrition for Growth Summit.** 2021. *Tokyo Compact on Global Nutrition for Growth Annex: Commitments*. Tokyo. <https://www.mofa.go.jp/mofaj/files/100275456.pdf>
- Nutrition for Growth Summit.** 2021. *Tokyo Nutrition Summit & UN Food Systems Summit*. Tokyo. https://nutritionforgrowth.org/wp-content/uploads/2021/09/N4G_UN_FoodSysSummit_9.23-1.pdf
- Popkin, B.M., Corvalan, C. & Grummer-Strawn, L.M.** 2020. Dynamics of the double burden of malnutrition and the changing nutrition reality. *The Lancet*, 395(10217): 65–74. <https://pubmed.ncbi.nlm.nih.gov/31852602/>



The “living” evidence gap map: Facilitating access to food systems and nutrition knowledge

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We are more than halfway through the Decade of Action on Nutrition (2016–2025), for which the United Nations identified six action areas essential to transforming nutrition around the world (FAO and WHO, 2020). The transformation of the food system outlined in action area 1 is crucial to achieving Sustainable Development Goal 2 (SDG 2): Zero Hunger. This goal currently appears harder to reach than ever (FAO *et al.*, 2020). To get back on track, policymakers need to make evidence-informed decisions based on what works, for whom and at what cost. The 2021 Nutrition for Growth (N4G) Summit in Tokyo came to the same conclusion: evidence of effective food systems-related interventions is crucial to advancing nutrition (N4G Summit, 2021).

Responding to this need, the International Initiative for Impact Evaluation (3ie) created an evidence gap map (EGM) for food systems and nutrition in 2021. The EGM was commissioned and funded by Germany's Federal Ministry for Economic Cooperation and Development through the Germany's Federal Ministry for Economic Cooperation and Development (BMZ) Knowledge for Nutrition programme. To make the latest evidence easily accessible to stakeholders, it has now been converted into the first ever “living EGM”. Through continuous updates until March 2023, it provides quarterly updates on newly identified studies on and developments in previously identified evidence gaps.

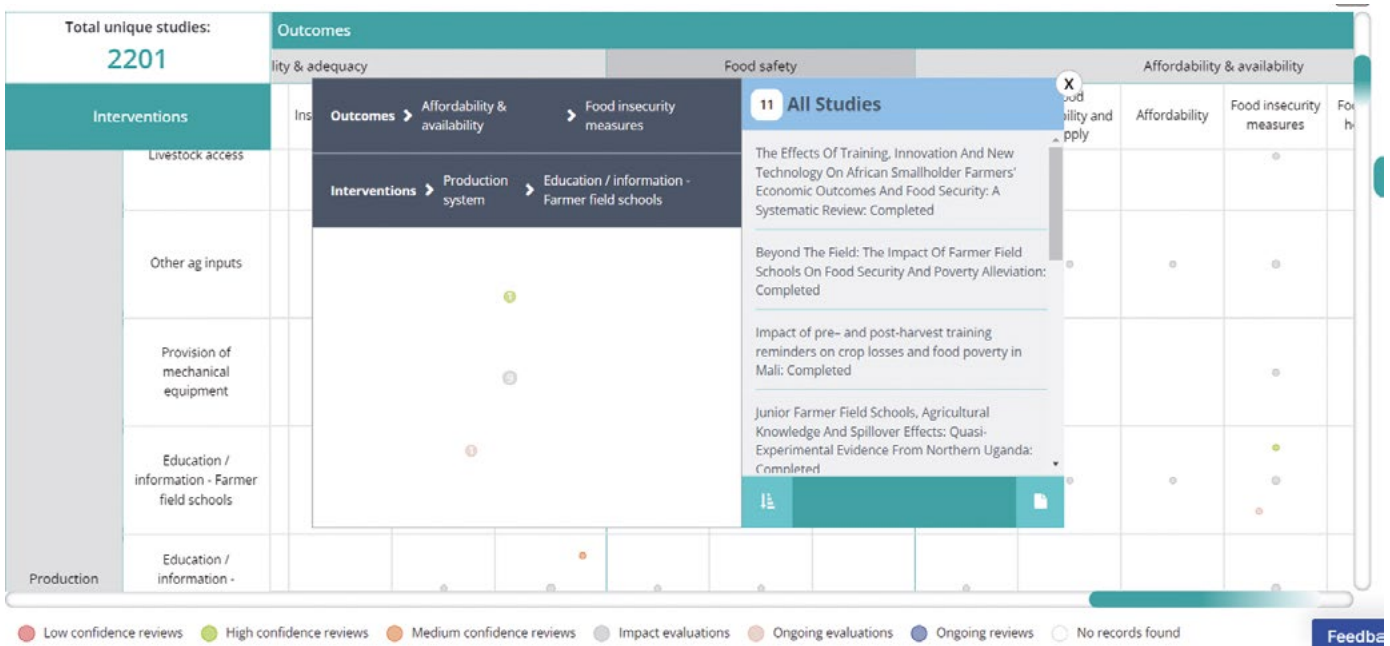
EGMs are interactive, innovative tools pioneered by 3ie. They systematically collate available evidence, identify evidence

gaps and support evidence production. To make EGMs, we develop a fixed framework, with interventions represented as rows of a matrix and outcomes represented as columns (see Figure 1; for definitions, see addendum).

Our framework is validated by an advisory board made up of academic and implementing stakeholders. We then conduct a systematic search of academic databases and grey literature to identify all relevant impact evaluations and systematic reviews of impact evaluations. The search and screening process resembles that of a systematic review. Rigorous inclusion/exclusion criteria are applied to make sure the studies included meet methodological standards (see addendum).

Studies are then assigned to cells in the framework reflecting the intervention-outcome combinations they consider. Bubbles are used to represent the studies, with the size of the bubble reflecting the number of studies in that cell. By selecting a bubble, stakeholders can find a list of all studies within that cell, directly linking to the articles. Systematic reviews are colour coded using a traffic-light system to represent review quality. Due to the number of impact evaluations, we did not score them on quality; rather, all impact evaluations that adopted includable methods are represented in the map. Several EGMs on nutrition have been published recently: one on innovative metrics and methods to study agriculture to nutrition pathways (Sparling *et al.*, 2021a) and another on nutrition and mental health (Sparling *et al.*, 2021b).

Figure 1. Screenshot of the online interactive tool



NOTE: Interventions represent rows and columns represent outcomes. Evaluations are put into cells reflecting the intervention-outcome combination they evaluate. Hovering the mouse over a cell reveals the references within that cell. The 11 impact evaluations in the figure consider the relationship between farmer field schools and food insecurity measures.

SOURCE: Moore, N., Lane, C., Storhaug, I., Franich, A., Rolker, H., Furgeson, J., Sparling, T. & Snilstveit, B. 2021. Food Systems and Nutrition Evidence Gap Map [online]. New Delhi, 3ie. Cited 31 July 2022. <https://developmentevidence.3ieimpact.org/egm/food-systems-and-nutrition-evidence-gap-map>

EGMs are an innovative tool for driving the research agenda. They function through two primary pathways.

Pathway 1: Improve accessibility of research

EGMs present an accessible database that can be easily navigated. Users can identify relevant articles on:

- an intervention-outcome combination of interests, by looking at a single cell;
- a specific type of intervention and the different outcomes evaluated, by looking across a row;
- a specific type of outcome and associated interventions, by looking down a column.

Stakeholders can consider how interventions outside of their immediate discipline affect outcomes of interest, or how their intervention affects outcomes not previously considered. These perspectives can support interdisciplinary collaboration and open new avenues for research on food systems and nutrition. EGMs also help stakeholders to identify context-specific evidence through filter options. Users can select a specific region, country, sex, age group or setting. They can specify a methodology, such as mixed-method evaluation or cost evidence. Using the EGM to identify relevant studies, stakeholders can

then conduct their own analytical synthesis in their area of interest. The findings from the food systems and nutrition EGM have already expedited a rapid synthesis of evidence on women's empowerment and fiscal policies (upcoming publications) by reducing screening requirements.

Pathway 2: Describe the evidence base

EGMs can form the basis of discussions about the prioritization and production of necessary research.

By looking at the distribution of the evidence base, EGM users can quickly see where studies are clustered or lacking. Additional primary research can be undertaken to fill relevant evidence gaps. In areas where there is sufficient primary research, synthesis work can be supported.

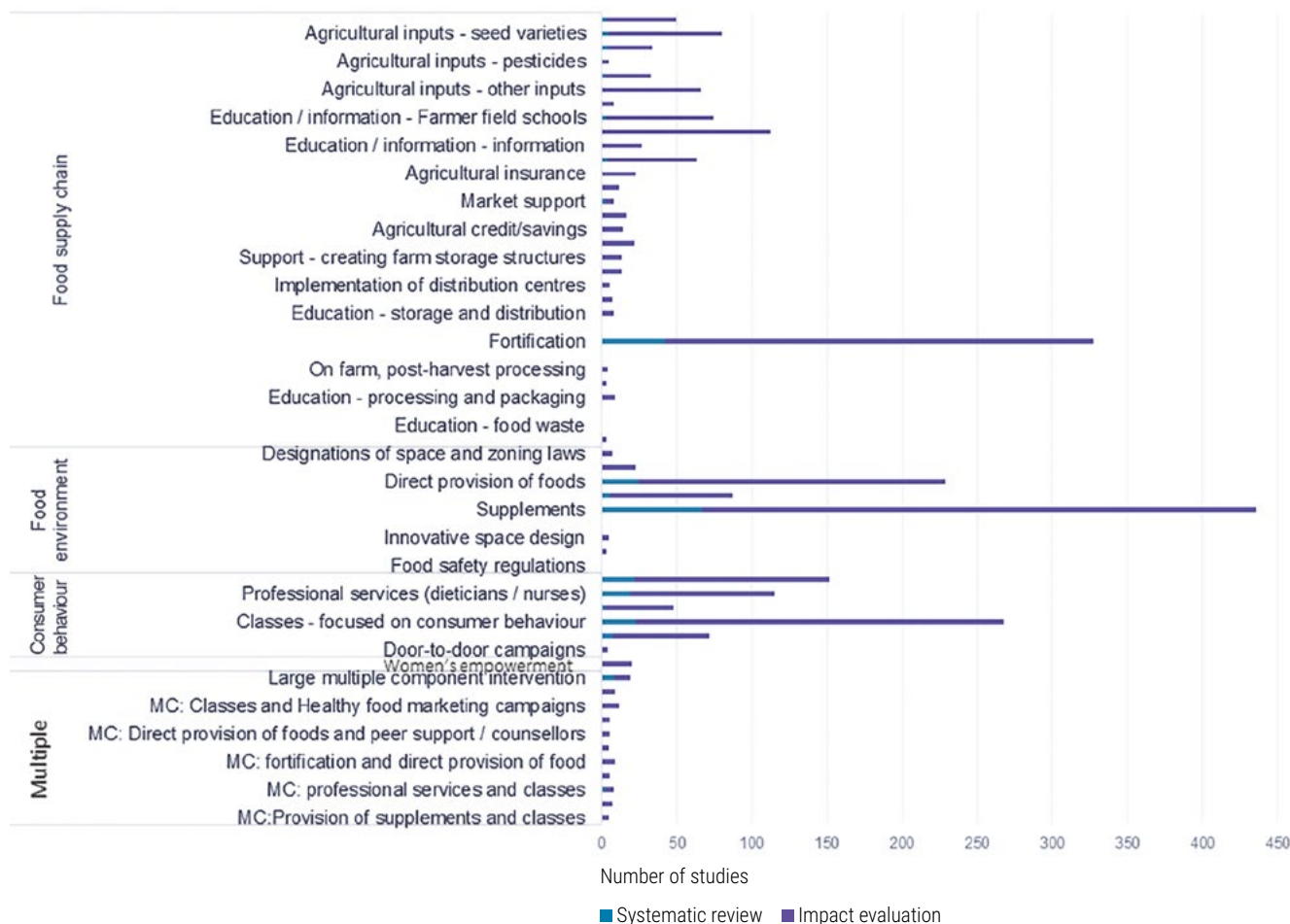
Highlights of the first instalment of the food systems and nutrition EGM

In early 2021, 3ie launched its largest-ever EGM (2 016 studies). Our [Food Systems and Nutrition Evidence Gap Map](#) presents all impact evaluations and systematic reviews of impact evaluations considering food security and nutrition within food systems in low- and middle-income countries (LMICs) published since 2000 (Moore *et al.*, 2021).

We chose to focus this EGM on LMICs, since the constraints experienced in high-income countries (HICs) and LMICs are quite different. This approach was validated by our research funder and advisory group.

Evaluations disproportionately considered supplement provision (20 percent), fortification (16 percent), direct food provision (11 percent) and peer support and counselling targeting consumer behaviour (7 percent) (Figure 2).

Figure 2. Distribution of impact evaluations and systematic reviews based on the intervention they consider



SOURCE: Based on Moore, N., Lane, C., Storhaug, I., Franich, A., Rolker, H., Furgeson, J., Sparling, T. & Shilstveit, B. 2021. *The effects of food systems interventions on food security and nutrition outcomes in low- and middle-income countries*. New Delhi, 3ie. <http://www.3ieimpact.org/sites/default/files/2021-01/EGM16-GIZ-FSN.pdf>

No impact evaluations studied advertising regulations, food-waste education programmes or packaging. Very few evaluations investigated governmental price manipulation (such as taxes or subsidies), women’s decision-making interventions, or women’s empowerment and environmental outcomes. There were many impact evaluations of interventions relating to agricultural extension, agricultural information provision and agricultural insurance, but few systematic reviews.

Impact evaluations were primarily conducted in sub-Saharan Africa (33 percent), South Asia (20 percent) and East Asia and the Pacific (17 percent), and mostly in rural settings. The vast majority of evaluations took place at the local and subnational level, resulting in less evidence on national and transnational interventions. This might be explained by a reliance on randomized controlled trials, which are harder to implement at national level. Roughly three-quarters of impact evaluations employed randomized designs.

Using the EGM: Areas for future research

Few studies examined interventions to support or measure **women's empowerment**. Women experience significant vulnerabilities within the food system and can drive positive change (Njuki *et al.*, 2021). Investments in women's empowerment are increasing. Rigorous impact evaluations are needed to ensure they achieve expected results.

Interventions related to governmental manipulation of prices (taxes and subsidies) and advertising and labelling regulations require additional evaluation. The widespread support for these policies (GLOPAN, 2021; von Braun *et al.*, 2021) without proper evaluation is a concern, given the number of people they affect. Taxes on sugar-sweetened beverages and labelling regulations for unhealthy foods have not been evaluated for their impacts on weight, yet more than 40 countries (including LMICs) tax sugar-sweetened beverages, while several (Brazil, China and Thailand) have adopted labelling regulations (Zhang *et al.*, 2014; Obesity Evidence Hub, 2020).

More work needs to consider the impacts of food systems interventions on the environment. The food system contributes significantly to global warming (Loken and DeClerck, 2020). Reducing carbon emissions while maintaining a healthy diet necessitates a total transformation of the food system. Although calls for this are increasing, action has been slow.

Lastly, we need systematic reviews that consider the effects of educational efforts within the food supply chain. Strengthening capacity within the food system has been identified as a promising approach for its transformation (Food Systems Summit, 2021). Many evaluations have been conducted in this area, but synthesis is lacking. We need to move from the question of "did it work once?" to "do these interventions generally work and in which contexts?"

Further findings for additional evaluation or synthesis work are grouped and listed below:

Additional interventions to evaluate

- On-farm, post-harvest processing
- Food packaging
- Innovative store design
- Cold-chain storage

Additional outcomes to consider

- Economic, social and political stability
- Food loss
- Insufficient diet measures

Additional opportunities for synthesis

- Agricultural extension and information-sharing within the food value chain
- Free or reduced-cost farm input provision for crop production
- Agricultural insurance products
- Outcomes related to other dietary measures

Highlights from the EGM update: are we filling the gaps?

In January 2022, we published our first update to the original food systems and nutrition EGM. The first update search was conducted in July 2021 (searches for the original EGM were conducted in May 2020) and resulted in 74 new studies. The [update](#) showed (Lane *et al.*, 2021):

- **A focus on the food supply chain:** Most of the new studies were concerned with the food supply chain (n=52), specifically the production system (n=42).
- **Continued growth of well-represented areas of research:** We found more studies on peer support and counselling (n=9), classes on consumer behaviour (n=6), and fortification (n=5).
- **A move towards quasi-experimental designs:** Eighty percent of studies in the original EGM used experimental designs, compared with 59 percent in the update. Statistical matching (n=11) and difference-in-difference (n=9) are becoming more common.
- **Filling gaps in the original EGM:** New studies were published on governmental price manipulation (n=1), women's empowerment (n=1) and insufficient diet measures (n=1). We also found three protocols for studies filling gaps in women's empowerment (n=2) and the food system's environmental impacts (n=1).

Conclusions

By employing rigorous methods to screen, classify and present the wide arc of food-systems interventions and their evaluated nutrition outcomes, our innovative tool facilitates evidence retrieval and use. It supports the multi-sectoral anchoring of nutrition and strengthens systems thinking to enhance integrated nutrition programming. It can also be used to drive meaningful empirical work to fill immediate gaps necessary for evidence-based decision-making. Continuous updates of the "living EGM" throughout 2023 will enable the easy identification of further changes in the evidence base. Reports, a brief, and blogs detailing our findings are available [online](#).

References

- FAO, IFAD, UNICEF, WFP & WHO.** 2020. *The State of Food Security and Nutrition in the World 2020: Transforming food systems for affordable healthy diets*. Rome, FAO. <https://www.fao.org/policy-support/tools-and-publications/resources-details/en/c/1298217/>
- FAO & WHO.** 2020. *Mid-term review of the UN Decade of Action on Nutrition–Foresight paper*. Rome and Geneva, Switzerland. <https://www.who.int/news/item/12-03-2020-mid-term-review-of-the-un-decade-of-action-on-nutrition>
- Food Systems Summit.** 2021. *Solution Cluster 4.1.2: Strengthening Capacity in Food Systems*. New York. <https://foodsystems.community/game-changing-propositions-solution-clusters/strengthening-capacity-in-food-systems-2/>
- GLOPAN (Global Panel on Agriculture and Food Systems for Nutrition).** 2021. *Game changing solutions for food system transformation*. London. <https://www.glopan.org/wp-content/uploads/2021/03/Game-Changing-Solutions-for-Food-System-Transformation-1.pdf>
- Lane, C., Tree, V., Storhaug, I. & Engelbert, M.** (2021) *Food Systems and Nutrition Evidence Gap Map Update #1 (May 2020 – June 2021)*. New Delhi, International Initiative for Impact Evaluation (3ie).
- Loken, B. & DeClerck, F.** 2020. *Diets for a Better Future: Rebooting and Reimagining Healthy and Sustainable Food Systems in the G20*. Oslo, EAT. https://eatforum.org/content/uploads/2020/07/Diets-for-a-Better-Future_G20_National-Dietary-Guidelines.pdf
- Moore, N., Lane, C., Storhaug, I., Franich, A., Rolker, H., Furgeson, J., Sparling, T. & Snilstveit, B.** 2021. *The effects of food systems interventions on food security and nutrition outcomes in low- and middle-income countries: 3ie Evidence Gap Map Report 16*. New Delhi, 3ie.
- N4G Summit.** 2021. *Commitment-Making Guide. Appendix: Mobilizing commitments for transformative change: Food Systems*. Tokyo.
- Njuki, J., Eissler, S., Malapit, H., Meinzen-Dick, R., Bryan, E. & Quisumbing, A.** 2021. *A review of evidence on gender equality, women's empowerment, and food systems*. Bonn, Germany, Center for Development Research (ZEF) in cooperation with the Scientific Group for the UN Food Systems Summit 2021. <https://bonndoc.ulb.uni-bonn.de/xmlui/handle/20.500.11811/9132>
- Obesity Evidence Hub.** 2020. *Countries that have implemented taxes on sugar-sweetened beverages (SSBs)*. Melbourne, Australia, Cancer Council Victoria. <https://www.obesityevidencehub.org.au/collections/prevention/countries-that-have-implemented-taxes-on-sugar-sweetened-beverages-ssbs>
- Sparling, T.M., White, H., Boakye, S., John, D. & Kadiyala, S.** 2021a. Understanding Pathways Between Agriculture, Food Systems, and Nutrition: An Evidence and Gap Map of Research Tools, Metrics, and Methods in the Last 10 Years. *Advances in Nutrition* 12(4): 1122–1136.
- Sparling TM, Deeney M, Cheng B, Han X, Lier C, Lin Z, Offner C, Santoso MV, Pfeiffer E, Emerson JA, Amadi FM.** Systematic evidence and gap map of research linking food security and nutrition to mental health. *Nature communications*. 2022 Aug 8;13(1):1–1. <https://www.researchsquare.com/article/rs-946583/v1>.
- Von Braun, J., Afsana, K., Fresco, L. & Hassan, M.** (2021) Food systems: seven priorities to end hunger and protect the planet. *Nature*, 597: 28–30.
- Zhang, Q., Liu, S., Liu, R., Xue, H. & Wang, Y.** (2014) Food Policy Approaches to Obesity Prevention: An International Perspective. *Current Obesity Reports*, 3(2): 171–182.

ADDENDUM

Further details, definitions, and examples of the interventions and outcomes can be found in:

Online appendix A: Additional methods detail

<https://www.3ieimpact.org/sites/default/files/2021-01/EGM16-Online-appendix-A-Additional-methods-detail.pdf>

Further details on the screening criteria used to identify relevant studies can be found in the final EGM report (Table 2, page 8):

<https://www.3ieimpact.org/sites/default/files/2021-01/EGM16-GIZ-FSN.pdf>

Open data sharing for dietary survey data

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One of the main obstacles to a healthy diet for all is the insufficiency of dietary data to support effective evidence-based policies and programmes (FAO and Intake, 2022; GLOPAN, 2016; IFPRI, 2014; Haddad *et al.*, 2016). To develop relevant policy actions, it is crucial to understand what people eat and drink.

However, many policymakers and programme managers rely on data based on the availability of food at national level (such as food supply data) or at household level (such as household survey data). While important, these data are not sufficient to understand food consumption and nutrient intakes and to assess the adequacy and quality of the diet of different population groups. Quantified data on what people eat and drink (individual quantitative food consumption (IQFC) data) are needed to bridge the knowledge gap and better inform nutrition and food-safety policies and programmes at global, national and subnational level.

IQFC data generate the evidence needed to address the challenges of malnutrition and hunger as set out in the collective global commitments of the United Nations Decade of Action on Nutrition (2016–2025) (United Nations, 2017) and to achieve the Sustainable Development Goals of the 2030 Agenda for Sustainable Development (United Nations, 2018). The urgent need for data was highlighted as one of the five priority areas of

the Tokyo Nutrition for Growth Summit 2021, which focused on promoting data-driven accountability. Across all constituency groups, better data, measurement and accountability are essential to facilitate more effective financing for nutrition and to drive equitable progress to ensure we leave no one behind.

Many countries, including some low-income countries, collect IQFC data. However, the number of low-and middle-income countries (LMICs) that have carried out large-scale, nationally representative dietary surveys remains low (FAO and Intake, 2022; de Quadros *et al.*, 2022). There is significant potential to expand the collection and improve the use of these data through greater dissemination and harmonization that enables analysis across time periods, seasons and geographical locations. In response to this gap, the Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO) have developed the FAO/WHO Global Individual Food consumption data Tool <https://www.fao.org/gift-individual-food-consumption/en/> (FAO/WHO GIFT) (FAO and WHO, 2016), an innovative, open-access online tool that provides access to harmonized IQFC data focused on LMICs.

The FAO/WHO GIFT platform is designed to support better data visualization and utilization and catalyse changes in nutrition.

The platform houses the following knowledge products:

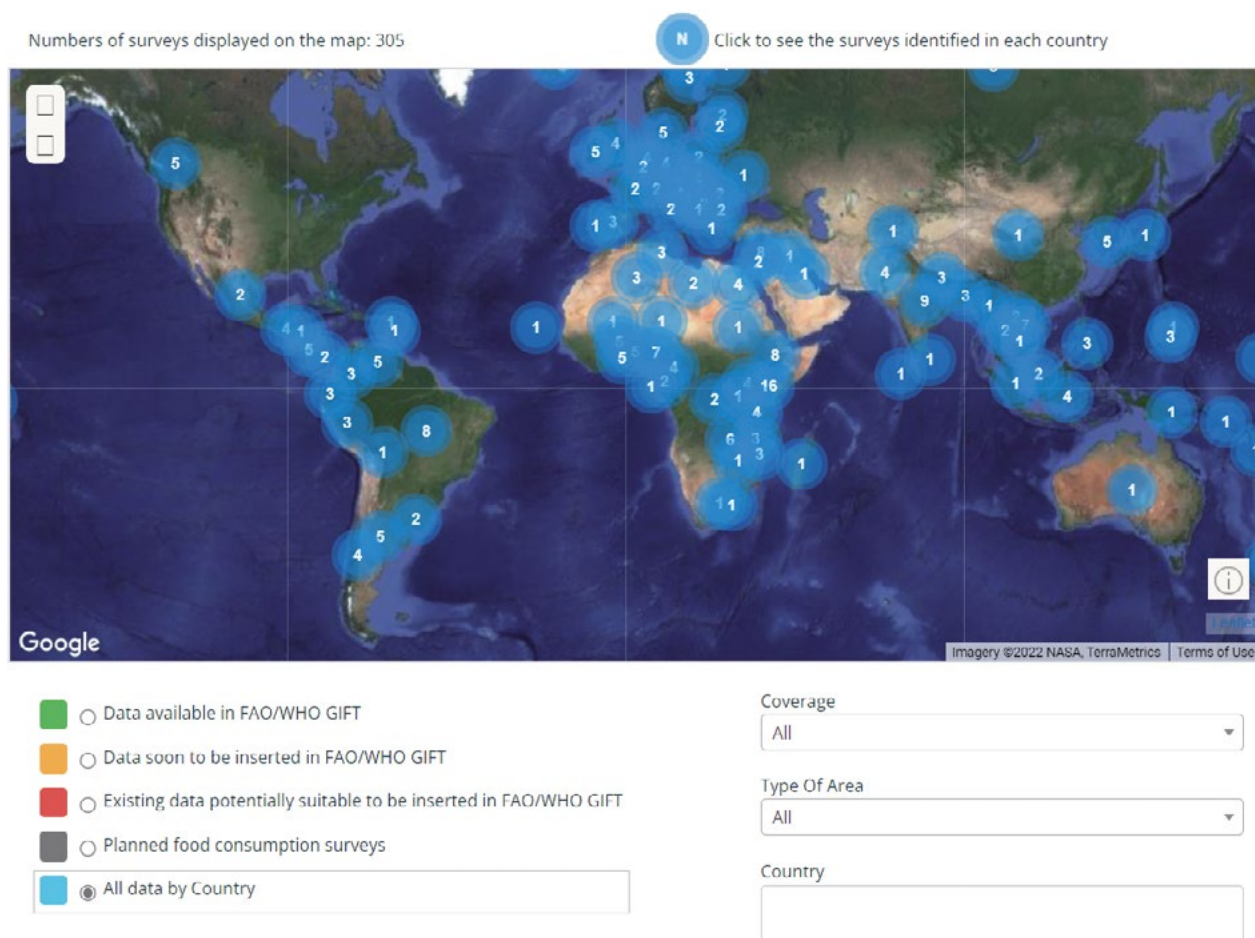
- **A global inventory of dietary surveys:** Information about existing IQFC surveys in the form of an interactive map with the surveys displayed by country. Each survey in the inventory is documented using a standardized metadata report that provides a comprehensive description of the survey (for example, title, objective of the data collection, survey design and methods used to collect data and estimate portion sizes).
- **Dietary survey indicators and summary statistics:** For each survey dataset shared through the FAO/WHO GIFT platform, ready-to-use indicators and summary statistics are available, covering three principal areas: food consumption, nutrition and food safety. Statistics for each area are presented in the form of infographics tailored to users who are not necessarily experts in nutrition or statistics.
- **Dietary survey microdata for download:** Each survey dataset shared through the FAO/WHO GIFT platform can be freely downloaded as microdata.¹⁷ All microdata are

harmonized in line with FAO/WHO GIFT standard data templates and harmonization protocols to provide users with a comparable view of the data from different surveys. Microdata can be accessed through the platform after a simple log-in and on accepting the data use terms and conditions.

Currently, 34 dietary survey datasets are available as microdata for users to download and the platform continues to grow. The inventory <https://www.fao.org/gift-individual-food-consumption/en/> of dietary surveys currently contains metadata information on 305 surveys conducted in 111 countries (Figure 1).

There is constant user traffic visiting the platform in search of dietary data, which increases directly with the number of datasets shared. Currently, the platform has on average 400 visits per week. In addition, selected datasets available through FAO/WHO GIFT are integrated into a partner WHO platform, the Food Safety Collaborative Platform (FOSCOLLAB), and used for the assessment of food-safety exposure risk.

Figure 1. FAO/WHO GIFT inventory of IQFC data and planned surveys



SOURCE: FAO and WHO. 2016. FAO/WHO Global Individual Food consumption data Tool [online]. Rome. Cited 30 May 2022. <https://www.fao.org/gift-individual-food-consumption/en>

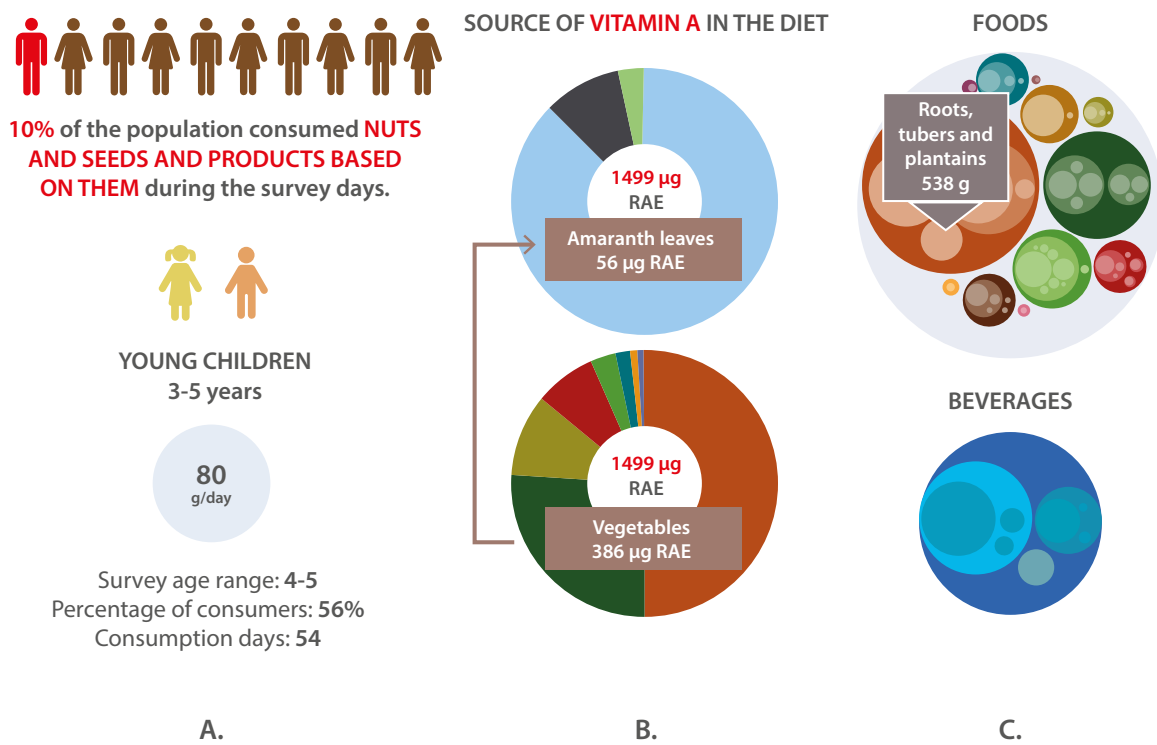
¹⁷ Microdata are the data collected from a survey in its most disaggregated and detailed format.

By disseminating harmonized IQFC data as microdata, FAO/WHO GIFT increases the number of stakeholders that can use the data, allows for the repurposing of data and helps to improve the quality of newly collected data. The platform is designed to serve a broad audience of stakeholders. The key target group is policymakers and governmental institutions

that want to use IQFC data in planning and implementing policies and programmes to improve nutrition.

The infographics and summary statistics section of the platform is dedicated to non-expert users and users who wish to obtain an overview of the survey findings (Figure 2).

Figure 2. Examples of infographics presented on the FAO/WHO GIFT platform



NOTES: The FAO/WHO GIFT platform provides answers tailored to the diverse needs of users from different sectors.

- (i) For decision makers looking for dietary data for food-safety purposes, data are presented on the percentage of consumers and on the consumption level of foods among high consumers in different population groups.
- (ii) For decision makers looking for dietary data for nutrition purposes, data are presented on the sources of nutrients in the diets.
- (iii) For decision makers looking for dietary data for agricultural purposes, data are presented on the level of consumption of different food groups and crops.

SOURCE: FAO and WHO. 2016. FAO/WHO Global Individual Food consumption data Tool [online]. Rome. Cited 30 May 2022.

<https://www.fao.org/gift-individual-food-consumption/en>

General dietary patterns can be visualized, together with the contribution of different foods and food groups to the average energy intake of a given population. Such visuals facilitate an understanding of the gaps in dietary intake, identify foods for which consumption should be promoted or discouraged to improve the diet, and pinpoint those for which fortification could be considered.

The food-safety infographic, conversely, presents summary statistics on the percentage of individuals in the population who consumed foods, or food groups of interest during the days of the survey and the observed elevated levels of

consumption. This type of analysis supports the assessment of dietary exposure to food-safety hazards, such as aflatoxins, by highlighting elevated levels of food consumption that may cause concern among the population of interest.

Other nutrition infographics generated by the platform include the sources of nutrients in the diet and the macronutrient contribution to the total energy intake in relation to recommended intake. New innovative infographics on the environmental impact of the diet and estimated usual intakes of nutrients are currently being developed and will be added to the platform.

The microdata download section is dedicated to users who wish to perform secondary data analysis. Over a period of three years from April 2019, when the monitoring of data downloads started, 1500 downloads were registered by more than 600 different users. Most users (58 percent of data downloads) said they wanted to use the data for research-related reasons, such as the analysis of the nutritional intakes of different populations, the analysis of health outcomes and different dietary habits or the assessment of food availability and access.

The second most common reason for downloading IQFC data was to learn and study (18 percent of downloads). Users in this group were students downloading data for use in their thesis or student/research projects. There were also cases of data being downloaded to learn how to structure and format a food consumption data file by users who were preparing to collect food consumption data themselves. Teachers who downloaded data for teaching purposes were also found in this group.

Many users (10 percent of download cases) declared an interest in using the data outside of the nutrition domain. More than half of cases classified in this group claimed to be using the data in the food-safety domain, particularly to perform exposure risk assessments. Other data uses identified in this group included an analysis of the environmental impact of diets, policy development and

evaluation, and the development of information technology (IT) applications for different purposes.

The remaining 14 percent of data downloads were either related to the user's interest in the functionalities and outputs of the FAO/WHO GIFT platform or were unspecified or unknown.

Usage and download statistics indicate that FAO/WHO GIFT is currently primarily supporting the development of knowledge, understanding and use of nutrition-related data from both a research and educational perspective. It serves a wide range of stakeholders and different purposes.

FAO/WHO GIFT provides visibility to the entities that have collected and shared their data. The aim is to create a "snowball effect", encouraging a broader group of data owners to share their IQFC data and promote the sharing of the most up-to-date data available. An analysis of user traffic on the FAO/WHO GIFT platform shows that open data sharing is bolstering nutrition information systems through innovative access and presentation of dietary data. The platform helps to fill the knowledge gap on what people eat and drink and allows a large and diverse group of stakeholders to access and use valuable dietary data (Leclercq *et al.*, 2019). If you would like to know more, please contact us at fao-who-gift@fao.org.

References

- FAO & Intake.** 2022. *Global report on the state of dietary data*. Rome, FAO. <https://doi.org/10.4060/cb8679en><https://doi.org/10.4060/cb8679en>
- De Quadros, V.P., Balcerzak, A., Allemand P., de Sousa, R.F., Bevere T., Arsenault, J., Deitchler M. & Holmes, B. A.** 2022. Global Trends in the Availability of Dietary Data in Low and Middle-Income Countries. *Nutrients*, 14(14): 2987. <https://doi.org/10.3390/nu14142987>
- FAO & WHO (World Health Organization).** 2016. FAO/WHO Global Individual Food consumption data Tool [online]. Cited 30 May 2022. <https://www.fao.org/gift-individual-food-consumption/en>
- GLOPAN (Global Panel on Agriculture and Food Systems for Nutrition).** 2016. *Food systems and diets: Facing the challenges of the 21st century*. London. <http://glopan.org/sites/default/files/ForesightReport.pdf>
- Haddad, L., Hawkes, C., Webb, P., Thomas, S., Beddington, J., Waage, J. & Flynn, D.** 2016. A new global research agenda for food. *Nature*, 540: 30–32.
- IFPRI (International Food Policy Research Institute).** 2014. *Global Nutrition Report 2014: Actions and Accountability to Accelerate the World's Progress on Nutrition*. Washington, DC.
- Leclercq, C., Allemand, P., Balcerzak, A., Branca, F., Sousa, R.F., Lartey, A., Lipp, M., Quadros, V.P. & Verger, P.** 2019. FAO/WHO GIFT (Global Individual Food consumption data Tool): a global repository for harmonised individual quantitative food consumption studies. *Proceedings of the Nutrition Society*, 78: 484–495.
- United Nations.** 2017. *United Nations Decade of Action on Nutrition 2016–2025: Work Programme*. Rome and Geneva, Switzerland. https://www.un.org/nutrition/sites/www.un.org.nutrition/files/general/pdf/work_programme_nutrition_decade.pdf
- United Nations.** 2018. *The Sustainable Development Goals Report 2018*. New York. <https://unstats.un.org/sdgs/files/report/2018/TheSustainableDevelopmentGoalsReport2018-EN.pdf>

Innovative individualized case management in nutrition

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Author's statement: The author declares having no conflicts of interest in the five years prior to this submission.

Data continue to show a high number of children affected by malnutrition. Globally, 6.7 percent of all children under the age of five (45.4 million) are wasted on any given day (UNICEF, WHO and World Bank, 2020). Children suffering from acute malnutrition face a significantly higher risk of mortality and morbidity (Black *et al.*, 2008). Most countries are unlikely to achieve the 2025 global nutrition targets, with only seven countries on track to possibly meet some of the infant and young child nutrition targets (Development Initiatives, 2021).

While this setback is down to many systemic complexities, one main challenge highlighted in the 2021 *Global Nutrition Report* is the need for granular nutrition data, which are crucial to progress tracking and monitoring (Development Initiatives, 2021). Especially in low- and middle-income countries, nutrition programme data collection and analysis methods remain inefficient, slow and error prone. Community-based management of acute malnutrition (CMAM) programmes globally still rely heavily on paper-based systems for beneficiary data management, leading to cumbersome beneficiary registration and follow-up, and delays in data needed to support the planning and monitoring of programme performance for decision-making and course correction. In addition to challenges of coverage, high defaulter rates have also been found to contribute to CMAM programmes' lack of effectiveness and limited coverage (Myatt *et al.*, 2013).

Exploring innovative alternatives for longitudinal case management has become a necessity to efficiently follow a beneficiary's journey through the continuum of care (from referral to treatment and recovery) while generating timely

data to improve the tracking of programme performance (as measured by Sphere¹⁸ and other key programmatic indicators).

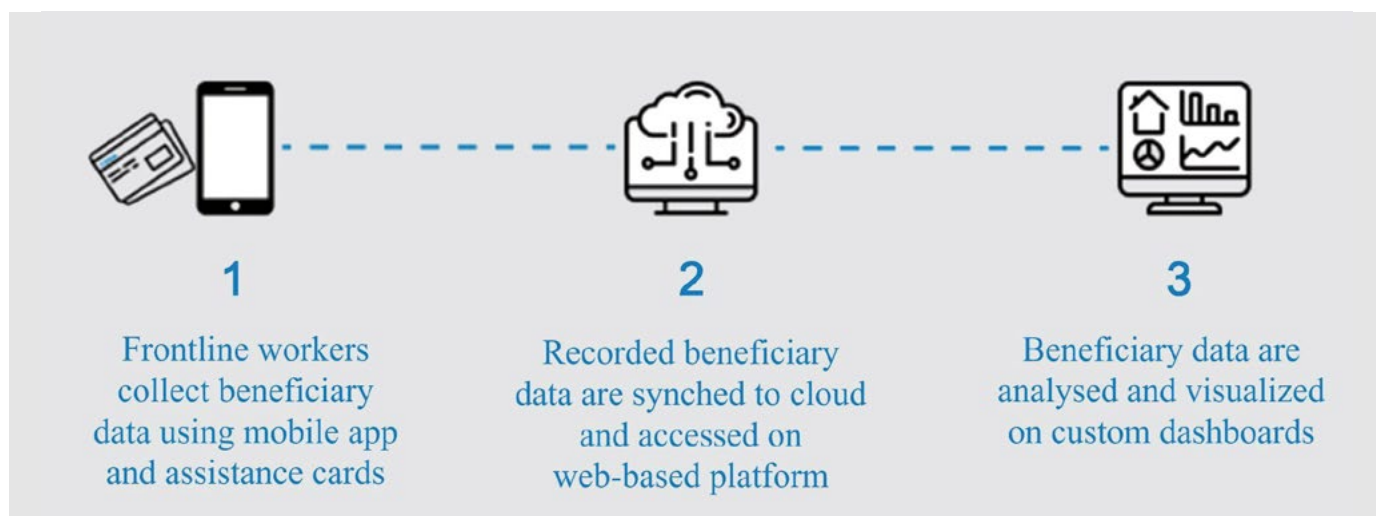
Supporting nutrition treatment programmes using digital solutions

The World Food Programme (WFP) has developed Conditional on Demand Assistance (CODA) as a solution to problems associated with case management, eligibility identification and the optimization of resources commonly identified in field implementation. CODA is a multifaceted digital solution designed to simplify and support the implementation of nutrition and health programmes through the digitization of country-specific protocols and the continuous recording of individualized data throughout a beneficiary's journey on the continuum of care. CODA is currently being expanded, from covering only treatment programmes to covering prevention programmes, taking into account existing linkages and referral pathways between them.

Using a mobile device and a durable near-field communication (NFC) smartcard, CODA replaces traditional paper-based records to ensure that beneficiary information can be securely recorded, tracked and monitored at an individual level and that programme performance can be analyzed accurately and efficiently. Through CODA, WFP enables frontline users to provide better services to beneficiaries and allows stakeholders to make more informed programmatic decisions to optimize quality and coverage through near- to real-time data and the monitoring of trends.

¹⁸ "Sphere is one of the foundations of the humanitarian work. It is the starting point for new humanitarian actors and a starting reference, providing guidance on priority actions and where to find more detailed technical information" (Sphere Association, 2018).

Figure 1. How CODA works



SOURCE: Authors' own elaboration.

CODA comprises three parts: a mobile application, a web-based management platform and a customized visual dashboard interface. Frontline workers use the mobile application to collect beneficiary information at the first point of service. Mobile devices and patient assistance cards record the provision of health services and goods, which are periodically synchronized to the cloud and accessible on the web-based platform. The offline functionality of the CODA Mobile Application allows frontline workers to record beneficiary data even in the most remote areas. The customized visual dashboard provides decision-makers with near to real-time information.

The impact of CODA: the case of South Sudan

CODA combines decision support for field health workers (end users) with the provision of analytics for programme management over time. It also autogenerates offline aggregate reports at a decentralized level, accessible on handheld mobile devices, on beneficiary enrolment and treatment outcomes for effective community outreach and defaulter/absentee tracing.

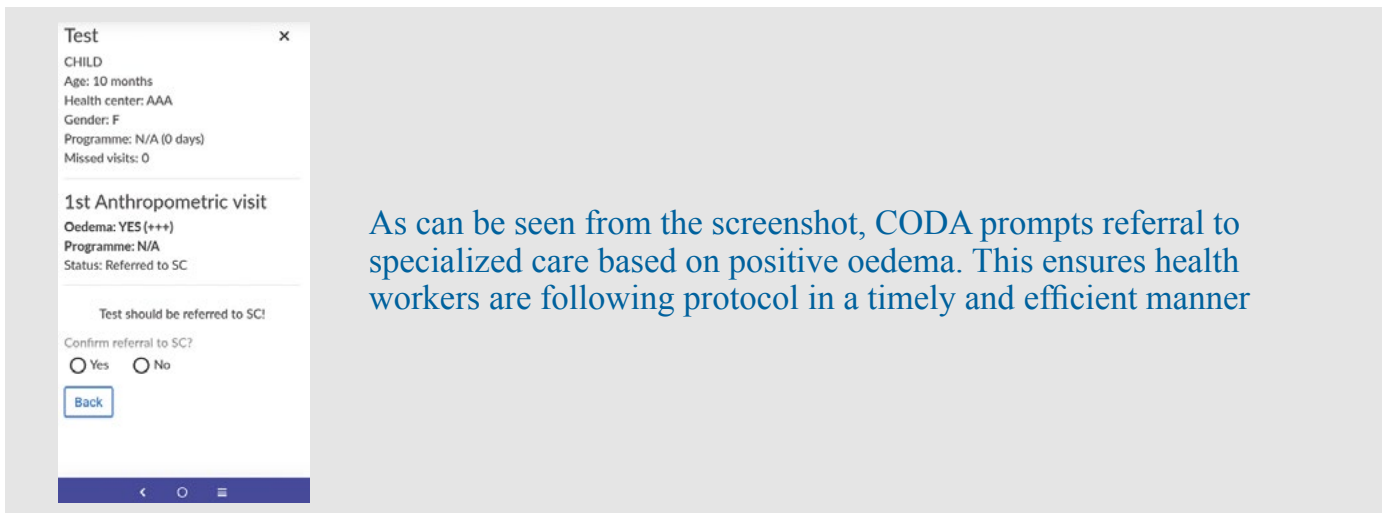
Since its launch in March 2018, CODA has been used exclusively for acute malnutrition treatment programmes, which target two vulnerable WFP beneficiary groups: children under five and pregnant and lactating women. With the assistance of cooperating partners such as MedAir, Action Against Hunger (ACF) and World Vision, CODA is being piloted in five countries – Afghanistan, the Democratic Republic of Congo, Madagascar, South Sudan and Tajikistan

– with more than 97 000 registered beneficiaries from more than 400 health centres. WFP plans to roll out CODA in other high-priority countries over the coming years.

In 2018, South Sudan was identified as one of the first CODA pilots. At the time, the country office was selected to co-create and pilot the innovation to help address the myriad challenges faced by various CMAM programmes globally in terms of beneficiary records, general protocol adherence, beneficiary tracking and targeting, health workers' difficulty in managing admission and discharge criteria, and tracking and following up with defaulters.

With its ability to address these service delivery issues quickly via digitized records, CODA was explored as a potential solution and rolled out initially to two sites in Aweil Center County during the product development phase. The pilot was eventually scaled up to 38 sites in varying contexts by early 2021. In July 2021, the WFP South Sudan country office conducted an extensive CODA review to assess overall project performance. The results of this review revealed some key areas where CODA has shown positive impact and benefits:

- **Enhanced treatment process:** According to the country-level review, CODA sites appear to have lower default and higher cure rates due to timely follow-up triggered by automatic prompts. More specifically, CODA generates automatic daily reports that can be accessed by health workers, including details of absent or defaulting beneficiaries expected to visit each day (including phone number

Figure 2. CODA app screenshot

As can be seen from the screenshot, CODA prompts referral to specialized care based on positive oedema. This ensures health workers are following protocol in a timely and efficient manner

SOURCE: Authors' own elaboration.

and address). Thus, the health workers are able to contact the identified beneficiaries to follow up and conduct home visits whenever needed. CODA was also reported to be ensuring the distribution of appropriate assistance in line with protocols and in-time referrals.

According to beneficiaries, CODA makes access to nutrition services more convenient by shortening waiting times, with a positive effect on health-seeking behaviours. "These new [CODA] cards cannot be easily destroyed [and now] I always go for my [child's] services at the right time," reported one CODA beneficiary caregiver in South Sudan.

- **Protocol adherence:** Improved compliance with the CMAM protocol for the treatment and management of acute malnutrition in South Sudan was observed during site monitoring visits and supportive supervision. To quote one end user, a nutrition assistant with World Vision South Sudan, "CODA for me is like a personal coach who reminds me of what to do next after every step in the treatment cycle; that way, I do not miss any important step". The significance of this impact is that, with high attrition levels and less refresher training on CMAM, CODA can fill a knowledge transfer gap.

- **Improved accuracy and time efficiency:** CODA users (including government officials) cited timely and aggregate reporting as a key contributor to data accuracy. Automatic daily reports have helped to save time and reduce the workload of clinical staff, who previously had to undertake manual tallies of paper-based records. It has thus boosted efficiency.

- **Offline working capabilities:** Information can be recorded offline, meaning users can reach beneficiaries even in the most remote locations with poor or no connectivity. This has allowed health workers to quickly retrieve/access beneficiaries' treatment and records using the CODA application. CODA allows for the customization of information collected to meet the country's programmatic requirements. Currently, CODA for CMAM mainly collects beneficiary-level information (date of birth, name, gender, phone number), anthropometric and medical information (such as weight, height, mid-upper-arm circumference (MUAC), oedema, medical complications), and the quantity of assistance recommended. The information is later synchronized to the platform when a connection is available. "CODA has made our work very easy. We no longer lose beneficiaries' information and, when they lose their cards, it takes less than a minute to issue a replacement with all the old information," said a nutrition manager with MedAir in South Sudan.

The South Sudan review and other country experiences from other pilots are informing the way forward. CODA is still in the research and development phase and the objective is to roll out a scalable and sustainable version in 2022. As CODA reaches more vulnerable communities, WFP will explore expanding its usage to record beneficiaries of different services across the continuum of care and beyond to nutrition programmes, to become an open-source solution that can allow beneficiaries to manage their data and eventually contribute to the digital public good.

References

- Black, R.E., Allen, L.H., Bhutta, Z.A., Caulfield L.E., de Onis, M., Ezzati, M., Mathers, M., Rivera, C. & Rivera, J.** 2008. Maternal and child undernutrition: Global and regional exposures and health consequences. *The Lancet*, 371(9608): 243-260.
<https://www.sciencedirect.com/science/article/abs/pii/S0140673607616900>
- Development Initiatives.** 2021. *2021 Global Nutrition Report: The state of global nutrition*. Bristol, UK.
<https://globalnutritionreport.org/reports/2021-global-nutrition-report/>
- Myatt, M. & Guerrero, S.** 2013. Why coverage is important: efficacy, effectiveness, coverage, and the impact of CMAM Interventions. *ENN Field Exchange*. 45: 39.
www.enonline.net/fex/45/coverage
- Sphere Association.** 2018. *Sphere Handbook: Humanitarian Charter and Minimum Standards in Disaster Response*, fourth edition. Geneva, Switzerland.
<https://spherestandards.org/wp-content/uploads/Sphere-Handbook-2018-EN.pdf>
- UNICEF (United Nations Children's Fund), WHO (World Health Organization) & World Bank.** 2020. *Joint Child Malnutrition Estimates*. New York, UNICEF.
<https://data.unicef.org/resources/jme-report-2020/>
- WFP (World Food Programme).** 2021. *Nutrition in Numbers, 2020*. Rome.
<https://www.wfp.org/publications/nutrition-numbers-report-2021>



A systematic framework to identify climate service entry points for transforming nutrition

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Background

Although climate variability and change impact food and nutrition programmes, policies and outcomes both directly and indirectly through their influences on food systems (Watts *et al.*, 2015; Willett *et al.*, 2019), the nutrition sector's use of climate services to inform the targeting and delivery of these actions has been extremely limited to date. However, climate services (Box 1) have a key role to play in helping to address malnutrition and achieve Sustainable Development Goal (SDG) 2 more broadly by informing risk assessment for the better targeting of actions, early warnings and long-term planning and preparedness (Downs *et al.*, 2022).

In particular, climate services can help manage and mitigate climate risks, including those arising from extreme events such as droughts or floods. These risks affect: i) food production, which can, in turn, influence both the quantity and quality of food produced; ii) food safety and food loss; iii) the availability, affordability and acceptability of foods, particularly those that are nutrient-rich; iv) diseases among animals and humans (Grace *et al.*, 2015; Myers *et al.*, 2017; Tirado *et al.*, 2010); and v) other factors, such as migration, livelihoods and women's empowerment, which have trickle-down effects on diets and nutrition (Watts *et al.*, 2015).

Box 1. Defining climate services

Climate services, defined by the Climate Services Partnership (2022) as "production, translation, transfer, and use of climate knowledge and information in climate-informed decision making and climate-smart policy and planning," aim to support climate adaptation by mitigating the negative effects of climate change and variability. The climate data and information underpinning climate services can include climatological (past), monitoring (present) and forecast (future) information.

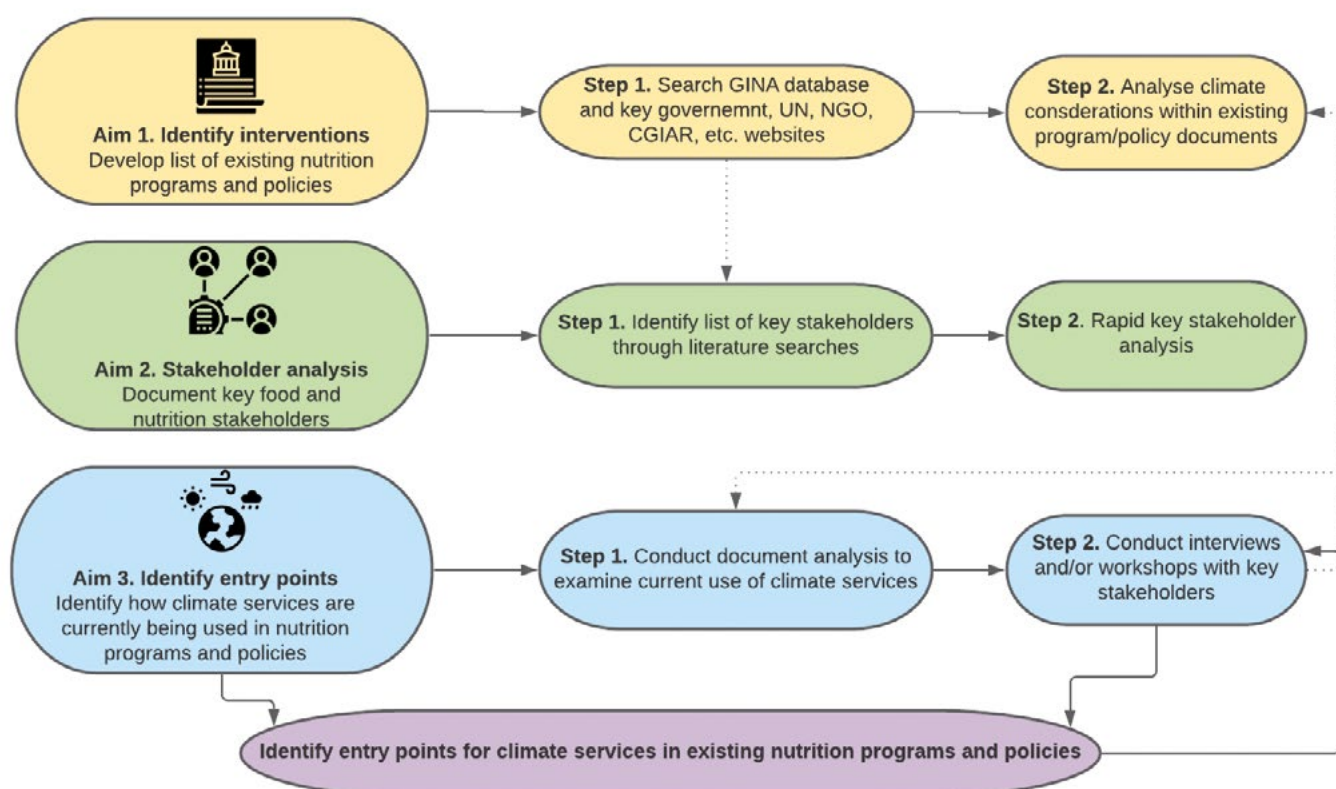
There is, therefore, an exigent need to advance climate service solutions aimed at improving diets and nutrition within the context of increasing climate variability, including extreme events. To help advance the understanding and use of climate services by the nutrition sector, this paper outlines a systematic framework that was developed in the context of the Adapting Agriculture to Climate Today, for Tomorrow (ACToday) Columbia World Project for identifying entry points for climate services aimed at improving diets and nutrition (Columbia Climate School, n.d.). In doing so, it shares experiences from the framework's application in two country contexts, Vietnam and Senegal, to demonstrate its value in guiding the coproduction of climate services for this sector.

Methodological approach

This work was undertaken as part of the Columbia World Project, ACToday, through Columbia University, New York. The primary objective of ACToday is to “identify and prioritize opportunities to improve the use of climate services in efforts to help end hunger, achieve food security, improve nutrition and/or promote sustainable agriculture in each of six target countries” (Columbia Climate School, n.d.).

The overarching goal of the work was to help address this objective by developing a foundational framework to enable the systematic identification of entry points for climate services within nutrition programmes, policies and actions using a food systems approach that could be applied in a standardized way in different country contexts. Figure 1 provides an overview of the framework aims and steps, which do not need to be completed sequentially or independently.

Figure 1. Overview of the framework aims and specific steps



SOURCE: Shauna Downs, Rutgers School of Public Health, Rutgers University, New Jersey.

In what follows, we outline the aims of the framework, its detailed component steps and the outcomes and lessons learned from its application in the contexts of Vietnam and Senegal. Institutional Review Board approval was obtained from Columbia University for all interviews conducted as part of this research.

Overview of the framework

Aim 1: Develop a list of the nutrition programmes and policies that are currently being implemented in the country and analyse whether and how they address climate considerations.

To identify entry points for integrating climate services into existing nutrition programmes and policies within a given country, it is useful to first understand the nutritional landscape. The initial aim of the framework, therefore, involves developing a list of nutrition programmes, policies or actions currently implemented in a given country and then analysing the extent to which they incorporate climate considerations. These actions tend to be multisectoral and cut across many organizations and ministries (for example, agriculture and health). They include those focused on improving the availability, affordability, acceptability and safety of nutrient-rich foods (such as animal-source foods, fruits and vegetables, legumes and nuts), as well as more nutrition-specific interventions focused on

improving dietary intakes and reducing disease risk, including in emergency situations.

To develop this list, Step 1 involves taking stock and compiling existing food and nutrition actions in a given country using web searches (Figure 1). First, the [Global database on the Implementation of Nutrition Action \(GINA\)](#), which provides a thorough summary of existing nutrition actions and key nutrition stakeholders in each country, can be used to identify existing nutrition policies, programmes and actions. Websites such as those of government ministries, non-governmental organizations, intergovernmental organizations, the CGIAR system and other entities working within or intersecting with the food system can be searched in tandem to identify additional nutrition and food programmes and policies. In some cases, there may also be information in the academic literature. Supplemental Table 1 provides a template to guide the compilation of country-specific food and nutrition actions.

After identifying key food and nutrition actions across the food system, we dig deeper to ascertain how these existing in-country policies and programmes consider climate to be important for identifying potential entry points for climate services.

To this end, Step 2 (Figure 1) consists of an initial skimming of documentation, followed by thorough reading and interpretation (Bowen, 2009). To facilitate this process, coding of the text to generate climate-related themes can be done using qualitative software (such as NVivo) or an Excel file. Climate-related codes can include concepts such as seasonality affecting food access, drought and food insecurity, floods and disease risk. The information that is compiled through this qualitative analysis can subsequently be used to further help identify gaps in terms of climate considerations and entry points for climate services and to triangulate interview data. Supplemental Table 2 provides an overview of the information that can be collected.

Aim 2: Document the key food and nutrition stakeholders in the country and their main roles and responsibilities.

Aim 2 of the framework involves conducting a rapid analysis of key stakeholders operating within the food and nutrition space. Although more in-depth processes for conducting stakeholder analysis exist, the goal of Aim 2's component steps is to identify the key players in the food and nutrition space in a given country and their roles and responsibilities. This information is intended to enable the identification of: i) potential stakeholders who can be interviewed to inform entry points for climate services and ii) organizations that could strengthen their use of climate services, or which are using climate services effectively and could be used as an example or champion for others.

Step 1 of the stakeholder analysis is to identify a list of key food and nutrition stakeholders, some of which may have already been identified through Aim 1. As the searches and examination of the literature are conducted, stakeholders that play a key role in the food system (are involved in policy/programme design, implementation, etc.) should be noted.

After identifying the key stakeholders, a stakeholder analysis tool adapted from existing tools (Salentine and Johnston, 2011; Schmeer, 1999) can be used in Step 2 to document stakeholder roles and responsibilities, as well as receptivity to the use of climate services. Supplemental Table 3 provides a template to guide the stakeholder analysis, which incorporates information about the stakeholders' potential role in the use of climate services, their level of commitment to adopting their use, etc. Ascertaining this information can be critical to identifying key in-country partners for capitalizing on and advancing the use of climate services.

In some instances, there may be uncertainty around aspects of a stakeholder's role or responsibilities. Combining the desk-based research with key stakeholder interviews is thus critical to completing the stakeholder analysis, particularly as it relates to their existing and potential use of climate services.

Aim 3: Identify how climate services are currently being used to inform actions across the food system and how they could be leveraged for future use.

Aim 3 is to identify entry points for using climate services to inform the delivery and implementation of food and nutrition actions pinpointed as part of Aim 1. A combination of findings from the desk-based research, as well as interviews and/or workshops with key stakeholders, can be used to help identify climate service entry points. The first step in identifying possible entry points for climate services includes understanding their current application and uptake within the country. Existing use of climate services may have already been identified as part of the desk review of food and nutrition actions conducted in Aim 1, however, there are probably other opportunities for the use of climate services that are not currently being tapped.

Conducting interviews and/or workshops with key stakeholders to triangulate the desk-based research conducted as part of the previous aims is critical to identifying entry points for climate services. Supplemental Table 4 provides an interview guide for key stakeholder interviews. Whenever possible, interviews should be recorded, with consent, then transcribed to facilitate analysis. This includes conducting open coding of the interview transcripts or detailed notes and organizing the codes based on key or recurring themes (Saldaña, 2015). To this end, qualitative software (such as NVivo) can be used.

The main themes derived from the interviews, combined with the desk-based research can then be used to inform entry points for the use of climate services. In workshops with key stakeholders, group prioritization exercises can be used to identify key entry points for the use of climate services. Entry points will likely be focused on three main areas: i) risk assessment for better targeting interventions; ii) early warnings; and ii) long-term planning and preparedness. Supplemental table 2 provides a template for identifying entry points for climate services.

Application of methods

To ascertain the usefulness of the framework in identifying entry points for climate services in a given country, it was piloted in Vietnam in July-August 2019 and in Senegal in May 2020-November 2021. Box 2 summarizes the approach and findings of the framework’s application in Vietnam, while Box 3 summarizes the same for Senegal.

Box 2. Summary of application of the framework in Vietnam

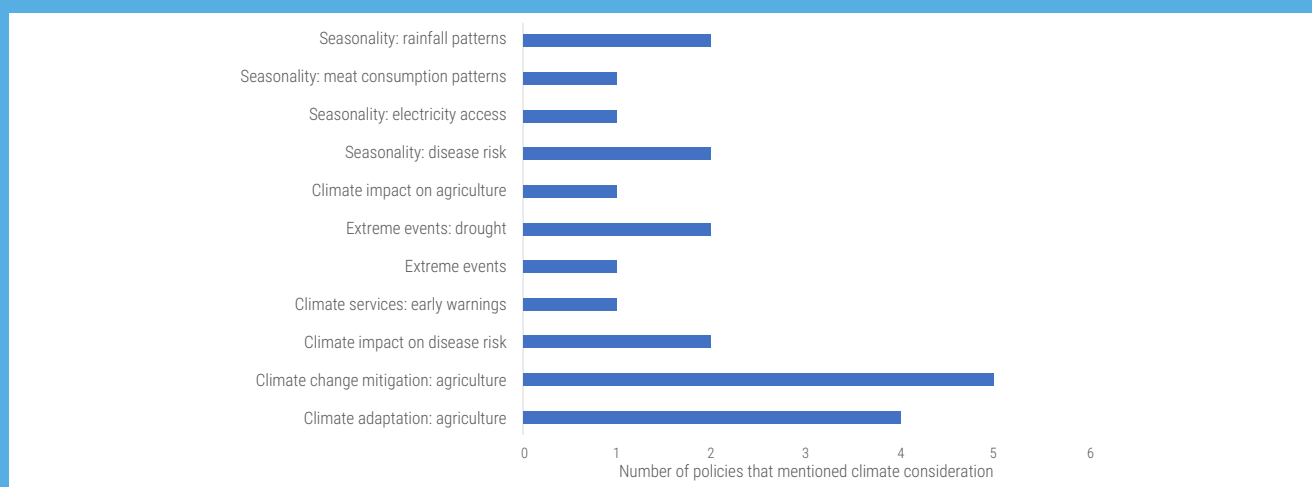
For Aim 1, food and nutrition actions in Vietnam were identified by searching the GINA database and websites of the Ministry of Health, research institutes and other organizations. Overall, 32 policies and programmes were examined, of which only 13 mentioned climate considerations (Figure 2) and only one of which explicitly mentioned climate services.

For Aim 2, stakeholder analysis and interviews (n=5) revealed that there were varying levels of knowledge and experience of the use of climate services. Several stakeholders seemed committed to using climate services, but in some cases, existing climate information was not meeting their needs.

In particular, these interviews demonstrated that both informational gaps (that is, data-related limitations affecting access and quality of data) and institutional constraints (such as organizational capacity) created barriers to the use of climate services in the nutrition community (Singh, Huynh and Downs, 2020). Based on these interviews, complemented with desk-based research, the main challenges to the use of climate information and services identified in Vietnam were inefficiencies in data-sharing mechanisms, limited access to information and limited analytical capability (Singh, Huynh and Downs, 2020). The potential entry points identified through the research to enable uptake of climate services thus included: improving inter-agency coordination and data interoperability, leveraging common platforms, integrating sector-specific climate data, overcoming capacity constraints, and improving climate advisory dissemination (Singh, Huynh and Downs, 2020).

To ascertain the usefulness of the framework in terms of identifying entry points for climate services, we conducted a debriefing after its application in Vietnam, during which respondents indicated the framework as a helpful way of identifying current climate considerations, as well as potential entry points for climate services in existing food and nutrition actions. One of the key takeaways from adopting the protocol was the iterative process by which the information was compiled.

Figure 2. Inclusion of climate considerations in nutrition policies and programmes in Vietnam



SOURCE: Shauna Downs Rutgers School of Public Health, Rutgers University, New Jersey.

Box 3. Summary of the application of the framework in Senegal

As part of Aim 1, the application of the framework in Senegal started with a review of nutrition-specific and nutrition-sensitive policies, programmes and actions documented through the GINA database. In addition, a detailed website search of organizations working in the food and nutrition space was also conducted. Unlike Vietnam, the results from the GINA database search in Senegal were scarce, and organizational websites did not provide viable avenues for follow-up.

As part of Aim 2, we identified relevant stakeholders for interviews based on suggestions from the World Food Programme in Senegal, a literature review and recommendations from the interviewees themselves. The respondents (n = 6) highlighted their experiences with large-scale programmes, such as the United States Agency for International Development (USAID)-funded Yaajeende and Kawolor projects, as well as the Feed the Future programme.

Most respondents provided anecdotal evidence of the impact of climate on agricultural outputs, emphasizing the shift in the onset of the rainy season. Beyond this tangible impact, however, none were familiar with climate services and their potential use, though some of them could envision the relevance and potential benefit of climate services to their organization's work.

In addition to the interviews conducted with key stakeholders, as part of Aim 3, we conducted a two-day workshop in Senegal (Grossi *et al.*, 2021) with a series of participatory exercises and dialogues to delve deeper into the potential entry points for climate services. The workshop, organized in the context of the ACToday project and in collaboration with the Senegal National Agency of Civil Aviation and Meteorology, the Human Food and Nutrition Research Laboratory of Cheikh Anta Diop University, and Senegal's National Council for Nutrition Development, brought together 22 participants from a broad range of academic, government, United Nations and non-profit organizations working in nutrition. Over the course of the workshop, participants identified opportunities for the incorporation of climate information into various nutrition-related decisions and interventions, and established climate information needs and priorities for the sector.

The six priority areas identified by participants where relevant climate information could improve the outcomes of nutrition-oriented activities (in order of priority) were the:

1. prevention of crop loss (both before and after harvest), including to pests and diseases during post-harvest and conservation stages;
2. promotion of high nutrition value varieties when responding to climate stress;
3. adaptation of food preservation and transformation practices to local climatic conditions;
4. adaptation of nutrition education activities to prevailing and forecasted climate conditions;
5. development and communication of dust forecasts to prevent acute respiratory infections (ARI);
6. prevention of climate-sensitive diarrheal diseases known to negatively impact the absorption of nutrients in the body.

Participants of the multi-stakeholder workshop also proposed the establishment of a national standing committee on nutrition and climate in Senegal to raise both awareness and funds to address these climate-nutrition issues.

Discussion

This manuscript provides an overview of a systematic framework aimed at identifying entry points for climate services in food and nutrition policies and programming. The motivation for such a framework has arisen from the potential and already documented impacts of climate variability on diets and nutrition outcomes and a recognition of the strong role that climate services can play in better targeting food and nutrition actions across the food system.

Despite this potential, the use of climate services to inform the targeting and delivery of food and nutrition programmes, policies and actions affected by climate has been limited. This is driven largely by a lack of knowledge on the part of key stakeholders leading nutrition actions on how to incorporate climate into their work (Jancloes *et al.*, 2014), as well as poor integration and coordination among the climate, agriculture and nutrition sectors to this end. While some stakeholders in these sectors may recognize that climate is influencing food production and that this

will have implications for diet and nutrition outcomes, they may not have the expertise (such as someone trained in and sensitized to climate fundamentals) within their organization or departments to incorporate climate considerations into their portfolio of work, particularly as the influence of climate on diets and nutrition may be through indirect pathways (Thompson, Fanzo and Garnett, 2015). Although significant progress has been made in recent years to bring the agriculture and nutrition sectors together, this has not been done to the same extent with climate (Garrett and Natalicchio 2010). While climate has been well integrated into policies, programmes and actions from an agricultural perspective, the same has been done in only a limited way for nutrition.

One of the reasons for the lack of coordination between climate and nutrition sectors may be the dearth of empirical evidence linking the two, as well as a lack of country-specific research and data. Moreover, while there is a substantial amount of literature that examines the impact of climate variability on food production, there is very little that examines how it influences the broader food system and nutrition outcomes (Davis *et al.*, 2021). These gaps in the existing evidence base likely make it difficult for nutrition stakeholders to identify the links between climate variability and nutrition outcomes.

In the absence of empirical evidence, the existing conceptual work that aims to describe the pathways by which climate variability can influence nutrition across the food system may be used as a starting point (Fanzo *et al.*, 2018). However, future research should focus on describing these linkages using empirical data. To date, much of the research examining the links between climate and nutrition has examined how long-term climate change will influence nutrition outcomes or how diets are contributing to our environmental footprint. Yet, there is a clear need to examine how climate variability, including extreme events, influences nutrition outcomes in the short term to provide additional insight into potential entry points for climate services.

In addition to the gaps in the knowledge base linking climate variability with nutrition outcomes, experiences from the preliminary application of the framework show that there may be significant gaps in terms of food and nutrition stakeholders' knowledge and familiarity with climate services. Although climate services are not new, many stakeholders may have had limited exposure to them, as well as to capacity building on climate fundamentals, creating challenges in identifying where the benefits of climate services within food and nutrition actions could be. However, by using this framework to first identify existing actions and examine the level of familiarity with and commitment to using climate services among different stakeholders, knowledge gaps and areas where potential knowledge brokering is needed can be identified.

As the Senegal experience illustrates, holding multisectoral stakeholder workshops that include stakeholders from nutrition, meteorological services and academia may be helpful in terms of sharing knowledge across sectors and encouraging nutrition stakeholders to include climate considerations within their work (WHO, 2011; Stewart-Ibarra *et al.*, 2019). Moreover, the creation of standing committees or other convening platforms, as proposed in the Senegal multi-stakeholder workshop as part of Aim 3 (Box 3), can create space for sustained engagement, dialogue and strategic coordination between traditionally distinct sectors.

The framework described here provides the initial steps for identifying potential entry points for climate services within food and nutrition programmes, policies and actions in a given country. Although this framework provides the foundation for building climate services into the work of various stakeholders, additional steps are likely to be needed to further refine and prioritize these entry points, as well as to create climate services that meet the needs of the different stakeholder groups.

Various tools or methodological approaches could be applied to refine and prioritize climate service entry points. For example, the Delphi method could be used in an effort to reach consensus on the prioritization of entry points (Colagiuri, Boylan and Morrice, 2015). Once entry points for climate services are prioritized, additional collaboration may be needed to ensure that the climate information and decision aids meet the needs of the end user and are ultimately taken up. Interviews and workshops conducted through this framework, for example, revealed that while some nutrition stakeholders were already receiving climate information, it was not provided in a form that could be easily interpreted, creating a bottleneck in the uptake of that climate information and derived services. Participatory workshops that facilitate the co-creation of climate services are thus an important next step after prioritizing entry points to ensure uptake (Christel *et al.*, 2018).

Conclusions

The framework described in this paper is designed to lay the foundations for the better integration of climate considerations into food and nutrition actions, as well as to identify where climate services might be leveraged to improve the targeting and long-term preparedness of those actions. Future work should apply the framework to additional countries and systematically assess its use. In addition to the steps set out in this framework, additional steps are likely to be needed to refine, prioritize and co-create climate services for the nutrition sector, as evidenced by the two case studies in Vietnam and Senegal.

Supplemental table 1. Template for guiding the compilation of country-specific food and nutrition actions

Policy/programme or action		Main goals	Targets		Published by	Start year	End year	Adopted (Y/N)	Climate considerations (Y/N)	Climate services		Seasonal considerations (Y/N)	Partners	Link to document
Title	Type		Population	Geographical area						Current use (Y/N)	List			
Provide the name of the policy, programme or action	Provide the type of policy, programme or action. Examples include legislation, nutrition policy document, agriculture policy document, WASH programme, etc	Most documents outline their main goal. You can just copy and paste them here. These tend to be overarching and are less specific than strategies	This refers to the population targeted in the policy or action. A few examples might be entire population, women, children under two years	This refers to the area in which the policy, programme or action is being implemented. It could be nationwide or in specify regions, etc.	This refers to the agency or organization that published or wrote the document. For example: Ministry of Agriculture, WHO, etc.	The year in which the policy, programme or action was initiated	The end date of the policy, programme or action (if applicable)	Indicate here using Y for yes and N for no, whether of not the policy, programme or action has been adopted	Does the policy, programme or action take into account any climate considerations? Does it mention climate in the document?	Current use of climate services (Y/N)	List of currently used climate services	Is seasonality considered in the design or implementation of the programme, policy, action? Indicate Y for yes and N for no. For example: is the programme only implemented during the hunger season?	List the government, United Nations, private sector, research partners, etc., involved	Provide the URL for the document

SOURCE: Authors' own elaboration.

Supplemental table 2. Template for identifying entry-points for climate services

Name of intervention	Entry point for climate services (Y/N)?	Describe climate service entry point and brief rationale			Comments
		Risk assessment for better targeting interventions	Early warnings	Long-term planning and preparedness	
Use the interventions that were identified in Aim 1	Indicate whether or not there is a potential entry point for climate services for this intervention: yes (Y) or no (N) Note that these are potential entry points. The climate services do not have to be currently in use	Under each of the main areas (risk assessment, early warning, long-term planning), identify which climate services could be used and why you have identified this as an entry point. Be as specific as possible in terms of the climate service entry point			Provide any comments that you think might be important to understanding the rationale for the entry points here

SOURCE: Authors' own elaboration.

Supplemental table 3. Template for conducting stakeholder analysis related to climate

Name of stakeholder organization, group or individual	International, national, regional or local stakeholder?	Stakeholder sector	Provide a brief description of the stakeholder	Why are they an important stakeholder in the food system?	What is their potential role in the use of climate services?	Level of knowledge/ experience related to climate services	Examples of level of knowledge/ experience related to climate services	Level of commitment to using climate services?	Constraints on using climate services
Provide the name of the stakeholder	Indicate at which level (international, national, regional, local) the stakeholder operates	Indicate the sector in which the stakeholder operates (nutrition, agriculture, emergency response, etc.)	Describe the primary purpose of the stakeholder	Briefly describe what makes them an important stakeholder, including their relevant roles and responsibilities	How might the stakeholder be able to use climate services? What would be their vested interest in using them? If they are already using them, indicate which climate services they are currently using and why	Provide an assessment of whether the stakeholder has low, medium or high knowledge of climate services. Although this is a crude (and subjective) measure, those that are currently using climate services in most of their programming would be considered to have high knowledge, whereas those with little awareness of climate services would be considered to have low knowledge. Many organizations or individuals may be in the middle (medium knowledge)	Provide examples of knowledge and use of climate services	Do they support or oppose the use of climate services? To what extent and why?	What are the limitations to their use of climate services? These could include lack of knowledge, resources, human capacity/ personnel, political or technological barriers, etc.

SOURCE: Authors' own elaboration.

Supplemental table 4. Interview guide for key stakeholder interviews and key workshop activities

Introduction

Thank you for agreeing to be interviewed. As I mentioned, we are interested in the links between climate and food systems with a particular focus on how climate services can be leveraged to improve the implementation of food and nutrition policies, programmes and actions. We would like to ask you questions related to existing food and nutrition actions, about the extent to which climate has been considered in those actions, as well as how climate might be considered more in future activities. Climate services aim to provide information about the climate to people whose activities are affected by climate shocks and stressors, such as changes in the seasons and extreme climate events like floods, heat waves or droughts. The climate information itself can take many forms. It can include risk assessments (to identify when and where systems are at risk from climate), up-to-date monitoring of climate conditions, or forecasts of future climate conditions.

Interview questions

1. Can you describe the key food and nutrition policies, programmes or actions in which your organization is involved?
 - a. How is climate considered in those policies/programmes/actions?
 - i. Probe: Seasonality considerations
2. Can you describe other key policies, programmes or actions that are aimed at improving food, nutrition or health outcomes in the country?
 - a. Probe (depending on stakeholder being interviewed)
 - i. Production of nutrient-rich foods, stabilization of income (such as cash transfers), improved food safety, increased availability, affordability and acceptability of nutrient-rich foods, reduced disease risk, improved access to health services, women's empowerment and reduced time poverty
 - ii. For each of the policies/programmes/actions identified:
 1. How is climate considered in those policies/programs/actions?
 - a. Probe: Seasonality considerations
3. What degree of importance are climate considerations given within your organization? Why?
4. How familiar is your organization with climate services?
 - a. Probe: Which climate services are currently being used?
5. What are the ways in which climate could be considered more in your organization's policies and programming?
 - a. In which ways could climate services be used to inform the design or implementation/delivery of your organization's programmes/policies/actions?
 - i. What are some of the barriers to the uptake of climate services?
 - ii. What are some of the facilitators to the uptake of climate services?
6. Who are the key stakeholders in the country's food system?
 - a. Which stakeholders consider climate to a greater extent in their policies and programming?

SOURCE: Authors' own elaboration.

References

- Afshin, A., Sur, P.J., Fay, K.A., Cornaby, L., Ferrara, G., Salama, J.S. et al.** 2019. Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *The Lancet*, 393(10184): 1958–1972. <https://pubmed.ncbi.nlm.nih.gov/30954305/>
- Bowen, G.A.** 2009. Document analysis as a qualitative research method. *Qualitative research journal*, 9(2): 27–40. https://www.researchgate.net/publication/240807798_Document_Analysis_as_a_Qualitative_Research_Method
- Christel, I., Hemment, D., Bojovic, D., Cucchiatti, F., Calvo, L., Stefaner, M. & Buontempo, C.** 2018. Introducing design in the development of effective climate services. *Climate Services*, 9: 111–121. <https://www.sciencedirect.com/science/article/pii/S2405880716300814>
- Climate Services Partnership.** 2022. What are Climate Services? [Online]. New York, Columbia University. Cited 1 August 2022. <https://climate-services.org/about-us/what-are-climate-services/>
- Colagiuri, R., Boylan, S. & Morrice, E.** 2015. Research priorities for NCD prevention and climate change: An international Delphi survey. *International Journal of Environmental Research and Public Health* 12(10): 12941–12957. <https://pubmed.ncbi.nlm.nih.gov/26501301/>
- Columbia Climate School.** n.d. Adapting Agriculture to Climate Today, for Tomorrow [online]. Cited 29 June 2022. New York. <https://iri.columbia.edu/actoday/>
- Davis, K.F., Downs, S. & Gephart, J.A.** 2021. Towards food supply chain resilience to environmental shocks. *Nature Food*, 2(1): 54–65. <https://www.nature.com/articles/s43016-020-00196-3>
- Downs, S., Thomson, M., Decklebaum, R. & Baethgen, W.** 2022. The role of climate services to help transform nutrition. In: *UN-Nutrition Journal*. Rome: UN-Nutrition.
- Fanzo, J., Davis, C., McLaren, R. & Choufani, J.** 2018. The effect of climate change across food systems: Implications for nutrition outcomes. *Global Food Security*, 18: 12–19. <https://www.sciencedirect.com/science/article/abs/pii/S2211912418300063>
- Garrett, J.L. & Natalicchio, M.** 2010. *Working multisectorally in nutrition: principles, practices, and case studies*. Washington, DC, International Food Policy Research Institute. <https://www.ifpri.org/publication/working-multisectorally-nutrition-principles-practices-and-case-studies>
- Grace, K., Davenport, F., Hanson, H., Funk, C. & Shukla, S.** 2015. Linking climate change and health outcomes: Examining the relationship between temperature, precipitation and birth weight in Africa. *Global Environmental Change*, 35: 125–137. <https://www.sciencedirect.com/science/article/abs/pii/S0959378015300066>
- Grossi, A. & Dinku, T.** 2022. Enhancing national climate services: How systems thinking can accelerate locally led adaptation. *One Earth*, 5(1): 74–83. <https://www.sciencedirect.com/science/article/pii/S2590332221007259>
- Grossi, A., Hansen, J., Trzaska, S. & Downs, S.** 2021. *Coproduction de services climatiques pour le secteur de la nutrition au Sénégal*. ACToday Workshop Report. New York, International Research Institute for Climate and Society and Columbia Climate School, Columbia University. <https://doi.org/10.7916/3k7p-fh44>
- HLPE (High-Level Panel of Experts on Food Security and Nutrition).** 2017. *Nutrition and food systems*. Rome, FAO. <https://www.unscn.org/en/resource-center/global-trends-and-emerging-issues?idnews=1745>
- Jancloes, M., Thomson, M., Costa, M.M., Hewitt, C., Corvalan, C., Dinku, T., Lowe, R. & Hayden, M.** 2014. Climate services to improve public health. *International Journal of Environmental Research and Public Health*, 11(5): 4555–4559. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4053884/>
- Myers, S.S., Smith, M.R., Guth, S., Golden, C.D., Vaitla, B., Mueller, N.D., Dangour, A.D. & Huybers, P.** 2017. Climate change and global food systems: potential impacts on food security and undernutrition. *Annual Review of Public Health*, 38: 259–277. <https://pubmed.ncbi.nlm.nih.gov/28125383/>
- Thompson, M., Fanzo, J. & Garnett, T.** 2015. Chapter 6: Climate Change and Nutrition. In: *Global Nutrition Report*. Washington, DC, International Food Policy Research Institute. <https://www.ifpri.org/publication/global-nutrition-report-2015>
- Saldaña, J.** 2015. *The coding manual for qualitative researchers*. London: Sage.
- Salentine, S. & Johnston, A.** 2011. *Tools for data demand and use in the health sector: Stakeholder engagement tool*. Chapel Hill, NC, University of North Carolina. https://www.measureevaluation.org/resources/publications/ms-11-46-e/at_download/document

- Schmeer, K.** 1999. Stakeholder analysis guidelines. In: *Policy toolkit for strengthening health sector reform*. Washington, DC, Center for Policy and Governance, United States Agency for International Development.
https://www.researchgate.net/publication/265021546_Stakeholder_Analysis_Guidelines
- Singh, P., Huynh, T. & Downs, S.** 2020. *Nutrition landscape and climate in Vietnam: Identifying climate service entry points*. CCAFS Working Paper no. 317. Wageningen, the Netherlands, CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).
<https://hdl.handle.net/10568/109083>
- Stewart-Ibarra, A.M., Romero, M., Hinds, A.Q., Lowe, R., Mahon, R., Van Meerbeeck, C.J. et al.** 2019. Co-developing climate services for public health: Stakeholder needs and perceptions for the prevention and control of Aedes-transmitted diseases in the Caribbean. *PLoS Neglected Tropical Diseases*, 13(10): e0007772.
<https://pubmed.ncbi.nlm.nih.gov/31658267/>
- Thomson, M.C. & Mason, S.** 2018. *Climate information for public health action*. New York, Routledge.
- Tirado, M.C., Clarke, R., Jaykus, L.A., McQuatters-Gollop, A. & Frank, J.M.** 2010. Climate change and food safety: A review. *Food Research International*, 43(7): 1745–1765.
<https://www.sciencedirect.com/science/article/abs/pii/S0963996910002231>
- Vaughan, C. & Dessai, S.** 2014. Climate services for society: origins, institutional arrangements, and design elements for an evaluation framework. *Wiley Interdisciplinary Reviews: Climate Change*, 5(5): 587–603.
<https://wires.onlinelibrary.wiley.com/doi/full/10.1002/wcc.290>
- Watts, N., Adger, W.N., Agnolucci, P., Blackstock, J., Byass, P., Cai, W. et al.** 2015. Health and climate change: policy responses to protect public health. *The Lancet*, 386(10006): 1861–1914.
[https://www.thelancet.com/journals/lanet/article/PIIS0140-6736\(15\)60854-6/fulltext](https://www.thelancet.com/journals/lanet/article/PIIS0140-6736(15)60854-6/fulltext)
- WHO (World Health Organization).** 2011. *Improving Climate Services for the Health Sector*. Geneva, Switzerland.
- Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S. et al.** 2019. Food in the Anthropocene: The EAT–Lancet Commission on healthy diets from sustainable food systems. *The Lancet*, 393(10170): 447–492.
<https://pubmed.ncbi.nlm.nih.gov/30660336/>

Potential of financial incentives to promote fruit and vegetable intake and support food security

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Financial incentives and disincentives have been used to encourage healthy eating among consumers and support food security (Hawkes, 2009; John *et al.*, 2021). Broadly conceptualized, incentives can prompt consumers to shift their food choices for economic gain, while disincentives can prevent economic loss (Gneezy, Meier and Rey-Biel, 2011). Financial incentives for consumers include vouchers or discounts for healthy food (for example, Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) provides vouchers to purchase WIC-approved foods). Financial disincentives for consumers include price restructuring or taxation of unhealthy foods and beverages, such as the taxation of sugar-sweetened beverages (Powell, Marinello and Leider, 2021).

Both incentive and disincentive approaches have the same overall goal: to promote more healthful eating behaviours (Gneezy, Meier and Rey-Biel, 2011; Mozaffarian, Rogoff and Ludwig, 2014). Disincentives are something of a “stick” approach, as they restrict consumer choice – disproportionately so for people on low incomes who struggle to afford food (Adams *et al.*, 2014). Disincentives are typically taxes that generate income for the jurisdiction when designed appropriately (Chiquiri *et al.*, 2021; Hawkes, 2009). Financial incentives, especially vouchers or discounts for fruits and vegetables, are more of a “carrot” approach, as they enhance consumer choice and increase the purchasing

power of people with low incomes. Incentives initially cost the implementer money to distribute, but have an impact on the local economy in the long term (through the multiplier effect) (Hawkes, 2009; Thilmany *et al.*, 2021).

With this perspective, this article focuses on federally supported financial incentives for fruits and vegetables as a policy innovation that has high potential to transform nutrition, drawing on the authors' leadership of the United States Department of Agriculture (USDA) National Institute of Food and Agriculture (NIFA) Gus Schumacher Nutrition Incentive Program's (GusNIP) Nutrition Incentive Program Training, Technical Assistance, Evaluation, and Information Center (NTAE).

Grounds for federally supported financial incentives for fruits and vegetables in the United States of America

Over the past decade, there have been several appeals for financial incentive support for fruits and vegetables. Béné *et al.* (2020, p.457) emphasized five priorities for supporting healthy diets for billions, including the “provision of discounts to households with low-income” to purchase fruits and vegetables as an intervention to “offset costs and generate new economic opportunities”. Barnidge *et al.* (2020, p.614) cite financial incentives as part of a framework that recognizes “food as a human right”.

The United Nations System Standing Committee on Nutrition (UNSCN) (2016) outlines “health-related food taxes and government subsidy schemes for healthy foods for lower-income groups” as a recommended investment strategy for implementing the Framework for Action of the Second International Conference on Nutrition. The Global Action Plan for the Prevention and Control of Noncommunicable Diseases (WHO, 2013) underscored subsidies as “economic tools ... that create incentives for behaviours associated with improved health outcomes”. Yet, incentives or subsidies for fruits and vegetables have not been implemented at scale, except in the United States of America, as we will discuss.

The increased availability of funding, the growing field of practitioners and ever more scientific literature underscore the momentum behind financial incentives for fruits and vegetables in the United States of America (Engel and Ruder, 2020; Bhat *et al.*, 2021). Two main types of financial incentive programme have developed over time. Nutrition incentive and produce prescription programmes work similarly, as participants receive money (in the form of vouchers, rebates, tokens or automatic discounts) to purchase fruits and vegetables in various retail settings (such as grocery stores or farmers markets). Nutrition incentive projects provide financial incentives to purchase more fruits and vegetables at the point of purchase for Supplemental Nutrition Assistance Program (SNAP) participants. Produce prescription projects work in tandem with healthcare entities to prescribe fruits and vegetables to low-income patients with chronic disease risk (such as type 2 diabetes) or Medicaid eligibility or participation, and/or those who screen positive for food insecurity.

Models suggest that financial incentives for fruits and vegetables may spur shifts to more healthful eating to reduce chronic disease morbidity, mortality and healthcare costs over the long term (Choi, Seligman and Basu, 2017; Mozaffarian *et al.*, 2018). These microsimulations demonstrate societal benefits, as financial incentives increase the purchasing power of consumers, create new economic opportunities for fruit and vegetable producers and retailers, and provide wraparound services for healthcare systems to address nutrition. A scoping review of financial incentives for fruits and vegetables among SNAP participants determined that 18 of 19 studies had a positive impact on the purchase and/or consumption of fruits and vegetables (Engel and Ruder, 2020). Evidence on the impact of financial incentives for fruits and vegetables on food security is mixed (Durward *et al.*, 2019; Savoie-Roskos *et al.*, 2016).

Two large national evaluations produced contradictory results on the potential impact of federally supported financial incentive programmes for fruits and vegetables. The Healthy Incentives Pilot was a randomized controlled trial that compared SNAP participants receiving nutrition incentives with those receiving no nutrition incentives and demonstrated that the nutrition incentive group purchased and consumed more fruits and vegetables than the control group (Olsho *et al.*, 2016). Later, an evaluation of the Food Insecurity Nutrition Incentive Program (FINI) resulted in no statistically significant change in fruit and vegetable intake, although research design methodologies should be considered when interpreting null findings (Vericker *et al.*, 2021). The intervention group included SNAP households near a site operating a FINI project, although many of the households did not participate in the programme.

Encouraging signs exist, but supporting evidence comes from modelling studies, a relatively small subset of projects operating in local areas, and one of two nationwide, federally funded national evaluations. There is a need for all-encompassing research to demonstrate the comprehensive impact of financial incentives on fruit and vegetable intake and food security.

The way forward: GusNIP as a cornerstone initiative in determining the significance of fruit and vegetable financial incentives for policy innovation

GusNIP, the successor to FINI, was appropriated in the 2018 Farm Bill and is administered by the USDA. It will provide USD 250 million of competitive grants over five years to community-based organizations to implement financial incentives for fruits and vegetables through nutrition incentive and produce prescription projects. From 2019 to 2021, 115 nutrition incentive and produce prescription grantees were awarded approximately USD 100 million in total funds, with more grants being awarded annually. In addition, USDA awarded a national GusNIP NTAE through a cooperative agreement funded following a grant competition to support GusNIP grantees in reporting, evaluation and technical assistance.

A driving factor in establishing the NTAE was to draw on experts in measurement and evaluation to aid in selecting, modifying and developing shared measures for GusNIP (Nugent *et al.*, 2021). A cohesive, robust and representative dataset is key to understanding aggregate impact across GusNIP projects with varying implementation models (Figure 1).

Figure 1. The power of shared measures across financial incentive programmes funded by GusNIP



SOURCE: Developed by Amanda Schneider, Marketing and Communications Manager, Gretchen Swanson Center for Nutrition

To develop a comprehensive set of shared measures, the NTAE has used a “bottom-up” approach that takes into account the historical use of measures, the ability to make comparisons with surveillance surveys, the capacity of GusNIP grantees and partners, interest in and need for specific data by policymakers and others, ways to mitigate participant burdens and literacy, and the scientific validity and reliability of available measures.

The initial set of shared measures examines sociodemographics, perceived health status, programme participation and satisfaction, food security status, fruit and vegetable intake, and the COVID-19 impacts of GusNIP participants through standardized surveys, as well as the implementation or process measures across participating retail sites (for example, retail characteristics and financial incentive amounts or types). The NTAE gathers this systematic scientific evidence by analysing aggregate data from GusNIP grantees. Ultimately, the shared measures will lead to an understanding of the overall impact on fruit and vegetable intake and food security, as well as potential mediators and moderators of these two outcomes. It is important to identify these variables in justifying policy support.

Strategic evaluation to determine the value of financial fruit and vegetable incentives in policy innovation

It is important to determine what consequential change in any intervention “looks like” to justify the integration of financial incentives for fruits and vegetables into future programming and, ultimately, policymaking. Strategic evaluation of the aggregate impact of financial incentives on fruit and vegetable intake and food security will ensure that the study design is robust, sensitive to change and generalizable.

The average American consumes about 2.5 cups of fruits and vegetables per day, which is below the recommendation of 3 to 5 cups of fruits and vegetables per day (USDA and USDHHS, 2020). Even small increases in fruit and vegetable intake protect against several chronic diseases such as type 2 diabetes, cardiovascular disease and some cancers (Aune *et al.*, 2017). Meaningful increases in fruit and vegetable intake have been detected at around 0.25 cups per day on average, when examining changes across individuals in a population (Bellavia *et al.*, 2013). Operationalizing policy supports for financial incentives in the United States of America will be feasible if gains in fruit and vegetable intake are observed over multiple years among GusNIP participants, a historically difficult health behaviour within which to observe change.

Food insecurity has persisted for more than 10 percent of the population for the last 25 years in the United States of America and, currently, nearly 14 million Americans are food insecure (USDA ERS, 2020). As food security, in and of itself, is a correlate for dietary quality and intertwined with multiple historically entrenched factors, it can be difficult to observe change on a population level (Byker Shanks *et al.*, 2020). Some participants may see an increase food security due to the receipt of financial incentives for fruits and vegetables, while others may require greater policy, systems and environmental support to ultimately achieve adequate and consistent access to affordable, safe and nutritious food. For example, the 2018 Farm Bill supports SNAP and WIC, which together serve an estimated 50 million or so households annually (USDA Food and Nutrition Service, 2022a; 2022b). Even if greater food security among some or all participants is observed due to the provision of financial incentives for fruits and vegetables, continued collaboration across multiple sectors is warranted to ensure adequate access to affordable, safe and nutritious food at all times.

To detect change in primary outcomes (such as fruit and vegetable intake or food security), the aggregated data analysed by the NTAE include data collected by GusNIP grantees, which include participants of produce prescription or nutrition incentive projects, as well as the food retail sites that distribute financial incentives, such as farmers markets and grocery stores or clinics for participating produce prescription projects. In Year 2 (2020–2021) of the NTAE's work, almost 10 000 participant-level surveys were collected and analysed, and data were collected from almost 2 000 food retail sites and clinics.

The participant-level outcome data from nutrition incentive projects are a cross-sectional sample that analyses outcomes by length of time enrolled as a proxy for dose (first time, less than six months, six months or more). For produce prescription projects, meanwhile, a longitudinal sample is collected (pre and post) to examine outcomes. The aggregated participant-level data represent a small subset of participants reached by GusNIP. In Year 2, nearly USD 20 million of nutrition incentives and produce prescriptions were redeemed by an estimated 760 000 unique participants. Alongside the aggregated dataset, the NTAE is collecting implementation data to understand factors of and barriers to success among participants, partners and communities.

The NTAE is pairing the aggregated dataset with adequately powered sub-studies with more rigorous research design, one for nutrition incentives and one for produce

prescriptions. As people with low income in the United States of America may receive other supports, the additional sub-studies are key to detecting the effect of nutrition incentives and produce prescriptions compared with matched control groups. The produce prescription sub-study will also analyse programmatic costs and healthcare cost effectiveness.

The NTAE is also building on previous work to estimate the local economic benefit of nutrition incentives by developing a public-facing online calculator using economic multipliers (Thilmany *et al.*, 2021). These sub-studies, paired with the multi-year aggregated data collected, will yield a substantial amount of evidence on the public health impact of financial incentives to promote fruit and vegetable intake and support food security.

Conclusions

Financial incentives to promote fruit and vegetable intake and support food security hold promise with regard to mitigating nutrition-related disparities among households with low income, yet their ultimate place as a policy that supports healthy diets will not be fully realized without a comprehensive understanding of impact across a cohort of projects. By assessing shared measures, the NTAE offers a viable path for understanding the population health impacts of financial incentives for fruits and vegetables. This US “case study” of GusNIP could be a critical linchpin in promoting the adoption, uptake and measurement of financial incentives for fruits and vegetables, both in the United States of America more broadly and globally.

References

- Adams, J., Giles, E.L., McColl, E. & Sniehotta, F.F.** 2014. Carrots, sticks and health behaviours: a framework for documenting the complexity of financial incentive interventions to change health behaviours. *Health Psychology Review*, 8(3): 286–295. <https://pubmed.ncbi.nlm.nih.gov/25053215/>
- Aune, D., Giovannucci, E., Boffetta, P., Fadness, L., Keum, N., Norat, T., Greenwood, D., Riboli, E., Vatten, L. & Tonstad, S.** 2017. Fruit and vegetable intake and the risk of cardiovascular disease, total cancer and all-cause mortality: A systematic review and dose-response meta-analysis of prospective studies. *International Journal of Epidemiology*, 46(3): 1029–1056. <https://pubmed.ncbi.nlm.nih.gov/28338764/>
- Barnidge, E.K., Stenmark, S.H., DeBor, M. & Seligman, H.K.** 2020. The right to food: Building upon “food is medicine”. *American Journal of Preventive Medicine*, 59(4): 611–614. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8769525/>
- Bellavia, A., Larsson, S.C., Bottai, M., Wolk, A. & Orsini, N.** 2013. Fruit and vegetable consumption and all-cause mortality: A dose-response analysis. *American Journal of Clinical Nutrition*, 8(2): 454–459. <https://pubmed.ncbi.nlm.nih.gov/23803880/>

- Béné, C., Fanzo, J., Haddad, L., Hawkes, C., Caron, P., Vermeulen, S., Herrero, M. & Oosterveer, P.** 2020. Five priorities to operationalize the EAT–Lancet commission report. *Nature Food*, 1: 457–459.
<https://www.nature.com/articles/s43016-020-0136-4>
- Byker Shanks, C., Calloway, E.E., Parks, C.A. & Yaroch, A.L.** 2020. Scaling up measurement to confront food insecurity in the USA. *Translational Behavioral Medicine*, 10(6): 1382–1389.
<https://academic.oup.com/tbm/article-abstract/10/6/1382/6024607?redirectedFrom=fulltext>
- Bhat, S., Coyle, D.H., Trieu, K., Neal, B., Mozaffarian, D., Marklund, M. & Wu, J.H.Y.** 2021. Healthy food prescription programs and their impact on dietary behavior and cardiometabolic risk factors: A systematic review and meta-analysis. *Advances in Nutrition*, 12(5): 1944–1956.
<https://academic.oup.com/tbm/article-abstract/10/6/1382/6024607?redirectedFrom=fulltext>
- Chiquiri, J., Pipito, A., Asada, Y. & Powell, L.** 2021. *Lessons Learned from the Adoption and Implementation of Sweetened Beverage Taxes in the United States: A Narrative Review*. P3RC Research Brief No. 119. Chicago, IL: University of Illinois.
https://p3rc.uic.edu/wp-content/uploads/sites/561/2021/08/Lssns-Lrmd-Adptn-Implmntn-US-SSB-Taxes_P3RC-Res-Brf-No.119_June-2021.pdf
- Choi, S.E., Seligman, H. & Basu, S.** 2017. Cost effectiveness of subsidizing fruit and vegetable purchases through the Supplemental Nutrition Assistance Program. *American Journal of Preventive Medicine*, 52(5): e147–e155.
<https://pubmed.ncbi.nlm.nih.gov/28153648/>
- Durward, C.M., Savoie-Roskos, M., Atoloye, A., Isabella, P., Jewkes, M.J., Ralls, B., Riggs, K. & LeBlanc, H.** 2019. Double Up Food Bucks participation is associated with increased fruit and vegetable consumption and food security among low-income adults. *Journal of Nutrition Education and Behavior*, 1(3): 342–347.
<https://www.sciencedirect.com/science/article/abs/pii/S1499404618307450>
- Engel, K. & Ruder, E.H.** 2020. Fruit and vegetable incentive programs for Supplemental Nutrition Assistance Program (SNAP) participants: A scoping review of program structure. *Nutrients*, 12(6): 1676.
<https://pubmed.ncbi.nlm.nih.gov/32512758/>
- Gneezy, U., Meier, S. & Rey-Biel, P.** 2011. When and why incentives (don't) work to modify behavior. *Journal of Economic Perspectives*, 25(4): 191–210.
<https://www.jstor.org/stable/41337236>
- Hawkes, C.** 2009. Financial Incentives and Disincentives to Encourage Healthy Eating. *Which? Magazine*, July 2009.
<https://about-which.s3.amazonaws.com/policy/media/documents/59b0032188971-financial-incentives-and-disincentives-to-encourage-healthy-eating-which-report-445285.pdf>
- John, S., Lyerly, R., Wilde, P., Cohen, E.D., Lawson, E. & Nunn, A.** 2021. The case for a national SNAP fruit and vegetable incentive program. *American Journal of Public Health*, 111(1): 27–29.
<https://pubmed.ncbi.nlm.nih.gov/33326275/>
- Mozaffarian, D., Rogoff, K.S. & Ludwig, D.S.** 2014. The real cost of food: can taxes and subsidies improve public health? *Journal of the American Medical Association (JAMA)*, 312(9): 889–890.
<https://pubmed.ncbi.nlm.nih.gov/25182094/>
- Mozaffarian, D., Liu, J., Sy, S., Huang, Y., Rehm, V., Lee, Y. et al.** 2018. Cost-effectiveness of financial incentives and disincentives for improving food purchases and health through the US Supplemental Nutrition Assistance Program (SNAP): A microsimulation study. *PLoS Medicine*, 15(10): e1002661.
<https://pubmed.ncbi.nlm.nih.gov/30278053/>
- Nugent, N., Byker Shanks, C., Seligman, H.K., Fricke, H., Parks, C.A., Stotz, S. & Yaroch, A.L.** 2021. Accelerating evaluation of financial incentives for fruits and vegetables: A case for shared measures. *International Journal of Environmental Research in Public Health*, 18(22): 12140.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8621044/>
- Olsho, L.E., Klerman, J.A., Wilde, P.E. & Bartlett, S.** 2016. Financial incentives increase fruit and vegetable intake among Supplemental Nutrition Assistance Program participants: A randomized controlled trial of the USDA Healthy Incentives Pilot. *American Journal of Clinical Nutrition*, 104(2): 423–435.
<https://pubmed.ncbi.nlm.nih.gov/27334234/>
- Powell, L.M., Marinello, S. & Leider, J.** 2021. A Review and Meta-analysis of Tax Pass-through of Local Sugar-Sweetened Beverage Taxes in the United States. Research Brief No. 120. Chicago, IL, Policy, Practice and Prevention Research Center, University of Illinois Chicago.
https://p3rc.uic.edu/wp-content/uploads/sites/561/2021/09/Rvw-Meta-Anal-Tax-PssThrhg-SSB-Taxes_Rsrch-Brf-No.-120_Jul-2021.pdf

Savoie-Roskos, M., Durward, C., Jeweks, M. & LeBlanc, H. 2016. Reducing food insecurity and improving fruit and vegetable intake among farmers' market incentive program participants. *Journal of Nutrition Education and Behavior*, 48(1): 70–76.e1. <https://www.sciencedirect.com/science/article/abs/pii/S1499404615007125>

Thilmany, D., Bauman, A., Love, E. & Jablonski, B.B.R. 2021. The Economic Contributions of Expanding Healthy Food Incentives. *SPUR*, 4 February 2021. <https://www.spur.org/publications/spur-report/2021-02-04/economic-contributions-expanding-healthy-food-incentives>

UNSCN (United Nations Standing Committee on Nutrition). 2016. *A Framework Analysis and Review of Evidence on Food System Investments for Improving Nutrition*. Rome. https://www.unscn.org/files/ICN2_TPM/EN_final_Investments_for_Healthy_Food_Systems_UNSCN.pdf

USDA (US Department of Agriculture) & USDHHS (US Department of Health and Human Services). 2020. *Dietary Guidelines for Americans, 2020-2025*. Rockville, MD and Alexandria, VA. <https://www.dietaryguidelines.gov/>

USDA ERS (Economic Research Service). 2020. Key Statistics & Graphics – Trends in Prevalence Rates [online]. Cited 31 May 2022. Washington, DC. <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/key-statistics-graphics/#trends>

USDA Food and Nutrition Service. 2022a. SNAP Data Tables [online]. Cited 31 May 2022. Alexandria, VA. <https://www.fns.usda.gov/pd/supplemental-nutrition-assistance-program-snap>

USDA Food and Nutrition Service. 2022b. WIC Data Tables [online]. Cited 31 May 2022. Alexandria, VA. <https://www.fns.usda.gov/pd/wic-program>

Vericker, T., Dixit-Joshi, S., Giesen, L., Gearing, M., Manglitz, C., Baier, K., Lee, H. & May, L. 2021. *Evaluation of the Implementation of Food Insecurity Nutrition Incentives (FINI): Final Report*. Alexandria, VA: USDA Food and Nutrition Service. <https://www.fns.usda.gov/snap/evaluation-implementation-food-insecurity-nutrition-incentives-fini-final-report>

WHO (World Health Organization). 2013. *Global action plan for the prevention and control of noncommunicable diseases 2013–2020*. Geneva, Switzerland. <https://apps.who.int/iris/bitstream/handle/10665/94384/?sequence=1>



Blended finance: Transforming food systems for nutrition, one small firm at a time

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As the United Nations Decade of Action on Nutrition passes its midpoint, it is becoming increasingly clear that more action will be needed to achieve its aims and deliver on the promise of attaining the Sustainable Development Goals (SDGs), to which nutrition is central (Development Initiatives, 2017). No country is on track to meet all nutrition targets by the 2025 deadline (Development Initiatives, 2020) and hunger is on the rise, with the COVID-19 pandemic and ramifications from conflicts threatening years of progress on nutrition (Headey *et al.*, 2020; FAO *et al.*, 2021). Meeting this challenge will require greater financial resources to support nutrition action.

Nutrition is arguably the development sector with the biggest imbalance between potential impact and level of investment: fewer than 1 percent of donor investments in development are in nutrition, but 22 percent of adult deaths are attributable to dietary risks, with an even greater share of child deaths attributable to undernutrition (Afshin *et al.*, 2019; Baker, 2021). Great social benefits are there for the taking – if only the resources to unlock them were available.

In this article, we explore one high-potential area for unlocking additional resources: blended finance. We explain how this approach could make a real difference by increasing access to finance for food system businesses, which could in turn make more – and more nutritious –

food available to consumers who need it. We highlight one soon-to-be-launched innovation aiming to do just this.¹⁹

Improving nutrition requires increasing access to nutritious food

A major underlying cause of poor nutrition is that nutritious foods are unavailable or unaffordable to many people worldwide, particularly the poorest. For example, more than 70 percent of Africans cannot afford a healthy diet, while only about half of the volume of fruit and vegetables needed to meet WHO dietary recommendations is even available on the continent (FAO *et al.*, 2020; Mason-D'Croz *et al.*, 2019). Heavily processed non-nutritious foods are often cheaper than more nutritious options (Headey and Alderman, 2019). Increasing food availability, accessibility and affordability – as well as desirability and convenience – is central to achieving a well-nourished population.

Private-sector companies play a key role in shaping food availability, accessibility and affordability; even agricultural households in low- and middle-income countries (LMICs) depend heavily on markets to purchase food (Gómez and Ricketts, 2013). Small and medium-sized enterprises (SMEs) are particularly important actors, as they – through their roles in production, transport, handling, processing and retail – deliver most of the food consumed in LMICs

¹⁹ The first part of this paper draws on a longer discussion paper by the Global Alliance for Improved Nutrition (Nordhagen, Condés and Garrett, 2019), while the theory of change of the Nutritious Foods Financing Facility (N3F) is further articulated (USAID Advancing Nutrition, 2021) and the metrics underlying its definition of nutritious foods are discussed in (Nordhagen and Neufeld, forthcoming).

(Demmler, 2020). SMEs also make large contributions to economic growth and employment, contributing up to 45 percent of employment and 33 percent of gross domestic product (GDP) across all sectors (Teima *et al.*, 2010).

Improving access to nutritious foods in LMICs requires enabling SMEs to bring such products to market in a financially sustainable way and in forms that are appealing and affordable to consumers. Where there is a viable business case, businesses will step in – but only if they have access to the financing and technical assistance needed to respond to that business case. In the agrifood sector specifically, financing combined with technical assistance could support SMEs in adding more nutritious products, increasing efficiency, improving quality (including convenience and safety) and expanding reach.

However, for SMEs in all sectors, financing is typically the largest barrier (World Bank, 2019), with a considerable global gap between the amount of finance needed and that provided, and about half of SMEs in LMICs lacking the financing they need (IFC, 2017; Teima *et al.*, 2010). From many investors' perspective, SME funding needs are relatively small – implying low profits for the amount of effort invested – but also risky, due to their limited collateral, short credit histories and difficult-to-predict growth (Beck and Demirguc-Kunt, 2006; Dalberg Advisors, 2017).

As a result of this perceived high risk-to-reward ratio, the financing available may be limited, with unattractive terms, such as high interest rates (Jenkins and Gilbert, 2018). This is particularly true for the “missing middle”: companies too big for microfinance, but too small for local banks and venture capitalists. For SMEs in food and agriculture, there is additional risk due to historically thin profit margins and exposure to climate shocks and changes, which are exacerbated by contextual risks in certain LMICs, such as insecurity and political instability (Limketkai, Guarnaschelli and Millan, 2019; Dalberg Advisors, 2017).

While agricultural funds exist and are growing, such investments account for only 3 percent of the capital mobilized from 2000 to 2016 (Dalberg Advisors, 2017). Moreover, very few food and agriculture funds have a nutrition mandate or focus on nutritious foods (Roy Bentley, 2019; Valoral Advisors, 2018). Instead, most investment goes to non-nutritious foods, often for export. For example, 70 percent of financing provided by the Council on Smallholder Finance, which supports smallholder farmers in LMICs, goes to coffee and cocoa (CSAF, 2021). The investment opportunities are much broader than this: food and agriculture accounts for 10 percent of global consumer

spending (Goedde, Horrii and Sanghvi, 2015), with an estimated USD 165 billion to USD 255 billion to be made in serving the increasing demand for higher-quality food from those emerging out of poverty (AlphaBeta, 2016).

Blended finance

Increasing investment in SMEs in the agrifood sector thus requires a mechanism that can help reduce inherent risk. One way of doing this is through blended finance. Blended finance brings together socially oriented donors and investors (such as development agencies and development finance institutions) that have a strong social mandate and high risk tolerance, with private investors that have capital and an interest in positive social impact, but are unable to bear much risk. Development funding is thus used to “de-risk” the investments by covering losses (“first-loss capital”) or providing guarantees, securitization, or insurance (Dalberg Advisors, 2017).

In so doing, they make the investment more attractive to private-sector investors – pulling in additional capital beyond what could be provided by the development sector. With enough interest from commercially driven investors, the public element of the financing can eventually be reduced or removed (Samans, 2016). Blended finance mechanisms often also include grant-funded technical assistance to help the target companies grow and improve. Blended finance had mobilized about USD 100 billion as of 2019 (Dalberg Advisors, 2018), particularly in energy, banking, mining and communications (OECD and United Nations Capital Development Fund, 2019).

A new innovation

In late 2022, a new blended finance mechanism is set to be launched to test this value proposition. The Nutritious Foods Financing Facility (N3F), a collaboration between the Global Alliance for Improved Nutrition (GAIN) and Incofin Investment Management, aims to demonstrate how investment in SMEs can increase the availability of safe and nutritious foods. Through an open-ended debt fund using a blended finance structure managed by Incofin, N3F will make senior and junior debt investments in SMEs in Sub-Saharan Africa. The aim is to fill the gap for SMEs that are too large for microfinance yet too small for direct investment and to de-risk investments for both investors and investees. Risk reduction will be ensured through accompanying technical assistance, overseen by GAIN, to improve firms' operations, product quality (particularly nutritional content) and financial performance. GAIN will also lead a learning agenda to develop definitions, metrics and monitoring tools

²⁰ More information on N3F is available at <https://ifssportal.nutritionconnect.org/solutions/explore/blended-financing-nutritious-food>.

to track N3F's impacts and enable other investors to bring a nutrition lens to their work.²⁰ This will include defining which nutritious foods should be targeted, establishing metrics to track firms' outputs and drafting monitoring tools that will allow firms to report on those metrics.

N3F will consider investments across the value chain, from inputs to retail, with a focus on processing, distribution and marketing. All companies must be involved in supporting the production of safe, nutritious foods for the local or regional population, with top prioritization going to minimally processed, inherently nutrient-dense foods, such as fruits, vegetables, nuts and seeds, as well as supplements for special populations (such as micronutrient powders) and fortified and biofortified foods with limited added salt, sugar or fat.

Investments will be based on clear nutritional criteria and will also take into consideration gender equity and environmental sustainability. For example, one firm in the N3F pipeline of potential investees is a Rwandan company that processes flours, including fortified versions, from locally produced maize and sells them at affordable prices to

lower-income consumers in Rwanda and nearby countries. The company recently introduced a new wholegrain maize flour (including fortified forms), which is used in local school meal programmes. Another pipeline company is a woman-led dairy in Kenya, which works with farmers to process raw milk into products such as yoghurt, extended shelf-life milk and fermented milk, and plans to introduce fortified milk products in the near future.

While N3F aims to achieve direct changes in access to nutritious foods in the communities where it works, its role in influencing the actions of others is meant to be even greater. Private investors control hundreds of billions of dollars that could be mobilized to help strengthen food systems and improve nutrition, but there are currently few mechanisms through which they can do so. By creating new metrics and approaches to targeting nutrition-sensitive investments and offering a demonstration effect of how they work in practice, N3F hopes to encourage other financial actors to put their money into nutrition and grow the coalition with a view to achieving the 2025 and 2030 agendas.

References

- Afshin, A., Sur, P.J., Fay, K.A., Cornaby, L., Ferrara, G., Salama, J.S., Mullany, E.C. et al.** 2019. Health Effects of Dietary Risks in 195 Countries, 1990–2017: A Systematic Analysis for the Global Burden of Disease Study 2017. *The Lancet*, 393(10184): 1958–72 [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(19\)30041-8/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(19)30041-8/fulltext)
- AlphaBeta.** 2016. *Valuing the SDG Prize in Food and Agriculture: Unlocking Business Opportunities to Accelerate Sustainable and Inclusive Growth*. Paper commissioned by the Business and Sustainable Development Commission. London, Business and Sustainable Development Commission. <http://businesscommission.org/our-work/valuing-the-sdg-prize-in-food-and-agriculture>
- Baker, S.** 2021. Global Financing for Nutrition: 45%≠1%. *LinkedIn* blog [online], 22 March 2021. Washington, DC, United States Agency for International Development (USAID). Cited 17 May 2022. <https://www.linkedin.com/pulse/global-financing-nutrition-451-shawn-baker/>
- Beck, T. and Demircuc-Kunt, A.** 2006. Small and Medium-Size Enterprises: Access to Finance as a Growth Constraint. *Journal of Banking & Finance*, 30(11): 2931–43. <https://doi.org/10.1016/j.jbankfin.2006.05.009>
- CSAF (Council on Smallholder Finance).** 2021. CSAF Open Data Portal [online]. Cambridge, MA. Cited 17 May 2022. <https://data.csaf.org/>
- Dalberg Advisors.** 2017. *Blended Finance Tools to Catalyze Investment in Agricultural Value Chains: An Initial Toolbox*. Report Commissioned by AfDB, DFID, AGRA and IFAD. New York.
- Dalberg Advisors.** 2018. *The Economics of Agri-SME Lending in East Africa*. New York. https://www.agrilinks.org/sites/default/files/resources/the_economics_of_agri_sme_lending_in_east_africa_final_report.pdf
- Demmler, K.M.** 2020. *The Role of Small and Medium-Sized Enterprises in Nutritious Food Supply Chains in Africa*. GAIN Working Paper Series No.2. Geneva, Switzerland, Global Alliance for Improved Nutrition (GAIN). <https://doi.org/10.36072/wp.2>
- Development Initiatives.** 2017. *Global Nutrition Report 2017: Nourishing the SDGs*. Bristol, UK. <https://globalnutritionreport.org/reports/2017-global-nutrition-report/>

- Development Initiatives.** 2020. *2020 Global Nutrition Report: Action on Equity to End Malnutrition*. Bristol, UK. <https://globalnutritionreport.org/reports/2020-global-nutrition-report/>
- FAO, IFAD, UNICEF, WFP, and WHO.** 2020. *The State of Food Security and Nutrition in the World 2020*. Rome. <https://doi.org/10.4060/ca9692en>
- FAO, IFAD, UNICEF, WFP and WHO.** 2021. *The State of Food Security and Nutrition in the World 2021*. Rome. <https://doi.org/10.4060/cb4474en>
- Goedde, L., Horrii, M. & Sanghvi, S.** 2015. Pursuing the Global Opportunity in Food and Agribusiness. In: McKinsey & Company, *Chemicals and Agriculture*, pp. 1–9. New York, McKinsey & Company.
- Gómez, M.I. & Ricketts, K.D.** 2013. Food Value Chain Transformations in Developing Countries: Selected Hypotheses on Nutritional Implications. *Food Policy*, 42: 139–50. <https://doi.org/10.1016/j.foodpol.2013.06.010>
- Headey, D.D. & Alderman, H.H.** 2019. The Relative Caloric Prices of Healthy and Unhealthy Foods Differ Systematically across Income Levels and Continents. *Journal of Nutrition*, 149(11): 2020–2033. <https://doi.org/10.1093/jn/nxz158>
- Headey, D.D, Heidkamp, R., Osendarp, S., Ruel, M., Scott, N., Black, R., Shekar, M. et al.** 2020. Impacts of COVID-19 on Childhood Malnutrition and Nutrition-Related Mortality. *The Lancet*, 396(10250): 519–521. [https://doi.org/10.1016/S0140-6736\(20\)31647-0](https://doi.org/10.1016/S0140-6736(20)31647-0)
- IFC (International Finance Corporation).** 2017. *MSME Finance Gap: Assessment of the Shortfalls and Opportunities in Financing Micro, Small, and Medium Enterprises in Emerging Markets*. Washington, DC. <https://openknowledge.worldbank.org/handle/10986/28881>
- Jenkins, B. & Gilbert, R.** 2018. *Fueling the Business of Nutrition: What Will It Take to Attract More Commercial Investment into Nutritious Food Value Chains?* Corporate Responsibility Initiative Discussion Paper. Cambridge, MA, Harvard Kennedy School.
- Limketkai, B., Guarnaschelli, S. & Millan, A.** 2019. *Financing the Transformation of Food Systems Under a Changing Climate*. Wageningen, Germany, CGIAR Climate Change, Agriculture and Food Security Program and KOIS Capital. <https://ccafs.cgiar.org/resources/publications/financing-transformation-food-systems-under-changing-climate>
- USAID Advancing Nutrition.** 2021. *Nutritious Food Financing Facility (N3F) Program Review Report*. Arlington, VA: USAID Advancing Nutrition.
- Mason-D’Croze, D., Bogard, J.R., Sulser, T.B., Cenacchi, N., Dunston, S., Herrero, M. & Wiebe, K.** 2019. Gaps between Fruit and Vegetable Production, Demand, and Recommended Consumption at Global and National Levels: An Integrated Modelling Study. *The Lancet Planetary Health*, 3(7): e318–329. [https://doi.org/10.1016/S2542-5196\(19\)30095-6](https://doi.org/10.1016/S2542-5196(19)30095-6)
- Nordhagen, S., Condés, S. & Garrett, G.** 2019. *Blended Finance: A Promising Approach to Unleash Private Investments in Nutritious Food Value Chains in Frontier Markets*. Geneva, Switzerland, Global Alliance for Improved Nutrition (GAIN). <https://doi.org/10.36072/dp.1>
- Nordhagen, S. & Neufeld, L.** (forthcoming). Impact Investing Holds Promise for Nutrition If Guided by Evidence. Accepted at *Journal of Nutrition*.
- OECD and United Nations Capital Development Fund.** 2019. “What Are the Latest Trends in Blended Finance for Least Developed Countries?” In: OECD and United Nations Capital Development Fund, *Blended Finance in the Least Developed Countries 2019*, pp. 15–40. Paris, OECD. <https://doi.org/10.1787/cc441769-en>
- Roy Bentley, M.P.** 2019. “Nutrition as an Investment Theme: Food and Agriculture Finance in Sub-Saharan Africa.” Master’s Dissertation. Geneva, Switzerland, Graduate Institute of Geneva. <https://repository.graduateinstitute.ch/record/297693>
- Samans, R.** 2016. Blending Public and Private Funds for Sustainable Development. In: OECD, *Development Co-Operation Report 2016: The Sustainable Development Goals as Business Opportunities*. Paris, OECD Publishing. <https://doi.org/10.1787/dcr-2016-en>
- Teima, G., Berthaud, A., Bruhn, M. De Castro, O., Joshi, M., Mirmulstein, M. & Onate, A.** 2010. *Scaling-up SME Access to Financial Services in the Developing World*. Washington, DC, World Bank. <http://documents.worldbank.org/curated/en/669161468140035907/Scaling-up-SME-access-to-financial-services-in-the-developing-world>
- Valoral Advisors.** 2018. *2018 Global Food & Agriculture Investment Outlook: Investing Profitability Whilst Fostering a Better Agriculture*. Luxembourg. <https://www.valoral.com/wp-content/uploads/2018-Global-Food-Agriculture-Investment-Outlook-Valoral-Advisors.pdf>
- World Bank.** 2019. Enterprise Surveys: Finance. Database. Washington, DC. Cited 5 January 2020. <https://www.enterprisesurveys.org/data/exploretopics/finance#--13>

COUNTRY-BASED INNOVATIONS

PROTEJA: Innovation to tackle childhood obesity in Brazil

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Childhood obesity is a global public health problem. It is a major risk factor for poor health throughout life, premature death, poor school attendance, levels and achievement, and poor employment prospects, as well as a heavy burden on health systems. Furthermore, overweight children and adolescents have an increased risk of becoming overweight adults and developing chronic non-communicable diseases (WHO, 2021). Therefore, in 2012, the World Health Assembly included "no increase in childhood overweight" as one of the Global Nutrition Targets 2025 (WHA, 2012). The proposed target is a challenge worldwide, including for Brazil, which has developed a series of innovative actions for the prevention and treatment of children living with obesity.

In Brazil, primary healthcare data from the Food and Nutrition Surveillance System (SISVAN) in 2021 revealed that about a third of children aged between 5 and 9 years (34.2 percent) and adolescents (32.7 percent) were overweight, while 18.1 percent and 13.0 percent, respectively, were

obese (Brazilian Ministry of Health, 2021). Trend analysis based on comparable representative surveys showed that between 1989 and 2006, overweight increased by 160 percent in children under five years of age, from 3 percent to 7.8 percent (IBGE, 2010). The Brazilian National Survey on Child Nutrition (ENANI) conducted in 2019 showed that 18.3 percent of children under the age of five were at risk of becoming overweight, while 10 percent were overweight or obese (UFRJ, 2022).

According to Organisation for Economic Co-operation and Development (OECD) studies, in Brazil, about 83 in every 100 000 deaths between 2020 and 2050 will be attributed to overweight and obesity, while life expectancy may be reduced by 3.3 years during that period (OECD, 2021). This will increase the economic burden on the Brazilian national health system (SUS), on society and on the economy in the form of lost productivity from premature deaths and illness, as well as a rise in healthcare costs for these individuals (Nilson *et al.*, 2019).

Over the last few decades, the unprocessed and minimally processed foods characteristic of a healthy and traditional Brazilian diet have been replaced by ultra-processed foods, even in early life. In 2021, data from SISVAN showed that 31 percent of children between the ages of 6 and 23 months had consumed ultra-processed foods on the day prior to the consultation. The prevalence was even higher among children aged 2 to 4 years (87.5 percent), 5 to 9 years (89 percent) and adolescents (86.8 percent) (Brazilian Ministry of Health, 2021). According to the 2019 Brazilian National Survey on Child Nutrition (ENANI), 80.5 percent of children between 6 and 23 months and 93.0 percent of children between 24 and 59 months consumed ultra-processed foods (UFRJ, 2021). Current dietary patterns greatly influence the prevalence of malnutrition in the Brazilian population, with similar effects worldwide (Monteiro *et al.*, 2019).

In light of the epidemiological nature of the situation and acknowledging the urgent need for cross-sectoral measures on this issue, the Brazilian government, through the Ministry of Health, has made several national and international commitments to stabilize and reverse the trend of childhood obesity to promote adequate and healthy diets and to build healthier food environments (Government of Brazil, 2021a; CAISAN, 2015; MERCOSUR, 2015; 2021a; PAHO, 2014).

In 2014, at the Fifty-third Meeting of the Pan American Health Organization (PAHO) Directing Council, the Brazilian Ministry of Health vowed to implement a Plan of Action for the Prevention of Obesity in Children and Adolescents, aimed at stabilizing and reversing the prevalence of obesity among the public (PAHO, 2014). In 2017, Brazil was the first country to formalize commitments to reduce obesity and improve the population's dietary patterns for the United Nations Decade of Action on Nutrition (2016–2025). As established in the Work Programme for the Nutrition Decade, aimed at accelerating and aligning efforts around its objectives, action areas and national commitments, in 2018, the Ministry of Health launched two Nutrition Decade action networks to exchange knowledge and good practice on dietary guidelines at the level of food processing, as well as Strategies for Reducing Salt Consumption for the Prevention and Control of Cardiovascular Disease in the Americas (CAISAN, 2015; United Nations, 2022).

These initial commitments led to more robust actions within the Intergovernmental Commission on Food and Nutrition Security of the Southern Common Market (MERCOSUR), formed by Argentina, Brazil, Paraguay and Uruguay, which aims to foster intersectoral actions that contribute to the right to food and to address all forms of malnutrition. These actions resulted in the signing of agreements between

the national ministers of health on obesity prevention, the protection of traditional diets and the promotion of the development of a healthy school environment in order to prevent and control the multiple consequences of malnutrition (MERCOSUR, 2015; 2021a; 2021b).

In 2021, Brazil's determination to reduce childhood obesity culminated in a joint commitment signed by the Ministry of Health and 18 partners, including the Ministries of Education and Citizenship, the National Council of Health Secretaries, health professional councils and associations, United Nations and international organizations, recognizing childhood obesity as an important public health concern that must be prioritized. They committed to strengthening and expanding actions to promote adequate and healthy food consumption and physical activity, as well as intersectoral actions for the prevention of childhood obesity and treatment of children living with obesity. Lastly, during the Tokyo Nutrition for Growth Summit, Brazil vowed to reduce the prevalence of obesity in children and adolescents by 2 percent by 2030, through the National Strategy for Prevention and Care of Childhood Obesity (PROTEJA) (Brazilian Ministry of Health, 2021a; 2022, Japan, 2022).

PROTEJA is a strategy launched in August 2021 by the Food and Nutrition Coordination Unit of the Ministry of Health to promote the implementation at scale of a package of actions at local level (Brazilian Ministry of Health, 2021a). It is innovative, in that it was designed to promote healthier environments in cities by taking into account the complexity of the multiple determinants of childhood obesity, particularly in urban contexts. Thus, it considers intersectoral policies and actions to reverse the obesogenic nature of the environments in which children, adolescents and their families live as a crucial aspect for the implementation. It also has specific funding and a team focused on supporting implementation at local level (Government of Brazil, 2021b).

PROTEJA is an acronym, with each letter representing a workstream that covers 20 essential (mandatory) and 41 complementary (optional) actions (please see the annex to this article for details). The essential actions are those proven to be effective in preventing childhood obesity and delivered mainly in primary healthcare settings. They can be grouped into the following action areas: i) food and nutritional surveillance, health promotion, prevention and treatment of overweight in children, adolescents and pregnant women within a primary healthcare setting; ii) health promotion in schools, so that they become settings that promote healthy eating practices and the regular practice of physical activity; iii) education, communication and information to promote healthy eating patterns and the

regular practice of physical activity; iv) training of healthcare professionals; v) cross-sectoral actions to promote healthier environments and healthier cities. The complementary actions aim to enable the implementation of the essential actions and help to safeguard food and nutrition security, access to comprehensive healthcare and the promotion of physical activity (Government of Brazil, 2021b).

PROTEJA highlights the need for cross-sectoral involvement and promotes the setting up of intersectoral working groups that engage representatives from health, education, agriculture, social development, urban planning, sports and the environment, among others, as a first step in planning, organizing and implementing the action package. This working group will be responsible for developing an implementation plan and will share in PROTEJA's management at local level.

All institutional support for the implementation of PROTEJA is coordinated by the Food and Nutrition Coordination Unit of the Ministry of Health, in partnership with the Brazilian states. Implementation will be further supported by the food and nutrition divisions of state and city administrations, by locally hired staff and by a network of academic and research institutions that have partnered with the Food and Nutrition Coordination Unit of the Ministry of Health. The Ministry of Health also has a partnership with several regional universities who are in direct contact with the municipalities and who conduct workshops to support the implementation of actions at local level.

Civil society is another key stakeholder in PROTEJA that can provide much support. To mobilize civil society, public opinion and policy managers, the Ministry of Health launched a national campaign on mainstream media, such as television, radio, social media and billboards. It held online technical events and produced and disseminated supporting technical documentation. In addition, PROTEJA's national implementation partners have been working to support the execution of actions and to encourage Brazilian society to recognize childhood obesity as a public health problem. They have been organizing online events, materials and national campaigns on the prevention of childhood obesity.

All levels of government – federal, state and municipal – can implement PROTEJA. Nonetheless, to support its implementation, the Ministry of Health has allocated a triennial budget totalling USD 19 million (2021 to 2023) to be transferred in annual instalments to 1 320 priority cities (Brazilian Ministry of Health, 2021a; 2021b). All 1 320 municipalities have committed to carrying out the 20 essential actions and five chosen complementary

actions. The prioritization criteria were municipalities with fewer than 30 000 inhabitants, a prevalence of overweight in children under 10 years of age greater than or equal to 15 percent, assessment coverage of nutritional status greater than 50 percent, and the presence of food consumption markers in primary healthcare for children under 10 years of age. Although all actions are monitored, the annual financial transfers depend on good performance over the previous year, measured by a monitoring system with three indicators: i) a growing number of children evaluated for their nutritional status; ii) a growing number of children evaluated for their dietary practices; and iii) a growing number of individual consultations for obesity in primary healthcare.

The actions carried out in Brazil align with the 2030 Agenda and the Sustainable Development Goals (SDGs), with nutrition recognized as a cross-cutting issue of health, education, agriculture, sustainability, and reducing poverty and inequality (United Nations, 2015). The national actions are a way of enhancing engagement in the Decade of Action on Nutrition (2016–2025) and the outcomes of the Second International Conference on Nutrition (ICN2) to coordinate efforts by countries to address the multiple burden of malnutrition (FAO and WHO, 2016). It also highlights the health sector as an important inducer of actions to transform and promote sustainable food systems, from production and access to the consumption of healthy and adequate food.

Brazil has built a strong, evidence-based and innovative strategy that aims to support a healthier environment for the country's children and their families. It is also a way of improving policy and inspiring other countries to introduce action packages that can promote healthier cities. PROTEJA's actions strengthen intersectoral partnerships, focusing on a common goal, the reduced prevalence of childhood obesity, by promoting healthier settings and healthy cities. This is an important step in achieving the objectives of the Decade of Action on Nutrition and the SDGs.

Annex. Mandatory essential actions of PROTEJA

PROTEJA acronym and workstreams		Essential actions of PROTEJA
P	<i>"Primeiro contato"</i> First point of contact (diagnosis and care actions in primary healthcare)	<ol style="list-style-type: none"> 1. Monitor the nutritional status and food consumption markers of children, adolescents and pregnant women in line with official documentation of the Ministry of Health. 2. Provide individual and collective multidisciplinary care in primary health care (PHC) level for pregnant women with pre-gestational excess weight or excessive gestational weight gain, in line with official documentation of the Ministry of Health. 3. Provide individual and collective multidisciplinary care in PHC for children and adolescents diagnosed with overweight and obesity, in line with official documentation of the Ministry of Health. 4. Equip basic health units (UBS) with at least a scale and stadiometer for adults and children, in line with official documentation of the Ministry of Health.
R	<i>"Responsabilidade"</i> Accountability (commitment)	<ol style="list-style-type: none"> 5. Develop a step-by-step plan for implementing PROTEJA.
O	<i>"Organização"</i> Organization (management)	<ol style="list-style-type: none"> 6. Include in municipal health plans goals for the prevention and care of childhood obesity as agreed in the formal instances of management and social control of SUS, including representatives from other sectors of public management. 7. Cross-sectoral articulation with various related sectors for the local management of PROTEJA. 8. Include progress on actions agreed by the municipality in the annual management report.
T	<i>"Transformação"</i> Transformation (food and nutrition education and physical activity)	<ol style="list-style-type: none"> 9. Implement, strengthen and/or expand the Breastfeeding and Complementary Feeding Strategy in the municipality. 10. Conduct individual and collective actions of food and nutrition education and physical activity at UBS and other public spaces for children, adolescents and pregnant women. 11. Conduct food and nutrition education and physical activity actions in schools, mainly through the PHC. 12. Ensure at least 15 minutes of physical activity per day, in addition to curricular physical education classes, in all schools and at all levels of education.
E	<i>"Educação"</i> Education (training)	<ol style="list-style-type: none"> 13. Ensure that educational and PHC professionals, including community health and social workers, are qualified in childhood obesity, based on the Ministry of Health's manuals, guides and protocols.
J	<i>"Janela de oportunidade"</i> Window of opportunity (communication)	<ol style="list-style-type: none"> 14. Conduct institutional campaigns in the mass media about childhood obesity. 15. Create printed and digital materials on PROTEJA and official guidelines from the Ministry of Health on adequate and healthy food and physical activity, to be made available in UBS, social assistance referral centres, psychosocial care centres, health academies, hospitals and schools.
A	<i>"Ambientes"</i> Environments	<ol style="list-style-type: none"> 16. Comply with the provisions of Article 22 of Resolution No. 06 of 5 August 2020 of the National Fund for Educational Development on the National School Feeding Programme. 17. Ensure healthy school canteens. 18. Create short food supply chains and other healthy food marketing strategies that serve all regions of the municipality, especially more vulnerable territories. 19. Promote and support urban agriculture, vegetable gardens in institutional settings, such as schools and health services, and in community spaces. 20. Map and qualify existing spaces and, if necessary, create new spaces for physical activity.

Optional complementary actions of PROTEJA

Actions in primary healthcare

- Qualify the monitoring of physical activity actions performed in the municipality.
- Manage excessive weight gain, gestational diabetes and pregnancy-induced hypertension.
- Offer at least one option of complementary and integrative practices to prevent and care for childhood obesity.
- Provide an integral support system in the healthcare system to provide adequate care in cases of severe obesity.

Training actions (continued education)

- Set aside sufficient work hours for primary healthcare workers to participate in at least one training session or course per year on childhood obesity, provided by the Ministry of Health.
- Offer at least one training course per year for primary healthcare workers who work mainly with pregnant women and children, on anthropometry and the assessment of food consumption markers.
- Offer at least one training course per year on healthy diets, physical activity and obesity for communication professionals (journalists, advertisers, designers, etc.).
- Establish partnerships with universities and colleges, with courses for health professionals to implement research/extension projects on childhood obesity.

Actions in schools

- Create laws to prevent associations between ultra-processed foods and food and nutrition education activities, books and events sponsored in schools.
- Establish guidelines to support health promotion activities in cities in accordance with the principles of the dietary guidelines published by the Ministry of Health.
- Purchase at least 30 percent of food for the National School Feeding Programme from family agriculture, in accordance with current national legislation.
- Ensure the free supply of drinking water in public schools.
- Install bicycle racks in schools and lockers to store school supplies.
- Invest in building and maintaining school infrastructure for physical activity.

Healthy environments

- Hold public hearings, together with legislators, to discuss the prevention of childhood obesity.
- Create laws to promote healthy environments.
- Implement programmes and actions that enable the active travel of children and adolescents from home to school.
- Carry out regular leisure activities that involve physical activity in public places in cities.
- Publicize the support network for the promotion of adequate food and healthy and physical activity in the municipality.
- Foster production chains that make healthy foods more available, considering storage, supply and/or distribution in line with good agricultural practices and integrated production systems, valuing the local food culture.
- Offer subsidies for the production of fresh and minimally processed foods.
- Create and publicize apps and other tools for mapping markets that sell fresh and minimally processed foods.
- Empower local merchants and retailers with strategies to transform food retail in healthier environments.
- Approve local legislation to establish a minimum height of 120 centimetres for ultra-processed food display shelves to protect children from such product offerings at points of sale.
- Approve local legislation for the mandatory provision of free drinking-water supply in public spaces, such as parks and squares, and in restaurants, snack bars, bars and similar establishments.
- Establish regulations on food donations by public facilities, whether for on-site consumption or for distribution, based on the principles of the official Dietary Guidelines for the Brazilian population.
- Encourage and support breastfeeding in daycare centres and schools, aimed at the continuity of breastfeeding.
- Strengthen and improve the implementation and enforcement of the Brazilian Code for Food Marketing for Infants (NBCAL) (Law 11.265/2006 and Decree No. 9.579/2018).
- Extend maternity leave to a minimum of six months and paternity leave to at least 20 days for municipal employees.
- Encourage private-sector adherence to the Empresa Cidadã (Citizen Enterprise) programme, pursuant to Law No. 11,770/2008 and regulated by Decree No. 10.854/2021.
- Implement and/or expand the network of collection points and breastmilk banks.
- Implement, strengthen and/or expand the Baby-Friendly Hospital Initiative in the municipal public healthcare network.
- Implement breastfeeding support rooms for working women in municipal public offices and encourage their use in the workplaces of other sectors of government and by the private sector, as well as in places with a large circulation of working women.
- Implement municipal laws that guarantee the right of women to breastfeed anywhere, be it in public or private spaces.
- Create and encourage the use of an online platform to identify and assess good public spaces for the practice of physical activity.

- Establish partnerships with clubs and other private businesses that can be used for free or at a low cost by the general public for physical activity and sports.
- Create “leisure streets” (streets regularly open to pedestrians) and promote their use for physical activity and sports.
- Invest in building and maintaining sidewalks and cycle paths, prioritizing socially vulnerable localities.
- Prioritize areas of greater social vulnerability for investment in adequate infrastructure for the practice of physical activity.
- Invest in adapting physical activity equipment available in public spaces for children with obesity.

References

- Brazilian Ministry of Health.** 2021. Relatórios públicos do Sisvan [online]. Cited 7 June 2020.
<http://sisaps.saude.gov.br/sisvan/relatoriopublico>
- Brazilian Ministry of Health.** 2021a. *PROTEJA: Estratégia Nacional para Prevenção e Atenção à Obesidade Infantil: orientações técnicas*. Brasília.
- Brazilian Ministry of Health.** 2021b. *Plano de Ações Estratégicas para o Enfrentamento das Doenças Crônicas e Agravos não Transmissíveis no Brasil 2021–2030*. Brasília.
- CAISAN (Câmara Interministerial de Segurança Alimentar e Nutricional).** 2015. *Compromissos do Brasil para a Década de Ação das Nações Unidas para a Nutrição (2016–2025)*. Brasília.
- FAO & WHO (World Health Organization).** 2016. *United Nations Decade of Action on Nutrition (2016–2025)*. Rome, FAO.
https://www.un.org/nutrition/sites/www.un.org.nutrition/files/general/pdf/work_programme_nutrition_decade.pdf
- Government of Brazil.** 2021a. *Diário Oficial da União: Portaria nº 1.862, 10 August 2021. Institui a Estratégia Nacional para Prevenção e Atenção à Obesidade Infantil – Proteja*. Brasília.
<https://www.in.gov.br/en/web/dou/-/portaria-gm/ms-n-1.862-de-10-de-agosto-de-2021-337532485>
- Government of Brazil.** 2021b. *Diário Oficial da União: Portaria nº 1.863, 10 August 2021. Institui incentivo financeiro federal de custeio destinado aos municípios para a implementação das ações de prevenção e atenção à obesidade infantil no âmbito da Estratégia Nacional para a Prevenção e Atenção à Obesidade Infantil – Proteja*. Brasília.
<https://www.in.gov.br/en/web/dou/-/portaria-gm/ms-n-1.863-de-10-de-agosto-de-2021-337541486>
- IBGE (Instituto Brasileiro de Geografia e Estatística).** 2010. *Pesquisa de Orçamentos Familiares 2008-2009. Antropometria e estado nutricional de crianças, adolescentes e adultos*. Rio de Janeiro, Brazil.
- Japan.** 2022. *Tokyo N4G Summit 2021: High Level Sessions* [online video]. Tokyo. Cited 1 August 2022.
<https://www.youtube.com/watch?v=jV5QsvfiL4c&t=14s>
- MERCOSUR.** 2015. *MERCOSUL/RMS/Acordo nº 03/15 Recomendação de políticas e medidas regulatórias para a prevenção e controle da obesidade*. Montevideo.
- MERCOSUR.** 2021a. *MERCOSUR/RMS/Auerdo nº 06/21. Promoción del entorno escolar saludable*. Montevideo.
- MERCOSUR.** 2021b. *MERCOSUR/RMS/Auerdo nº 06/21. Recomendação de políticas para a proteção das dietas tradicionais*. Montevideo.
- Monteiro, C.A., Cannon, G., Lawrence, M., Costa Louzada, M.L. & Pereira Machado, P.** 2019. *Ultra-processed foods, diet quality, and health using the NOVA classification system*. Rome, FAO.
- Nilson, E.A.F., Andrade, R.D.C.S., de Brito, D.A. & de Oliveira, M.L.** 2019. Costs attributable to obesity, hypertension, and diabetes in the Unified Health System, Brazil, 2018. *Revista Panamericana de Salud Publica*, 10(44): e32.
- OECD (Organisation for Economic Co-operation and Development).** 2021. *OECD Reviews of Health Systems: Brazil 2021*. Paris.
- PAHO (Pan American Health Organization).** 2014. *Plan of Action for the Prevention of Obesity in Children and Adolescents*. Washington, DC.
- United Nations.** 2015. *Transforming our world: the 2030 agenda for sustainable development*. New York.
<https://sdgs.un.org/sites/default/files/publications/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf>

United Nations. 2022. *Decade of Action on Nutrition* [online]. New York. Cited 1 August 2022.

<https://www.un.org/nutrition/action-networks>

UFRJ (Universidade Federal do Rio de Janeiro). 2021. *Prevalência de indicadores de alimentação de crianças menores de 5 anos: ENANI 2019* [online]. Rio de Janeiro, Brazil. Cited 1 August 2022.

<https://enani.nutricao.ufrj.br/index.php/relatorios/>

UFRJ. 2022. *Estado Nutricional Antropométrico da Criança e da Mãe: Prevalência de indicadores antropométrico de crianças brasileiras menores de 5 anos de idade e suas mães biológicas: ENANI 2019* [online]. Rio de Janeiro, Brazil. Cited 1 August 2022.

<https://enani.nutricao.ufrj.br/index.php/relatorios/>

WHA (World Health Assembly). 2012. Resolution WHA65.6. Comprehensive implementation plan on maternal, infant and young child nutrition. In: *Sixty-fifth World Health Assembly Geneva, 21–26 May 2012. Resolutions and decisions, annexes*. Geneva, Switzerland.

WHO. 2021. *Overweight and obesity*. Geneva, Switzerland.

<https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>

World Bank Group. 2020. *Obesity: health and economic consequences of an impending global challenge*. Washington, DC.

The Seqota Declaration: From proof of concept to expansion phase

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Stunting – the restriction of a child’s potential growth (Black *et al.*, 2008), as measured by a height-for-age z-score of more than two standard deviations below the World Health Organization (WHO) Child Growth Standards median – remains a global public health concern. Globally, 21.3 percent (or 144 million) of children under the age of five suffered from stunting in 2019 (UNICEF, WHO and World Bank Group, 2020). Of these stunted children, 78.2 million lived in Asia, 57.5 million in Africa and 4.7 million in the Latin American and Caribbean region. Africa was the only region where the number of stunted children increased between 2000 and 2019. The increase in the number of stunted children was highest in the East, Central and West African regions, while the stunting burden was highest in East Africa (UNICEF, WHO and World Bank Group, 2020).

Stunting is a chronic condition that mainly occurs in the crucial first 1 000 days of life. Stunted children not only have poor health, making them more susceptible to morbidity and mortality, but also have poorer mental development, lower achievements in school, shorter adult height and reduced adult income (Victora *et al.*, 2008). According to the World Food Programme (WFP) and African Union Commission (AUC) *Cost of Hunger in Africa* studies on 21 countries: i) 8 percent to 44 percent of all child mortality is associated with undernutrition; ii) between 1 percent and 18 percent of all school-year repetitions are associated with stunting; iii) stunted children achieve 0.2 to 3.6 years less of school education; iv) child mortality associated with undernutrition has reduced national workforces by 1 percent to 13.7 percent; and v) 40 percent to 67 percent of the working age population suffered from stunting as a child (WFP and AUC, 2022). The total estimated yearly cost of undernutrition in

these countries, in terms of gross domestic product, varies from 2 percent (for Egypt) to 17 percent (for Ethiopia) (WFP and AUC, 2022).

A modelling exercise of lifetime earnings in the United Republic of Tanzania based on height found that the eradication of stunting would add USD 539 (at 2009 US dollar levels) to the lifetime earnings of each individual (Alderman, Hoogeveen and Rossi, 2009). Similarly, a study in Mexico showed that a 1 cm increase in height was associated with a 1.4 percent increase in wages (Vogl, 2014) and that a reduction in global levels of stunting of 20 percent would lead to a rise in income of 11 percent (Hoddinott *et al.*, 2013).

The vicious cycle of undernutrition and disease means that stunted children are more likely to become sick due to their immunodeficiency status, and sick children are more likely to become stunted due to poor nutrient absorption (UNICEF, 2013). Stunting also carries an elevated risk of death. A moderately stunted child carries twice the risk of dying of a non-stunted child, while the mortality risk is more than fourfold among severely stunted children. A severely stunted child faces a 5.5 times greater risk of dying than a non-stunted child (McDonald *et al.*, 2013). Stunted children are more likely to start school late and to repeat a grade or drop out of school (Mendez and Adair, 1999; Daniels and Adair, 2004; Martorell *et al.*, 2010). Adair *et al.* (2013) estimate that improving linear growth for children under the age of two by one standard deviation adds about half a grade of school attainment. Malnutrition leads to lost growth potential associated with school achievement and reduced earnings (Global Panel on Agriculture and Food Systems for Nutrition, 2016).

Evidence suggests that when more-empowered, better-educated women can earn and control income, there is a decline in infant mortality rates, improved child health and nutrition, and cycles of poverty are broken through increases in agricultural productivity and slower population growth (Coleman, 2011). Without addressing gender inequality, it is difficult to address lifecycle nutrition and put an end to the intergenerational effect of malnutrition (UNICEF and Liverpool School of Tropical Medicine, 2011).

Consecutive Ethiopian Demographic and Health Surveys show that Ethiopia has seen a significant decline in the prevalence of childhood stunting over the last 20 years, from 58 percent in 2000 to 37 percent in 2019, with significant regional variations (Central Statistical Agency of Ethiopia and ICF, 2012; 2016; EPHI and ICF, 2021; Central Statistical Agency of Ethiopia and ORC Macro, 2001; 2006). The stunting burden in Ethiopia is characterized by wealth inequalities, with the wealthy experiencing a lower prevalence of and a larger reduction in stunting over time (Tasic *et al.*, 2020). The key drivers of the reduction in stunting in Ethiopia have been both nutrition-specific and nutrition-sensitive sectors, with a particular focus on the agricultural sector, healthcare access, sanitation and education (Tasic *et al.*, 2020). In Ethiopia, women's socioeconomic empowerment in terms of access to education, information, media and income-generating activities is strongly associated with lower rates of childhood stunting and wasting, while women's decision-making power is positively associated with better health status for children (Abreha, Walelign and Zereyesus, 2020).

Despite the decline in stunting in Ethiopia over the last 20 years (by 2.25 percent per year), the gains have been insufficient to reduce stunting among the under fives to the desired 26 percent by 2020, per the National Nutrition Program II (Government of Ethiopia, 2016). Nor have they been enough to meet the global World Health Assembly (WHA) target of reducing the prevalence of stunting by 40 percent by 2025 (Gillespie *et al.*, 2013) or to meet the Seqota Declaration target of 0 percent stunting in children under two by 2030 (Government of Ethiopia, 2015). The Comprehensive Africa Agriculture Development Programme's Malabo Declaration also aims to end hunger, reduce child stunting by 10 percent and halve poverty by 2025 (African Union, 2014).

If Ethiopia does achieve the WHA target of a 40 percent reduction in the number of stunted children under five by 2025, the cumulative increase in income for the non-stunted workforce could be USD 16 billion from 2035 to 2060 (assuming workers are not stunted from the year they enter the labour force) (Hoddinott, 2016). High-impact

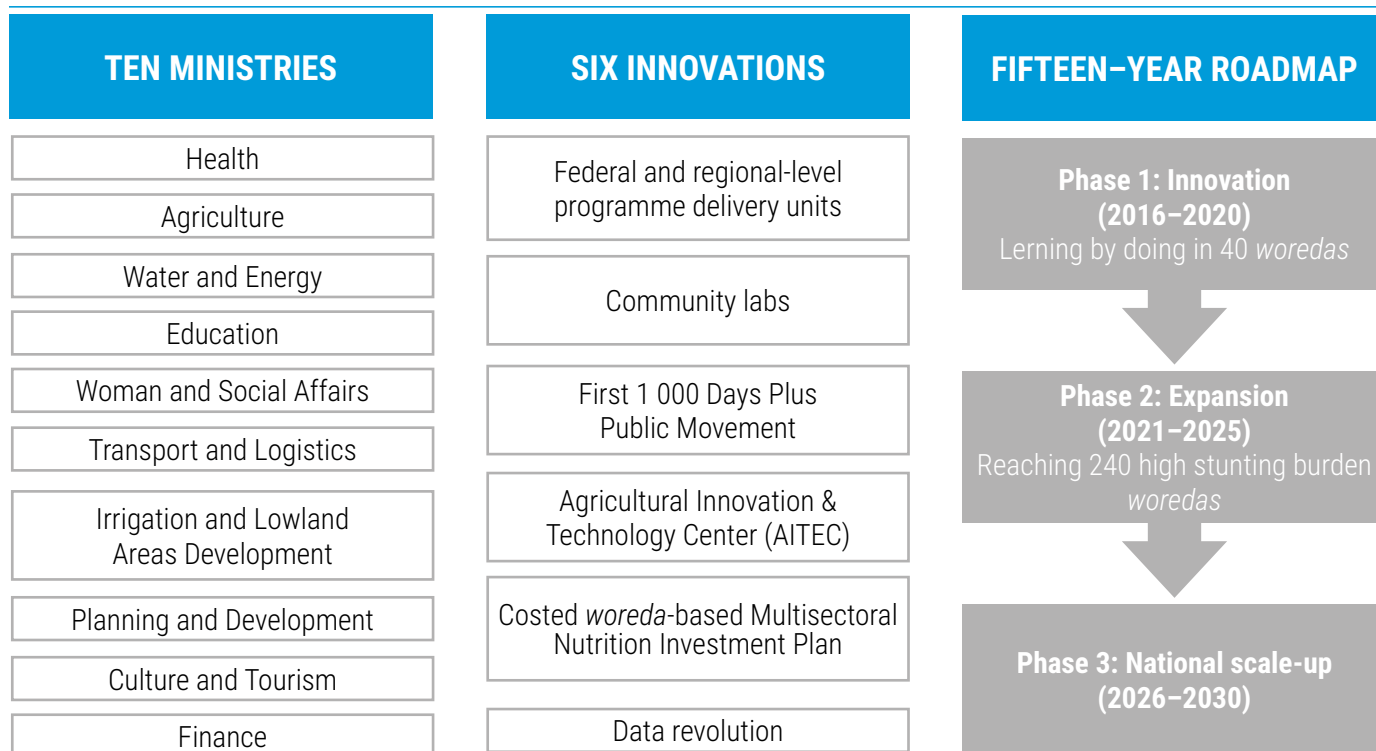
nutrition interventions that could lead to an annual average rate of reduction of 4 percent and above are required to meet the local Seqota Declaration stunting reduction targets among children under two years of age. Thus, a renewed commitment for a combination of high-impact nutrition-specific and nutrition-sensitive interventions is necessary to accelerate and optimize reductions in stunting in Ethiopia, especially in the Seqota Declaration intervention areas.

With the African Union's designation of 2022 as the Africa Year of Nutrition, there is renewed hope of a commitment to accelerating actions towards the reduction of malnutrition in all its forms. Taking a multisectoral interdisciplinary approach to nutrition is further emphasized in the African Common Position on Food Systems (AUDA-NEPAD, 2021). Ethiopia has a huge opportunity, having launched its food-based dietary guidelines earlier in 2022 to support policy, programme and consumer actions (Government of Ethiopia, 2022).

Background to the Seqota Declaration

The Government of Ethiopia launched the Seqota Declaration in 2015 to end stunting in children under two by 2030 (Government of Ethiopia, 2015). The Declaration builds on and contributes to the National Nutrition Program (Government of Ethiopia, 2016) and the National Food and Nutrition Policy (Government of Ethiopia, 2018) and implements a three-phased multisectoral approach to end stunting. The "innovation phase" was implemented between 2015 and 2020. Learning and evidence from this phase will inform the design and implementation of the "expansion phase" (2021–2025) and the "scale-up phase" (2026–2030). Following a preparatory period in 2016 and 2017, the Seqota Declaration was fully implemented from 2018. As of 2021, the Government of Ethiopia, together with its development partners, had implemented the Seqota Declaration innovation phase in 40 *woredas* of Amhara and Tigray states.

Figure 1. The Seqota Declaration implementation strategy



SOURCE: Ministry of Health of Ethiopia, Seqota Declaration Delivery Unit.

The innovation phase of the Seqota Declaration consists of testing the six innovations through a learning-by-doing approach, as well as providing high-level leadership and coordination to implement the innovation-phase investment plan across the nine implementing sectors at federal, regional, zonal and *woreda* level. Though the innovation phase started slowly in 2017–2018, it gradually gained momentum with more and more government and development partner ownership. The government has demonstrated high-level leadership commitment through the interministerial steering committee meetings led by the deputy prime minister at federal level and by regional presidents at regional level.

Further momentum was built through technical and high-level “learning journeys”. Four ministers, six state ministers and regional bureau heads and other high-level leaders participated in the interministerial learning journey for the Amhara and Tigray Seqota Declaration *woredas*, for instance. The interministerial committee subsequently agreed on new priorities based on local problems and set interministerial targets that were tracked biannually. This also facilitated budgetary allocation directly from the national treasury, which the government has sustained in the years that followed.

The Seqota Declaration innovation-phase investment plan, which incorporates monitoring and reporting, has been used by the *woredas* to implement the innovation phase. This has facilitated implementation at federal, regional and *woreda* level and further encouraged development partners to contribute towards one goal and coordinate their investments to end stunting per the Seqota Declaration. The outcomes of these investments are tracked using biannual score cards at *woreda*, regional and federal level, with intersectoral teams and partners reviewing the technical aspects and the leadership team reviewing performance and providing direction in areas that require corrective action.

Ten ministries – agriculture, health, education, water and energy, social protection and women, irrigation, transport, culture and tourism, finance, and innovation and technology – are working together to meet the Seqota Declaration goal of ending stunting. In recent years, the Seqota Declaration programme has been supporting the 40 innovation-phase *woredas* in the Tigray and Amhara regions in improving nutrition by boosting demand for basic human services, such as improved health for children and women, greater access to education and the promotion of school health and nutrition services, better access to clean water and sanitation services, nutrition-sensitive livelihood support, women’s empowerment, and social and environmental protection.

Table 1. Interministerial priority performance measurement indicators score card

Interministerial priority performance indicator	2017–2021 target EFY 2010–2013 target	2017–2021 performance EFY 2010–2013 performance	Scorecard percentage
Pregnant and lactating women and children under five to receive access to better health and nutrition services	1 397 563	962 173	69%
Pregnant and lactating women to have access to nutrient-dense plant and animal-sourced foods	544 056	588 357	108%
People to have access to clean and safe water supply	4 508 801	3 052 243	68%
Students to learn in a better school environment and be reached through a school health and nutrition package	1 471 440	847 440	58%
Pregnant and lactating women and children under five to gain access to productive safety-net programme interventions	158 085	88 477	56%
People to have access to all-weather roads	130 000	102 605	79%
Women and children to receive access to social, economic and protection services	925 902	462 857	50%
Average			70%

SOURCE: Ministry of Health of Ethiopia, Seqota Declaration Delivery Unit.

Innovation-phase achievements and impacts

A. Programme performance: Table 1 summarizes the performance scorecard over a four-year period, 2017–2021 (corresponding to Ethiopian fiscal years (EFYs) 2010–2013).

B. Outcome of the six innovations tested

Six innovations were tested to address the challenges of multisectoral programming during the innovation phase. Five of these proved to be effective and ready for upscaling in the expansion phase. The proof of concept informed

how the innovations could solve problems associated with poor multisectoral coordination and governance, performance management and evidence-based decision making, empower the community to identify and resolve its own problems, address issues of water access and efficient utilization in water-stressed settings, improve various social and behavioural change-related issues, and how to build the capacity of local government for effective resource mobilization, partnership management and evidence-based decision making in the expansion phase *woredas*.

Table 2. Outcomes of the six innovations tested during the innovation phase

Innovation tested	Multisectoral challenges to be resolved	Status as of June 2021	Action to be taken during the expansion phase
Programme delivery unit (PDU)	Inadequate government leadership Poor coordination among sectors	Establishing the PDU enabled the Government of Ethiopia to ensure high-level ownership and leadership and effective coordination among sectors at all levels. PDU implementation guidelines have been documented and adopted for use in establishing food and nutrition offices in other regions.	Deploy additional staff to strengthen Food and Nutrition Coordination Offices Strengthen the federal PDU to effectively lead the expansion phase
Community lab	Lack of community participation to solve own problems	The community lab process enabled the community to identify its own problems and come up with local solutions. A community lab manual was developed and tested. Solutions driven by the community lab process are being implemented in 24 <i>woredas</i> .	Expand the community lab approach to expansion phase <i>woredas</i>
Data revolution	Lack of timeliness, quality of data	A multisectoral Unified Nutrition Information System for Ethiopia was developed and is being tested in eight Seqota Declaration and other <i>woredas</i> . This tool has supported data transfer using a web-based platform.	Cascade to other regions Ensure data quality
First 1 000 Days Plus Public Movement for social behaviour change communication (SBCC)	High social and behaviour-related factors affecting children and women	The PDU has developed the 1 000 Days Plus Public Movement strategy using an ecological model and implemented it at all levels. This enabled the PDU to conduct a wide range of activities for SBCC. In addition, SBCC mainstreaming guidelines were developed to support sectors in their planning.	Support newly joined regions in developing and implementing contextualized strategy and support sectors in using the SBCC mainstreaming guide
Costed <i>woreda</i> -based planning (CWBP)	Lack of ownership, accountability and resource allocation	The CWBP process enabled the <i>woreda</i> cabinet to own the multisectoral plan, mobilize local resources (government, community and partners) and utilize the plan for performance management in all 40 <i>innovation-phase woredas</i> .	The 240 <i>woredas</i> (except those in conflict zones) are currently preparing CWBP Implement resource tracking and partnership management tool
Agricultural innovation technology	Low productivity of nutrition-dense foods Water-use inefficiency	The construction of an agricultural innovation technology centre is in progress and is now partially functional. A bank of water technologies has been identified. In East Belesa, NUFiltration technology has been installed and is being used.	Finalize the centre Expand NUFiltration technology

SOURCE: Ministry of Health of Ethiopia, Seqota Declaration Delivery Unit

C. Impact assessment result of the innovation phase

Method: The innovation-phase impact evaluation was conducted together with Johns Hopkins University, with the financial support of Big Win Philanthropy, using LiST methodology. To estimate the impact of the innovation phase of the Seqota Declaration, the team modelled the effect of greater coverage of programme interventions on stunting and child mortality. The model considered the impact of agricultural, nutritional, health, SBCC and water, sanitation and hygiene (WASH) interventions on stunting and child mortality – the same interventions included in the

Seqota Declaration baseline report. Changes in intervention coverage from baseline were estimated using data from the Ethiopia Health Management Information System and the Seqota Declaration Programme Performance Scorecard. The LiST model was used to estimate changes in the neonatal mortality rate (NNMR), under-five mortality rate (U5MR), stunting rate, number of additional lives saved and number of stunting cases averted. Additional lives saved and stunting cases averted were calculated by estimating the number of cases or deaths avoided under the observed scale-up compared with a scenario in which the 2018 baseline coverage was held constant.

Result: The impact of the innovation-phase interventions has a lagged effect on stunting, as changes in disease incidence and nutrition in the early ages translate into the avoidance of child deaths. Overall, by 2021, the impact of

innovation-phase interventions (in 40 *woredas*) was a 7.9 percent absolute reduction or 15.5 percent relative reduction in stunting in Amhara and a 6.7 percent absolute reduction or 18.5 percent relative reduction in stunting in Tigray.

Table 3. Change in prevalence of stunting against reference levels (%)

		2018	2019	2020	2021
Tigray					
NNMR	Seqota implementation	20.82	20.54	20.46	20.42
	Reference (no intervention)	20.82	20.81	20.81	20.81
U5MR	Seqota	41.56	39.27	38.58	38.24
	Reference	41.46	41.21	40.98	40.93
Stunting rate	Seqota	39.71	36.73	34.66	32.31
	Reference	39.71	39.79	39.91	39.97
Amhara					
NNMR	Seqota implementation	25.11	24.73	24.69	24.61
	Reference (no intervention)	25.11	25.10	25.10	25.10
U5MR	Seqota	46.88	44.22	43.53	43.10
	Reference	46.88	46.50	46.27	46.21
Stunting rate	Seqota	51.05	47.68	45.56	43.06
	Reference	51.05	51.26	51.50	51.64

SOURCE: Johns Hopkins University. 2021. *Seqota Declaration: Innovation Phase Impact Assessment, June 2021*. Baltimore, MD.

By 2021, the innovation-phase interventions had resulted in the prevention of almost 1 031 child deaths in Tigray and Amhara and averted more than 109 000 stunting cases in the intervention *woredas*. The greatest impacts on mortality occurred in the youngest

age groups, which bear the greatest mortality burden. The stunting impact was greatest in the 6–23-month age group, which is when stunting typically emerges as breastfeeding wanes and infant and young child feeding practices have significant effects.

Table 4. Number of child stunting cases averted in the innovation phase

Region	Category	Age group	2018	2019	2020	2021
Tigray	Stunting cases averted	0–23 months	–	10 047	11 467	12 196
		24–59 months	–	342	6 771	14 934
		Subtotal	–	10 389	18 238	27 130
Amhara	Stunting cases averted	0–23 months	–	10 219	11 457	11 977
		24–59 months	–	280	6 270	34 871
		Subtotal	–	10 499	17 727	25 848
Innovation phase – stunting cases averted		Total 0–23 months	–	20 266	22 924	24 173
		Total 24–59 months	–	622	13 041	28 805
		Total/year	–	20 888	35 965	52 978
		Innovation phase (2018–2021)				109 831

SOURCE: Johns Hopkins University. 2021. *Seqota Declaration: Innovation Phase Impact Assessment, June 2021*. Baltimore, MD.

Increased coverage of agricultural, health, SBCC and WASH interventions have contributed to the observed reduction in stunting. However, agricultural interventions had the greatest impact. Improved complementary feeding was the primary driver of the reduction in stunting, accounting for more than 90 percent of

stunting cases averted. Over 75 percent of households in the target population were reached with at least one agricultural intervention. Improved agricultural production translated into reduced household food insecurity and better nutrition for pregnant women and young children.

Table 5. Types of intervention and the number of stunting cases averted

		2018	2019	2020	2021
Tigray	Appropriate complementary feeding	0	9 564	16 534	25 014
	Vitamin A supplementation	0	126	458	527
	Improved water	0	234	405	509
	Water connection in the home	0	148	255	320
	Food supplementation for low BMI women	0	124	296	311
	Improved sanitation	0	97	167	210
	Age-appropriate breastfeeding practices	0	55	45	139
	Hand washing with soap	0	41	71	89
	Rotavirus vaccine	0	0	4	6
	Maternal age and birth order	0	0	3	5
Amhara	Appropriate complementary feeding	0	9 723	16 196	23 956
	Vitamin A supplementation	0	106	389	443
	Improved water	0	209	355	441
	Water connection in the home	0	136	289	303
	Food supplementation for low BMI women	0	132	224	278
	Improved sanitation	0	89	151	188
	Age-appropriate breastfeeding practices	0	65	52	151
	Hand washing with soap	0	36	62	77
	Rotavirus vaccine	0	0	4	6
	Maternal age and birth order	0	0	3	5

SOURCE: Johns Hopkins University. 2021. *Seqota Declaration: Innovation Phase Impact Assessment, June 2021*. Baltimore, MD.

D. Innovation-phase success factors

The key success factors in the innovation phase were:

- The commitment of the federal and regional governments and the implementing sectors was a driver of success during the innovation phase. This commitment ranged from the regular review of Seqota Declaration priorities and plans, approval actions to be executed during the implementation period, and providing leadership and corrective measures to improve performance at all levels during implementation. The federal and regional governments were fully committed to allocating resources from the national treasury and regional government budgets.

- Development partners made major contributions during the innovation phase. These were made through direct investment in the execution of the PDU plan and in the innovations being tested, or by providing financial and technical support for the execution of costed *woreda*-based plans. The development partners also helped by deploying technical partners and assistance to support the innovations.
- The innovations tested also contributed to the successful outcome of the innovation phase. They enhanced multisectoral coordination and governance at all levels and improved the capacity of all stakeholders when it came to performance management and evidence-based decision making. Moreover, they empowered communities

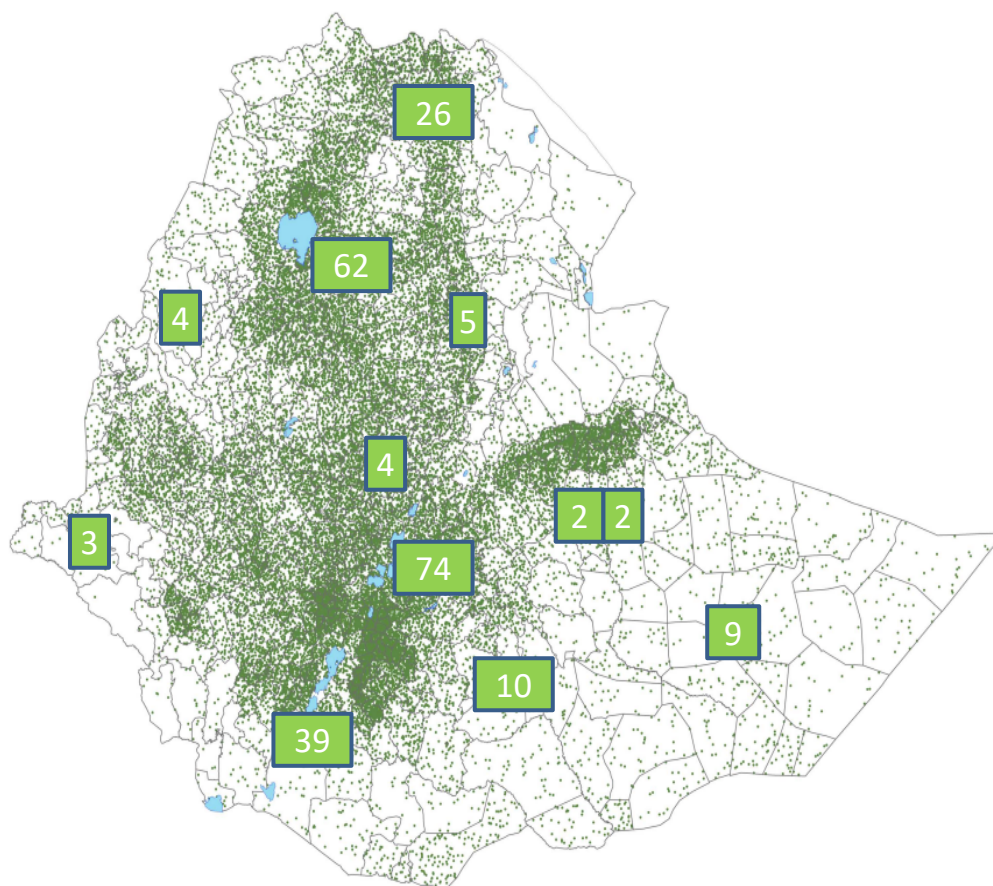
to actively participate and identify and solve their own problems using local solutions. One example is addressing issues of water access and efficient utilization in water-stressed settings by installing technologies such as NUfiltration. The First 1 000 Days Plus Public Movement (Ministry of Health, n.d.) involved all stakeholders at all levels to support and promote behavioural change. The capacity of *woreda* administrators and sectors was strengthened through the *woreda*-based planning system, which was utilized for resource mobilization, partnership management and to measure performance using scorecard targets set in plans on a monthly, quarterly and annual basis. Based on performance findings, corrective actions were taken.

- A gender analysis was conducted to determine the gender-responsiveness of the Seqota Declaration innovation-phase programme and take corrective action to ensure that it was gender responsive.

Moving forward to the expansion phase

The government of Ethiopia signed off on the expansion phase of the Seqota Declaration in December 2020. Since then, preparations have been made to launch the next phase, including the synthesis of evidence to inform interventions and investment decisions, the mobilization of resources to support the first year, and the development of an expansion and scale-up phase roadmap (Government of Ethiopia, 2021). In August 2021, the government launched the expansion phase in tandem with its new Food and Nutrition Strategy. This phase will be implemented in 240 *woredas* (including the innovation-phase *woredas*) and is expected to reach about 700 *woredas* before by the time it ends. An additional 350 *woredas* are expected to be covered during the scale-up phase. The expansion phase will cover a total of 240 *woredas* serving a total population of 27 million people, 996 764 pregnant and lactating women and 2 166 316 children under the age of two.

Figure 2. Distribution of expansion phase *woredas* across the country



SOURCE: Government of Ethiopia. 2021. *Seqota Declaration: Roadmap for Expansion and Scale-up Phases 2021–2030*. Addis Ababa..

Informed by the programmatic experience of the innovation phase, as well as a review of global and national evidence, the proposed goals and high-impact interventions of the Seqota Declaration expansion and scale-up phases are based on the following key assumptions:

- stunting as the main outcome
- a 3 percent or more annual stunting reduction among children under the age of two

- sustained high-level political commitment to act at scale
- 28 percent as the baseline prevalence of stunting (EPHI and ICF, 2019)
- minimum coverage of at least 70 percent for all high-impact interventions

The total cost of the expansion phase is estimated at ETB 85 billion (USD 2.66 billion). The cost increases each year as the number of *woredas* involved in full-scale implementation grows.

Table 6. Estimated annual cost of the Seqota Declaration, by strategic objective (expansion phase, 2021–2025)

Strategic Objective		EXPANSION PHASE COSTS (ETB)					Total Expansion Phase costs (ETB)
		YR1	YR2	YR3	YR4	YR5	
Strategic Objective 1	Improve access diverse, adequate, nutrient rich and safe food all year round	3 823 219 900	10 857 386 789	8 898 419 303	15 578 774 642	15 352 251 542	54 510 052 176
Strategic Objective 2	Improve maternal, child and adolescent feeding and health care practices	97 528 304	87 552 604	239 730 844	339 824 987	319 405 787	1 084 042 526
Strategic Objective 3	Universal access to safe and clean water, sanitation and hygiene services, and adoption of improved practices	1 123 211 520	2 336 817 060	3 284 424 998	3 284 424 998	1 729 924 290	11 758 802 866
Strategic Objective 4	Enhance schools' role for improved nutrition practice and creation of nutrition change agents for the nation	908 216 564	944 017 834	1 665 816 041	1 768 979 430	1 016 714 773	6 303 744 642
Strategic Objective 5	Increase the resilience of households and communities through social protection (social safety nets)	15 136 756	15 136 756	24 169 216	12 327 195	2 700 000	69 469 922
Strategic Objective 6	Enhance women empowerment, gender equity and child protection	185 017 572	478 904 692	804 883 992	804 327 192	1 054 327 192	3 327 460 639
Strategic Objective 7	Enhance market accessibility and affordability of foods	26 150 000	76 665 936	183 968 895	178 118 895	178 118 895	643 022 623
Strategic Objective 8	Fostering an enabling environment for strong governance and coordination of multi-sectoral stunting reduction efforts	627 007 659	1 119 864 365	2 318 800 179	1 908 324 552	1 056 200 919	7 013 817 674
Total Seqota Declaration costs (ETB)		6 805 488 274	15 916 346 037	17 420 213 468	23 875 101 890	20 709 643 397	84 710 413 067
Total Seqota Declaration costs (USD) (exchange rate USD:ETB=31.82)		213 885 308	500 224 588	547 488 669	750 355 200	650 870 044	2 662 309 012

SOURCE: Government of Ethiopia. 2021. *Seqota Declaration: Roadmap for Expansion and Scale-up Phases 2021-2030*. Addis Ababa.

Following the strong partnership and effective contribution of development partners during the innovation phase, the Government of Ethiopia has called on all stakeholders to contribute technically and financially to ensure the

effective implementation of evidence-based, high-impact, nutrition-sensitive, nutrition-specific and infrastructural interventions for the success of the expansion phase in order to prevent deaths and avert stunting.

References

Abreha, S.K., Walelign, S.Z. & Zerayesus, Y.A. 2020. Associations between women's empowerment and children's health status in Ethiopia. *PLoS ONE*, 15(7): e0235825. <https://pubmed.ncbi.nlm.nih.gov/32687506/>

Adair, L.S., Fall, C.H.D., Osmond, C., Stein, A.D., Martorell, R., Ramirez-Zea, M. et al. 2013. Associations of linear growth and relative weight gain in early life with adult health and human capital in countries of low and middle income: findings from five birth cohort studies. *The Lancet*, 382: 525–534. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5323242/>

- African Union.** 2014. *The Malabo Declaration on Accelerated Growth and Transformation for Shared Prosperity and Improved Livelihoods*. Malabo. https://www.resakss.org/sites/default/files/Malabo%20Declaration%20on%20Agriculture_2014_11%2026-.pdf
- AUDA-NEPAD (African Union Development Agency-New Partnership for Africa's Development).** 2021. African Common Position on Food Systems. Midrand, South Africa. <https://www.nepad.org/publication/African-common-position-food-systems>
- Alderman, H., Hoogeveen, H. & Rossi, M.** 2009. Preschool nutrition and subsequent schooling attainment: longitudinal evidence from Tanzania. *Economic Development and Cultural Change*, 57(2): 239–260. <https://openknowledge.worldbank.org/handle/10986/5514>
- Black, R.E., Allen, L.H., Bhutta, Z.A., Caulfield, L.E., de Onis, M., Ezzati, M. et al.** 2008. Maternal and child undernutrition: global and regional exposures and health consequences. *The Lancet*, 371(9608): 243–260. <https://pubmed.ncbi.nlm.nih.gov/18207566/>
- Central Statistical Agency of Ethiopia & ICF.** 2012. *Ethiopia Demographic and Health Survey 2011*. Addis Ababa and Calverton, MD. <https://www.usaid.gov/sites/default/files/documents/1860/Demographic%20Health%20Survey%202011%20Ethiopia%20Final%20Report.pdf>
- Central Statistical Agency of Ethiopia & ICF. Ethiopia Demographic and Health Survey.** 2016. Addis Ababa and Rockville, MD. https://www.researchgate.net/publication/320109833_Ethiopian_Demographic_and_Health_Survey_2016
- Central Statistical Agency of Ethiopia & ORC Macro.** 2001. *Ethiopia Demographic and Health Survey 2000*. Addis Ababa and Calverton, MD. <https://microdata.worldbank.org/index.php/catalog/1379>
- Central Statistical Agency of Ethiopia & ORC Macro.** 2005. *Ethiopia Demographic and Health Survey 2005*. Addis Ababa and Calverton, MD. <https://microdata.worldbank.org/index.php/catalog/1380>
- Coleman, I.** 2011. Women and the global economy. *Yale Journal of International Affairs*, 6(1): 25–31. https://slidelegend.com/women-and-the-global-economy-yale-journal-of-international-affairs_59bff67e1723dd1242166462.html
- Daniels, M. & Adair, L.** 2004. Growth in young Filipino children predicts schooling trajectories through high school. *Journal of Nutrition*, 134: 1439–1446. <https://pubmed.ncbi.nlm.nih.gov/15173409/>
- EPHI (Ethiopian Public Health Institute) and ICF.** 2021. *Ethiopia Mini Demographic and Health Survey 2019: Final Report*. Rockville, MD. <https://dhsprogram.com/pubs/pdf/FR363/FR363.pdf>
- Gillespie, S., Haddad, L., Mannar, V., Menon, P. & Nisbett, N.** 2013. The Politics of Reducing Malnutrition: Building Commitment and Accelerating Progress. *The Lancet*, 382(9891): 552–569. <https://www.sciencedirect.com/science/article/abs/pii/S0140673613608429>
- Global Panel on Agriculture and Food Systems for Nutrition.** 2016. *The cost of malnutrition: Why policy action is urgent*. London. <https://www.gov.uk/research-for-development-outputs/the-cost-of-malnutrition-why-policy-action-is-urgent>
- Government of Ethiopia.** 2015. *The Seqota Declaration*. Addis Ababa. https://www.moh.gov.et/site/THE_SEQOTA_DECLARATION
- Government of Ethiopia.** 2016. *National Nutrition Program (NNPII) 2016–2020*. Addis Ababa. <https://www.fao.org/faolex/results/details/en/c/LEX-FAOC190946/>
- Government of Ethiopia.** 2018. *Food and Nutrition Policy*. Addis Ababa. <https://www.nipn.ephi.gov.et/sites/default/files/2020-05/Food%20and%20Nutrition%20Policy.pdf>
- Government of Ethiopia.** 2021. *Seqota Declaration: Roadmap for Expansion and Scale-up Phases 2021–2030*. Addis Ababa.
- Government of Ethiopia.** 2022. *Food-Based Dietary Guidelines Booklet – 2022*. Addis Ababa. https://ephi.gov.et/wp-content/uploads/2021/02/Booklet_web.pdf
- Hoddinott, J.** 2016. *The economics of reducing malnutrition in sub-Saharan Africa*. London, UK, Global Panel on Agriculture and Food Systems for Nutrition.

- Hoddinott, J., Alderman, H., Behrman, J.R., Haddad, L. & Horton, S.** The economic rationale for investing in stunting reduction. *Maternal and Child Nutrition*, 9(Suppl. 2): 69–82.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6860695/>
- Johns Hopkins University.** 2021. *Seqota Declaration: Innovation Phase Impact Assessment*, June 2021. Baltimore, MD.
- Martorell, R., Horta, B.L., Adair, L.S., Stein, A.D., Richter, L., Fall, C.H.D. et al.** 2010. Weight gain in the first two years of life is an important predictor of schooling outcomes in pooled analysis from five birth cohorts from low- and middle-income countries. *Journal of Nutrition*, 140(2): 348–354.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2806888/>
- McDonald, C.M., Olofin, I., Flaxman, S., Fawzi, W.W., Spiegelman, D., Caulfield, L.E. et al.** 2013. The effect of multiple anthropometric deficits on child mortality: meta-analysis of individual data in 10 prospective studies from developing countries. *American Journal of Clinical Nutrition*, 97(4): 896–901.
<https://pubmed.ncbi.nlm.nih.gov/23426036/>
- Mendez, M.A. & Adair, L.S.** 1999. Severity and timing of stunting in the first two years of life affect performance on cognitive tests in late childhood. *Journal of Nutrition*, 129(8): 1555–1562.
<https://academic.oup.com/jn/article/129/8/1555/4721820>
- Ministry of Health. n.d.** First 1,000 Days Plus Public Movement. Factsheet. Addis Ababa.
https://www.bigwin.org/nm_pent_bigwp/wp-content/uploads/2019/10/FactSheet_First1000Days_WEB.pdf
- Tasic, H., Akseer, N., Gebreyesus, S.H., Atallahjan, A., Brar, S., Confreda, E. et al.** 2020. Drivers of stunting reduction in Ethiopia: a country case study. *American Journal of Clinical Nutrition*, 112(Suppl 2): 875S–893S.
<https://pubmed.ncbi.nlm.nih.gov/32844167/>
- UNICEF (United Nations Children's Fund).** 2013. *Improving Child Nutrition: The achievable imperative for global progress*. New York.
<https://www.unicef.org/hk/en/publication/improving-child-nutrition-the-achievable-imperative-for-global-progress/>
- UNICEF & Liverpool School of Tropical Medicine.** 2011. *Gender Influences on Child Survival, Health and Nutrition: A Narrative Review*. New York, UNICEF.
- UNICEF, WHO (World Health Organization) & World Bank Group.** 2020. *Levels and trends in child malnutrition. UNICEF/WHO/World Bank Group joint child malnutrition estimates. Key findings of the 2020 edition*. Geneva, Switzerland, WHO.
<https://www.who.int/publications/i/item/9789240025257>
- Victora, C.G., Adair, L., Fall, C., Hallal, P.C., Martorell, R., Richter, L. et al.** 2008. Maternal and child undernutrition: consequences for adult health and human capital. *The Lancet*, 371(9609): 340–357.
<https://pubmed.ncbi.nlm.nih.gov/18206223/>
- Vogl, T.** 2014. Height, skills, and labor market outcomes in Mexico. *Journal of Development Economics*, 107: 84–96.
<https://www.sciencedirect.com/science/article/abs/pii/S0304387813001697>
- WFP (World Food Programme) & AUC (African Union Commission).** 2022. The Cost of Hunger in Africa: Ethiopia 2013. In: *The Cost of Hunger in Africa Series*. Rome, WFP.
<https://www.wfp.org/publications/cost-hunger-africa-series>

Cash assistance to improve food access and dietary diversity in urban slums in Dhaka

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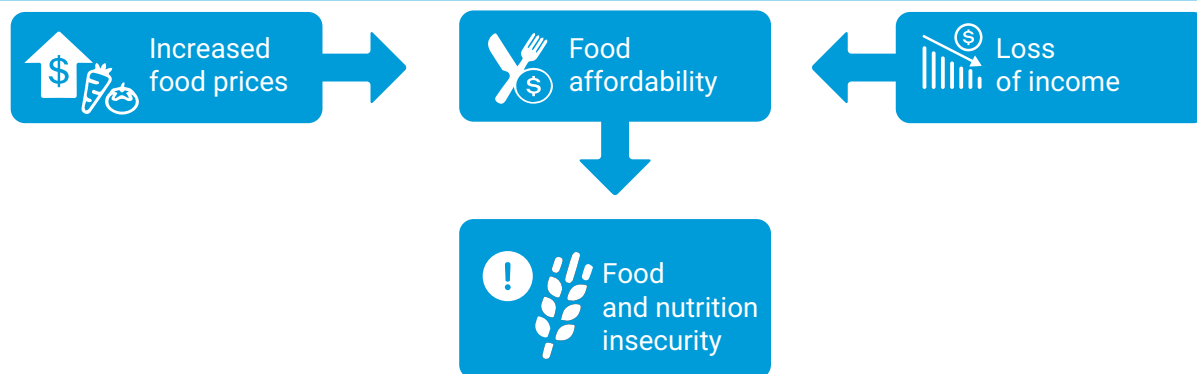
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Urban poor households in low- and middle-income countries have been severely affected by the COVID-19 pandemic, especially those who lost their incomes, such as daily wage earners and informal sector workers. By April 2020, the income of Bangladeshi urban slum dwellers had declined by 75 percent (PPRC-BIGD, 2020) a drastic hit to living conditions. Households that previously managed to make ends meet suddenly became food insecure (Figure 1).

Figure 1. The dual economic impact of COVID-19 on food affordability and food and nutrition insecurity



SOURCE: Authors' own elaboration.

As the pandemic unfolded, it was evident that many existing social protection programmes were not fit for purpose and unable to provide an adequate response, due to inaccurate targeting and a lack of access for workers in the informal economy (UNDP, 2020). The disproportionate impact of COVID-19 on urban populations forced governments to adapt, supplement and scale up their existing social protection programmes to cover the most vulnerable households in urban areas.

World Food Programme (WFP) country offices across the Asia and the Pacific region have supported the efforts of governments as technical advisors, service providers and complementary actors, enabling governments to implement social protection programmes more effectively and providing additional social support where necessary (WFP, 2020).

This paper presents an example from Dhaka, where WFP piloted an innovative cash assistance programme in two urban slums

during the COVID-19 pandemic. This intervention shows the potential to improve food and nutrition security in urban slums by making healthy foods more affordable and by promoting the consumption of healthy and diverse diets through a combination of behaviour change communication (BCC) and cash incentives.

Overview and innovative aspects

A total of 7,607 households in low-income urban areas of Kalyanpur and Sattala Bosti (Mohakhali) in Dhaka participated in the pilot project from September 2020 to July 2021. These two locations were chosen as most of their residents had daily wages and other low-paid jobs that were significantly affected by the pandemic and lockdown. Participating households were identified using the government's safety net criteria (including pregnant and lactating women, elderly, disabled, widowed and female-headed households).

Each household received unconditional monthly cash assistance of BDT 3 000 (USD 35) with a view to supplementing household resources to diversify diets and meet up to 60 percent of daily calorie intake needs, as calculated from the operational guidelines issued by the Cash Working Group (Cash Working Group Bangladesh, 2020).

Thirty local vendors agreed to provide a stable supply of food items in seven selected food groups: i) starchy food (including fortified rice containing vitamins A, B1, B12, folic acid, zinc and iron), ii) green leafy vegetables, iii) vitamin A-fortified oil, iv) eggs, v) pulses, vi) orange flesh fruits and vegetables and vii) other fruits and vegetables. A colour-coded flyer listing included foods items was distributed to beneficiaries, while a similar poster was clearly displayed in each shop (WFP, 2020).

Payments were made using a popular mobile banking system (bKash) to eliminate cash handling and minimize person-to-person contact in accordance with COVID-19 safety protocols; the same system as was used to transfer the monthly cash assistance.

Blockchain technology was used to monitor household expenditure and purchasing patterns and to release and calculate cash incentives. Beneficiaries received a card with a QR code to identify them when making purchases. This system included data protection functions and minimized financial risks.

Two nutrition-sensitive mechanisms were used in combination with monthly cash assistance to promote healthy food and diverse food choices:

1. Cashback rewards conditional on spending monthly cash assistance on selected food items

Beneficiaries were encouraged to have their purchases tracked through blockchain technology, which allowed them to earn a monthly bonus (cashback) if they spent money on healthy foods and adhered to certain conditions.

If beneficiaries spent a minimum of BDT 150 (USD 1.80) per category on at least five of the seven selected food groups, they received a cashback reward the following month. Recognizing that part of the cash received would probably be spent on other, urgent non-food needs, two different thresholds for cashback were allocated randomly to the two slums (Table 1) to try to understand whether and how different thresholds might influence behaviour.

Table 1. Differences in the cashback mechanism between the two urban slums

	Kalyanpur		Sattala Bosti	
	BDT	USD	BDT	USD
Unconditional cash assistance amount per month	3 000	35	3 000	35
Threshold to spend on healthy food basket to receive maximum cashback per month (minimum spend on at least five healthy food groups)	2 000	23.3	3 000	35
Maximum amount of starchy food counting towards cashback per month	470	5.5	700	8.2
Maximum amount of fortified oil counting towards cashback per month	200	2.3	300	3.5
Mandatory minimum purchase per food group for at least five food groups per month to be entitled to cashback	150	1.8	150	1.8
Maximum cashback amount per month	750	8.8	750	8.8

SOURCE: Authors' own elaboration.

The amount of cashback was calculated as a percentage of the monthly cash assistance spent on selected food items. The threshold to receive the maximum amount of cashback per month (BDT 750) was lower in Kalyanpur (37.5 percent of BDT 2 000) than Sattala Bosti (25 percent of BDT 3 000). Overconsumption of rice and oil is a common issue in Bangladesh. To mitigate this and promote dietary diversity, limits were placed on the amount of cashback that could be earned by buying starchy foods and oil.

2. Behaviour change communication

A range of strategies was used to increase awareness about the importance of diverse and nutritious diets for healthy living. These included home visits, flyer distribution, text messages and posters in the shops and in the community. BCC targeted both males and females.

Implementation challenges

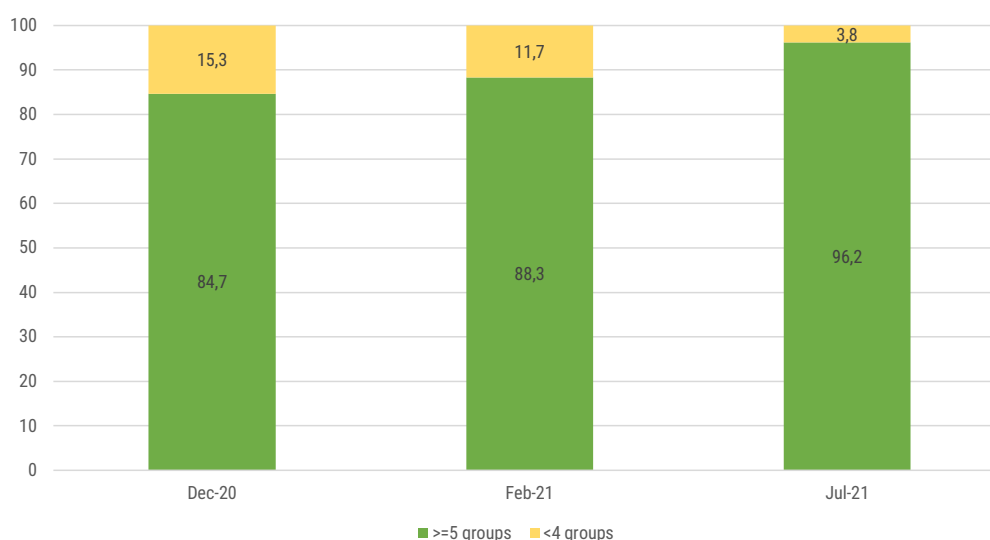
Due to the urgent need to start the cash distribution to mitigate the economic impact of the COVID-19 pandemic on food security and nutrition outcomes,

some compromises were made on implementation arrangements. The first cash transfers were undertaken in November 2020, before the finalization of the various BCC materials. Thus, cashback was calculated based on 10 percent of all purchases of healthy food, irrespective of how many food groups beneficiaries purchased from, but with a maximum amount calculated for cashback on starchy food and oil to mitigate overconsumption. The first BCC took place in February 2021 and the conditions for earning cashback were introduced simultaneously.

Outcomes of the pilot

The purchase data collected through blockchain shows a steady increase in the purchase of healthy food, especially fruits and vegetables, in both slums between December 2020 and July 2021 (Figure 2). Data on purchase patterns were not collected at baseline in September 2020. However, the conditions to qualify for cashback and BCC were not implemented until February, so is it possible to track the change in purchase patterns linked to these programme components between February and July 2021.

Figure 2. Percentage of households purchasing food from five or more food groups per month



SOURCE: Authors' own elaboration.

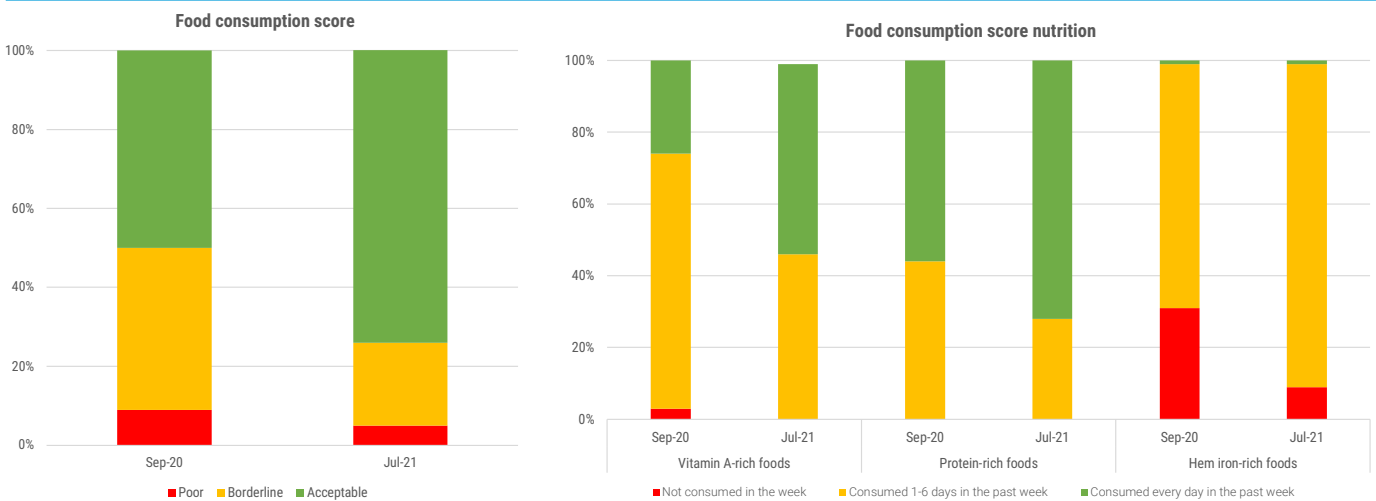
The proportion of households purchasing food from five or more food groups increased from 85 percent in December 2020 to 88 percent in February 2021 ($p < 0.0003$) (with cashback only) and rose further to 96 percent in July 2021 ($p < 0.0001$) (after the addition of BCC and conditions for cashback, as described).

The increase in the purchase of healthy foods was greater in Kalyanpur slum (a 77 percent increase from December to April), where the threshold for cashback was lower, than in

Sattala Bosti slum (a 41 percent increase from December to April). This could be explained by the fact that in Kalyanpur beneficiaries were more likely to reach the threshold, receive the monthly bonus and, therefore, have more money to spend.

The programme monitoring data showed a significant improvement in the proportion of households with an "acceptable" food consumption score, from 50 percent in September 2020 (baseline prior to the first cash transfers in November 2020) to 75 percent in July 2021 (Figure 3).

Figure 3. Food consumption score and associated nutrition (at baseline and endline)

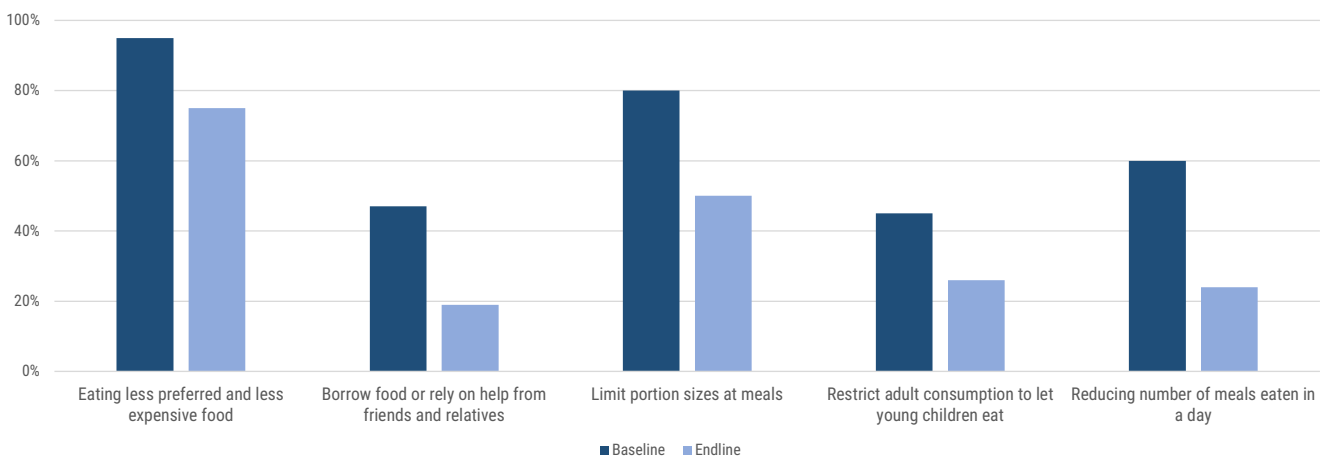


SOURCE: Authors' own elaboration.

A similar improvement was found in food consumption score nutrition, with increased consumption across all three dimensions (vitamin A-rich foods, protein-rich foods and foods rich in heme-iron). Meat was not included in the seven food groups that qualified for cashback (due to food-safety concerns during the pandemic). This, combined with the high price of meat, may explain the low consumption of foods rich in heme-iron.

The average coping strategy index declined from 21 in September 2020 (baseline prior to the first cash transfers in November 2020) to 10 in July 2021 (endline). Figure 4 shows that all five food-based coping mechanisms showed a reduction over the same period.

Figure 4. Percentage of households adopting food-based coping strategies (at baseline and endline)



SOURCE: Authors' own elaboration.

While these findings indicate an overall improvement in purchase and consumption patterns, further work is needed to refine the different components of the pilot and document the impact. Thus, a second iteration of the pilot is ongoing, while an impact evaluation is planned for a third iteration.

Future and sustainability of the intervention

A second iteration of the pilot began in two other urban slums in Dhaka in May 2021. WFP is testing mobile phone-based approaches to delivering nutrition messages in combination with cash incentives, compared with face-to-face BCC

and cash incentives in the first iteration, thus trying to accommodate the more mobile nature of the urban working population. The Food and Agriculture Organization of the United Nations is facilitating linkages between urban food vendors and farmers' groups producing vegetables and fruits in nearby peri-urban areas and involving traditional vegetable hawkers working in the slums.

For a third iteration, WFP and the Bangladeshi Ministry of Women and Child Affairs are planning to align the approach with the country's Mother and Child Benefit Programme, one of the larger social protection programmes in Bangladesh. This is expected to start in some areas in Dhaka in July 2022 and will build on the combination of the cash incentive and BCC to make unconditional cash payments more nutrition sensitive. An impact evaluation of the third iteration (randomized controlled trial) is planned together with WFP and Cornell University to collect further evidence of effectiveness.

References

- Cash Working Group Bangladesh.** 2020. *Cash package for COVID-19 Response: Operational Guidelines*. Dhaka. https://fscluster.org/sites/default/files/documents/guidelines_on_cash_package_for_covid_19_response_final_on_24.4.20.pdf
- PPRC-BIGD (Power and Participation Research Centre-BRAC Institute for Governance and Development).** 2020. *Rapid Response Research: Livelihoods, coping and support during COVID-19 crisis*. Dhaka. <https://bigd.bracu.ac.bd/publications/livelihoods-coping-and-support-during-covid-19-crisis-report/>
- UNDP (United Nations Development Programme).** 2020. *Addressing the COVID-19 economic crisis in Asia through social protection*. New York. <https://www.undp.org/publications/addressing-covid-19-economic-crisis-asia-through-social-protection>
- WFP.** 2022. *Food security and diets in urban Asia: How resilient are food systems in times of COVID-19? An analysis and characterization of 8 urban food systems in selected cities in Asia*. Rome. <https://www.wfp.org/publications/food-security-and-diets-urban-asia-how-resilient-are-food-systems-times-covid-19>

GLOBAL INSIGHTS

Do climate-resilient market systems hold the key to transforming access to nutrient-dense foods?

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The inadequate consumption of nutrient-dense foods (NDFs), particularly fruits and vegetables and animal-sourced foods, contributes to a range of health and nutrition problems. It is important to eat fruit and vegetables to achieve micronutrient sufficiency and to help combat cardiovascular disease and some cancers (Aune *et al.*, 2017; Lim *et al.*, 2012). Animal-sourced foods are a valuable font of bioavailable micronutrients and have been associated with reduced child stunting (Asare *et al.*, 2022; Zaharia *et al.*, 2021).

With only eight years in which to achieve the Sustainable Development Goal 2 (SDG 2) targets of “Zero Hunger” and “zero malnutrition”, physical and socioeconomic access to safe, desirable and stable supplies of NDFs is still widely regarded as inadequate in much of the world (FAO *et al.*, 2021; GLOPAN, 2020). A recent review by Frank *et al.* (2019) estimated that only 18 percent of individuals in low- and middle-income countries (LMICs) consumed the World Health Organization’s (WHO) recommended 400 grams per day of fruits and vegetables.

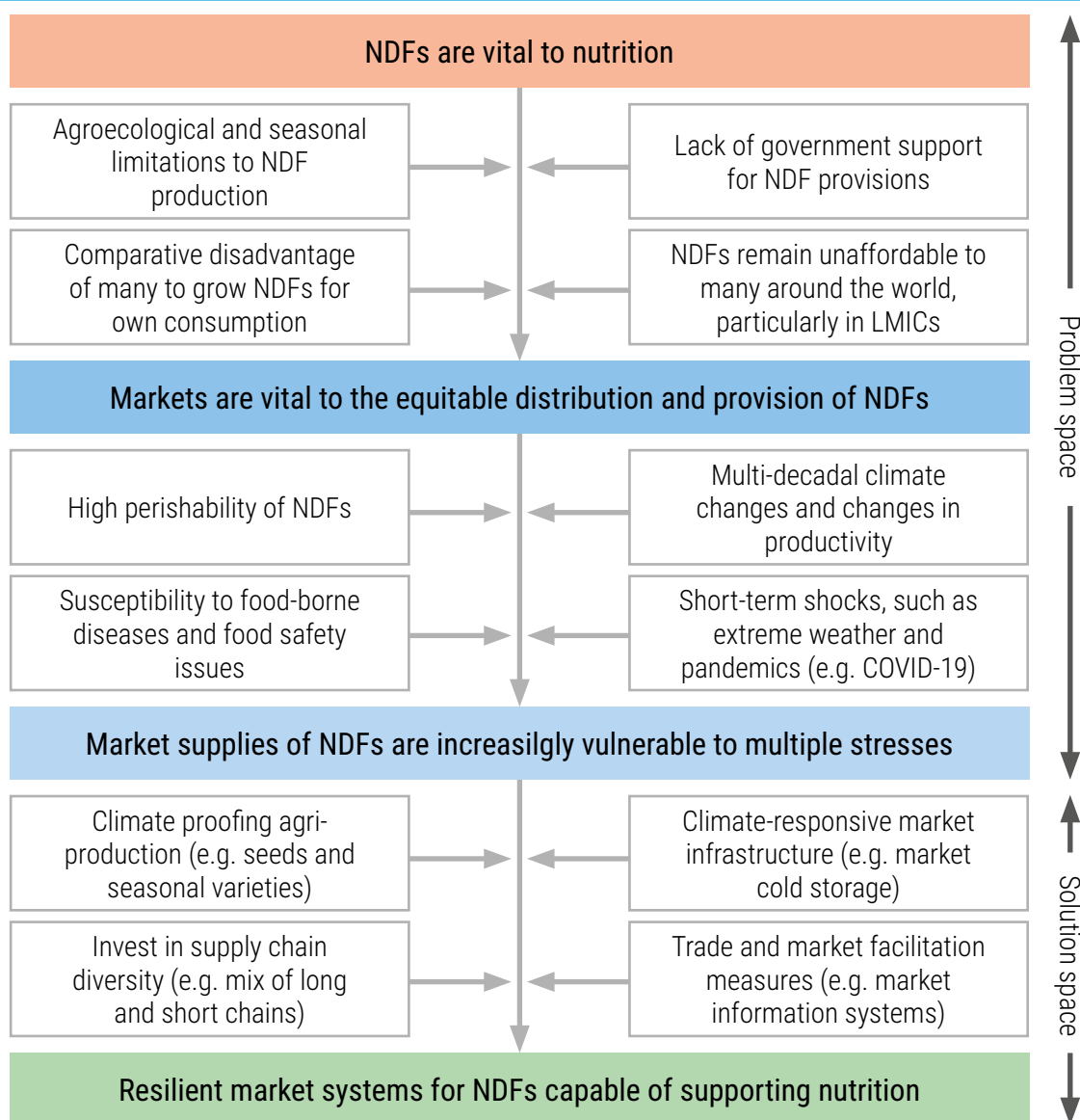
Market interventions for NDFs

Well-functioning food markets are critical to the equitable delivery of NDFs to LMIC populations. Even in low-income agricultural settings, households have been found to rely

heavily on markets to build dietary diversity and improve nutritional outcomes, particularly in lean seasons (Abay and Hirvonen, 2017; Sibhatu, Krishna and Qaim, 2015; Zanello, Shankar and Poole, 2019). The almost exclusive delivery of fruits and vegetables and animal-sourced foods via market mechanisms contrasts with the marketing of staples, which are often subject to public support, for example, in the form of public distribution systems. Furthermore, unlike most staple cereals and pulses, which may be stored for months, the perishability of fruits and vegetables and animal-sourced foods magnifies the importance of efficient transport, storage and market information systems in combating problems such as food loss, price instability and the degradation of food quality (Figure 1).

Government policies for NDFs traditionally focus on upstream aspects, targeting commercial opportunities for farmers, while interventions by civil society predominantly focus on consumer elements (such as home or kitchen gardens, or improving food environments). However, there is growing recognition of the transformative potential of broader, nutrition-sensitive, market-focused interventions that focus on food-system processes between the farm gate and retail food environment (namely, storage and processing, distribution and market infrastructure).

Figure 1. Conceptual framework linking the problem space of vulnerable NDFs and the potential solution space of climate-resilient market systems



SOURCE: Authors' own elaboration.

These interventions ultimately aim to improve the efficiency, equitability and safety of NDF distribution, storage and marketing (Allen and de Brauw, 2018; Cooper *et al.*, 2021; Gelli *et al.*, 2015). Prominent examples include the upgrading of physical (for example, cold storage at market sites and improved inter-market road connectivity) and/or digital infrastructure (such as price information systems), as well as the formalization of food safety standards at markets sites (Figure 1). Market interventions have the potential to impact large numbers of consumers and are inherently scalable, as they facilitate a natural propensity to buy, sell and exchange. Moreover, when designed with consideration for nutrition, they can cut across individual food value chains to boost several NDFs simultaneously.

Resilience in the perfect storm

While markets present potential leverage points for scaling up equitable access to NDFs, it is important to note that they are something of a double-edged sword. The effects of market failure are felt disproportionately by those sections of society most vulnerable to bottlenecks associated with unequal access to technology and infrastructure, geographical and/or economic remoteness, and structural inequalities (for example, women, the economically disempowered and other marginalized groups).

The concept of food-system resilience has gained prominence over the past decade, particularly in relation to the recovery

of food availability and affordability following natural or man-made shocks (Béné, 2020; Béné *et al.*, 2016). The prioritization of short-term shocks reflects the need to recover food security immediately following a crisis, often by providing humanitarian relief. In this context, the COVID-19 pandemic and the effects of associated travel restrictions on food distribution are widely acknowledged to have exposed the lack of resilience at the heart of our food systems (Fan *et al.*, 2021; GLOPAN, 2021; Swinnen, McDermott and Yosuf, 2021).

However, if we wish to transform nutrition beyond 2030, we must also strengthen markets to deal with the creeping changes we are seeing as the Earth's system moves beyond the relatively stable environmental conditions that have supported human development for the past 12,000 years (Rockström *et al.*, 2020; Steffen *et al.*, 2018).

The latest Intergovernmental Panel on Climate Change (IPCC, 2022) and International Food Policy Research Institute (IFPRI, 2022) reports add further weight to the notion of an impending "perfect storm" (Beddington, 2009), involving decadal-scale changes in average temperatures and rainfall patterns, plus increasingly frequent and extreme weather events associated with cascading disturbances such as wildfires and floods. The primary impacts are further magnified by secondary drivers, including (but not exhaustively) projected declines in the yields and nutritional values of fruits, vegetables and seeds in a warmer world (Alae-Carew *et al.*, 2020; Scheelbeek *et al.*, 2018), the intensification of conflicts around food scarcity (Queiroz *et al.*, 2021), and national and international population changes as a result of climate-induced migration (Barnett and Adger, 2007).

Plotting the way forward: climate-resilient market systems

Finding new and sustainable ways to build resilience to the impending perfect storm of intensifying climate-related drivers is vital, given i) the nutritional importance of NDFs, ii) their vulnerability to spoilage, and iii) the implications of market failure for all associated actors. However, empirical evidence for market-actor resilience remains "factually non-existent" (Béné, 2020, p.810). While the Market System Resilience framework of Downing *et al.* (2018) qualitatively links resilience to various behaviours, including cooperation and competition, it prioritizes short-term extreme events over multi-decadal creeping trajectories.

Two systematic reviews provide further evidence of this knowledge gap. First, Meyer (2020) identifies the dominance of studies on the resilience of production (for example, climate-resilient agriculture) and adaptive farmer behaviours following a shock – recommending the need

to study resilience beyond the farm gate. Second, in the context of supply-chain resilience to environmental shocks, Davis, Downs and Gephart (2021) find that both the study of perishables and the study of midstream storage, processing and retail dynamics are disproportionately underrepresented relative to staple crop production.

Therefore, a number of knowledge gaps erode our ability to develop climate-resilient market systems to help achieve global nutrition targets by 2030 and beyond. These include understanding the market interventions that help to improve equitable access to NDFs while imbuing resilience against multiple interacting climate-related stresses; exploring how to synergistically combine interventions to maximize resilience in multiple supply-chain segments; and identifying interventions which, when scaled up, may actually contribute to climate change (for example, via greenhouse gas emissions) and subsequently undercut long-term resilience. Given these knowledge gaps, it is not unreasonable to suggest that local food-system actors and policymakers are having to navigate the perfect storm while blindfolded.

To remove the blindfold, and in line with the long-standing concept of social-ecological resilience (Folke, 2006), market interventions must help local actors to anticipate long-term changes (in average temperatures, for instance) and short-term shocks (such as droughts); strengthen market capacity to absorb external (such as climate change) and internal (such as crop productivity declines) stresses; and reorganize markets onto more resilient trajectories following failure.

To this end, the examples in Table 1 are underpinned by two key concepts. First, the influence of interventions must extend beyond physical marketplaces, involving both the upstream processes of distribution and downstream processes of food safety, food loss and consumption choice. The inability to account for feedback loops across food supply chains is known to lead to unforeseen and unintended consequences (Nicholson *et al.*, 2020), such as improving outcomes at one end of the chain (for example, agricultural livelihoods) while degrading outcomes at the other (for example, nutritional outcomes). Therefore, we argue for a "whole-market" approach to resilience, whereby climate-resilient market systems proactively foster synergies and counter trade-offs impacting all actors buying and selling NDFs.

Second, as long established in natural resource management fields (Carpenter *et al.*, 2001), diversity must be about more than production diversity. In a whole-market approach, diversity must aim for equitable access to a mix of short and long supply chains, individual and collective marketing approaches, multiple transport, storage and

energy alternatives, and an emphasis on dietary diversity in consumer policy and programming (Table 1). Building diversity in the market system is a prudent strategy for insuring against growing systematic risk, but may involve efficiency trade-offs in the short to medium term. However, the long-term benefits associated with flexibility and adaptability are likely to be considerable, and governments must prepare to invest and legislate accordingly.

Table 1. Example market-system interventions to boost climate-related resilience and improve accessibility to NDFs in underserved markets and communities

Intervention	Rationale behind intervention	Potential trade-offs and traps
Investing in climate-proof seed varieties and livestock breeds.	Attempt to ensure yield impacts of climate shocks are minimized (currently the area where most resilience focus is concentrated).	Without efforts to maintain crop diversity that adapts to changing climate conditions, there is a risk of monocultures emerging that lock-in production to past conditions.
Establishing price information systems connecting producing villages to market sites and larger wholesale markets to downstream retail markets.	When climate or other shocks cause a deficit in one area and local prices spike, produce can flow from surplus areas in response to price signals.	Information systems should be publicly accessible to improve market transparency for as many actors as possible. Entrance barriers (such as membership fees) may lock out smallholder farmers.
Strategically developing a mix of short and long supply chains for NDFs.	When one or more supply chains fail, other lines of supply can quickly fill the gap.	Access to supply chains may be moderated by farmer size, status and/or other socioeconomic barriers. Additional interventions may be required to ensure market access is equitable
Mix of traditional spot-based market yard transactions, contract farming and online e-commerce platforms.	As above; in addition, by removing the need for market actors to spend multiple hours outside negotiating terms and prices, virtual marketplaces help to reduce heat exposure for both people and perishable produce.	Innovative e-commerce platforms such as “B2B apps” may be less accessible to older and/or less technologically savvy market actors. Further, new marketing pathways may require buyer-seller relationships built up over many years to be broken.
Use climate-resilient infrastructure when upgrading markets, including increased use of shade and ventilation, raised platforms and improved wastewater management. Energy supplies should also be renewable.	As temperatures continue to increase, precipitation patterns change and extreme events become more frequent, climate-proof infrastructure in markets will help farmers, traders and consumers to continue accessing the marketplace.	Upgrades should avoid costing farmers and market actors both directly, for example, by requiring these actors to self-fund infrastructure upgrades, and indirectly, for example, by reducing the capacity of the market. Access to climate-proof infrastructure should not be conditional on overcoming entrance costs.
Market site-based cold-storage development, particularly energy-efficient and clean technology (such as solar-powered) options.	Enables NDFs to be sold to consumers over longer periods by lengthening shelf-life, especially as heat episodes worsen.	Similar to above, cold storage access may be unequal, especially if there are participation costs. Also, unclean energy options will be associated with undesirable greenhouse gas emissions.
Invest in strategies to combat food losses at multiple stages of food supply chains, for example, through better handling, packaging and secure transportation.	As horticultural productivity changes in response to heightened temperatures and extreme events, reducing leakages from the supply chain will be vital to livelihood and food securities.	Access to food-loss strategies should not depend on overcoming unreasonable participation barriers. Similarly, reduction strategies should not be reserved for the urban markets or the supply chains serving the most exclusive consumers.
Improved food safety and quality standards, particularly in retail food environments/markets, for example, covering of produce, improved hygiene practices of retailers, training on avoidance of contamination.	The perceived desirability of food is generally considered a major driver of consumption. Practices that guard against food adulteration and contamination will help to counteract losses in food accessibility generated by declines in productivity and increases in spoilage.	In common with the examples above, existing inequalities must not be reinforced by reserving food safety interventions for urban “elite” consumers and/or international export supply chains.

SOURCE: Authors’ own elaboration.

Understanding the climate-resilience of nutrition-sensitive markets will require the increased application of methods capable of handling multiple dependent and independent variables, often connected by feedback loops, such as in-depth qualitative narrative approaches and non-linear simulation approaches, such as system dynamics modelling and agent-based modelling. The last 15 years have seen significant progress in the comprehension of policies and

interventions that help to build more nutrition-sensitive and inclusive food systems. However, given the need to preserve nutritional gains made in the lead-up to 2030, as well as to “future-proof” any policies and approaches beyond 2030, we must treat today as a window of opportunity to start exploring the extent to which market-based interventions either reinforce or undermine resilience to projected 21st-century climate stresses.



References

- Abay, K. & Hirvonen, K.** 2017. Does Market Access Mitigate the Impact of Seasonality on Child Growth? Panel Data Evidence from Northern Ethiopia. *Journal of Development Studies*, 53: 1414–1429.
<https://doi.org/10.1080/00220388.2016.1251586>
- Alae-Carew, C., Nicoleau, S., Bird, F.A., Hawkins, P., Tuomisto, H.L., Haines, A., Dangour, A.D. & Scheelbeek, P.F.D.** 2020. The impact of environmental changes on the yield and nutritional quality of fruits, nuts and seeds: a systematic review. *Environmental Research Letters*, 15(2): 23002.
<https://doi.org/10.1088/1748-9326/ab5cc0>
- Allen, S. & de Brauw, A.** 2018. Nutrition sensitive value chains: Theory, progress, and open questions. *Global Food Security*, 16: 22–28.
<https://www.sciencedirect.com/science/article/abs/pii/S2211912416301171>

- Asare, H., Rosi, A., Faber, M., Smuts, C.M. & Ricci, C.** 2022. Animal-source foods as a suitable complementary food for improved physical growth in 6 to 24-month-old children in low- and middle-income countries: a systematic review and meta-analysis of randomised controlled trials. *British Journal of Nutrition*: 1–11. <https://doi.org/10.1017/S0007114522000290>
- Aune, D., Giovannucci, E., Boffetta, P., Fadnes, L.T., Keum, N., Norat, T., Greenwood, D.C., Riboli, E., Vatten, L.J. & Tonstad, S.** 2017. Fruit and vegetable intake and the risk of cardiovascular disease, total cancer and all-cause mortality—a systematic review and dose-response meta-analysis of prospective studies. *International Journal of Epidemiology*, 46(3): 1029–1056. <https://doi.org/10.1093/ije/dyw319>
- Barnett, J. & Adger, W.N.** 2007. Climate change, human security and violent conflict. *Political Geography*, 26(6): 639–655. <https://doi.org/10.1016/j.polgeo.2007.03.003>
- Beddington, J.R.** 2009. Food, Energy, Water, and the Climate: A Perfect Storm of Global Events? Presentation to the Sustainable Development UK Annual Conference, 19 March 2009. London.
- Béné, C.** 2020. 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 Security*, 12: 805–822. <https://doi.org/10.1007/s12571-020-01076-1>
- Béné, C., Headey, D., Haddad, L. & von Grebmer, K.** 2016. Is resilience a useful concept in the context of food security and nutrition programmes? Some conceptual and practical considerations. *Food Security*, 8: 123–138. <https://doi.org/10.1007/s12571-015-0526-x>
- Carpenter, S., Walker, B., Anderies, J.M. & Abel, N.** 2001. From Metaphor to Measurement: Resilience of What to What? *Ecosystems*, 4: 765–781. <https://doi.org/10.1007/s10021-001-0045-9>
- Cooper, G.S., Shankar, B., Rich, K.M., Ratna, N.N., Alam, M.J., Singh, N. & Kadiyala, S.** 2021. Can fruit and vegetable aggregation systems better balance improved producer livelihoods with more equitable distribution? *World Development*, 148: 105678. <https://www.sciencedirect.com/science/article/pii/S0305750X2100293X>
- Davis, K.F., Downs, S. & Gephart, J.A.** 2021. Towards food supply chain resilience to environmental shocks. *Nature Food*, 2: 54–65. <https://doi.org/10.1038/s43016-020-00196-3>
- Downing, J., Field, M., Ripley, M. & Sebstad, J.** 2018. *Market System Resilience: A Framework For Measurement*. Washington, DC: United States Agency for International Development. https://www.usaid.gov/sites/default/files/documents/1866/Market-Systems-Resilience-Measurement-Framework-Report-Final_public-August-2019.pdf
- Fan, S., Teng, P., Chew, P., Smith, G. & Copeland, L.** 2021. Food system resilience and COVID-19 – Lessons from the Asian experience. *Global Food Security*, 28: 100501. <https://www.sciencedirect.com/science/article/pii/S2211912421000110>
- FAO, IFAD, UNICEF, WFP & WHO.** 2021. *The State of Food Security and Nutrition in the World 2021. Transforming food systems for food security, improved nutrition and affordable healthy diets for all*. Rome, FAO. <https://www.fao.org/publications/sofi/2021/en/>
- Folke, C.** 2006. Resilience: The emergence of a perspective for social–ecological systems analyses. *Global Environmental Change*, 16(3): 253–267. <https://www.sciencedirect.com/science/article/pii/S0959378006000379>
- Frank, S.M., Webster, J., McKenzie, B., Geldsetzer, P., Manne-Goehler, J., Andall-Brereton, G. et al.** 2019. Consumption of Fruits and Vegetables Among Individuals 15 Years and Older in 28 Low- and Middle-Income Countries. *Journal of Nutrition*, 149(7): 1252–1259. <https://doi.org/10.1093/jn/nxz040>
- Gelli, A., Hawkes, C., Donovan, J., Harris, J., Allen, S., de Brauw, A., Henson, S., Johnson, N., Garrett, J. & Ryckembusch, D.** 2015. *Value Chains and Nutrition: A Framework to Support the Identification, Design, and Evaluation of Interventions*. IFPRI Discussion Paper 01413. Washington, DC, International Food Policy Research Institute. https://a4nh.cgiar.org/files/2012/07/Value_chains_and_nutrition_A_framework_to_support_the_identification_design_and_evaluation_of_interventions.pdf
- GLOPAN (Global Panel on Agriculture and Food Systems for Nutrition).** 2021. COVID-19 and Food Systems: Rebuilding for Resilience. In: *Food Systems Summit 2021*. Rome. <https://www.un.org/en/food-systems-summit/news/covid-19-and-food-systems-rebuilding-resilience>

- GLOPAN.** 2020. *Future Food Systems: For people, our planet, and prosperity*. London. <https://foresight.glopan.org/>
- IFPRI (International Food Policy Research Institute).** 2022. *2022 Global Food Policy Report: Climate Change and Food Systems*. Washington, DC. <https://doi.org/10.2499/9780896294257>
- IPCC (Intergovernmental Panel on Climate Change).** 2022. *Climate Change 2022: Impacts, Adaptation, and Vulnerability*. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Geneva, Switzerland. <https://www.ipcc.ch/report/ar6/wg2/>
- Lim, S.S., Vos, T., Flaxman, A.D., Danaei, G., Shibuya, K., Adair-Rohani, H. et al.** 2012. A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010. *The Lancet*, 380(9859): 2224–2260. [https://doi.org/10.1016/S0140-6736\(12\)61766-8](https://doi.org/10.1016/S0140-6736(12)61766-8)
- Meyer, M.A.** 2020. The role of resilience in food system studies in low- and middle-income countries. *Global Food Security*, 24: 100356. <https://doi.org/10.1016/j.gfs.2020.100356>
- Nicholson, C.F., Kopainsky, B., Stephens, E.C., Parsons, D., Jones, A.D., Garrett, J. & Phillips, E.L.** 2020. Conceptual frameworks linking agriculture and food security. *Nature Food*, 1: 541–551. <https://doi.org/10.1038/s43016-020-00142-3>
- Queiroz, C., Norström, A.V, Downing, A., Harmáčková, Z. V, De Coning, C., Adams, V. et al.** 2021. Investment in resilient food systems in the most vulnerable and fragile regions is critical. *Nature Food*, 2: 546–551. <https://doi.org/10.1038/s43016-021-00345-2>
- Rockström, J., Edenhofer, O., Gaertner, J. & DeClerck, F.** 2020. Planet-proofing the global food system. *Nature Food*, 1: 3–5. <https://doi.org/10.1038/s43016-019-0010-4>
- Scheelbeek, P.F.D., Bird, F.A., Tuomisto, H.L., Green, R., Harris, F.B., Joy, E.J.M., Chalabi, Z., Allen, E., Haines, A. & Dangour, A.D.** 2018. Effect of environmental changes on vegetable and legume yields and nutritional quality. *Proceedings of the National Academy of Sciences*, 115(26): 6804–6809. <https://doi.org/10.1073/pnas.1800442115>
- Sibhatu, K.T., Krishna, V.V. & Qaim, M.** 2015. Production diversity and dietary diversity in smallholder farm households. *Proceedings of the National Academy of Sciences*, 112(34): 10657–10662. <https://doi.org/10.1073/pnas.1510982112>
- Steffen, W., Rockström, J., Richardson, K., Lenton, T.M., Folke, C., Liverman, D. et al.** 2018. Trajectories of the Earth System in the Anthropocene. *Proceedings of the National Academy of Sciences*, 115(33): 8252–8259. <https://doi.org/10.1073/pnas.1810141115>
- Swinnen, J.F.M., McDermott, J. & Yosuf, S.** 2021. Beyond the Pandemic: Transforming Food Systems after COVID-19. In: *2021 Global Food Policy Report: Transforming Food Systems after COVID-19*. Washington, DC, International Food Policy Research Institute, pp. 6–19. <https://doi.org/10.2499/9780896293991>
- United Nations.** 2015. *Transforming our world: the 2030 Agenda for Sustainable Development*. New York. <https://sdgs.un.org/2030agenda>
- Zaharia, S., Ghosh, S., Shrestha, R., Manohar, S., Thorne-Lyman, A.L., Bashaasha, B. et al.** 2021. Sustained intake of animal-sourced foods is associated with less stunting in young children. *Nature Food*, 2: 246–254. <https://doi.org/10.1038/s43016-021-00259-z>
- Zanello, G., Shankar, B. & Poole, N.** 2019. Buy or make? Agricultural production diversity, markets and dietary diversity in Afghanistan. *Food Policy*, 87: 101731. <https://doi.org/10.1016/j.foodpol.2019.101731>

Next-generation school feeding: Nourishing our children while building climate resilience

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At the start of 2020, 388 million children, or one in every two schoolchildren in more than 160 countries, were receiving a school meal every day, making school feeding the largest social safety net in the world (WFP, 2020a). Between 2013 and 2020, the number of children receiving school meals jumped almost 10 percent, reflecting the increased institutionalization of such programmes as part of government policies for national development.

Furthermore, governments have increasingly recognized the multiple benefits of an approach known as home-grown school feeding (HGFS). This builds on existing school feeding programmes by sourcing food for school meals locally from smallholder farmers in an effort to boost agricultural development, strengthen local food systems and move people out of poverty (FAO and WFP, 2018).

We believe HGFS approaches provide an important framework for mainstreaming climate-smart agriculture (CSA) and innovation for scaling up climate action to strengthen programming approaches that enable cross-cutting action to transform nutrition. They simultaneously facilitate multiple-duty actions and programme options that address malnutrition in all its forms, while helping to achieve global climate, food and biodiversity goals.

Home-grown models assume that households and local smallholder farmers benefit from guaranteed school-market demand, while schoolchildren benefit from more diverse diets that include culturally appropriate, nutrient-rich

indigenous foods. There are positive multiplier effects for other groups of people along the value chain, such as local catering businesses – many led by women – traders and transporters, and rural small and medium-sized enterprises (SMEs), which achieve higher incomes (FAO and WFP, 2018). We believe that guaranteed demand and the focus on local livelihoods that HGFS embraces are an important pull strategy for the often research- and supply-driven approaches of CSA.

To meet food demand and secure the long-term impact of HGFS interventions, procuring directly from individual smallholder farmers is often impractical and best addressed through farmer organizations or cooperatives (WFP, 2014). Farmer organizations help overcome the barriers to market entry that smallholders often face by facilitating the aggregation of small quantities, easing access to services (such as inputs, credit and transport), reducing transaction costs and enhancing bargaining power and the capacity to negotiate contracts and tenders. Farmer organizations provide effective platforms for delivering technical support and training and improving management, organizational, marketing and entrepreneurial skills.

Well-established training and learning-by-doing approaches through farmer organizations, such as farmer field schools and business schools, can enable smallholders to improve their technical knowledge and business management skills (FAO and Procasur, 2021). An adapted farmer business school approach was recently used in Kenya to strengthen

farmers' organizational, negotiation, entrepreneurial and market skills, as well as to deliver agroecology training to produce more crop diversity for school meals. It also addressed farmers' limited knowledge of the nutritional value of African indigenous vegetables, as well as post-harvest handling, quality and food safety, and long-term biodiversity conservation (Borelli *et al.*, 2021).

Acknowledging the need for more climate change-responsive approaches to school feeding (FAO and WFP, 2018; WFP, 2020b) and finding ways for school procurement and menus to emphasize more climate-resilient foods (Gelli and Aurino, 2021; GCNF, 2021; Singh and Conway, 2021) makes HGSF platforms a good strategic entry point for a stronger climate-resilience component in school feeding, especially when integrated with national CSA actions and other national agricultural support efforts linked to nutrition-sensitive agriculture that better harness the use of agrobiodiversity (Singh, 2021). Such HGSF platforms would promote innovation and behavioural change with regard to climate-sensitive agriculture, influencing how smallholders and communities and other actors along the HGSF value chain respond and adapt to climate change.

Incorporating the experience and lessons learned from the work of the CGIAR Research Programme on Climate Change, Agriculture and Food Security (CCAFS) and partners in co-designing innovation platforms such as climate-smart villages and local technical agro-climatic committees, would make HGSF platforms a focus for scaling up adaptation options in agriculture, supporting the production of climate-resilient foods (Aggarwal *et al.*, 2018; Loboguerrero *et al.*, 2018a; Andrieu *et al.*, 2019; Osorio-Garcia *et al.*, 2019). Including climate-smart agricultural value-chain approaches would broaden the focus to other value-chain actors, including SMEs, and create awareness of the impacts of climate change along the different stages of the HGSF value chain and reveal additional opportunities for adaptation (Mwongera *et al.*, 2019). Better linkages to climate services, including climate forecasting, tailored agro-advisory services and innovative insurance, would further underpin HGSF, making more climate-resilient farmer organizations, cooperatives and SMEs bankable and investible when it comes to school food provision.

A more climate change-responsive approach to school feeding also provides opportunities to link to broader aspects of school education, especially through school garden-based learning. School gardens can serve as learning labs for children to better understand the risks and impacts of climate change and to demonstrate ways of adapting. This has been demonstrated in the Philippines,

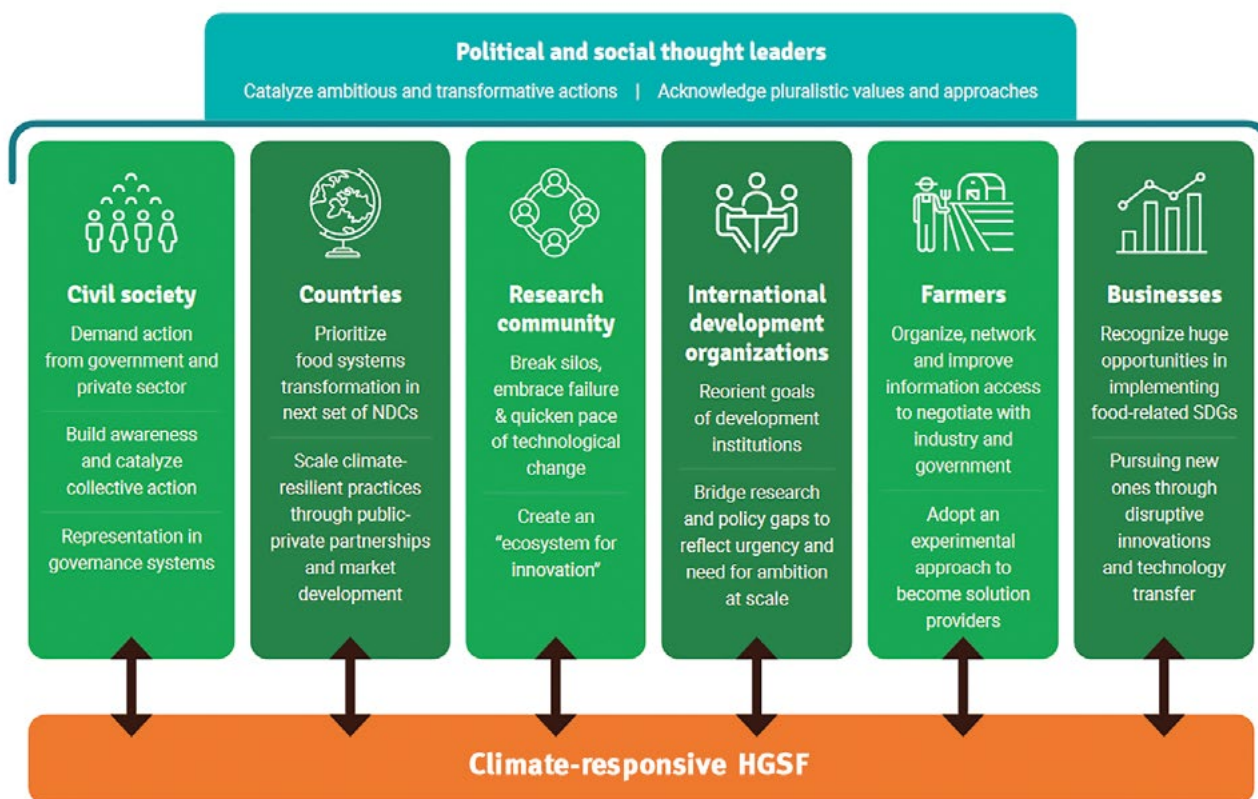
where regenerative gardening systems with climate-resilient practices have been widely promoted in schools (Gonsalves, Hunter and Lauridsen, 2020), and in Cauca, Colombia, where kindergarten teachers and children grow vegetables together while learning how weather influences plant growth and the importance of looking after soils as part of promoting CSA (Comfacauca, 2017).

Such actions change norms around school food and build consumer demand for culturally appropriate, climate-resilient foods. Planting diverse crops together with multipurpose trees on garden boundaries helps sequester carbon in tree biomass and soils, while promoting the greening of schools and cooler environments for learning and play. A holistic approach linking HGSF, the promotion of CSA and school garden-based learning would empower schoolchildren as future agents of change for climate action and healthy eating in their schools, homes and communities.

Improving the availability of climate-resilient, nutrient-rich foods would be transformational for school-aged children's nutrition. Integrated approaches linking the establishment of school gardens to awareness-raising on the nutritional value of locally sourced foods, the integration of agrobiodiversity benefits in school curricula and the use of garden produce to teach food preparation and healthy eating, combined with school feeding, would contribute significantly to reducing the burden of malnutrition among school-aged children (Hunter *et al.*, 2020).

Bringing together HGSF and climate action in a way that addresses the triple challenge of climate, food and biodiversity while nourishing school-aged children presents challenges and opportunities. Addressing these and catalysing action requires working with a range of stakeholders and actors (Figure 1, Box 1).

Figure 1. Stakeholder groups required for a more climate-responsive approach to HGSF



SOURCE: Adapted from Steiner, A., Aguilar, G., Bomba, K., Bonilla, J.P., Campbell, A., Echeverria, R. et al. 2020. *Actions to Transform Food Systems under Climate Change*. Wageningen, the Netherlands, CGIAR Research Programme on Climate Change, Agriculture and Food Security (CCAFS).

Key to achieving this is enabling stakeholders to work in a cross-sectoral way that acknowledges and embraces the intimate interrelationships between biodiversity, nutrition and climate outcomes. The guidance on mainstreaming biodiversity for nutrition and health that broadly encompasses the five critical steps identified in the *Global Nutrition Report 2018* for speeding up action to end malnutrition in all its forms is one example of a conceptual

framework that can help guide this process (WHO, 2020, Figure 9). For example, countries could prioritize and promote a more climate change-responsive approach to school feeding in their Nationally Determined Contributions (NDCs), National Adaptation Plans (NAPs) and long-term strategies under the United Nations Framework Convention on Climate Change (UNFCCC) (Box 1).

Box 1. Catalysing action on HGSF and climate: stakeholders and potential roles

Countries: Governments need to work cross sectorally and recognize the intimate interrelationships between climate, biodiversity and nutrition outcomes. Actions that promote a more climate change-responsive approach to school feeding should be prioritized in NDCs, NAPs and long-term strategies under the UNFCCC. These actions need to be based on context-specific needs and readiness for implementation. Opportunities include public-private partnerships to scale up HGSF and climate action, and providing the right incentives through appropriate policies.

Research community: The research community needs to break down silos between climate, biodiversity and nutrition expertise to provide end-to-end solutions that meet the needs of all stakeholders involved in HGSF. This includes promoting an environment for transdisciplinary work, where researchers are integrated with policymakers, the private sector and development practitioners, which is fit for purpose and goes beyond traditional comfort zones. Changes will be needed to incentivize structures, management and governance in public-sector agricultural research for development systems to scale up HGSF and climate action.

International development organizations: Non-governmental organizations, international institutions and donors need to reorient the goals of development institutions and bridge research and policy gaps to forge a combined agenda aimed at achieving global climate, food and biodiversity goals. Major opportunities include facilitating South–South, North–South and Triangular cooperation strategies to reach scale in relation to HGSF and climate action, as well as facilitating the development and deployment of public-private partnerships. International development organizations need to show leadership on emerging topics such as HGSF and climate action.

Farmers: Farmers remain on the front line of climate change, nutrition and biodiversity challenges, but these challenges could be turned into opportunities and farmers could provide the solutions. This will require farmers to strive to make their voices heard in decision-making processes. Development work with farmers needs to consider the priorities and opportunities of different farmer groups: small-scale farmers, women, youth, marginalized and indigenous farmers.

Businesses: Businesses should recognise the opportunities of participating in initiatives that can provide triple wins on climate, biodiversity and nutrition. Incentives need to be developed to catalyse businesses participation. Some of these actions include improving the transparency and accountability of finance and major commodity supply chains, and transforming procurement and supply-chain policies to incentivize climate-smart HGSF.

Civil society: The role of civil society in demanding climate action has been in the spotlight in recent years. Climate, biodiversity and nutrition challenges are a key concern for an increasing number of voters. Social movements need to continue demanding ambitious action from governments and the private sector, building awareness and fostering collective action among communities.

Political and social thought leaders: To promote HGSF and climate actions, we need strong leadership, both intellectual and political, to escalate the issue to the highest levels. There is a need for support from world leaders, but this leadership needs to catalyse ambitious and transformative action by private and public stakeholders, acknowledging pluralistic values and approaches. As immediate beneficiaries, young people and schoolchildren have an important role to play in galvanizing climate action in areas that require social change, such as HGSF.

SOURCE: Steiner, A., Aguilar, G., Bomba, K., Bonilla, J.P., Campbell, A., Echeverria, R. et al. 2020. *Actions to Transform Food Systems under Climate Change*. Wageningen, the Netherlands, CCAFS. <https://ccafs.cgiar.org/resources/publications/actions-transform-food-systems-under-climate-change>
 Hellin, J., Fisher, E. and Loboguerrero, A.M. 2021. Reflections on enhancing the impact of climate risk management through transformative adaptation. *Frontiers in Climate*, 3: 751691. <https://www.frontiersin.org/articles/10.3389/fclim.2021.751691/full>

School closures during the COVID-19 pandemic brought a decade's growth in school feeding programmes to a dramatic halt, leaving about 370 million school children without access to their one reliable meal a day. Global resolve to restore these critical safety nets has become even more of a priority, with a key focus on scaling up HGSF approaches (WFP, 2020a). To this end, a new Global School Meals Coalition was launched at the UN Food Systems Summit with the aim of nurturing future collaboration and innovation to help countries build back better. Moreover, the World Food Programme has launched a new 10-year school feeding strategy (2020–2030), which calls for more research, interventions and

design to foster a climate change-responsive approach to school feeding (WFP, 2020b).

We believe a more integrated approach to HGSF that empowers farmer organizations to take climate action by incorporating and building on CCAFS and partners' systematic research and evidence generation, experiences, innovation and practices on the ground over the last 10 years (Loboguerrero *et al.*, 2018b; Steiner *et al.*, 2020) could inform the decision-making, design and implementation of future HGSF in a way that not only facilitates local nutrition and food system transformation, but makes a significant contribution to the triple challenge of meeting climate, food and biodiversity goals.

References

- Aggarwal, P.K., Jarvis, A., Campbell, B.M., Zougmore, R.B., Khatri-Chhetri, A., Vermeulen, S.J. et al.** 2018. The climate-smart village approach: framework of an integrative strategy for scaling up adaptation options in agriculture. *Ecology and Society*, 23(1): 14. <https://doi.org/10.5751/ES-09844-230114>
- Andrieu, N., Howland, F., Acosta-Alba, I., Le Coq, J.F., Osorio-Garcia, A.M., Martinez-Baron, D., Gamba-Trimiño, C., Loboguerrero, A.M. & Chia, E.** 2019. Co-designing climate-smart farming systems with local stakeholders: A methodological framework for achieving large-scale change. *Frontiers in Sustainable Food Systems*, 3: 37. <https://doi.org/10.3389/fsufs.2019.00037>
- Borelli, T., Wasike, V., Manjella, A. & Hunter, D.** 2021. Linking farmers, African leafy vegetables and schools to improve diets and nutrition in Busia county, Kenya. In: L. Swensson *et al.* (eds) *Public Food Procurement for Sustainable Food Systems and Healthy Diets*. Rome, FAO, Alliance of Bioversity International and CIAT, and Universidade Federal do Rio Grande do Sul – Editora da UFRGS. <https://doi.org/10.4060/cb7969en>
- Comfacaucá.** 2017. *Una huerta que se convirtió en empresa infantil*. 11th edition. Cauca, Colombia, Caja de Compensación Familiar del Cauca.
- FAO & Procasur.** 2021. *Compendium of case studies: successful practices, tools and mechanism to design, implement and monitor home-grown school feeding (HGSF) programmes in Africa*. Nairobi. <https://www.fao.org/3/cb3911en/cb3911en.pdf>
- FAO & WFP.** 2018. *Home-grown School Feeding Resource Framework: Technical Document*. Rome. <https://www.fao.org/policy-support/tools-and-publications/resources-details/en/c/1329641/>
- Gelli, A. & Aurino, E.** (2021) School food procurement and making the links between agriculture, health and nutrition. In: L. Swensson *et al.* (eds) *Public Food Procurement for Sustainable Food Systems and Healthy Diets*. FAO, Alliance of Bioversity International and CIAT, and Universidade Federal do Rio Grande do Sul – Editora da UFRGS. <https://www.fao.org/3/cb7960en/cb7960en.pdf>
- GCNF (Global Child Nutrition Foundation).** 2021. *School Meal Programs Around the World: Report Based on the 2019 Global Survey of School Meal Programs*. Seattle, WA. <https://reliefweb.int/report/world/school-meal-programs-around-world-report-based-global-survey-school-meal-programs>
- Gonsalves, J., Hunter, D. & Lauridsen, N.** 2020. School gardens: multiple functions and multiple outcomes. In: J. Gonsalves, D. Hunter & N. Lauridsen (eds) *Agrobiodiversity, School Gardens and Healthy Diets: Promoting Biodiversity, Food and Sustainable Nutrition*. London, Routledge, pp 1–32.
- Hellin, J., Fisher, E. & Loboguerrero, A.M.** 2021. Reflections on enhancing the impact of climate risk management through transformative adaptation. *Frontiers in Climate*, 3: 751691. <https://www.frontiersin.org/articles/10.3389/fclim.2021.751691/full>
- Hunter, D., Monville-Oro, E., Burgos, B., Rogel, C.N., Calub, B., Gonsalves, J. & Lauridsen, N.** 2020. *Schools, Gardens and Agrobiodiversity: Promoting Biodiversity, Food, Nutrition and Healthy Diets*. London, Routledge. <https://cgspace.cgiar.org/handle/10568/107465>

- Loboguerrero, A.M., Boshell, F., León, G., Martínez-Baron, D., Giraldo, D., Mejía, L.R., Díaz, E. & Cock, J.** 2018a. Bridging the gap between climate science and farmers in Colombia. *Climate Risk Management*, 22: 67–81. <https://doi.org/10.1016/j.crm.2018.08.001>
- Loboguerrero, A.M., Birch, J., Thornton, P., Meza, L., Sunga, I., Bong, B.B. et al.** (2018b). *Feeding the World in a Changing Climate: An Adaptation Roadmap for Agriculture*. Rotterdam, The Netherlands, and Washington, DC, Global Commission on Adaptation.
- Mwongera, C., Nowak, A., Notenbaert, A.M., Grey, S., Osiemo, J., Kinyua, I., Lizarazo, M. & Girvetz, E.** 2019. Climate-smart agricultural value chains: risk and perspectives. In: T. Rosenstock, A. Nowak & E.H. Girvetz (eds) *The Climate-smart Agriculture Papers: Investigating the Business of a Productive, Resilient and Low Emission Future*. Cham, Switzerland, Springer Open, pp.235–245.
- Osorio-García, A.M., Paz, L., Howland, F., Ortega, L.A., Acosta-Alba, I., Arenas, L. et al.** 2019. Can an innovation platform support a local process of climate-smart agriculture implementation? A case study in Cauca, Colombia. *Agroecology and Sustainable Food Systems*, 44(3): 378–411. <https://doi.org/10.1080/21683565.2019.1629373>
- Singh, S.** 2021. Home-grown school feeding: promoting the diversification of local production systems through nutrition-sensitive demand for neglected and underutilized species. In: L. Swensson et al. (eds) *Public Food Procurement for Sustainable Food Systems and Healthy Diets*. FAO, Alliance of Bioversity International and CIAT, and Universidade Federal do Rio Grande do Sul – Editora da UFRGS. <https://www.fao.org/3/cb7960en/cb7960en.pdf>
- Singh, S. & Conway, G.R.** 2021. *Home Grown School Feeding: Enabling Healthy and Sustainable Food Systems*. London, Centre for Environmental Policy, Imperial College.
- Steiner, A., Aguilar, G., Bomba, K., Bonilla, J.P., Campbell, A., Echeverria, R. et al.** 2020. *Actions to Transform Food Systems under Climate Change*. Wageningen, the Netherlands, CGIAR Research Programme on Climate Change, Agriculture and Food Security (CCAFS).
- WFP (World Food Programme).** 2014. *Home-grown School Feeding: A Framework to Link School Feeding with Local Agricultural Production*. Rome. <https://www.wfp.org/publications/home-grown-school-feeding-framework-link-school-feeding-local-agricultural-production>
- WFP.** 2020a. *State of School Feeding Worldwide 2020*. Rome. <https://www.wfp.org/publications/state-school-feeding-worldwide-2020>
- WFP.** 2020b. *A Chance for Every Schoolchild: Partnering to Scale Up School Health and Nutrition for Human Capital. WFP School Feeding Strategy 2020–2030*. Rome. <https://www.wfp.org/publications/chance-every-schoolchild-wfp-school-feeding-strategy-2020-2030>
- WHO (World Health Organization).** 2020. *Guidance on Mainstreaming Biodiversity for Nutrition and Health*. Geneva, Switzerland. <https://www.who.int/publications/i/item/guidance-mainstreaming-biodiversity-for-nutrition-and-health>

Gender and nutrition at the United Nations Food Systems Summit and Nutrition for Growth Summit

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The development community is increasingly acknowledging gender and nutrition as important, integral and interdependent cross-cutting issues. Evidence shows that gender inequality is both a cause and a consequence of malnutrition, trapping women and girls in a vicious multigenerational cycle of poverty and unmet potential. Gender inequality is a key barrier to women and girls exercising their right to proper food and nutrition. At the same time, poor nutrition and health severely limit women and girls' ability to exercise their rights in all aspects of their lives.

This reciprocal relationship between gender and nutrition has catalysed efforts to mainstream gender into nutrition policy and programming. Launched in 2020, the Gender-Transformative Framework for Nutrition (GTFN) provides a framework for examining and addressing the power dynamics and gender inequalities that put women and girls at a higher risk of malnutrition and prevent the attainment of global nutrition objectives (GTFN, 2020). To further the collective understanding of and dialogue on equitably transforming nutrition systems, this article presents an analysis, using the GTFN, of government commitments made during the United Nations Food Systems Summit (UNFSS) and Nutrition for Growth (N4G) Summit held in

2021. We conducted a discourse analysis to determine how successfully gender equality and women's empowerment were integrated into these key commitments for improved nutrition and food systems transformation.

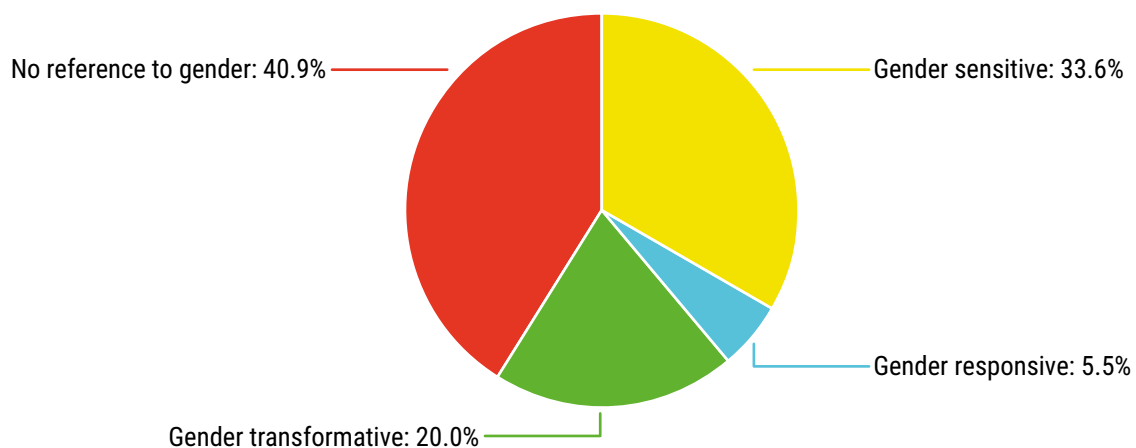
The GTFN is a conceptual framework supported by research and practice that takes a person-centred approach to identifying evidenced-based methods of designing, implementing and evaluating gender-transformative nutrition programmes and policies. The GTFN expands the potential of nutrition programmes and policies to tackle gender inequalities by facilitating the analysis of gender power dynamics on different levels and across multiple systems. The framework defines gender-transformative actions as those that seek to build equitable social norms, structures and policies, in addition to individual gender-equitable behaviour, while also transforming the harmful root causes of inequality. The GTFN emphasizes that, unless gender-transformative approaches are prioritized, it will not be possible to make progress on improving nutrition and access to affordable, healthy diets for all.

As part of the September 2021 UNFSS, Member States submitted national pathways (NPs) outlining government

priorities for food systems transformation, informed by participatory national dialogues throughout the summit process. We conducted discourse analysis between 8 and 17 November 2021 on the themes of gender and nutrition on the 110 NPs available (43 percent of the 194 United Nations Member States did not submit a NP) (United Nations, 2021). Commitments were searched for terms relating to women and girls' access, participation, decision-making, empowerment, inclusion and equality, as well as for linkages between gender and nutrition, such as women and girls' nutrition, fortification and anaemia. Based on these findings, we categorized the NPs as gender sensitive (33.6 percent), gender responsive (5.5 percent) or gender transformative (20 percent).

Gender was not referenced at all in 40.9 percent of the available NPs. According to GTFN definitions, "gender sensitive" indicates recognition of gender issues, "gender responsive" indicates responsiveness to gender issues, and a "gender-transformative" approach indicates that national governments sought to address the root causes of gender inequality in institutions, systems and policy (GTFN, n.d.). The most notable finding was that 54 percent of the NPs referenced nutrition in the context of gender – demonstrating how widely recognized these gender and nutrition linkages are. However, as the following graph shows, approaches were considerably more focused on gender sensitivity and responsiveness than on transformation.

Figure 1. Gender categorization of UNFSS NPs



SOURCE: Authors' own elaboration, based on data from United Nations, 2021. *United Nations Food Systems Summit Member State Dialogue Convenors and Pathways*. New York. <https://summitdialogues.org/overview/member-state-food-systems-summit-dialogues/convenors/>

The UNFSS analysis found that Member States frequently referenced "equality for all", "inclusion for the most vulnerable" or "families" without explicitly citing women, girls or gender-specific actions. Discussions of nutrition focused on children and their vulnerabilities more frequently than on women and girls. When women were referenced in the context of nutrition, it was overwhelmingly with regard to their reproductive role, such as improving maternal healthcare, the prevalence of anaemia or breastfeeding practices. This shows that the discourse on gender and nutrition still primarily addresses women and girls in the context of their role as mothers and characterizes equality without explicitly discussing gender.

Nonetheless, the prevalence of transformative approaches in 22 of the 110 NPs offers a starting point for the future of gender-nutrition actions and women and girls' inclusion in food systems. For example, Tajikistan's NP identifies persistent gender inequalities as a root cause of women's access to and

participation in food, health, nutrition and educational systems (Government of Tajikistan, 2021). It highlights women's lack of leadership, decision-making and control over resources as key issues contributing to inequality in food systems, while making specific commitments to address them and rebalance the power dynamics. Similarly, the Lao People's Democratic Republic NP notes that women and girls are nutritionally the most vulnerable, yet face persistent gendered barriers to participating in food systems (Government of the Lao People's Democratic Republic and United Nations, Lao People's Democratic Republic, 2021). The NP highlights the need for enabling environments and social protection systems, along with equal access to inputs, services, markets and opportunities through value chains and equal control over income and benefits, to close the gender gaps.

Following the UNFSS, the December 2021 N4G Summit was a milestone in accelerating progress to end all forms of malnutrition by 2030. The event resulted in more than 300 nutritional commitments, including USD 27 billion in

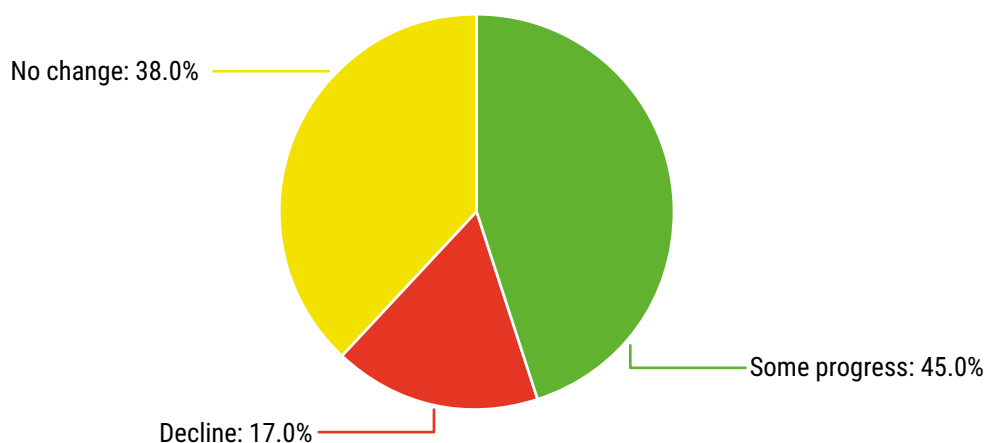
new financial investment from governments, civil society and the private sector. There were insufficient data on those commitments to apply the same methodology used for the UNFSS discourse analysis. However, analysis of the 2021 N4G Tokyo Compact revealed significant shortcomings in terms of prioritizing gender equality within Member State commitments (N4G, 2021a). Sadly, gender was not even mentioned in the final Compact, endorsed by 212 stakeholders. In the annex of commitments, only four Member States made specific reference to gender (N4G, 2021b).

A comparison of the N4G summit commitments made in 2013 with those made in 2021 shows that, in a limited number of countries (13), significant strides were made on including actions that recognized and integrated gender considerations (N4G, 2013a; 2013b; 2021a; 2021b). Given the transformational impact of addressing anaemia with a view to increasing educational achievement and livelihood opportunities for women and girls, the analysis considered

commitments related to anaemia as a positive step towards addressing gender inequality (WHO, 2020). In total, 14 Member States made specific commitments to anaemia reduction, although several of these related solely to pregnant women. Compared with the commitments made at the 2013 N4G Summit, where just three Member States made anaemia-related commitments (N4G, 2013a), some progress has been made.

In 2013, only three Member States referenced gender mainstreaming in their targets, similar to the 2021 findings. Among the 29 Member States that made commitments both in 2013 and 2021, 45 percent showed some progress on the inclusion of gender equality, 38 percent demonstrated no change on the inclusion of gender in their commitments and, unfortunately, 17 percent showed a decline in their prioritization of gender equality. As the chart shows, this illustrates significant progress, but the inclusion of gender equality in addressing nutrition clearly varies greatly from country to country.

Figure 2. N4G comparison of progress towards gender equality, 2013 to 2021



SOURCE: Authors' own elaboration, based on data from United Nations. 2021. *United Nations Food Systems Summit Member State Dialogue Convenors and Pathways*. New York. <https://summitdialogues.org/overview/member-state-food-systems-summit-dialogues/convenors/>

Overall, nutrition commitments fell short of recognizing women and girls as rights holders. Clearly, much needs to be done to strive towards gender-transformative structural change. One consistent theme in both the 2013 and 2021 N4G commitments, like the UNFSS analysis, is that women and girls are often linked to nutrition solely through their reproductive or caregiving roles, thus unintentionally focusing on them as a means to achieve better outcomes in children. Of the 37 countries that had any mention of women or gender in their 2021 N4G commitments, 27 were in reference only to women's reproductive roles. Not only does this perspective reinforce gender stereotypes that womanhood equals motherhood, but it also suggests a

false dichotomy, when in fact women's and children's rights to good nutrition are equally important and can both be met.

The 2021 N4G and UNFSS Summits also failed to adequately consider the impacts of COVID-19 on both gender equality and nutrition. COVID-19 disproportionately affected women and girls in alarming ways. Disruptions to nutrition services resulted in a reversal of gains towards a reduction in maternal and neonatal mortality (UNICEF, 2021). Strain on the food system had a disproportionate impact on women, as they contribute significantly to agricultural production and are often responsible for ensuring nutrition within their households. On top of this, during the COVID-19 pandemic,

women and girls took on a large burden of unpaid care work, saw reduced livelihood opportunities and experienced increased rates of gender-based violence (FAO, 2020). This highlights the importance, now more than ever, of addressing the unequal power dynamics and discriminatory normative behaviours that continue to disadvantage women and girls and put them at a higher risk of malnutrition.

While we have made some progress on linking nutritional concerns with broader gender inequalities, the analysis of Member States' commitments at UNFSS and N4G demonstrates that stakeholders have not understood or prioritized gender-transformative actions as a foundational investment in realizing nutrition goals.

To date, minimal efforts have been made to mainstream gender into nutrition programmes and, more generally, to invest in gender-transformative actions. Even before 2013, we recognized that it was insufficient – and potentially harmful – to

seek to improve individual women and girls' situations without addressing the discriminatory gender norms and unequal gendered power imbalances that contribute to inequality and malnutrition (GTFN, 2020). An effective response to today's problems requires that gender equality and the empowerment of women and girls be the central foundation upon which multi-sectoral responses for nutrition are built.

Drawing on Sustainable Development Goal 5 (SDG 5), as well as the establishment of gender equality integration among all 17 SDGs, it is time to address gaps in how we both understand and address malnutrition and gender inequality. At the next summits on nutrition and food systems, we must achieve commitments and actions that prioritize gender equality and women and girls' empowerment. We must look beyond addressing women's reproductive roles in order to change conditions, so that women and girls can recognize and act on their own power and take the lead as transformational change agents to improve their nutrition and to establish it as a right in and of itself.

References

- FAO.** 2020. *Gendered impacts of COVID-19 and equitable policy responses in agriculture, food security and nutrition*. Rome. <https://www.fao.org/3/ca9198en/CA9198EN.pdf>
- Government of Tajikistan.** 2021. *Draft National Food Systems Pathway for Tajikistan*. New York, UNFSS Dialogues Gateway. https://summitdialogues.org/wp-content/uploads/2021/09/Draft_NFSP_270821-Eng.docx
- Government of the Lao People's Democratic Republic and the United Nations, Lao People's Democratic Republic.** 2021. Synthesis report: *Pathways to Sustainable Food Systems*. New York, UNFSS Dialogues Gateway. https://summitdialogues.org/wp-content/uploads/2021/09/Synthesis-Report_FSS-2021-9-16.pdf
- GTFN (Gender-Transformative Framework for Nutrition). n.d.** Definitions and Concepts [online]. Mississauga, Canada. Cited 17 May 2022. <https://www.gendernutritionframework.org/definitions-and-concepts>
- GTFN.** 2020. *A Gender-Transformative Framework for Nutrition: Advancing nutrition and gender equality together*. Mississauga, Canada, World Vision Canada. <https://www.gendernutritionframework.org/resources>
- N4G (Nutrition for Growth).** 2013a. *Nutrition for Growth Commitments: Executive Summary*. London. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/207274/nutrition-for-growth-commitments.pdf
- N4G.** 2013b. *Global Nutrition for Growth Compact*. London. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/248760/Endorserscompact_update7_10_2013.pdf
- N4G.** 2021a. *Tokyo Compact on Global Nutrition for Growth*. Tokyo. <https://nutritionforgrowth.org/wp-content/uploads/2021/12/%E2%98%8512091700%E3%80%90Full-Ver%E3%80%91Tokyo-Compact-on-Global-Nutrition-for-Growth.pdf>
- N4G.** 2021b. *Tokyo Compact on Global Nutrition for Growth – Annex: Commitments*. Tokyo. https://nutritionforgrowth.org/wp-content/uploads/2021/12/Tokyo-Compact-on-Global-N4G_Annex_Dec-14.pdf
- United Nations.** 2021. *United Nations Food Systems Summit Member State Dialogue Convenors and Pathways*. New York. <https://summitdialogues.org/overview/member-state-food-systems-summit-dialogues/convenors/>
- UNICEF (United Nations Children's Fund).** 2021. *Potential impacts of the COVID-19 pandemic on diets, practices, and services in UNICEF's Eastern and Southern Africa region*. Nairobi. <https://www.unicef.org/esa/media/9156/file/Covid-19-and-Diets-Phase1-ESA.pdf>
- WHO (World Health Organization).** 2020. *Global anaemia reduction efforts among women of reproductive age: impact, achievement of targets and the way forward for optimizing efforts*. Geneva, Switzerland. <https://www.who.int/publications/i/item/9789240012202>

The Committee on World Food Security Guidelines on Food Systems and Nutrition: A blueprint for priority action

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Malnutrition in all its forms – including undernutrition, micronutrient deficiency, obesity and overweight – is a major global challenge to which no country is immune. Regions and countries are, in many cases, dealing with multiple forms of malnutrition simultaneously. The 2022 *State of Food Security and Nutrition in the World report*, for example, indicates that hunger is on the rise. Between 702 and 828 million people were hungry in 2021 – around 46 million more than the previous year and 150 million more than 2019 (FAO, IFAD, UNICEF, WFP and WHO, 2022). While the number of people suffering from micronutrient deficiencies is tragic and alarming, at the same time, the number of adults who are overweight or obese is also growing, putting them at high risk of diet-related non-communicable diseases.

Moreover, healthy diets are simply unaffordable for billions of people (FAO, IFAD, UNICEF, WFP and WHO, 2021),²¹ especially those in the poorest segments of the population. This contributes to the rise of multiple forms of malnutrition and negatively affects health outcomes globally.

The growing prevalence, severity and complexity of malnutrition requires the implementation of integrated policy approaches that address its multiple forms and target their root causes across food systems – from food supply chains to food environments and consumer behaviour. This approach takes into account the impacts that food systems have on human and planetary health by shaping actions and decisions taken by producers, as well as choices made by consumers. Such an integrated perspective looks at the influence

that decisions and choices with regard to production and consumption have on the ability of food systems to deliver healthy diets in a sustainable way (HLPE, 2017).

A food systems approach is essential to developing coordinated policies and interventions across sectors. It helps to make them inclusive, equitable and resilient, thus strengthening their ability to provide affordable healthy diets, enhance livelihoods and foster the sustainable use and management of ecosystems and natural resources.

To address these challenges and respond to calls for coordinated action to address malnutrition through a food systems approach, in 2021, the Committee on World Food Security (CFS)²² developed its Voluntary Guidelines on Food Systems and Nutrition (the Guidelines) (CFS, 2021) through an inclusive process informed by the scientific evidence of the High Level Panel of Experts on Food Security and Nutrition's *Nutrition and Food Systems* report (HLPE, 2017).

The Guidelines are a concrete tool for governments, United Nations agencies and other stakeholders. They offer guidance on and inspiration for the development of policies and interventions to address malnutrition in all its forms from a holistic perspective that considers food systems in their totality and looks at the multidimensional causes of malnutrition.

The Guidelines' 105 recommendations, grouped into seven categories, provide a framework for bringing together the

²¹ According to FAO, IFAD, UNICEF, WFP and WHO (2021), "the high cost of healthy diets and persistently high levels of poverty and income inequality continue to keep healthy diets out of reach for around 3 billion people in every region of the world".

²² The CFS is an inclusive international and intergovernmental platform of the United Nations that brings together a wide range of stakeholders to discuss, negotiate and find consensus on global policy guidance with regard to food security and nutrition issues.

full diversity of actors involved in food systems. The framework recognizes that all parts of the food system are interconnected and that any action or decision taken to address one aspect of a food system impacts other aspects of it.

The Guidelines adopt a holistic food systems approach. They cite the need to consider food systems in their totality and go beyond agricultural production alone. They are, therefore, intended to support the development of coordinated, multisectoral interventions within and across food systems and their constituent elements to improve their ability to deliver healthy diets and to generate positive environmental outcomes.

The Guidelines seek to promote policy coherence and reduce policy fragmentation between relevant sectors, such as health, agriculture, education, environment, gender, social protection, trade and employment – all of which impact food systems and nutrition. They provide a set of recommendations on diverse and relevant issues, ranging from the promotion of transparent and accountable governance mechanisms to sustainable food supply chains, equitable access to healthy diets, food safety, nutrition knowledge and education, gender equality and women's empowerment, and resilient food systems in humanitarian contexts. They are meant to serve as a practical guide and checklist to help countries and others develop their food systems and nutrition roadmaps by defining the main policy entry points within those systems and identifying challenges, priorities and actions.

The Guidelines now serve as an internationally agreed policy tool, as common ground on food systems to which governments can refer when formulating policies related to agriculture and food. CFS member states and other stakeholders now have the responsibility to make sure these recommendations are converted into concrete actions at regional, national and local level. Countries will also need to determine which recommendations in the Guidelines are relevant to their context, how to enact them, who is responsible for enacting them and what impact they will have.

To this end, it will be essential to build a supportive political environment, accompanied by solid, sustained investment. There will be a need to develop institutional and human capacity to fulfil some of the recommendations and this will need to be supported by coalitions and networks that hold governments to account on conflicts of interest and issues of human rights.

The legitimacy and wide ownership of the Guidelines that arose from the engagement of a broad range of stakeholders may incentivize countries to promote their adaptation to local realities and priorities (bearing in mind a number of lessons that emerged from the multilateral negotiation process that led to their adoption). First, not everyone agreed fully with everything in the Guidelines, but everyone was heard in a series of inclusive meetings on the text, so consensus was reached. Second, the type, interpretation and prioritization of evidence that supported the recommendations in the Guidelines can vary depending on the position and viewpoint of stakeholders. Third, definitions and consensus on definitions matter. Terms such as “healthy” versus “unhealthy” diets, “nutritious foods”, “food systems” and “sustainable food systems” have different meanings, and coming to a consensus on such key concepts is no small feat.

The *People-centered Food Systems: Fostering Human Rights-based Approaches* project, led by Johns Hopkins University and supported by the Swiss Agency for Development and Cooperation, will be using the Guidelines to strengthen a human rights-based approach to food systems in four countries: Cambodia, Ethiopia, Honduras and Uganda. This will be done by using advocacy, building capacity and developing accountability tools that better integrate human rights frameworks into food system policy and action.

The Guidelines are one such tool that will be used because of their emphasis on taking a systemic, intersectoral approach. As such, they are useful as a “prism” for refocusing the generic approach of the United Nations Declaration on the Rights of Peasants and Other People Working in Rural Areas (United Nations General Assembly, 2018) and redirecting policy attention to food systems for improved food security, diets and nutrition outcomes. An additional strength of the Guidelines is that their structure is organized into actionable focus areas, so can offer guidance to rights holders and stakeholders on identifying actionable interventions.

The project will use the Guidelines to focus in-country discussions on policy entry points/actions to improve food systems across several national agencies. In each pilot country, stakeholders will identify policy entry points and actions from the Guidelines that they perceive as being particularly relevant to their context – ensuring a strong level of country specificity in the discussions. Each country will propose a shortlist of recommendations from the Guidelines that can advance the fulfilment of specific rights for rural food system actors. For each recommendation, countries will also identify who would benefit from that recommendation,

who are the duty bearers and how the recommendation addresses the specific rights of beneficiaries.

The implementation of the Guidelines at national level is a promising start, one year after their formal endorsement. It

is hoped that more countries and other organizations and stakeholders will begin to consider how the Guidelines and their recommendations can be used as a blueprint to better inform their food systems efforts to improve food security, diets, and sustainable human and planetary health.



References

CFS (Committee on World Food Security). 2021. *CFS Voluntary Guidelines on Food Systems and Nutrition*. Rome, FAO. <https://www.fao.org/cfs/vgfsn/en/>

FAO, IFAD (International Fund for Agricultural Development), UNICEF (United Nations Children’s Fund), WFP (World Food Programme) & WHO (World Health Organization). 2021. *The State of Food Security and Nutrition 2021: Transforming food systems for food security, improved nutrition and affordable healthy diets for all*. Rome, FAO. <https://www.fao.org/3/cb4474en/cb4474en.pdf>

FAO, IFAD, UNICEF, WFP & WHO. 2022. *The State of Food Security and Nutrition in the World 2022: Repurposing food and agricultural policies to make healthy diets more affordable*. Rome, FAO. <https://www.fao.org/documents/card/en/c/cc0639en>

HLPE (High Level Panel of Experts on Food Security and Nutrition). 2017. *Nutrition and Food Systems*. Rome, FAO. <https://www.fao.org/3/i7846e/i7846e.pdf>

United Nations General Assembly. 2018. *United Nations Declaration on the Rights of Peasants and Other People Working in Rural Areas*. A/HRC/RES/39/12. New York. <https://www.fao.org/family-farming/detail/en/c/1197482/>

COUNTRY-BASED INSIGHTS

Two decades of Brazil's National Food and Nutrition Policy

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Lasting change requires policy continuity. Transforming nutrition, therefore, requires sound policies and programmes, implemented at scale for a sustained period of time. Brazil offers a prime example of such food and nutrition policies, accompanied by programmes with these essential elements (Vasconcelos, 2005; Burlandy, 2009; Jaime, 2019). This paper aims to offer some insights into the factors that have contributed to their achievement, as well as the challenges they have faced.

PNAN: Two iterations of one state policy

Brazil's National Food and Nutrition Policy (PNAN) is a national policy that has undergone many political changes over the last 20 years. It is a prime example of the coordination and development of public policies in the health sector, as well as the adoption of an intersectoral perspective. The first iteration of the PNAN was passed by decree in 1999 (Ministry of Health, 1999), while its second iteration was passed in 2011 (Department of Primary Care, 2012). These were two very different times in Brazilian political history. Nonetheless, the technical quality of the PNAN, its internal coherence and its broad support ensured its survival, while allowing adaptation to new circumstances and challenges.

The formulation of the first iteration of the PNAN took place in a neoliberal political context, when reducing the size of the state was the priority. This period was marked by the abolition of certain public institutions considered inefficient or unnecessary from a neoliberal perspective. Among them was the National Food and Nutrition Institute (INAN), responsible for the management of food and nutrition programmes, which was dismantled in 1997.

In 1998, to fill the void created by the closure of INAN, the National Food and Nutrition Policy Coordination Unit (CGPAN) was established within the newly created Secretariat of Health Policies of the Ministry of Health (Santos *et al.*, 2021; Mattos, 2021).

While the CGPAN was still being structured, its technical staff, together with the academic community, skilfully conducted a participatory process to develop the PNAN (Pinheiro and Carvalho, 2008), building on requirements and definitions formulated during the First National Conference on Food and Nutrition Security of 1994. Themed "Hunger: a national issue", this event was preceded by 26 state conferences. It brought together around 1 800 participants representing different government agencies and civil-society organizations (CSOs), and its programme comprised 50 working groups. This conference resulted in 333 proposals for a food security policy (Silva, 2020).

The following elements were essential to the definition of PNAN's scope: the axes of action defined at the First National Conference; the sound epidemiological data available, which already recognized the nutritional transition and the need to address both nutritional deficiencies and obesity; the adoption of the human right to adequate food as a guiding principle; and the recognition that food and nutrition security could only be achieved through truly intersectoral actions (Ministry of Health, 1999; Santos *et al.*, 2021; Silva, 2020; Recine and Vasconcellos, 2011; Pinheiro and Carvalho, 2010).

The second iteration of the PNAN was formulated in a much different political and institutional environment, characterized on the one hand by the vast expansion of Brazil’s primary healthcare network and, on the other, by the institutionalization of food and nutrition security policies through the establishment of the intersectoral National Food and Nutrition Security System (Presidency of the Republic of Brazil, 2006). Notably, the process of developing the second iteration of the PNAN was even more inclusive and participatory than the first,

encompassing national and subnational dialogue involving CSOs, health professionals, policymakers and implementers, and the academic community (Department of Primary Care, 2012; Santos *et al.*, 2021).

Scope of PNAN iterations 1 and 2

Tables 1 and 2 present a brief description of the scope of the two iterations of the PNAN.

Table 1. Seven guidelines from the first iteration of the PNAN, 1999

1. Promoting intersectoral actions aimed at universal access to food	Identifies the health sector, along with other government sectors, CSOs and the productive sector, as being responsible for actions determining universal access to high-quality food.
2. Ensuring the safety and quality of food and the provision of services in this context	Focuses on redirecting and strengthening health surveillance actions to ensure the safety and quality of food products and the provision of food services.
3. Monitoring the food and nutrition situation	Emphasizes the expansion and improvement of the Food and Nutrition Surveillance System to encompass different nutritional problems, feeding practices and age groups.
4. Promoting healthy eating habits and lifestyles	Includes initiatives to promote, protect and support breastfeeding; promote healthy lifestyles; reinforce regional eating habits; prevent chronic non-communicable diseases; monitor the industrialization and commercialization of pharmaceutical and/or dietetic products presented as solutions to nutritional problems; and monitor marketing practices.
5. Preventing and controlling dietary and nutritional disorders and diseases	Action based on i) a scenario of morbidity and mortality, dominated by binomial malnutrition/ infection and micronutrient deficiency, and ii) a scenario in which overweight and obesity, diabetes, cardiovascular diseases and cancers predominate. Includes healthcare measures, micronutrient or food supplementation, food fortification, breastfeeding promotion, health promotion and control of dietary and nutritional disorders.
6. Promoting lines of research	Supports lines of research that allow the mastering of situations and factors relevant to the definition and implementation of nutrition actions.
7. Development and training of human resources	Spans issues inherent to guaranteeing the human right to adequate food and nutrition. Prioritizes training professionals to provide the necessary technical cooperation required by other management spheres to standardize concepts and procedures that will become indispensable to the implementation of the PNAN, and ensures a continuous process of evaluation and monitoring.

SOURCE: Ministry of Health. 1999. Ordinance No. 710 of 10 June 1999. Approval of the National Food and Nutrition Policy. *Official Gazette*, 15 June 1999.

Table 2. Nine guidelines from the second iteration of the PNAN, 2011

1. Organization of nutritional care in the health system	The organization of various health services to provide care related to food and nutrition, aimed at the promotion and protection of health, prevention, diagnosis and treatment of disorders. Must be associated with other healthcare actions that target individuals, families and communities, contributing to the formation of an integrated, effective and humanized care network.
2. Promotion of adequate and healthy eating	Strategies that enable individuals and communities to engage in eating practices appropriate to their biological and sociocultural situation and to foster the sustainable use of the environment. Should combine initiatives focused on i) healthy public policies; ii) the creation of environments favourable to health, where individuals and communities can practice healthy behaviour; iii) the reinforcement of community action; iv) the development of personal skills through participatory and permanent processes; and v) the reorientation of services from the perspective of health promotion. Assumes intersectoral actions.
3. Food and nutrition surveillance	Describes and forecasts trends in the food and nutrition situation of the population and their determining factors. Should incorporate monitoring in health services and information derived from health information systems, population surveys and scientific production. Aims to support the planning of nutritional care and actions related to the promotion of health and adequate and healthy eating and the quality and regulation of food in the health system management spheres (national, state and municipal). Also aims to contribute to the social participation and control and diagnosis of food and nutrition security within the territories.
4. Management of food and nutrition actions in the health system	Sets out two systems: i) the Brazilian health system, the institutional locus of the PNAN, and ii) the Food and Nutrition Security System (SISAN), for intersectoral organization and coordination. Assumes the establishment of partnerships and the inter-institutional set-up necessary to strengthen the convergence of the PNAN with national health and food and nutrition security plans. Includes financing strategies for the implementation of PNAN guidelines, international cooperation based on the principle of the human right to food, and continuous processes for monitoring and evaluating implementation.
5. Participation and social control	Corroborates the mechanisms of social participation predicted within the scope of the Brazilian health system and in intersectoral arenas.
6. Qualification of the workforce	Encompasses the development and strengthening of technical mechanisms and organizational strategies for educating the workforce in management and nutritional care; valuing health professionals through training and permanent education; guaranteeing labour and social security rights; qualifying work relationships; and promoting careers that associate worker development with qualifications in services offered to users.
7. Food control and regulation	Addresses the standardization and sanitary control of food production, marketing and distribution based on risk analysis. Encompasses the revision and improvement of health regulations in light of the guarantee of the human right to food; the monitoring of food quality, considering not only its microbiological and toxicological aspects but also its nutritional composition; monitoring of food advertising; improvement of the nutrition labelling of foods; etc.
8. Research, innovation and knowledge on food and nutrition	Encompasses the strengthening of information systems, the promotion of population research and studies of the design and evaluation of new interventions, as well as programmes and actions proposed by the PNAN, and the strengthening of technical–scientific cooperation networks.
9. Cooperation and coordination for food and nutrition security	Encompasses the interaction of the PNAN with the National Policy for Food and Nutrition Security and economic and social development policies. Highlights actions aimed at i) improving the health and nutrition of families on income transfer programmes, implying greater access to health services; (ii) expanding dialogue with sectors responsible for agricultural production, distribution, supply and local food trade to increase access to healthy food; (iii) promoting adequate and healthy eating in institutional environments; (iv) establishing education and socio-assistance networks for the promotion of food and nutrition education; (v) setting up health monitoring to regulate the quality of processed foods and to support the production of food from family farms, agrarian reform settlements and traditional communities.

SOURCE: Department of Primary Care. 2012. *National Food and Nutrition Policy*. Brasília: Ministry of Health.

A comparison between the two iterations reveals a significant conceptual and programmatic evolution from 1998 to 2011, but without interruption, despite the very different political environments involved. Guidelines were updated and/or reframed (Santos *et al.*, 2021). New approaches and guidelines were incorporated, including for

mainstreaming nutrition into all levels of the Brazilian health system. The second iteration of the PNAN also had greater focus on subnational and intersectoral dialogue (Recine *et al.*, 2021). Value was placed on strategies for the expansion of promotion and care processes within the health system, with explicit priority given to primary care. The PNAN's focus

on interfederative and intersectoral dialogue (Recine *et al.*, 2021), which accompanied many institutional changes in Brazilian public policy (Mattos, 2021), was noteworthy.

Of note, too, was the replacement of a guideline in the first iteration, focusing on the “prevention and control of nutritional disorders and diseases associated with food and nutrition”, with a guideline on the “organization of nutritional care” in the second. This represented an evolution in approach aimed at overcoming the historical dichotomy between public health (health promotion measures and the prevention of disease) and assistance (treatment measures and care for the sick) (Mattos, 2021).

In addition, the updated guideline adopted a comprehensive, integrated and systemic approach to healthcare that shifted away from the vertical public health nutrition programmes of the past. Another example was the inclusion of a new guideline on the “management of food and nutrition actions in the health system”, with central elements on the implementation of the PNAN, including its financing.

Reflections on PNAN implementation

While epidemiological reality underlines the importance of mainstreaming food and nutrition actions into health systems, budget allocations and organizational priorities do not always follow. Thus, the implementation of PNAN presented many challenges, requiring creativity and resolute action from all concerned.

Advocating for mainstreaming nutrition was an essential step. As mentioned, the second iteration of the PNAN included a guideline on the “organization of nutritional care in the health system”. This provided an opportunity to reach out to different sectors and to examine the various levels of healthcare through a nutritional lens. While priority was given to primary healthcare as the systemic entry point, PNAN implementation required the articulation of practices at all levels of care. This led to the development of protocols, technical norms and standards for nutritional assessment and monitoring, for inpatient and outpatient therapeutic feeding and for hospital catering, among other things. The PNAN coordinating unit is housed in the Ministry of Health’s Department of Health Promotion, which hinders articulation with regulatory processes and financing mechanisms for curative care, adding to the challenges (Alves *et al.*, 2021).

Another implementation challenge was the need to ensure coherence at subnational level – no easy task in a country as vast as Brazil, with more than 5 500 municipalities. The PNAN

enabled the organization of nutritional teams at state and municipal level and the establishment of a nutritional action implementation network. This broad nutrition structure included technical support, through knowledge exchanges at meetings and in training activities, as well as financing, with the allocation of resources for nutrition action to municipalities that met certain criteria depending on the programme in question (population and epidemiological indicators, among other things).

However, in many municipalities, especially in poorer areas, the nutrition teams were small, with fragile employment arrangements and high employee turnover. To overcome these challenges, continuous efforts were made to mainstream nutrition into municipal and state policy. This required addressing another weakness: the low awareness of and value placed on nutrition by health councils at state and municipal level (Fagundes, Damião and Ribeiro, 2021). The governance of the Brazilian health system includes health councils at federal, state and municipal level. These councils are made up of government representatives, beneficiaries and health workers. Decisions on priorities and policies are the responsibility of these councils. Consequently, many awareness-raising and advocacy efforts were undertaken.

PNAN implementation also included the financing of academic groups to support capacity building, the development of technical materials, and monitoring and evaluation to generate the needed evidence base to guide eventual course corrections or redirection.

Another, equally important dimension of PNAN implementation was engagement with CSOs through formal (public consultations, workshops) and informal channels. A continued and structured dialogue with civil society took place through the National Health Council, which includes an Intersectoral Chamber for Food and Nutrition. Another important platform for engaging with civil society on nutrition was the National Food and Nutrition Security Council (CONSEA), when it was active (Recine *et al.*, 2020). CONSEA comprised one-third representatives of various governmental sectors and two-thirds CSOs, which presided over it (Presidency of the Republic of Brazil, 2006). The engagement of civil society ensured technical and political support for PNAN, which was crucial to its longevity.

PNAN requires intersectoral cooperation and collaboration to ensure food and nutrition security. The second iteration of PNAN was developed at a time when food and nutrition security was a national priority. SISAN was formally

established during this period, with two institutional pillars to ensure intersectorality: i) the government-focused Interministerial Chamber for Food and Nutrition Security (CAISAN), with corresponding structures at state and municipal government level; and ii) CONSEA.

The SISAN law formalized a broad and multidimensional definition of food and nutrition security, where the food and nutrition dimensions were inseparable, leading to the articulation of various policies and programmes within a food systems approach. These included technical and financial support for family farmers, organic and agroecological agriculture, the management of land tenure issues, the protection of the territories and modes of production of Indigenous Peoples and traditional communities, and the improvement of the National School Meals Programme with the public procurement of food from family farms.

Consistent with the broad definition of food and nutrition security, health and nutrition issues featured more heavily in CONSEA discussions, as well as in the very large and inclusive national food and nutrition security conferences held every four years from 2004 to 2015. It was here that support was won, for example, for the revision of the nutritional labelling of packaged foods and an update, in 2014, of the Dietary Guidelines for the Brazilian Population (Department of Primary Care, 2014). The latter incorporated sustainability concerns and adopted the NOVA food classification (Monteiro *et al.*, 2016) and, based on this, recommended avoiding the consumption of ultra-processed foods.

Another example of the enhanced importance of nutrition in these intersectoral processes was the establishment of a working group on obesity at CAISAN. This group comprised representatives from different ministries, in unprecedented recognition of the state's role and responsibilities in addressing the challenge of preventing obesity and caring for people with obesity. The result was the formulation of an intersectoral strategy with lines of action including increased availability and access to adequate and healthy foods; education, communication and information; the promotion of healthy environments and lifestyles; food and nutritional surveillance; comprehensive healthcare for individuals with overweight/obesity in the health system; and the regulation and control of food quality and safety (CAISAN, 2014).

The challenges that featured in the first 20 years of PNAN implementation remain. They include budget security, maintaining and enhancing the capacity of the state

and municipal network of nutrition teams, and ensuring synergistic and multidisciplinary work processes. These challenges have been intensified by the growing complexity of the food and nutrition agenda, including its interlinkages with the environment (HLPE, 2017; Swinburn *et al.*, 2019).

The situation is further complicated by the rise in food and nutrition insecurity that Brazil has faced due to the economic recession that began in 2016, subsequent fiscal austerity measures and the dismantling of rights guarantee policies, as well as the COVID-19 pandemic (PENSSAN, 2022; FIAN Brasil, 2021). Nonetheless, the very existence of the PNAN and its social grounding are key to tackling such challenges.

Final considerations

Reflecting on the first 20 years of PNAN allows us to identify some of the key elements that appear essential if food and nutrition policy processes are to sustainably transform nutrition for the better.

First, since its original iteration, the PNAN has had an internal technical coherence that has sustained it, while being flexible enough to be updated effectively and adapted to changes in Brazil's epidemiological, political and social reality. Second, inclusiveness and participation established a firm foundation. Social actors involved in developing and implementing the PNAN played a key role in assuring its technical quality and epidemiological relevance, but also provided a much-needed policy support network, ensuring its social value and longevity.

Third, actively seeking dialogue, the inclusion of perspectives and implementation coherence at subnational level ensured the robustness that PNAN needed to support its longevity and implementation efforts. Fourth, the embrace of intersectorality and the adoption of a systemic approach provided the basis for reaching out broadly, not just to other government sectors, but also to society in general.

References

- Alves, K.P.S., Santos, C.C.S., Lignan, J.B. & Albuquerque, R.M.** 2021. Between intentions and contingencies, old programs and demands for new nutritional care practices in the Brazilian Unified National Health System. *Cadernos de Saúde Pública*, 37(Sup 1):e00050221. Available in: <http://cadernos.ensp.fiocruz.br/static//arquivo/1678-4464-csp-37-s1-e00050221-en.pdf>
- Burlandy, L.** 2009. A construção da política de segurança alimentar e nutricional no Brasil: estratégias e desafios para a promoção da intersetorialidade no âmbito federal de governo. *Ciência Saúde Coletiva*, 14(3): 851–860. <https://www.scielo.br/j/csc/a/DfcQzJ7fGMVkdF3bbdKzM50/>
- CAISAN (Interministerial Chamber for Food Security and Nutrition).** 2014. *Estratégia Intersetorial de Prevenção e Controle da Obesidade: recomendações para estados e municípios*. Brasília.
- Department of Primary Care.** 2012. *Política Nacional de Alimentação e Nutrição*. Brasília, Ministry of Health.
- Department of Primary Care.** 2014. *Dietary Guidelines for the Brazilian population*. Brasília, Ministry of Health.
- Fagundes, A.A., Damião, J.J. & Ribeiro, R.C.L.** 2021. Reflections on the decentralization processes of the Brazilian National Food and Nutrition Policy in its 20 years. *Cadernos de Saúde Pública*, 37(Sup 1): e00038421. Available in: <http://cadernos.ensp.fiocruz.br/static//arquivo/1678-4464-csp-37-s1-e00038421-en.pdf>
- FIAN Brasil.** 2021. *Informe DHANA 2021: Pandemia, desigualdade e fome*. Brasília.
- HLPE (High Level Panel of Experts on Food Security and Nutrition).** 2017. *Nutrition and food systems: A report by the High Level Panel of Experts on Food Security and Nutrition*. Rome, FAO. <https://www.fao.org/policy-support/tools-and-publications/resources-details/en/c/1155796/>
- Jaime, P.C.** 2019. *Histórico das políticas públicas de alimentação e nutrição no Brasil*. In: P.C. Jaime (ed.) *Políticas públicas de alimentação e nutrição*. Rio de Janeiro, Brazil, Atheneu, pp.11–20.
- Mattos, R.** 2021. National food and nutrition policies and the institutional trajectories of the rights to health and food. *Cadernos de Saúde Pública*, 37(Sup. 1): e00149120. Available in: <http://cadernos.ensp.fiocruz.br/static//arquivo/1678-4464-csp-37-s1-e00149120-en.pdf>
- Ministry of Health.** 1999. Portaria nº 710, de 10 de junho de 1999. Aprova a Política Nacional de Alimentação e Nutrição. *Diário Oficial da União*, 15 June 1999.
- Monteiro, C.A., Cannon, G., Levy, R., Moubarac, J.C., Jaime, P., Martins, A.P., Canella, D., Louzada, M. & Parra, D.** 2016. NOVA. The star shines bright. *World Nutrition*, 7(1-3): 28–38. <https://www.worldnutritionjournal.org/index.php/wn/article/view/5>
- PENSSAN (Brazilian Food Sovereignty and Security Research Network).** 2022. *II Inquérito Nacional sobre Insegurança Alimentar no Contexto da Pandemia da COVID-19 no Brasil*. II VIGISAN: final report. São Paulo, Brazil, Fundação Friedrich Ebert.
- Pinheiro, A.R.O. & Carvalho, D.B.B.** 2008. Estado e mercado: adversários ou aliados no processo de implementação da Política Nacional de Alimentação e Nutrição? Elementos para um debate sobre medidas de regulamentação. *Saúde e Sociedade*, 17: 170–183. <https://www.scielosp.org/article/sausoc/2008.v17n2/170-183/>
- Pinheiro, A.R.O. & Carvalho, M.F.C.C.** 2010. Transformando o problema da fome em questão alimentar e nutricional: uma crônica de desigualdade social. *Ciência Saúde Coletiva*, 15: 121–130. <https://www.scielo.br/j/csc/a/yV8gXL7yTTbvnqqSh6WnLts/>
- Presidency of the Republic of Brazil.** 2006. *Lei No. 11.346 de 15 de setembro de 2006. Cria Sistema Nacional de Segurança Alimentar e Nutricional – SISAN com vistas em assegurar o direito humano à alimentação adequada e dá outras providências*. Brasília.
- Recine, E. & Vasconcellos, A.B.** 2011. Políticas nacionais e o campo da alimentação e nutrição em saúde coletiva: cenário atual. *Ciência Saúde Coletiva*, 16: 73–79. <https://www.scielosp.org/article/csc/2011.v16n1/73-79/>
- Recine, E., Bandeira, L., Pereira, T.N. & Castro, I.R.R.** 2021. Brazilian National Food and Nutrition Policy: celebrating 20 years of implementation. *Cadernos de Saúde Pública*, 37 (Sup 1): e00194521. Available in: <http://cadernos.ensp.fiocruz.br/static//arquivo/1678-4464-csp-37-s1-e00194521-en.pdf>

Recine, E., Fagundes, A.A., Silva, B.L., Garcia, G.S., Ribeiro, R.C.L. & Gabriel, C.G. 2020. Reflections on the extinction of the National Council for Food and Nutrition Security and the confrontation of Covid-19 in Brazil. *Revista de Nutrição*, 33: e200176. <https://www.scielo.br/j/rn/a/sNB5F8yBvGsDNDQHYmKK6qw/>

Santos, S.M.C., Ramos, F.P., Medeiros, M.A.T., Mata, M.M. & Vasconcelos, F.A.G. 2021. Advances and setbacks in the 20 years of the Brazilian National Food and Nutrition Policy. *Reports in Public Health*, 37(Sup 1): e00150220. <https://scielosp.org/pdf/csp/2021.v37suppl1/e00150220/en>

Silva, B.L. 2020. *A trajetória das conferências nacionais de segurança alimentar e nutricional no Brasil: uma análise histórica e conceitual de 1994 a 2015*. Dissertation, Masters in Nutrition. Florianópolis, Brazil, Universidade Federal de Santa Catarina, Centre for Health Sciences.

Swinburn, B., Kraak, V.I., Allender, S., Atkins, V.J., Baker, P.I., Bogard, J.R. et al. 2019. The global syndemic of obesity, undernutrition, and climate change: The Lancet Commission Report. *The Lancet*, 393(10173): 791–846. <https://pubmed.ncbi.nlm.nih.gov/30700377/>

Vasconcelos, F.A.G. 2005. Combate à fome no Brasil: uma análise histórica de Vargas a Lula. *Revista de Nutrição*, 18: 439–457. https://www.researchgate.net/publication/240770060_Combate_a_fome_no_Brasil_uma_analise_historica_de_Vargas_a_Lula.

Fortification of wheat flour milled by small-scale *chakkis* in Pakistan

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Pakistan is facing a multiple burden of malnutrition, with high levels of undernutrition, overweight, obesity and micronutrient deficiency. According to the 2018 National Nutrition Survey, 40.2 percent of children are stunted, or too short for their age; 17.7 percent are wasted, or too thin for their height; 28.9 percent are underweight; more than half are anaemic and suffering from deficiencies in essential nutrients and vitamins, such as iron (28.6 percent), zinc (18.6 percent), vitamin A (51.5 percent) and vitamin D (62.7 percent); and 9.5 percent are overweight or obese (Ministry of National Health Services, Regulations and Coordination, 2019).

Poor diet is a common denominator of all forms of malnutrition. A lack of dietary diversity, be it because of poverty, unaffordability, a challenging food environment (Hasnain, 2020) and/or choice, is a key contributor to poor nutrition across the life stages. In Pakistan, only 3.6 percent of children aged 6 to 23 months are receiving the minimum acceptable diet and this figure is even lower among rural populations. Eliminating all forms of malnutrition is among the Pakistani government's top priorities.

To this end, the Government of Pakistan and the World Food Programme (WFP) commissioned a feasibility study to identify plausible entry points and a scalable model for the fortification of wholewheat flour from small-scale mills (*chakkis*) (Ministry of National Health Services, Regulations and Coordination and WFP, 2018). A previous study in 2017 the Fortification Assessment Coverage Toolkit (FACT) survey by the Global Alliance for Improved Nutrition (GAIN) and Oxford Policy Management (2017) estimated

that nearly 70 percent of the population consumed wheat flour from *chakkis*, hence fortification at *chakki* level was identified as an important strategy for alleviating the burden of micronutrient deficiency.

Pakistan's National Fortification Alliance developed a national food fortification strategy back in 2017 (Ministry of National Health Services, Regulations and Coordination, 2017). Mandatory fortification is decentralized to the provincial level. Three provinces Sind, Khyber and Balochistan have food fortification legislation in place. Wheat-flour fortification efforts exist in Pakistan to support the implementation of the strategy. A limited number of large-scale mills are being supported by internationally sponsored projects (see, for example, Nutrition International, n.d.). However, as the FACT survey has estimated, a very large proportion of the population is consuming the flour produced by *chakkis* (GAIN and Oxford Policy Management, 2017). So even if all of the large-scale mills fortified 100 percent of their flour, this would only reach 30 percent of the population. It is, therefore, crucial to further explore the potential of the *chakki* business model as part of the wider ecosystem of support for micronutrient fortification in Pakistan for the benefit of millions of people.

Unlike other WFP-supported fortification programmes, *chakkis* are privately owned, and WFP does not buy the commodity. The model focuses on balancing supply and demand. Minimal investment and the development of business-to-business, business-to-consumer and person-to-person relationships creates a sustainable

market for fortified wholewheat flour. It takes a commercial approach to getting the fortified flour on the market, using a revolving funding mechanism led by the Ministry of National Health Services, Regulations and Coordination to overcome issues faced by other projects aiming to support the small-scale fortification of wheat flour, such as disparate locations and interruptions to the supply of premix.

Feasibility study

WFP conducted a feasibility study in 2018. This included the assessment and identification of *chakkis* in targeted areas, the generation of balanced supply and demand for fortified wholewheat flour, the collaborative promotion of fortified wholewheat flour and the implementation of a robust quality assurance system.

WFP engaged in a consultative process with the government and relevant stakeholders to implement the proposed model for the fortification of *chakki* flour. It aimed to discuss how to stoke demand through advocacy and the establishment of a technical advisory committee. The study focused on two districts, Islamabad and Rawalpindi, where more than 10 *chakkis* were provided with microfeeders, premix and capacity-building assistance.

During the study, 2 184 million tonnes of fortified *chakki* flour were produced over nine months and sold directly to consumers, benefiting 351 000 people, without WFP stepping in as a buyer. As a result, WFP has observed a consistent increase in the number and share of households opting for fortified flour, from 25 percent in December 2020 to almost 90 percent, according to a recent estimate from June 2022.

Figure 1. At Shafaf Atta Chakki, Bhatta Chowk, Rawalpindi, during the mass awareness campaign run by Blackbox media company



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The increase in purchases of fortified flour was down to multiple factors, including supply and demand. The *chakki* business is well entrenched in Pakistani society and the communities in which the *chakkis* are situated have been home to many generations of buyers. There is a mutual trust between *chakki* sellers and customer that has been built over decades. To fortify the flour, the *chakki* owners had to be convinced of the need for and benefits of fortification and presented with a business model that could lead to a sustainable, long-term increase in sales. The same *chakki* owners then served as agents of change in convincing their customers to fortify their own wheat or to buy the commercially fortified wheat from them.

Health workers, primarily women, are another well-trusted group of community leaders. They were provided with information on the benefits of fortified wheat flour and, for very small stipend, were engaged to promote the purchase of fortified wholewheat flour over unfortified flour from their nearby *chakkis*. We observed a snowball effect as the message spread through communities with balanced supply. In addition, a short-term media campaign was run for around two months, which included radio messages, Facebook posts, newspaper blogs and vehicles branded with well-known animated characters, which were sent to relevant communities to spread the message on the benefits of fortified wholewheat flour and its availability in the area.

In a second phase, which is already funded, the model is being expanded to 50 *chakkis* in five districts, with the aim of providing more than 2.7 million people with fortified flour and generating about 9 000 million tonnes of fortified wholewheat flour over a nine-month period. A management information system will be implemented to store monitoring and quality control data.

Figure 2. On the streets of Rawalpindi during the mass awareness campaign run by Blackbox media company



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Figure 3. Shafaf Atta Chakki – the booths at project *chakkis* were provided by WFP, with branding to raise mass awareness



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Upscaling

The promising results of the study suggest scaling up the project in a systematic way to reach a maximum number of consumers. The fortification of *chakki* flour can become one of the main game-changing interventions to improve the quality of diets and fill micronutrient gaps in Pakistan. The programme ultimately aims to provide four key nutrients to 70 percent of Pakistani consumers and presents a unique opportunity to achieve a strong and sustainable public health impact with relatively little investment by partnering with small-scale entrepreneurs.

To address the global nutrition issue and tackle micronutrient deficiencies in innovative ways through WFP programmes, it is crucial to tap into the large, disparate small-scale milling industry (*chakkis*). With an increasing percentage of Pakistanis sourcing their staple foodstuffs from small-scale flour mills, these mills present a unique opportunity to increase the availability and intake of nutrients something that has proved challenging in the past due to the lack of a market and other issues, such as quality assurance and sustainability.

As part of its model, WFP is providing support to enable the registration of *chakkis* with the government. An association linking all *chakkis* through a single coordination platform is planned under the lead of the National Fortification Alliance of the Ministry of National Health Services, Regulations and Coordination.

The Association will also be used to procure premix. WFP will provide the initial funding and a third party will be appointed to procure and distribute it. The *chakkis* will pass the cost of the premix on to the customers and the revolving fund will be replenished under the supervision of the National Fortification Alliance. At a later stage, when the project scales up further, provincial associations will be formed under the existing provincial chapters of the National Fortification Alliance, but the procurement of premix will continue to be managed by the Association at national level.

The establishment of an association of *chakkis* and the revolving fund mechanism are expected to address the issue of scattered location and to ensure the uninterrupted, sustainable supply of premix. However, some non-refundable investment is still needed to scale up the initiative, to cover equipment and initial premix costs, and to pay for mass awareness campaigns for all 70 000 *chakki* mills nationally.

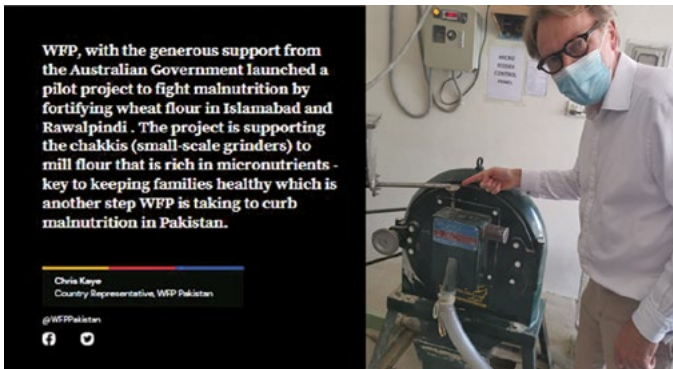
National and provincial governments are expected to contribute to the scaling up of *chakki* flour fortification. Though nothing has yet been put on paper, two provinces, Sind and Khyber, are likely to support up to 1 000 *chakki* units each. Bilateral donors and private companies with a history of supporting fortification are being approached. Government funding is also likely. The expectation is that the non-refundable investment will create the enabling environment to enforce existing legislation.

Conclusion and the way forward

The fortification of wholewheat flour from small-scale mills (*chakkis*) can become a game-changing solution that adds value to the food system by achieving a high public health impact for relatively little investment.

The model seems to be self-sustaining and easy to scale up, as it requires a low level of investment amid sustainable demand and a target market of 70 percent of all consumers. This means that if the concept is proven scalable, there is outstanding potential for outreach and impact on nutrition and health. The innovative model, once proven, has high potential to transform nutrition in developing countries with a similar staples market without the need to change local dietary preferences.

Figure 4. During a surprise visit by the Country Director to oversee fortification at *chakkis* in Rawalpindi and Islamabad, at Rashid Atta Chakki, Sihala, Islamabad



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Figure 5. At a meeting with *chakki* owners held in conjunction with the National Fortification Alliance at the National Institute of Health, Chak Shahzad, Islamabad



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References

- 2Global Alliance for Improved Nutrition (GAIN) & Oxford Policy Management.** 2017. *Fortification Assessment Coverage Toolkit (FACT) survey in Pakistan, 2017*. Geneva, Switzerland.
<https://www.gainhealth.org/sites/default/files/publications/documents/pakistan-fact-survey-2017-final-report-aug2018-corrected.pdf>
- Hasnain, S.** 2020. Disrupted food environments in Pakistan: connections and disruptions in the consumer experience. *Geografiska Annaler: Series B, Human Geography*, 102(1): 118–133.
<https://www.tandfonline.com/doi/full/10.1080/04353684.2020.1718526>
- Ministry of National Health Services, Regulations and Coordination.** 2017. *Pakistan National Food Fortification Strategy*. Islamabad.
<https://sunpc.org.pk/wp-content/uploads/2019/06/National-Food-Fortification-Strategy.pdf>
- Ministry of National Health Services, Regulations and Coordination.** 2019. *National Nutrition Survey 2018*. Islamabad.
<https://www.unicef.org/pakistan/media/1951/file/Final%20Key%20Findings%20Report%202019.pdf>
- Ministry of National Health Services, Regulations and Coordination & WFP.** 2018. *A Feasibility Study on the Fortification of Wheat Flour Milled Small-Scale Grinders (Chakkis)*. Islamabad.
- Nutrition International. n.d.** *Saving lives through food fortification in Pakistan, 2016–2021* [online]. Ottawa. Cited 27 July 2022.
<https://www.nutritionintl.org/project/food-fortification-program-ffp-pakistan/>

Zero-waste farming: A practical circular economy model for transforming nutrition in Nauru

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However nutritious the food, the journey of dietary action begins with production. Fruits and vegetables, for example, are harvested on farms, seafood is collected from the ocean and livestock is raised in the fields. We propose the concept of "circular economy" as a sustainable agri-production approach to transforming nutrition.

Nauru is an island in the southern Pacific, and large-scale agricultural production is challenging due to its geography. Its flat landscape restricts land precipitation from a hydrological perspective, while its sandy soils have lower water retention rates and are relatively infertile (Nauru, 2014). The challenges facing growers in Nauru have limited agricultural produce, leading to nutritional issues (Nauru, 2021).

Nowadays, most of the food on Nauru is imported (Nauru, 2021). However, fresh vegetables and fruits are not the import of choice, as preservation is challenging, making it more difficult to ensure quality. Highly processed foods and foods with more preservatives feed people, but carry associated health risks (Popkin *et al.*, 2021). In addition, transportation raises the price of food. Even though the government has implemented a policy to reduce taxes on healthy foods (Thow *et al.*, 2011), they are still more expensive than non-healthy alternatives. The priority is how to make these healthy choices more accessible. We have, therefore, attempted to merge the circular economy concept with local farming activities.

The Taiwan Technical Mission (TTM) has been working in Nauru for decades. In the beginning, most farming materials were imported, including the substrate for seedlings, fertilizers and agricultural chemicals. At that time, the TTM was dedicated to increasing local production, so that more fruits and vegetables could start to be harvested on the TTM farm (Figure 1). However, supply remains highly reliant on imported resources.

Figure 1. The TTM farm in Anabar District, Nauru

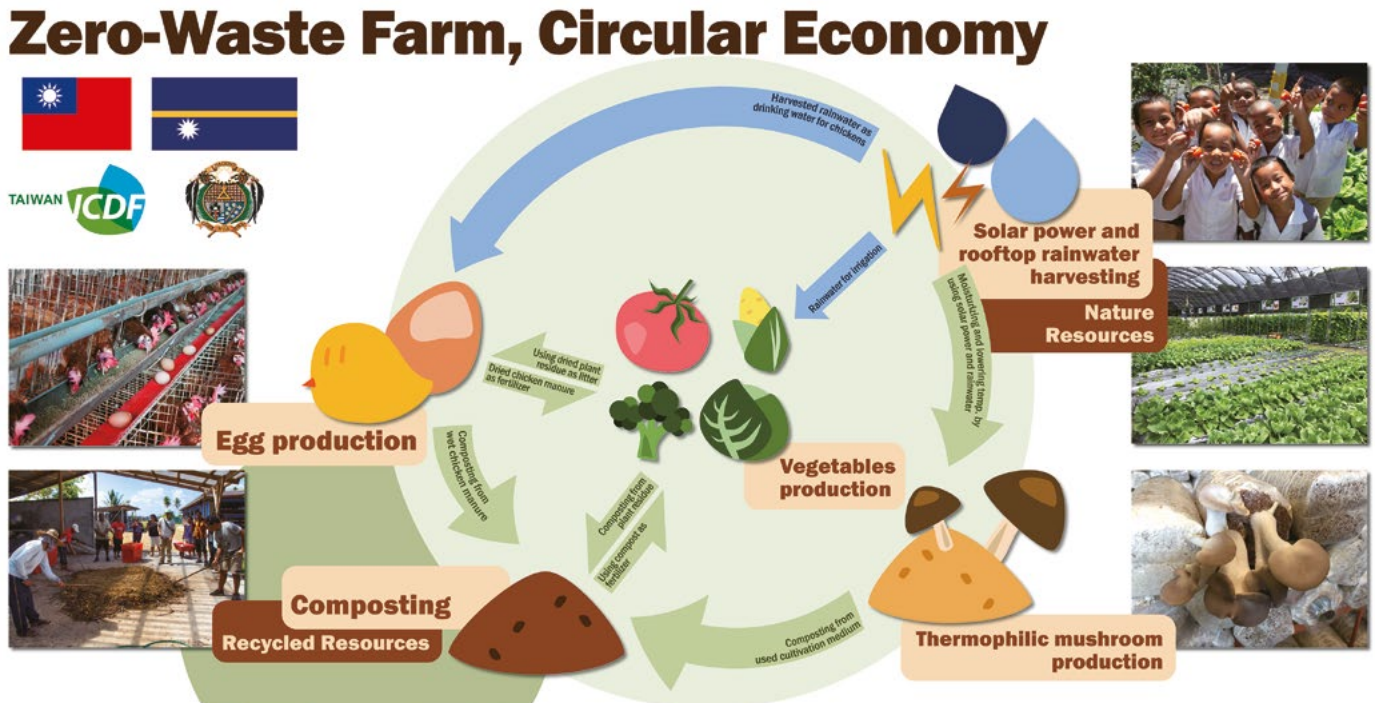


SOURCE: Y.L. Lee, 2019, TTM in Nauru.

In the 2010s, industry in Taiwan Province of China introduced the concept of a circular economy, with firms required to adjust their business model to become more sustainable.

TTM also adopted this concept in Nauru, organizing and connecting resources to develop a circular farming model (Figure 2) with local production at its core.

Figure 2. The TTM circular farming model



SOURCE: S.C. Yu, 2021, TTM in Nauru.

Organic waste, such as dry branches and fallen leaves from all over the island, sawdust, chicken manure and even kitchen waste were collected to make compost for the soil to improve fertility. For more sustainable livestock farming, vegetable waste was used as animal feed, reducing the dependence on imported feed. Guttering and water tanks were used to collect rainfall for water for animals and crops. Solar panels on the farm roof provided electricity to power equipment such as the water pump for the livestock temperature control system.

The circular model cannot function fully without external resources, but it can reduce the reliance on materials that may place a burden on the environment through transportation. Furthermore, the model can improve soil conditions in relatively cheap and more eco-friendly ways.

This model has been successfully implemented in recent years and continues to improve. However, the system has only been used on the TTM farm and needs to be extended across the country for more sustainable food production. Promotion programmes have been designed with the

cooperation of government sectors to raise community awareness. The Agriculture Division of the Department of Commerce, Industry and Environment and the Public Health Centre of the Ministry of Health have mainly focused on local farming and healthy eating to date (Nauru, 2013).

Large- and small-scale extension and advocacy programmes have been launched, with content tailored to various groups, such as students, patients with non-communicable diseases, and community committees. There is a farm visiting programme for young children. The children are introduced to the basic concept of the circular economy and experience fruit harvesting to educate and pique their interest in food production and agriculture. Community workshops (Yu *et al.*, 2020) teach the growers complex skills and emphasize farm management, providing information about organizing their garden. The advocacy programme provides healthy eating and dietary advice and includes cooking demonstrations to help participants choose the right foods or grow their own.

Transforming nutrition is advocated in all these activities, however, we often receive feedback from participants that

circular farming may be too hard in practice. The complaints included limited gardening space and sandy soils that need a large amount of fertile substrate to grow crops. We, therefore, came up with the idea of "bag culture" (Figure 3) which minimized circular farming to recycled bags. These

bags are filled with fermented compost from the farm and can be used in a suitable sunny place in a garden or mixed with topsoil to grow fruits and vegetables. This handy tool is more attractive to participants and shares the same principles as circular farming.

Figure 3. Promoting Nauru's "bag culture"



SOURCE: S.C. Yu, 2021, TTM in Nauru.

In 2021, the *Kiãõ Oangam* app (Figure 4), meaning "plant our food", was launched. The app was developed by the Commonwealth of Learning and the Nauru Division of Agriculture of the Department of Commerce, Industry, and Environment in consultation with TTM. It provides users with guidance on how to start a kitchen garden and includes crop information, such as planting instructions,

nutritional value, and recipes (Commonwealth of Learning, 2021). The content was designed specifically for Nauru, with all crops mentioned in the app tested to ensure that they can be grown on the island. We believe that the app could assist growers "from farm to table", enabling more people to be involved in circular farming by lowering the barriers to having a garden.

Figure 4. The kitchen garden app, Kiãõ Oangam

SOURCE: S.C. Yu, 2021, TTM in Nauru.

Challenges have emerged with these programmes. For example, water resources are limited on the island, especially during the dry season. Even though rain guttering has been installed, people can usually only rely on rainwater for a few

months, but demand for desalinated water is set to grow in the coming growing seasons. This could be a big obstacle for those keen to start their own garden. Meanwhile, advocacy or activities may not always grab people's attention. Hence, we must consider creative solutions to these challenges, such as recycled water from air conditioners, laundry and bathing. Exciting promotional activities through social media will also be considered. Time will tell whether such ideas are feasible or not.

In summary, we believe that circular farming is an appropriate solution to transforming nutrition. We have used it in Nauru, strengthening the food system and making it more resilient to environmental shocks. Farming is challenging, but should be sustainable, so providing a relatively easy and accessible approach will help people take action and transform nutrition. Furthermore, promoting such farming activities is essential in order to encourage more people across the country to engage in circular farming for sustainable food production. Creativity will be key to greasing the wheels and making them turn.

References

- Commonwealth of Learning** (2021) COL-developed app to Improve Food and Nutrition Security in Nauru [online]. Burnaby, BC. <https://www.col.org/news/col-developed-app-to-improve-food-and-nutrition-security-in-nauru/#:~:text=COL-developed%20app%20to%20improve%20food%20and%20nutrition%20security,nutrition%20and%20diversify%20food%20production%20in%20the%20country>
- Nauru**. 2013. *Nauru National Assessment Report*. Prepared for the Third International Conference on Small Island Developing States (SIDS), Apia, Samoa, 1-4 September 2014. Yaren.
- Nauru**. 2014. *Second National Communication*. Yaren. https://unfccc.int/sites/default/files/resource/Final_Nauru_SNC_Report_revised.pdf
- Nauru**. 2021. *Nauru National Food Systems Pathway*. Prepared for the United Nations Food System Summit 2021. Yaren. https://summitdialogues.org/wp-content/uploads/2021/09/FSS-National-Pathway-Nauru_2021_September_2021_FinalDraft_Approved.pdf
- Popkin, B.M., Barquera, S., Corvalan, C., Hofman, K.J., Monteiro, C., Ng, S.W., Swart, E.C. & Smith Taillie, L.** 2021. Towards Unified and Impactful Policies to Reduce Ultra-Processed Food Consumption and Promote Healthier Eating. *The Lancet Diabetes & Endocrinology*, 9(7):462–470. <https://www.sciencedirect.com/science/article/abs/pii/S2213858721000784>
- Thow, A.M., Qusted, C., Juventin, L., Kun, R., Nisha Khan, A. & Swinburn. B.** 2011. Taxing Soft Drinks in the Pacific: Implementation Lessons for Improving Health. *Health Promotion International*, 26(1): 55–64. <https://www.jstor.org/stable/45153372>
- Yu, J., Chou, C.C. & Cain, S.** 2020. "On the Road to Reduce NCDs in Nauru". *The Devpolicy Blog*. Canberra, Development Policy Centre, Crawford School of Public Policy, College of Asia and the Pacific, Australian National University. <https://devpolicy.org/on-the-road-to-reduce-ncds-in-nauru-20201202-2/?print=print>

Insights into Benin's National Integrated School Feeding Programme: A pathway to improving nutrition

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Sharing borders with Togo, Nigeria, Burkina Faso and Niger, Benin has 121 kilometres of coastline along the Gulf of Guinea and benefits from a stable democratic regime. The population was about 11.88 million in 2019, with a fertility rate of 5.7 children per woman and a life expectancy of 61.2 years (INSAE and ICF, 2019). In 2020, Benin ranked 158th out of 189 countries in the Human Development Index, with 49.5 percent of the population living below the income poverty line (UNDP, 2020). The economy is heavily dependent on agriculture and informal re-export and transit trade with Nigeria (20 percent of gross domestic product (GDP)) (World Bank, 2020). The unemployment rate was estimated at 2.4 percent in 2019, with a high level of underemployment (72.9 percent) (AfDB, 2022).

These factors were exacerbated by the country's low levels of education. The educational system faces persistent challenges, with a total adult literacy rate in 2018 of 42 percent and adult female literacy rate of just 31 percent (World Bank, 2018). The quality of education and the school environment are poor and, in many rural districts, the enrolment rate at primary schools remains less than 50 percent, particularly among girls (INSAE and ICF, 2019). In 2018–2019, only 54.8 percent of students managed to complete primary education (World Bank, 2020).

The nutritional situation and food insecurity of the population, especially women and children, are worrying. In 2018, 32.2 percent of children under five years of age suffered from chronic malnutrition and 72 percent were anaemic (INSAE and ICF, 2019). Food insecurity is rife in impoverished rural households and often worsens during the lean season (March to July) or in times of crisis (WFP Benin, 2021). Food insecurity in Benin is down to several factors, including chronic household poverty, climatic hazards such as flooding, a high incidence of childhood and waterborne diseases, such as diarrhoea, weak health systems and insufficient access to drinking water and sanitation.

Faced with this gloomy situation, school feeding was identified as an essential measure to reduce the school dropout rate, increase retention rates, fight hunger among schoolchildren and promote Benin's economic growth and development.

The National Forum on School Feeding was held at Cotonou (the economic capital of Benin) in April 2010. The National School Feeding Policy was developed thereafter and adopted by the Council of Ministers in October 2014 (Government of Benin, 2015). A second school feeding workshop was held in November 2015.

As a result, the Government of Benin included school canteens among the Ministry of Maternal and Primary Education's (MEMP) priority programmes in both its first (2016–2021) and second (2021–2026) five-year action plans (Government of Benin, 2021). Among the 8 169 public schools that existed in Benin in 2015–2016, only 2 566 were equipped with canteens, corresponding to a national coverage rate of 31 percent (Government of Benin & WFP, 2018). The government's aim is to progressively extend school canteens to all public schools in the country, reaching 100 percent by 2026. As of 2022, school canteen coverage had reached 75 percent, according to MEMP estimates.

The Government of Benin is making firm efforts to embed school feeding as a tool for economic growth. Launched in 2017, the National Integrated School Feeding Programme (PNASI) is as an initiative of the Government of Benin, put into operation by the World Food Programme (WFP), to improve school retention rates and school performance and, ultimately, the country's economic growth (Government of Benin and WFP, 2018).

This paper aims to provide insights into the strengths, weaknesses, opportunities and threats (SWOT) of the Benin PNASI as a pathway for improving the nutrition of primary schoolchildren.

Benin's experience with school feeding programmes

Prior to conducting its SWOT analysis of the PNASI, the team conducted a review of the different approaches to school feeding tried in Benin since the 1970s. The documents reviewed were mainly government reports and those from implementing agencies.

Catholic Relief Services (CRS) school canteen programme

CRS has been conducting a school feeding programme in Benin since 2002. As of March 2021, with funding support from the United States Department of Agriculture (USDA) McGovern-Dole Food for Education Program, it covered 44 000 schoolchildren in the two departments of Borgou and Alibori (CRS and USDA, 2022). The project has three components: (i) an education component (equipped classrooms, refectory, stores, kitchens, latrines and fencing), teaching materials and school supplies; (ii) a health component (periodic deworming, functional infirmary); and (iii) school fields or community plantations that supplement imported food with local and fresh produce. This canteen programme was designed not only to provide short-term food assistance to students in rural elementary school in the northern departments of Borgou and Alibori, but also to promote increased participation in

the education system, leading to improved livelihood security through increased productivity, higher incomes, better health and reduced fertility in the long run. The programme has two particularly strong aspects: the establishment of school fields, gardens or community plantations and the combination of local food for a balanced diet. The food basket is composed of rice, improved semolina, oil and lentils. In addition, there are quarterly take-home rations (oil) for the most assiduous pupils, especially girls. CRS was recently granted a new five-year award (October 2021–September 2026) by USDA to continue supporting the Government of Benin and the PNASI in reaching the goal of universal canteen coverage (USDA and CRS, 2022).

Global Partner for Education (GPE) school canteen programme

The implementation of canteens financed by the Community Budget Fund/Global Partnership for Education (CBF/GPE) began at the start of the 2014–2015 school year, providing meals to schoolchildren in 17 communes. The approach was to recruit service providers to serve school meals. Every child received a meal on every school day – at a cost of XOF 150 (around USD 0.23) per meal – from a provider recruited locally for this purpose. The funds were paid to the provider every two weeks upon presentation of documentation confirming that the service had been provided. Follow-up was conducted by local non-governmental organizations. A major issue with this programme was a delay in paying the providers, which often affected the quality of the food offered to the children. The programme is no longer operational and the schools have all been folded into the PNASI (Government of Benin, 2015).

WFP school canteen programme

WFP has been supporting the Government of Benin in implementing school canteen projects since 1975. The food distributed enables children to be offered a hot meal, cooked in schools, every school day. The daily food ration per child comprises 150g of cereals (maize: 75g, rice: 75g), 30g of white beans/yellow split peas, 10g of oil enriched with vitamins A and D, and 3g of iodized salt. In 2017, the programme assisted 114 000 schoolchildren in 620 schools in 19 municipalities (Government of Benin and WFP, 2019a). The project takes a multisectoral approach, spanning education, health (the periodic deworming of children), nutrition (balanced meals, various dishes made from local products, the promotion of moringa, nutrition education for teachers and students), hygiene and sanitation, agriculture (the promotion of school gardens and fields, reforestation, the promotion of local production and purchases) and community mobilization and participation. This programme has been greatly expanded and integrated into the PNASI.

PNASI – current programme

The PNASI is part of the operationalization of the National School Feeding Policy. Its aim is that "by 2025, all school children in Benin have access to a balanced, healthy and varied diet that reduces their vulnerability to hunger and improves their access, retention and performance in school" (Government of Benin and WFP, 2018). By taking a multisectoral approach, the PNASI aims to strengthen school feeding in Benin to improve children's school performance and nutritional status and gives priority to local and diverse food purchases. Specifically, the programme objectives are to: i) ensure the regular provision of nutritious and safe school meals to pupils in public elementary school; ii) use schools as a key entry point for generating support for education, agriculture and health, iii) invest in the development of the institutional framework and improve the steering, coordination and monitoring of the school feeding programme (Government of Benin and WFP 2018). The PNASI is being put into operation by WFP and is 85 percent funded by the Government of Benin. The Governments of Germany and the Netherlands and a private donor contribute the remaining 15 percent.

Components and activities of the PNASI

The PNASI spans two main areas: (i) the operation of school canteens and (ii) institutional and operational capacity building. There are six sub-components to the school canteen operations:

1. Supply of meals to schools: In 2020, WFP provided daily nutritious meals to 660 654 schoolchildren in 3 849 primary schools based in the 77 communes of Benin (WFP, 2021). In 2021, 717 206 schoolchildren received a hot meal every day for an average of 175 days per school year (WFP, forthcoming). The direct beneficiaries are students, teachers and directors of public elementary schools and members of the parent-teacher associations of the 3 850 schools. Indirect beneficiaries include parents of schoolchildren, communities and local authorities responsible for the proper functioning of schools. The food basket provides 745 kilocalories a day to each child through the foodstuffs detailed in Table 1.

Table 1. WFP PNASI food basket

Foodstuffs	Individual daily ration of foodstuffs
Cereals	150 g (maize, 75 g and rice, 75 g)
Pulses	30 g
Vegetable oil (vitamin A and D)	10 g
Iodized salt	3 g
Total	193 g

SOURCE: WFP. 2019. *Benin Country Strategic Plan 2019-2023*. Revised 2020. Geneva, Switzerland. <https://www.wfp.org/operations/bj02-benin-country-strategic-plan-2019-2023>

2. School community participation: In addition to the food basket provided by WFP, communities are asked to contribute to the programme by providing staple foods, firewood for kitchens and cooks, developing school gardens to provide fresh vegetables, and providing additional financial resources to buy ingredients and animal protein sources. Community engagement and financial contributions are important to ensure the quality of the meal served to children and the success of the programme. This is an essential and fundamental aspect of the programme's sustainability.

3. Food purchases: The foodstuffs purchased are cereals

(corn and rice), pulses (white beans and yellow peas), fortified oil and iodized salt. They are supplied locally, but also imported.

4. Storage and conservation of foodstuffs: WFP ensures the proper storage of foodstuffs in warehouses in the departments of the schools assisted by the programme (Figure 1). In total, there are eight warehouses, with a mean capacity of 15 500 tonnes.

5. Transport and distribution of food: Food is supplied on demand to the schools by private transport operators contracted by WFP. Enough food is delivered for three months at a time.

6. Complementary activities: Some activities have been undertaken with a view to children's health and nutrition, such as deworming campaigns, handwashing and hygiene, and healthy eating campaigns. Actions have also been undertaken to improve the school environment, such as the installation of sanitation facilities, school gardening and income-generating activities.

The institutional and operational capacity-building component includes: technical assistance provided by WFP for the implementation of the programme; the development of a training plan for school feeding stakeholders in accordance with identified needs; and the sensitization of communities in order to galvanize their involvement in and support for school canteens (Government of Benin and WFP, 2018).

To link school feeding to local production, the following activities have been added: i) organizing local smallholder farmers/producers to grow and deliver food to schools; ii) sharing information with local producer groups on the food needs of school canteens; and iii) strengthening the capacity of smallholder farmers to increase and improve the quality of their production (Government of Benin and WFP, 2018).

The food basket and beneficiaries

The direct beneficiaries are the students – an estimated 712 206 in 2022. Primary school teachers, directors and members of the parent-teacher associations of the 3 850 schools (Figure 1) also benefit from the meals. Indirect beneficiaries include parents, communities and local authorities responsible for the proper functioning of schools (WFP, 2021).

A hot meal is served to schoolchildren every day at noon. The canteens operate throughout the school year, for an average of 165 days. The food basket is adapted to habitual local food consumption. The food basket provides 745 kilocalories daily to the children, as detailed in Table 1 (WFP, 2021).

Strengths and weaknesses of the PNASI

The authors conducted a SWOT analysis based on insights gained from the review of various documents (Government of Benin and WFP, 2018; 2019a; 2019b, forthcoming). The results are summarized in Figure 1.

Figure 1. SWOT analysis of the PNASI in Benin



SOURCE: Authors' own elaboration.

Strengths and weaknesses

It is important to highlight the strong support of the Government of Benin, reflected in its regular budget allocation to the PNASI. Another key resource is the in-country expertise of WFP and other United Nations agencies in the management of school feeding programmes. The close involvement of the programme's technical and financial partners is an important asset in facing challenges. These strengths have translated into results as follows (WFP, 2021):

- With the extension of canteens from 31 percent to 75 percent of schools, more than 700 000 schoolchildren receive a hot meal every day.
- School canteen implementation is among the key factors contributing to better school performance (retention increased from 42.9 percent in 2014 to 54.8 percent in 2019 and the dropout rate fell from 57.3 percent in 2014 to 33.9 percent in 2018).
- More than 85 percent of food distributed in school canteens is locally purchased, contributing to local economic development and building local community resilience.

The weaknesses in the implementation of the PNASI, in contrast, relate to low literacy rates, the weak anchoring of nutrition activities and a lack of management skills at community level. In addition, the financial contribution of local communities is very limited: the non-payment of enrolment fees is high, while administrative procedures can hold up food resources essential to the functioning of canteens. The principle that every child must benefit from the school canteen whether they have paid or not discourages the few parents who are contributing from continuing to pay.

School gardens are ineffective in some areas. It is, therefore, common to see some school canteens closed for several days due to a lack of tomatoes and/or other fresh produce. Another weakness is the unavailability of cooks, who are increasingly disengaged for lack of motivation.

On the nutritional side, the food basket is poor in animal proteins and fresh fruits and vegetables. Inadequate culinary practices unsuited to preserving the nutrients in meals are another limitation.

Threats and opportunities of the PNASI

Some of the opportunities of and threats to the PNASI are presented in Figure 2. Every year, during the rainy season, about 20 percent of assisted schools in different regions of Benin are inaccessible for logistical reasons. The lack

of clean and safe water for cooking and drinking in more than 50 percent of school canteens is another major threat. Moreover, the country's economic crisis, a decline in public resources and social conflict are also hindering programme success.

The greatest opportunity lies in the willingness of economic operators from both the private and the public sectors to become involved in the school feeding programme. This presents an enormous chance for the programme to become a real entry point for local economic and social development.

Improving the current school feeding programme to address nutritional problems in Benin

Although school feeding is present in more than 75 percent of Benin's public schools and reaches 70 percent of primary schoolchildren, the Government of Benin, WFP and the other stakeholders in this integrated approach need to take further steps to address the aforementioned issues and achieve the 2025 vision of the National School Feeding Policy. The required efforts include, but are not limited to:

- Improving the nutritional quality of the food basket, taking into account the food habits and diversity of each region. In addition, to date, the effectiveness of the programme in the fight against micronutrient deficiencies (especially iron, zinc and vitamin A) among schoolchildren remains unknown and needs to be researched.
- Involving research institutions to further investigate the programme's effectiveness. Future research could help identify: i) strategies to improve the food basket in terms of animal products, fruits and vegetables by leveraging the potential of local and indigenous products and ii) how to add micronutrient-rich foods and other elements to the programme that improve the vitamin A and iron status of schoolchildren.

Conclusions

The Benin PNASI is a real pathway for the continuity of nutrition actions beyond the first two years of life. The Government of Benin's commitment to school feeding is clear. Benin is a founding member of the School Meals Coalition to improve or restore national, sustainable school meal programmes. In addition, at the ministerial roundtable segment of the Transforming Education pre-Summit in Paris on 26–28 June 2022, the Minister of Education of Benin said that Benin was a "champion of meals at school" as part of the country's broader commitment to transforming education (Transforming Education Pre-Summit, 2022).

Improving the current school feeding programme by providing potable water in schools, supplying food from local producers, reinforcing health prevention actions and focusing on nutritional aspects, such as micronutrient-rich meals, as well as the systematic sanitation of the food preparation and consumption environment could not

only lead to improvements in the academic performance of students, but also of their nutritional status. Thankfully, WFP is already undertaking some of these actions in close collaboration with national stakeholders and other United Nations agencies to the benefit not only of primary school-age children in Benin, but the whole country.

References

AfDB (African Development Bank). 2022. Benin Economic Outlook. In: *African Economic Outlook 2022*. Abidjan.

<https://www.afdb.org/en/countries-west-africa-benin/benin-economic-outlook>

Government of Benin. 2015. *Report on Second School Feeding National Forum*. Cotonou, Benin, Ministry of Maternal and Primary Education.

Government of Benin. 2021. *Programme d'Actions du Gouvernement (PAG 2021–2026)*. Porto-Novo.

https://finances.bj/wp-content/uploads/2022/01/presentation_pag-2021-2026-seance-appropriation-06-01-2021.pdf.pdf

Government of Benin & WFP (World Food Programme). 2018. *Document de projet du Programme National d'Alimentation Scolaire Intégré (PNASI)*. Cotonou, Benin, WFP.

Government of Benin & WFP. 2019a. *Programme d'alimentation scolaire du Bénin. Analyse Coût-Bénéfice*. Cotonou, Benin, WFP.

<https://docs.wfp.org/api/documents/WFP-0000114270/download/>

Government of Benin & WFP. 2019b. *Evaluation Décentralisée Evaluation conjointe à mi-parcours du Programme National d'Alimentation Scolaire Intégré (PNASI) Aout 2017–Mai 2019*. Cotonou, Benin, WFP.

https://docs.wfp.org/api/documents/WFP-0000112478/download/?_ga=2.75563861.1305708313.1659200029-2046248813.1659200029

Government of Benin & WFP. *Forthcoming. Benin, Integrated National School Feeding Programme (PNASI) 2017–2021: Joint Evaluation*. Cotonou, Benin, WFP.

INSAE (Institut National de la Statistique et de l'Analyse Économique) & ICF. 2019. *Enquête Démographique et de Santé au Bénin, 2017–2018*. Cotonou, Benin and Rockville, MD.

https://instad.bj/images/docs/insae-statistiques/enquetes-recensements/EDS/2017-2018/1.Benin_EDSBV_Rapport_final.pdf

UNDP (United Nations Development Programme). 2020. *Human Development Report 2020: Benin*. New York.

<https://hdr.undp.org/sites/default/files/Country-Profiles/BEN.pdf>

UNESCO (United Nations Educational, Scientific and Cultural Organization). 2022. *Committing to Transformation* [online video]. Speech delivered by Salimane Karimou, Minister of Maternal and Primary Education of Benin. Transforming Education Pre Summit, 28–30 June 2022. Paris. Cited 3 August 2022.

<https://www.youtube.com/watch?v=RtdV-x9dZgY&list=PLQKguCR9-WuY7vhmq8hSiYW1MCUlwV8Ao&index=17>

USDA (United States Department of Agriculture) and CRS (Catholic Relief Services). 2022. Republic of Benin Catholic Relief Services, McGovern-Dole International Food for Education and Child Nutrition Program (Keun Faaba III) Agreement No.: FFE-680-2021/002-00: October 2021–September 2026. Washington, DC.

https://www.crs.org/sites/default/files/solicitation_number_bj162762.03.2022_0.pdf

WFP. 2021. *Benin: Annual country report 2020*. Geneva, Switzerland.

<https://docs.wfp.org/api/documents/WFP-0000125378/download/>

WFP. Forthcoming. *Benin: Annual country report 2021*. Geneva, Switzerland.

World Bank. 2018. Literacy rate, adult female (% of females ages 15 and above) [online]. Washington, DC. Cited 2 August 2022.

<https://data.worldbank.org/indicator/SE.ADT.LITR.FE.ZS?locations=BJ>

World Bank. 2020. *The World Bank in Benin* [online]. Washington, DC. Cited 2 August 2022.

<https://www.worldbank.org/en/country/benin/overview>

The collaboration between CFS and UN-Nutrition by H.E. Ambassador Gabriel Ferrero of Spain

Dear Editor,

Today, we are dealing with a hunger and malnutrition crisis of worrying proportions. The compounding challenges of COVID-19, climate change and conflict, including the war in Ukraine, have thrown global food, agricultural, financial and energy systems and markets into turmoil, resulting in a food crisis that is ravaging families around the world.

As is often the case, it is the poorest households, those most excluded or those in vulnerable situations, especially children, women and girls, that are being hit first and hardest.

The scale and magnitude of the challenge is so enormous that acting is not enough. We must act together. Policy responses alone will not be enough; they must be coordinated and converge in support of country-led solutions guided by the Sustainable Development Goals, which are our most comprehensive blueprint for sustainable development.

The ongoing collaboration between UN-Nutrition and the Committee on World Food Security (CFS) is a perfect example of the kind of partnership we need and should be strengthening.

UN-Nutrition and CFS have worked together to foster a comprehensive, holistic approach to developing coordinated policies and interventions across sectors that impact or are impacted by our food systems. This culminated in the endorsement of the CFS Voluntary Guidelines on Food Systems and Nutrition (VGFSN) in February 2021 after an intense, inclusive and consultative process informed by the scientific evidence of the CFS High Level Panel of Experts (HLPE) report on Nutrition and Food Systems.

UN-Nutrition has been at the forefront of driving the use of these guidelines by countries to inform their national policies, legal frameworks, development programmes and investment plans. Its actions have included the development of an evidentiary platform for agrifood systems and nutrition in collaboration with the Food and Agriculture Organization of the United Nations to provide evidence and tools to support governments and stakeholders in the uptake of the guidelines.

A lot more still needs to be done to deliver sufficient, safe, affordable and nutritious food for all people, to provide employment and income, particularly in rural areas, while fully respecting planetary boundaries. We must remain committed to the sustainable transformation of our food systems. I call on UN-Nutrition Members and others to continue working with and through CFS to make this possible.

Yours faithfully,

Gabriel Ferrero

Ambassador at Large, Global Food Security, Ministry of Foreign Affairs, European Union and Cooperation of Spain, and CFS Chair

LETTERS TO THE EDITOR

Understanding the lived experience of food insecurity of mothers in Hong Kong by Belinda Ng

Dear Editor,

I would like to talk about the importance of understanding the lived experience of food insecurity among low-income mothers in Hong Kong when tailoring interventions to ensure food security.

Having volunteered in the Sham Shui Po area, Hong Kong's poorest district, during the summer of 2020, I came to understand that low-income families there struggle enormously to afford sufficient nutritious food due to high food prices – something that has intensified since the onset of the COVID-19 pandemic. Motivated by this experience, for my undergraduate research thesis, I decided to study how and why mothers with young children living in the Sham Shui Po district used a variety of socio-spatial strategies to source and cook food for their families.

Interviews conducted with 21 mothers revealed the challenges they face in accessing and preparing nutritious foods for themselves and their families in the district. In terms of food access, the mothers tended to buy food from local supermarkets and markets. While they cared strongly about ensuring their children had a sufficiently nutritious diet, the mothers generally felt that this was out of reach, citing the high cost of food items, such as milk powder for their infants. In addition, some were not sure what food was considered “healthy” for their children, prompting them to buy cheaper and more processed foods, such as instant noodles, as part of their weekly shopping trips.

To ensure that they could provide food in sufficient quantities for their families, the mothers also visited food banks run by non-governmental organizations (NGOs) on occasion. However, some mothers faced challenges accessing food assistance from local NGOs. The rigid screening process requiring registration with the food bank meant that low-income households where a family member was employed as a casual worker could not register due to their inability to produce evidence of a pay cheque. Food banks also had strict requirements on the duration of service usage.

Some mothers observed that hot meal service collection points were too far away for them to visit while taking care of their young children and failed to provide enough food for the household. Others noted how food banks tended to give them a lot of canned and preserved food, which they thought too unhealthy for their children. As a result, the mothers often ate the canned and preserved food items themselves, or ate less to ensure their children could eat more nutrient-dense and higher-quality food items. This is important, as it shows that interventions to increase access to nutrition in low-income households need to consider that diets differ between members of a household and understand the reasons for it.

These women, who are the primary food providers in their families, are having to juggle key considerations of price, time constraints, distance and childcare responsibilities in trying to access food, while also facing challenges in accessing charitable food support as a result of their low-income status. Actions to ensure access to food banks and hot meal services could be made more inclusive by easing the registration processes and tailoring them to individual circumstances.

Food banks also need to be more attentive to feedback from the beneficiaries of these services on what they truly need. One way to do this is to leverage WeChat, one of the most popular social media platforms used by the mothers, to disseminate information on distribution points and gather feedback. WeChat could also be an effective means of delivering nutrition education to the mothers and forming new networks between the mothers to exchange information on food access in the district.

Yours faithfully,

Belinda Ng

Hong Kong youth leader of the Act4Food Act4Change campaign facilitated by the Global Alliance for Improved Nutrition (GAIN) and Food Foundation

The Nutrition Decade's action interventions with double or triple-duty potential by Celia Burgaz

Dear Editor,

Our food system has a high impact on human and planetary health. How food is produced, processed, lost, packaged, distributed, promoted, provided, consumed and wasted are all key areas of potential intervention to reverse current trends. Meaningful, long-lasting solutions will not be easy to achieve. But they need to happen, as our food system is expected to provide food security and nutritious diets for a world population projected to grow to nearly 10 billion by 2050.

With this letter, I would like to outline some examples of effective, concrete policy-level actions that are helping to transform nutrition for the better, ensuring that food systems are healthier, more equal and sustainable. Such actions argue for governments to implement strategies with the potential for double or triple duty. They would be part of a more holistic approach to sustainable and healthy diets and to tackling the current global syndemic, a concept used to describe the three ongoing global pandemics: undernutrition, obesity/NCDs and climate change. If policymakers use food systems thinking, efforts to address the syndemic will be more integrated and coherent and, consequently, more effective.

So, how can governments act to meet the demand for nutritious food and provide healthy diets for all without impairing biodiversity and the environment? Even if the available evidence is still limited, we are now able to reach some interesting conclusions that may be of use to actors working to transform nutrition for the better.

The triple-duty potential of agricultural interventions should not be underestimated, as sustainable practices have positive impacts on food security, healthy diets and environmental sustainability. Agroecology helps farmers to diversify production, improving the diets of local communities and facilitating the inclusion of women in implementing farm innovations, while boosting household income through women-led industry and commercialization opportunities.

School programmes have a positive effect on healthy diets and reduce micronutrient deficiencies, food insecurity and nutrition inequalities, with favourable economic benefits. Overall, even if they sometimes increase the amount of food wasted, these interventions have clear, long-lasting double-duty potential.

When it comes to fiscal measures, food subsidies and social programmes have a huge impact on our purchases and healthier diets, while taxes on less beneficial products have been shown to improve the transition to healthier habits.

There have been significant drops in the purchase of taxed goods in Mexico, South Africa and the United Kingdom of Great Britain and Northern Ireland, for example. Imposing such taxes on red or processed meat could have double-duty potential with regard to health and environmental sustainability.

Moreover, within the food environment, interventions related to food labelling, marketing and retail could have double-duty potential, as they can increase the purchase of more sustainable and healthier food products.

Lastly, an important consideration is that labelling and taxes can positively impact industry-led reformulation towards the creation of healthier and more sustainable food products.

All in all, such food system actions have positive impacts on the nutrition transition and should be considered by governments when designing programmes to tackle climate change and malnutrition in all its forms.

Yours faithfully,

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UN-Nutrition Journal. Volume 1: Transforming nutrition Corrigendum

[06 February 2023]

The following corrections were made to the PDF of the report after it went to print.

Page	Location	Text in printed PDF	Text in corrected PDF
146	Title	Cash assistance to improve food acces and dietary diversity in urban slums in Dhaka	Cash assistance to improve food access and dietary diversity in urban slums in Dhaka

[09 January 2023]

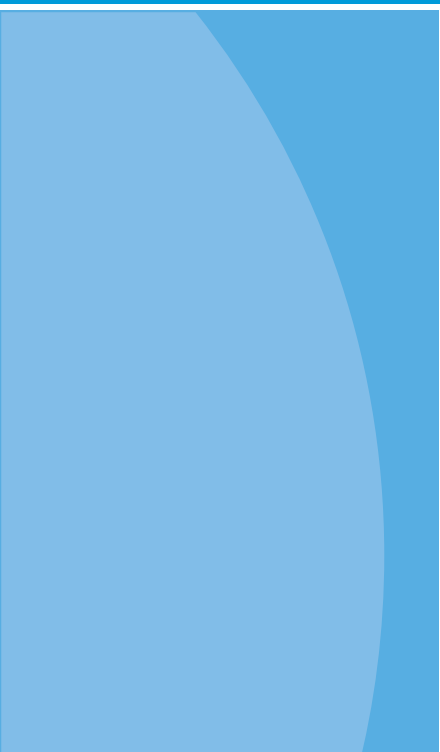
The following corrections were made to the PDF of the report after it went to print.

Page	Location	Text in printed PDF	Text in corrected PDF
29	Figure 1 – Localization of selected territorial markets		More detailed maps for territorial markets in Malawi, Burkina Faso and Rwanda
30	Figure 2	Vitamin-A rich fruits and vegetables	Vitamin A-rich fruits and vegetables
32	Figure 3	Vitamin-A rich fruits and vegetables	Vitamin A-rich fruits and vegetables
35	Figure 5	Vitamin-A rich fruits and vegetables	Vitamin A-rich fruits and vegetables
36	Figure 6	Vitamin-A rich fruits and vegetables	Vitamin A-rich fruits and vegetables

[23 November 2022]

The following corrections were made to the PDF of the report after it went to print.

Page	Location	Text in printed PDF	Text in corrected PDF
35	Figure 5 - Bar graph for Rwanda	Every day Several days per month More than one day per week Once per month Once per week Once every few months	Every time I come to the market Sometimes when I come to the market Most of the time when I come to the market Never





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