Can the agricultural development community end hunger differently?

Ten high-impact nutrition-sensitive interventions for agrifood systems

Carin Smaller, Jaron Porciello, David Laborde, Elsa Olivetti, and Oshani Perera

HESAT2030
Ending Hunger Sustainably, Nutritiously, and Equitably

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About this Report

Hesat2030 is supported by the German Federal Ministry for Economic Cooperation and Development (BMZ) and the Gates Foundation, and builds on the findings of Ceres2030 – Sustainable solutions to end hunger, jointly published in 2020 with Nature Research. Ceres2030 provided a high impact roadmap for donors to effectively end hunger and double the incomes and productivity of small-scale producers while protecting the climate. Hesat2030 expands the focus of Ceres2030 to show the value of integrating nutrition-sensitive interventions across the agriculture and food (agrifood) system—from production to markets to consumption—and bundling components, to improve diet quality, and contribute to ending hunger and all forms of malnutrition.

This report, based on a scientific paper (Potani et al., forthcoming), provides donors and governments in low-income countries with ten high-impact nutrition-sensitive interventions in agrifood systems to contribute to ending hunger and all forms of malnutrition. The focus is on promoting healthy diets as an essential albeit insufficient way to address each form of malnutrition. The interventions in agrifood systems need to accompany a multi-sector response in health, education, water, sanitation, and hygiene, and social protection that must be purposeful, deliberate, and long term. A comprehensive set of nutrition-specific and nutrition-sensitive interventions across systems is provided in the Investment Framework for Nutrition 2024 (World Bank, 2024). While social protection programmes are not strictly agrifood interventions, some of these are included in this report given the close and direct link to improved dietary outcomes, particularly for children, adolescents, and women of reproductive age.

This report builds on and deepens the agrifood systems evidence presented in the Invest Framework for Nutrition 2024, and earlier work by (Hawkes et al., 2020), identifying 42 policies and actions to orient food systems towards healthier diets for all. While recognising the importance of unhealthy food environments and the growing evidence on the need for regulatory interventions to make food environments healthier (e.g. sugar taxes and advertising bans), this is not the focus of this report. Rather this report examines the opportunity for donors to invest in nutrition-sensitive interventions in agrifood systems to improve access, availability and affordability of healthy diets for the poorest and most vulnerable populations in low-income countries.

Acknowledgements

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Executive Summary

The findings from this report show that the agricultural development community can end hunger differently. It shows how this can be done through investment in ten high-impact nutrition sensitive interventions in agrifood systems that improve food security and dietary outcomes without continued harm to the planet.

Aid has played a critical role in decreasing hunger in the world from 13 percent, or 825 million people in 2002, to 8.2 percent, or 673 million people in 2024. In the same period, official development assistance (ODA) to agriculture and food security doubled, going from US$ 5.6 billion per year to 11.8 billion. ODA has been a key contributor to the decline in hunger levels.

But while hunger has declined, overweight and obesity are skyrocketing, and micronutrient malnutrition, often referred to as hidden hunger, has remained static. At the same time, the negative environmental impacts generated from the way we produce food are exacerbating climate change, biodiversity loss, and soil degradation. The focus on a few staple crops has made agriculture less resilient to climate shocks and contributed to a food environment that favours unhealthy foods high in calories and low in nutrients. For the past five years, hunger has only been decreasing sporadically, and only slowly, while health and environmental problems have worsened at an alarming rate.

The donor community faces a choice. It can continue the same trajectory, slowly chipping away at hunger levels within their agriculture, rural development and food security divisions, while leaving other forms of malnutrition and the environment to health and environment divisions. But this approach no longer makes sense; and some donor agencies have already taken steps to better integrate agricultural development, food security, and nutrition programmes. Lower levels of aid and higher inflation is also forcing donors to find ways to do more with less. This makes the shift even more imperative.

Donors can contribute to reducing hunger through a stronger focus on nutrition and protection of the environment. This is the conclusion of this report, which is based on 1,732 individual studies across 83 countries and drawn from 52 high-quality systematic reviews and meta-analyses published over the past 20 years.

The evidence points to ten high-impact, nutrition-sensitive interventions in agrifood system for donors and governments in low-income countries to prioritise in their efforts to ending hunger and all forms of malnutrition, while protecting the environment. The interventions target consumption, markets, and production and are: **(1) diversification towards fruits, vegetables, and pulses, including agroforestry, (2) sustainable aquaculture and livestock, (3) home gardens, (4) biofortification, (5) storage, distribution, processing and trade infrastructure, (6) food fortification, (7) food safety, (8) shifting and influencing diet choices (through nutrition education, social and behavioural change communication (SBCC), labelling, etc.), (9) nutritious school meals, and (10) food vouchers and cash transfers.**

To be effective, interventions need to be designed and implemented in bundles. The value of bundling a portfolio of interventions reduces overall costs and enhances effectiveness. None of these interventions work in isolation, and none produce nutritional outcomes without specific and intentional nutrition objectives in the design and implementation of the interventions, alongside complementary interventions in other sectors. None will protect the environment unless environmental trade-offs are identified, measured, and mitigated. That requires a systems approach.

Currently US$ 8 billion of agriculture and food aid is allocated to these interventions per year, out of a total of US$ 230 billion per year. But aid can no longer serve as a gap filler. Instead, it should be used to catalyse much larger resource flows from the domestic public and private sectors. To achieve this shift requires a change in mindset by focusing on the highest-impact interventions backed by the evidence, incentives that reward the achievement of outcomes rather than activities, and financial and business models that can effectively use small amounts of aid to catalyse larger capital flows.

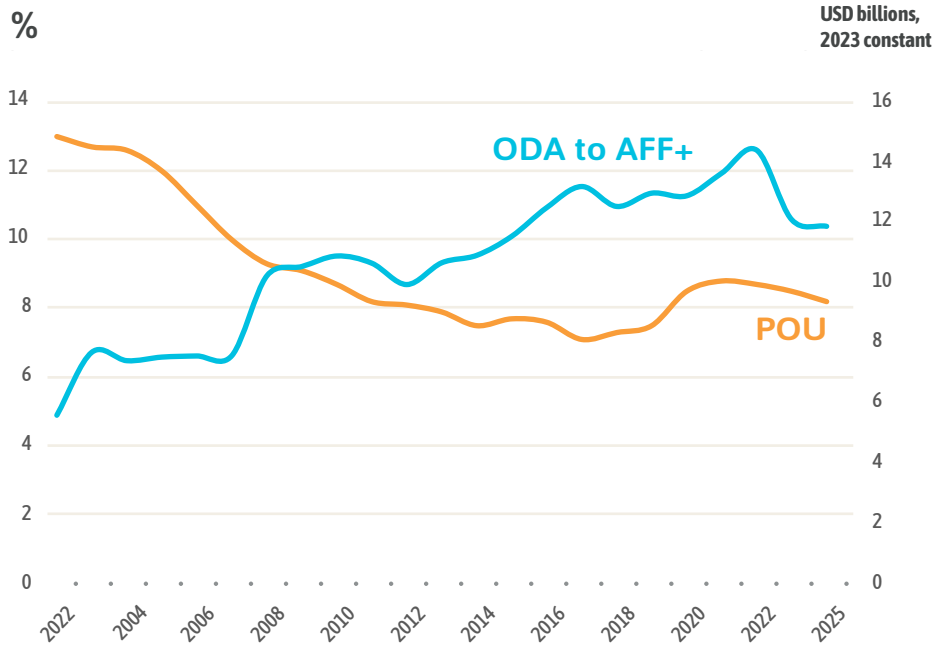
1. Introduction

Aid has played a critical role in decreasing hunger in the world from 13 percent of the population, or 825 million people, in 2002 to 8.2 percent, or 673 million people, in 2024. ODA to agriculture and food security during the same period doubled, going from US$ 5.6 billion per year to US$ 11.8 billion, as allocated to agriculture, forestry and fishing, rural development, and emergency food assistance (AFF+) (Figure 1). ODA has played an important role in contributing to the decline in hunger levels.

And yet, the global community is not on track to fulfil its commitment to end hunger and all forms of malnutrition by 2030. Hunger remains a major problem in low- and lower-middle-income countries, affecting an estimated 673 million people (FAO et al., 2025). African countries have the highest proportion of people affected by hunger (20 percent of the population), while India has the highest number of people affected by hunger (nearly 150 million people) (FAO et al., 2025). All other forms of malnutrition are either skyrocketing (e.g. overweight) or stagnating (e.g. micronutrient malnutrition). For example, over half of pre-school aged children and two-thirds of women aged 15 to 49 years have micronutrient deficiencies (Stevens et al., 2022). Two-thirds of pre-school aged children and one-third of women aged 15 to 49 years consume diets that are not sufficiently diverse, thereby putting them at risk of inadequate intake of essential vitamins and minerals required for good nutrition and health (FAO et al., 2025). If we continue along this trajectory, 512 million people will still face hunger in 2030, of whom nearly 60 percent will be in Africa (FAO et al., 2025). This means that by 2030, hunger levels will be only slightly lower than they were in 2015 (570 million people), when the world committed to eradicating hunger with the United Nations Sustainable Development Goals (SDGs) (FAO et al., 2025).

Aid has played a critical role in decreasing hunger in the past 20 years

Figure 1: Prevalence of undernourishment (POU) vs official development assistance to agriculture, forestry, fishing, rural development and emergency food assistance (ODA to AFF+), 2002 - 2024



Source: FAOSTAT SDG Indicators, OECD DAC CRS Flows

Delivering calories has had significant positive effects. Much of the global effort to date has focused on quantity rather than quality. Increasing the availability of wheat, maize, and rice was seen as the core pathway to eradicate hunger. This approach has been highly effective at reducing caloric hunger. The first global food survey of seventy countries in 1946 found that more than 50 percent of the population were not getting enough calories; today it is down to 9 percent, even with a significant increase in population numbers (FAO, 1946; FAO et al., 2024). Many countries have rapidly reduced caloric hunger in the past thirty years, including China, Cambodia, Chile, Indonesia, Thailand, and Vietnam. These countries have witnessed the most rapid transformation of agrifood systems in history, ending widespread hunger in decades, rather than in centuries, as was the case in Europe.

But it is no longer sufficient. The effect of addressing hunger through calories alone has contributed to the colossal health and environmental impacts that people are now facing. Multiple forms of malnutrition have emerged as a major crisis affecting one in three people worldwide (Pradeilles et al., 2018). An estimated 20 percent of global mortality is now attributed to poor-quality diets that are low in whole grains, vegetables, and fruits and high in sodium and sugar (GBD 2017 Diet Collaborators, 2019; Afshin et al., 2019). More recently, because of cumulating biological and epidemiological evidence globally, there has been a shift towards a healthy diet approach that not only addresses food security but also reduces multiple forms of malnutrition (hunger, undernutrition, micronutrient deficiency, obesity) (Popkin & Laar, 2025; Popkin & Ng, 2022; Popkin et al., 2020; Chandak et al., 2017; Uauy et al., 2011). Consuming safe and nutritious food is critical, as articulated in the internationally agreed definition of food security: "All people, at all times, have physical and economic access to sufficient, safe and nutritious food" (World Food Summit, 1996).

While diets may vary by geography, culture, and economy, to be healthy they must be guided by four core principles: diversity, moderation, adequacy, and balance (FAO & WHO, 2024). They must be adequate in essential nutrients without excess, diverse in foods consumed, balanced in dietary energy and its primary sources (carbohydrates, fats, protein), and moderate in the consumption of foods and dietary components shown to have negative health effects (FAO & WHO, 2024). Nutritious, safe and locally relevant foods (articulated in national dietary guidelines), must be both available and affordable, but must also be appealing and convenient to consumers. Yet for too many, the current cost of a healthy diet is unaffordable (Herforth et al., 2020).

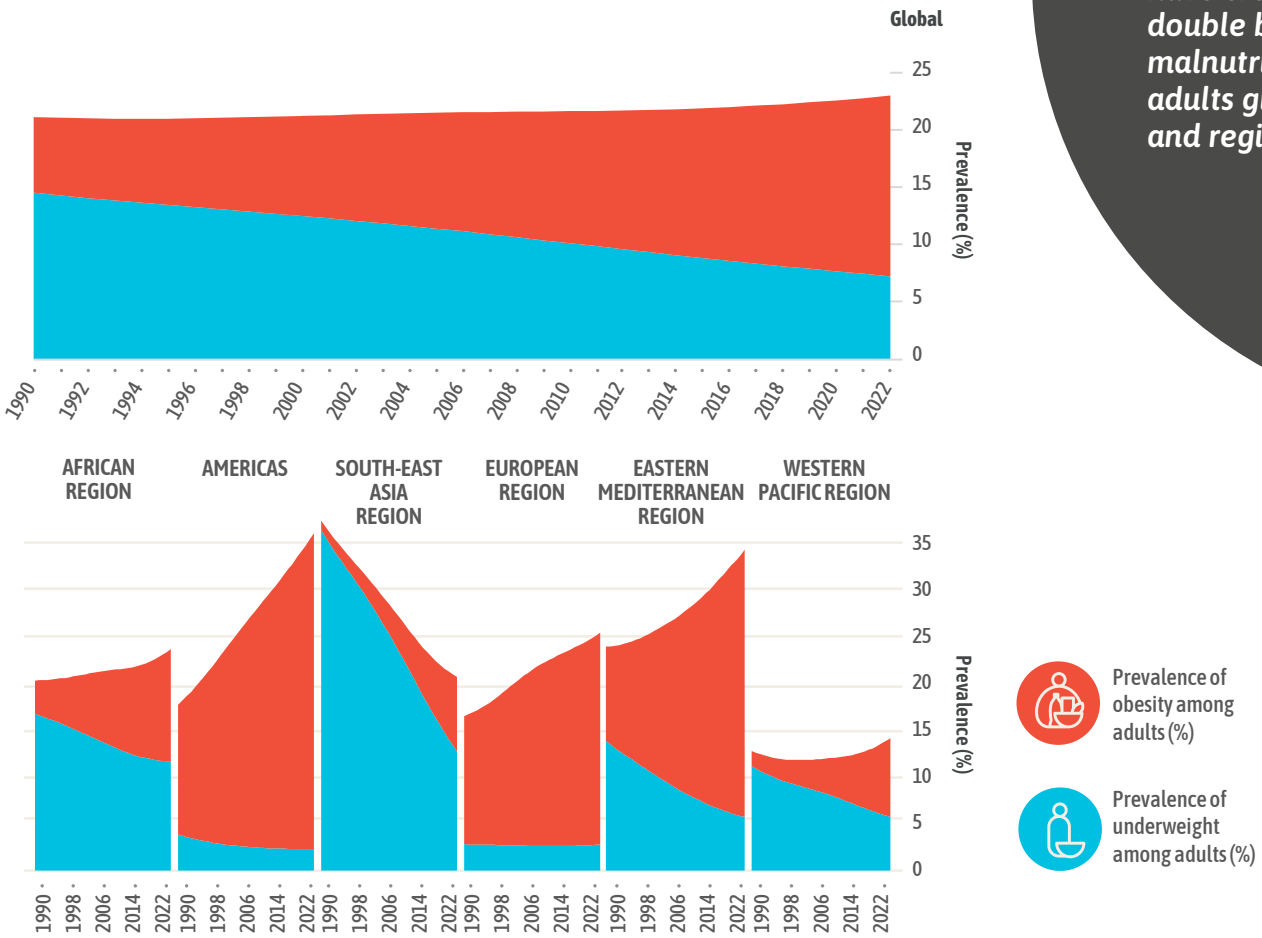
Addressing hunger and all forms of malnutrition requires a multi-sector approach, of which enabling access to and consumption of healthy diets is a necessary condition. This requires investments in agrifood systems, as part of a multi-sector approach in health, education, water, sanitation, and hygiene, and social protection. That requires a systems approach.

2. Over-reliance on staple crops, economic precarity, and poor food choices are exacerbating hunger and malnutrition

The negative effects of the current approach to ending hunger have created a double burden of malnutrition globally, and in all regions of the world (Figure 2)**.** This means that donors and governments, including in low-income countries, now have to simultaneously address hunger and obesity, and sometimes even in the same person. Among adults aged 20 years and older, 350 million globally were underweight, and 880 million globally were living with obesity (Figure 2). Among older children and adolescents aged 5-19 years, 190 million globally were living in thinness, while 160 million globally were living with obesity (Figure 3).

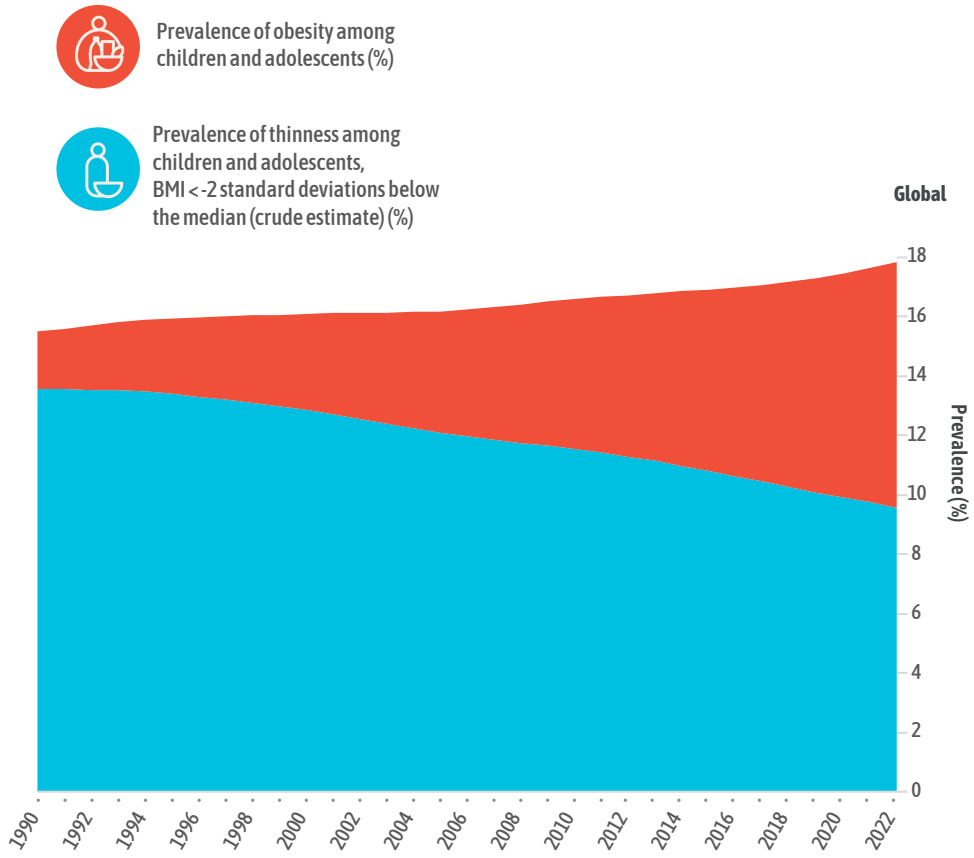
The negative effects of the current approach to ending hunger have created a double burden of malnutrition for adults globally and regionally

Figure 2: Prevalence of underweight and overweight amount adults aged 20 years and older, globally and regionally, 1990 - 2022



Source: (WHO, 2024b)

Figure 3: Prevalence of overweight and thinness amount children and adolescents aged 5-19 years

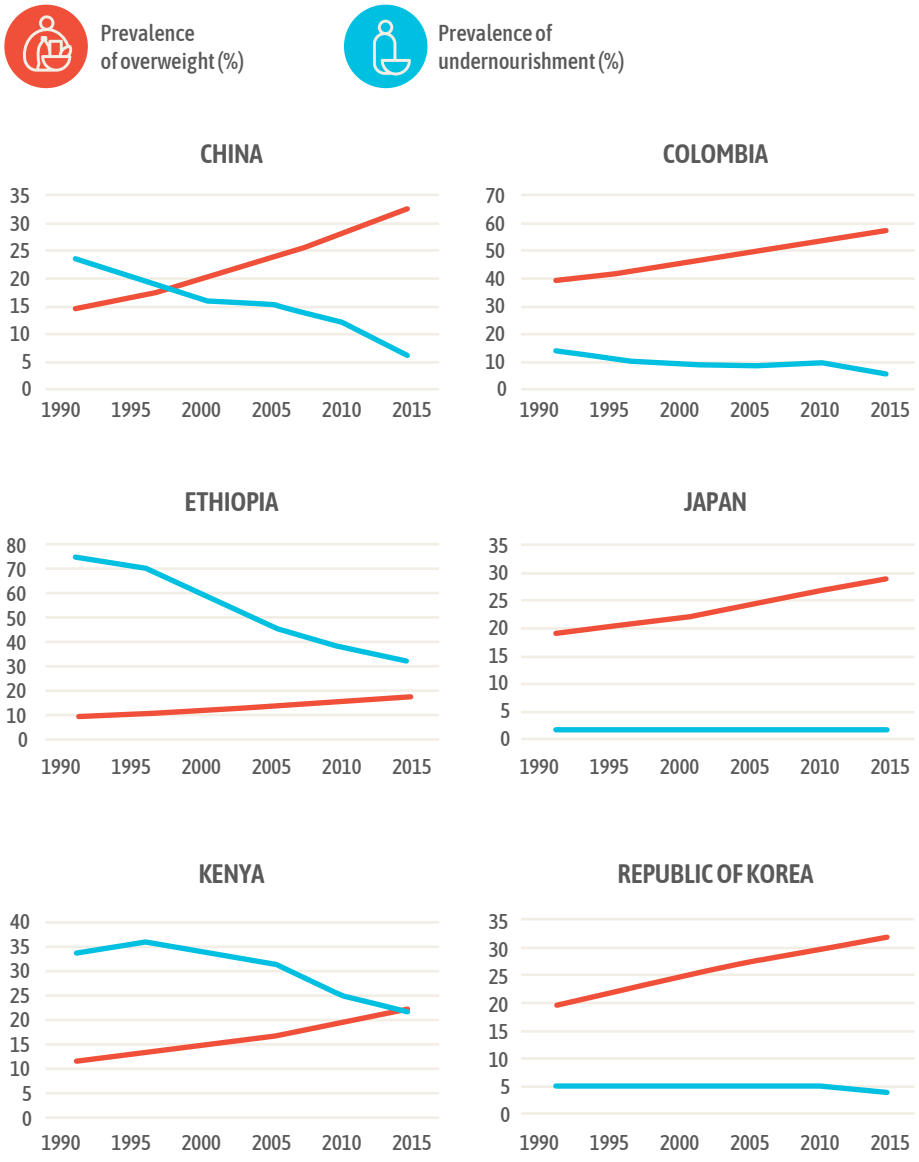


Source: (WHO, 2024b)

The negative effects of the current approach to ending hunger have created a double burden of malnutrition for children

Those negative effects are powerfully illustrated in the experiences of China, Colombia, Ethiopia, Japan, Kenya, and the Republic of Korea (Figure 4**)**. Between 1990 and 2022, Colombia and China made significant progress in eradicating hunger, but the levels of overweight have skyrocketed. Korea and Japan had already eradicated hunger by 1990, but their overweight numbers have continued to climb. Ethiopia and Kenya, on the other hand, have not yet succeeded in eradicating hunger, but their overweight numbers are climbing fast, placing them on the same trajectory as China and Colombia. The preferred path would be to eradicate hunger without dramatically increasing the number of overweight and obese, two factors linked to chronic health problems. Healthy diets are the clear connector to this preferred path.

Figure 4: Prevalence of undernourishment and overweight among adults aged 18 years and older, 1990 - 2015



Source: Authors' own based on Vos et al., 2020

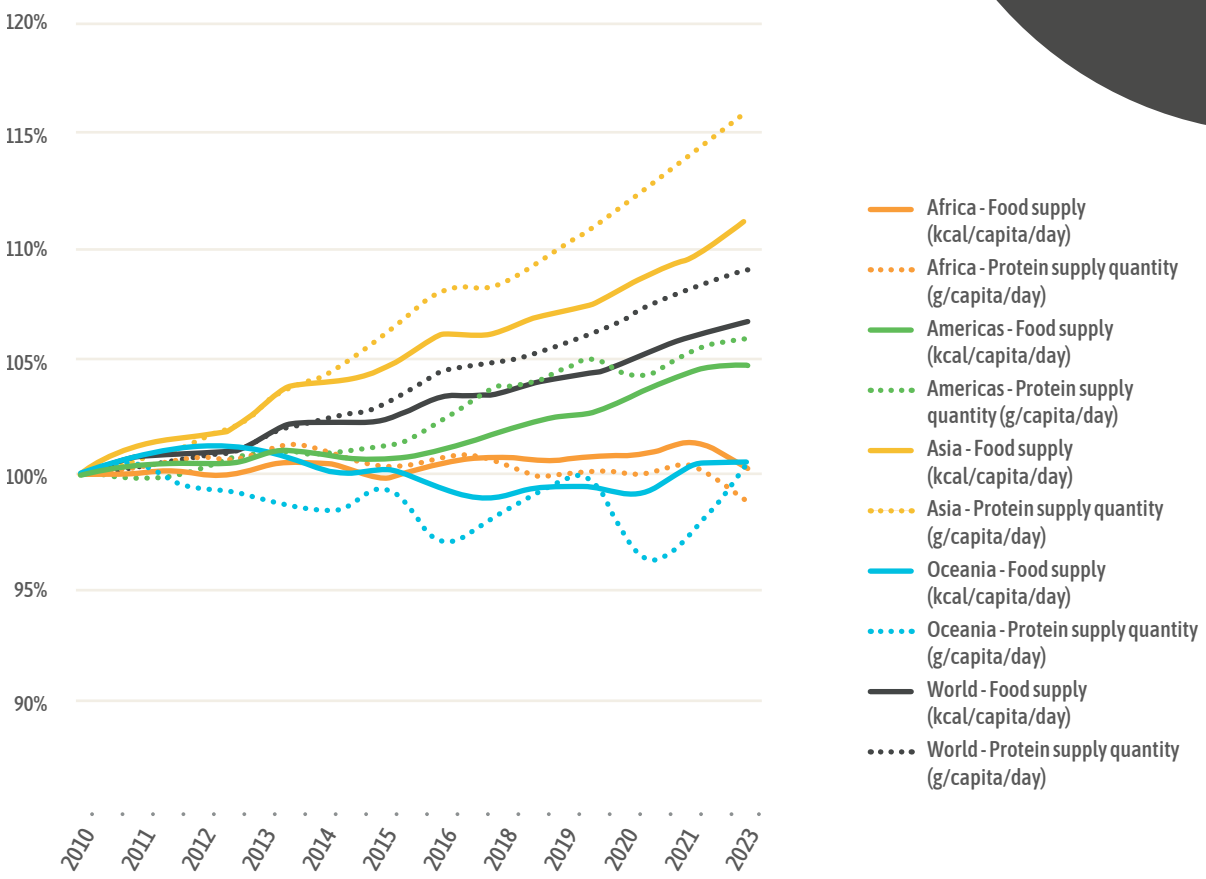
Countries have made significant progress in eradicating hunger but levels of overweight continue to climb

The consequences of exposure to hunger and malnutrition are more severe for people living in low- and lower-middle-income countries. Apart from the short-term risk of morbidity and mortality, the long-term consequences of hunger and all forms of malnutrition include greater risk of impaired cognitive function and physical development, obesity, and non-communicable diseases (NCDs). These impacts are both intra- and inter-generational (Popkin et al., 2020; Uauy et al., 2011; Wells et al., 2020). These populations are also more likely to continue to succumb to the cycle of poverty that worsens hunger and all forms of malnutrition. Additionally, treating people with multiple forms of malnutrition is very expensive for the health budgets in developing countries (Hoddinott et al., 2013; Li et al., 2023).

Agricultural development has been highly successful at increasing the supply of staple foods and proteins. The world continues to produce more food per inhabitant every year, including more proteins (Figure 5). There is enough food to feed the world, or rather, enough staples and proteins.

Food and protein supply continue to grow, but unevenly across regions

Figure 5: Evolution of food supply and protein supply per capita (2010 = 100%)



Source: FAOSTAT, accessed March 2026

The problem is not the lack of calories, but the lack of diverse foods needed for healthy diets, the discrepancies between where it is produced and where it is consumed, and the inability of vulnerable populations to buy it. For example, populations in Asia and Latin America have increased their supply of staple foods and proteins, with corresponding declines in hunger and poverty, while populations in Africa and Oceania have stagnated or reduced their supply of staple foods and proteins, with corresponding increases in hunger and poverty (FAO & IFPRI, 2020). While many middle-income countries, on average, produce enough fruit and vegetables to meet the recommended levels established by the WHO and FAO, low-income countries have had little growth in average vegetable production and availability remains below recommended consumption levels (Schreinemachers et al., 2018).

Affordability of healthy diets remains a major obstacle in both low- and middle-income countries. Healthy diets remain economically out of reach for most people living in low- and middle-income countries. A healthy diet costs US$ 4.50 per day (global mean) (FAO et al., 2025), while 44 percent of the global population lives below US$ 6.85 a day (FAO et al., 2024). Poverty and a lack of access to healthy diets go hand in hand, affecting 3.2 billion people, or one in three people, globally (FAO et al., 2024).

3. Reversing structural failures by realigning incentives

The current agriculture and food system reflects multiple structural failures in how governments invest in and incentivise production, markets, and consumption patterns. For the past 50 years, policies have promoted the production and marketing of staple and oilseed crops through price incentives, subsidies for seeds and fertilisers, and grain procurement for food security stocks, among other measures (Pingali, 2015). These policies have limited incentives for farmers to diversify their production systems (Bowman & Zilberman, 2013; Pingali, 2015).

Agricultural subsidies overwhelmingly favour staple foods—especially maize, wheat and rice—followed by beef, milk, and sugar. Since the Green Revolution period, these subsidies have contributed to higher production of and lower prices for staple foods, while simultaneously phasing out farming of more nutrient-dense crops and crops that do not receive the same level of government support, thus reducing diversity and nutrient density in the local food supply (Hoekman, B. et al., 2004; Kataki, P.K., 2002; Pingali, 2015; UNCTAD & FAO, 2017; World Bank & IMF, 2012).

Subsidies have distorted markets globally, regionally, and nationally towards cereals (Bowman, M.S. & Zilberman, D., 2013; Rodríguez-Mireles, S. et al., 2021) and disincentivised production of more nutritious foods, such as fruits, vegetables, and pulses (DeBoe, G, 2020; FAO, 2015). This directly impacts price and availability and creates a disincentive for people to diversify their diets, especially the poorest and most vulnerable (World Bank & IMF, 2012). Subsidies have also impacted the food industry which has used these abundant and cheap staple foods to produce low-cost, unhealthy inputs, such as high-fructose corn syrup made from maize and oils containing saturated fats (Abay, K.A. et al., 2022; Siegel, K.R. et al., 2016). There is an explosion of readily available, inexpensive, heavily marketed unhealthy foods that are energy dense, but nutrient poor (Lancet, 2025).

At the same time, extreme levels of concentration in food and agricultural markets are allowing some companies to charge excessive margins on seeds, fertilisers, animal feed, eggs, and poultry— all products that are critical to the economically vulnerable and that can support diversification to more nutritious foods and healthy diets (Cheng, 2020; International Finance Corporation, 2021; Roberts, 2020). Since the firms that sell the inputs control prices and large buyers control the market for their outputs, consumers pay inflated prices, while small- and medium-sized producers are squeezed both upstream and downstream (Christiaensen & Martin, 2018; OECD, 2018; Paelo et al., 2018; Tups & Dannenberg, 2023; Vilakazi & Roberts, 2019). The processing sector is also heavily concentrated in many developing countries—specifically in Africa—so SMEs struggle to enter and compete with large firms (Buthelezi et al., 2023). At the retail level, consumers in African cities pay higher food prices than in other developing countries (Allen, 2017; Nakamura et al., 2020), thereby limiting accessibility of food and driving food insecurity (Baulch et al., 2021; Bell et al., 2020; Cedrez et al., 2020; Ochieng et al., 2019; Sitko & Chisanga, 2017).

The diets of smallholder farming households in low- and middle-income countries are adversely impacted by these dysfunctional markets. When a farming system caters to export crops or staples, it produces very little for local consumption. Any shocks that slow export markets, such as pandemics or wars, can immediately impact farmers' livelihoods and increase food insecurity. Meanwhile, diets in peri-urban and urban areas are increasingly shaped by the increased availability of low-cost, heavily marketed unhealthy foods, often high in fat and sugar, and the unavailability and high cost of healthy foods. Limited options drive poor food choices, leading to increased consumption of unhealthy foods. This puts food-insecure people on a lifelong trajectory towards poor health conditions, including non-communicable diseases (Wells et al., 2020).

Agriculture remains the first line of defence against hunger and malnutrition. Investing in nutrition-sensitive agriculture ensures that agrifood systems deliver not just more food, but more healthy food, while addressing systemic issues that hinder efforts to eliminate hunger and all forms of malnutrition. A portfolio of interventions across agrifood systems can link food produced on the farm with people's dietary needs, including those populations that are nutritionally vulnerable, such as children, pregnant women, rural communities, and increasingly, urban populations (Ruel et al., 2018).

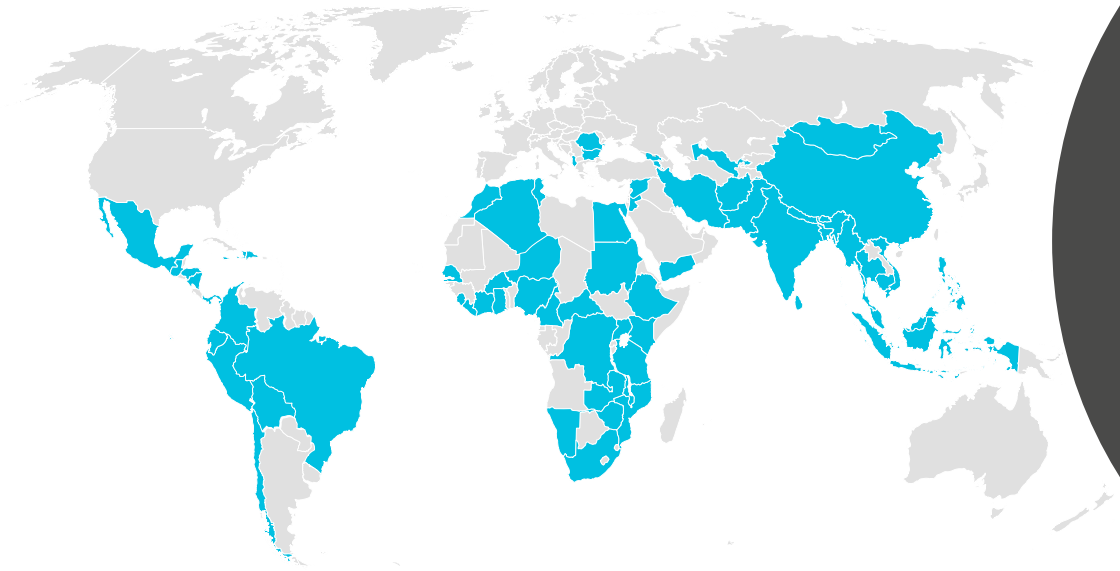
Image generated in adobe firefly by Gemini 3.1, 2026

4. Method for identifying and selecting the ten high-impact interventions

Identifying, selecting, appraising and synthesising the evidence

The ten high-impact intervention areas presented in this report come from 1,732 individual studies across 83 countries and are drawn from 52 high-quality systematic reviews and meta-analysis published over the past 20 years (Figure 6).

Figure 6: Country coverage for the 1,732 studies included in the 52 reviews



83
Countries

1,732
Individual studies

52
High-quality reviews

Source: Authors' own

Systematic reviews provided the scientific foundation for the ten high-impact interventions. By following established protocols to identify, select, appraise, and synthesise literature, they ensure consistency and transparency in how evidence is assembled and interpreted (Gurevitch et al., 2018). The interventions analysed in this report were identified through a "review of reviews," or umbrella reviews. Umbrella reviews synthesise evidence from multiple systematic reviews and meta-analyses, rather than individual primary studies as in a single systematic review, to provide a higher-level view of what is known across a topic (Aromataris et al., 2015). This approach is especially useful in fields with a large and fragmented body of review-level evidence, or where multiple outcomes are of interest, as it consolidates findings to show where evidence is consistent, where it diverges, and where gaps remain. It is also more time- and cost-efficient than conducting multiple new systematic reviews and is well suited to address strategic or policy-oriented questions that compare a range of interventions and identify those with the strongest and most reliable evidence base.

However, this approach towards standardisation can narrow what counts as valid evidence. Strict inclusion criteria and reliance on published and peer-reviewed sources may exclude context-specific knowledge and practitioner insights. Systematic reviews are also not designed to address normative questions (Owens et al., 2026). They cannot determine who holds responsibility, how duties are allocated, or how rights are defined and protected. These are inherently political and ethical considerations within the domain of policy. Policy plays a generative role in shaping how evidence is interpreted and applied, and must be continuously created, debated, and adapted. While systematic review evidence can inform these processes, it must be considered alongside lived experience, values, and broader social context (Schneider et al., 2025).

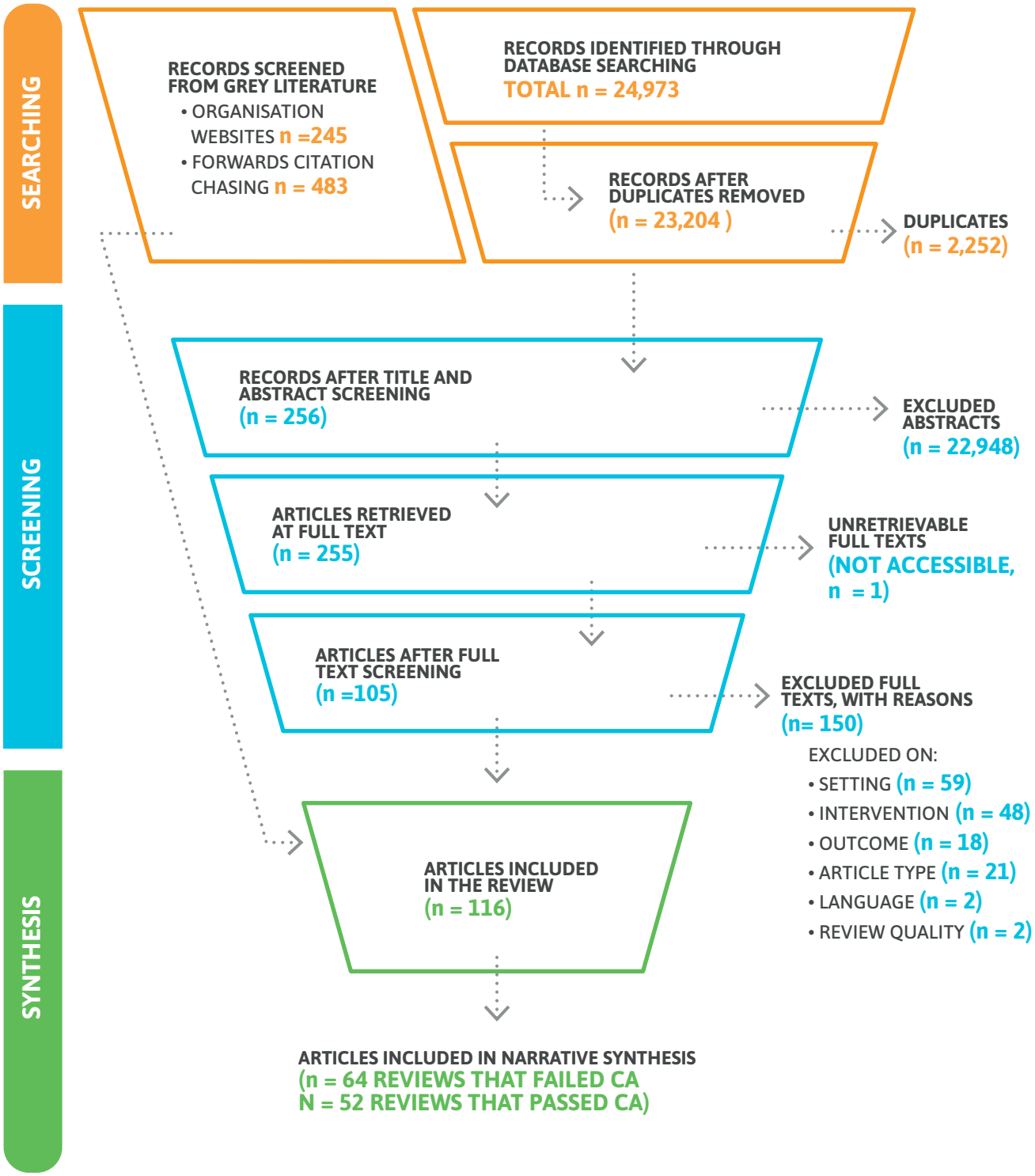
The search was deliberately broad, drawing on multiple sources to minimise the risk of missing relevant work. Database searches returned nearly 25,000 records. These were supplemented by searches of organisational websites and forward citation chasing from already-identified reviews — an important step, since a significant share of agricultural research relevant to LMICs exists outside of peer-reviewed journals and would be invisible to database searches alone. After removing duplicates, just over 23,200 records were screened at the title and abstract level. This narrowed the pool to 256 records taken forward for full-text review. Of the 255 articles successfully retrieved, 150 were excluded for documented reasons — most commonly because they did not match the required geographic setting (59 records), did not evaluate a relevant intervention for our outcomes (48 records), or did not report on outcomes of interest (18 records). Smaller numbers were excluded based on article type, language, or review quality. This process yielded 116 reviews included in the overall review (Figure 7, see full list of 116 reviews here).

To be eligible, studies had to focus on nutrition-sensitive interventions operating through agrifood systems and report outcomes across three broad domains: food security and diet quality, nutritional status, and wider household-level outcomes including food affordability, income, agricultural productivity, and women's empowerment (See Annex I for a full list of outcomes and indicators). Within food security, we captured household-level food access, dietary composition, protein intake, and both individual and household dietary diversity. For nutritional status, we tracked a comprehensive range of indicators spanning child growth outcomes, including stunting, wasting, and underweight, alongside micronutrient deficiencies such as iron, vitamin A, zinc, iodine, vitamin D, calcium, and folate, as well as overweight and obesity. We also recorded data on breastfeeding practices, where reported.

Beyond nutrition, the framework captured women's empowerment in agriculture, household income from on- and off-farm activities, and agricultural productivity, including the diversity of crops and livestock produced.

All evidence had to be drawn from low- and lower-middle-income countries, or from mixed-income studies where LMIC-specific data could be extracted separately. Reviews using any synthesis method (meta-analysis, narrative synthesis, or scoping approaches) were eligible, provided they were published from January 2008 onward and available in English, Spanish, or French. The 2008 start date was chosen to capture evidence generated since the first global food price crisis, a turning point that significantly reshaped international thinking on food systems and nutrition.

Figure 7: Method for identifying and selecting evidence

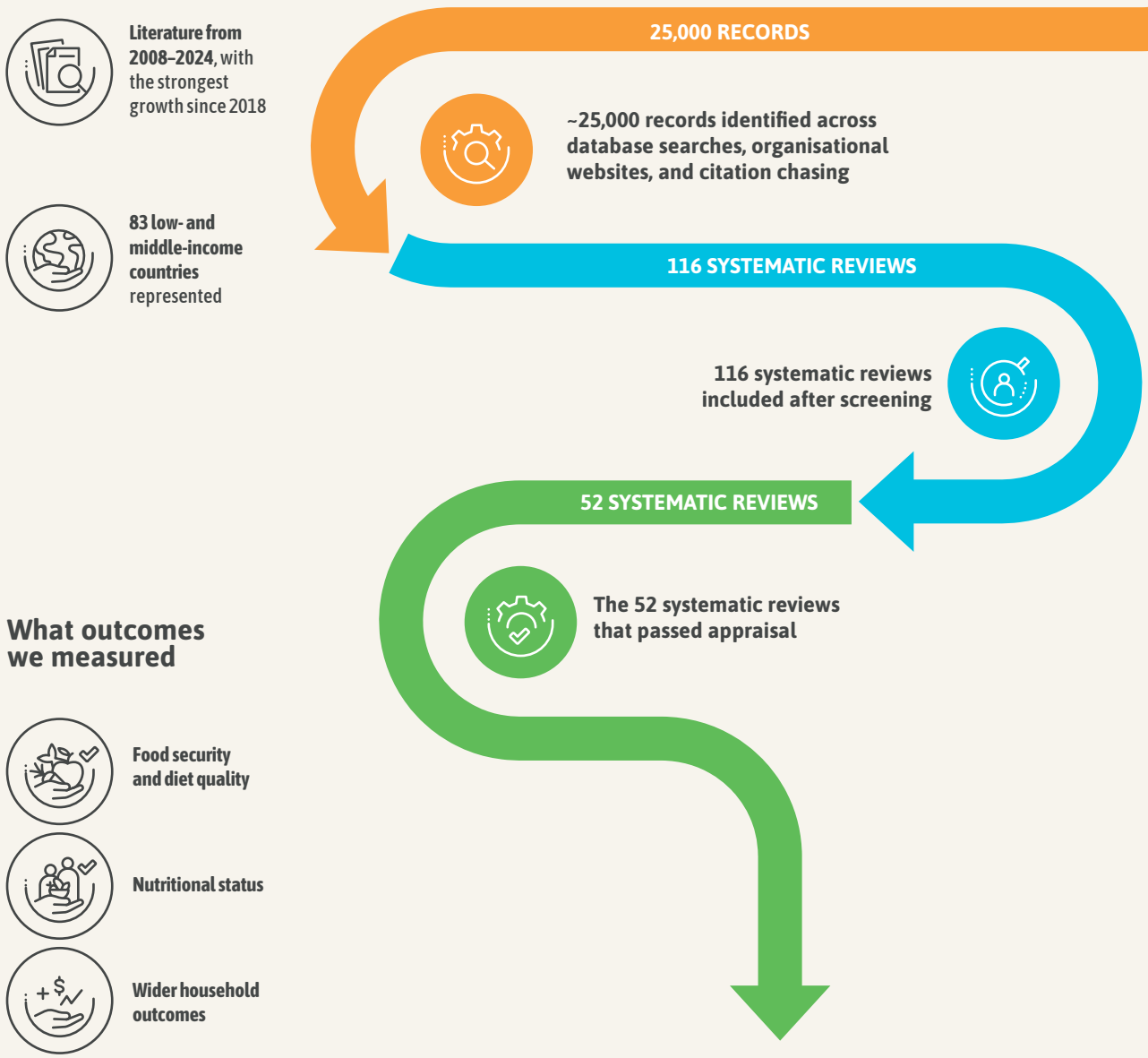


Source: Authors' own

Inclusion in the review was not sufficient on its own. Each of the 116 reviews was then subjected to independent critical appraisal to assess methodological rigour and reporting transparency, using the Collaboration for Environmental Evidence Synthesis Assessment Tool's (CEESAT) criteria for Evidence Overviews (Annex 2).

The 52 systematic reviews that passed appraisal collectively cover 83 low- and lower-middle-income countries and employ a range of synthesis methods: 27 used meta-analysis, 21 used narrative synthesis, one used meta-regression, and three were scoping reviews (Box 1). They evaluated nutrition-sensitive interventions either in isolation or in combination with complementary approaches. The body of evidence has grown substantially in recent years — qualifying reviews were modest in number through 2018 but increased steadily thereafter, with the largest concentration published between 2021 and 2022 and a cumulative total exceeding 50 by 2024. This upward trend reflects deepening scholarly and policy attention to the role of agrifood systems in addressing hunger and all forms of malnutrition across low- and lower-middle-income countries, and provides a meaningful and expanding foundation for the analysis and recommendations that follow.

Box 1: Where does the evidence come from?



Note: A full list of the 116 reviews assessed, along with reasons for their exclusion, is available in the annex.

Classifying and bundling interventions across agrifood systems

We classify interventions across the agriculture and food system to reflect how diets can be improved through both supply- and demand-side pathways, and the markets that connect them. We use three broad categories: producing sustainably and nutritiously (production), boosting fair and efficient markets (markets), and consuming healthy diets (consumption).

Producing sustainably and nutritiously includes interventions that enhance household-level food production to increase the availability of diverse, nutrient-dense foods. These include home gardens, livestock and poultry rearing, aquaculture, agroforestry, and improved seed systems. Evidence from 20 reviews in sub-Saharan Africa, South Asia, and Central America shows that these approaches can improve food availability and dietary diversity.

Boosting fair and efficient markets focuses on improving access, efficiency, and safety within agrifood systems. These interventions include market linkages for smallholder farmers, input subsidies and financing, storage and post-harvest systems, market information services, and infrastructure such as roads and electricity, or processing facilities for food fortification. Food safety interventions, covering the handling, preparation, and storage of food, are also critical to ensuring that increased food availability translates into healthy diets. Three reviews assessed interventions in this category.

Consuming healthy diets includes interventions that directly shift and influence diet choices. These include nutrition education, food fortification, social safety nets (e.g., cash transfers), social and behaviour change communication (SBCC), and school meals. This is the most extensively studied category, with 31 reviews contributing to the evidence base.

This is a simplified categorisation of a complex system. Missing from this representation is a more complex analysis of the food environments: the physical, economic, political and sociocultural contexts in which each consumer engages with the food system. To account for this, policy levers—such as regulation, pricing, and market incentives—play a central role in influencing dietary behaviour, while sustained improvements in diet quality depend on integrated approaches that operate across multiple sectors and levels of the food system. This was beyond the scope of this report, which focuses on the role of donors in investing in nutrition-sensitive interventions in agrifood systems to improve access, availability and affordability of healthy diets for the poorest and most vulnerable populations in low-income countries.

Across all categories, interventions are rarely implemented in isolation. Instead, they are frequently bundled together to address multiple constraints simultaneously. Common combinations include bundling agricultural interventions with nutrition education, training, or SBCC, and, less frequently, with social safety nets. For example, home garden programmes are often combined with inputs such as seeds, livestock, or aquaculture. We build on reports, such as the 42 policies and actions for food systems (Hawkes et al., 2020), which present a consolidated set of policy actions with clear pathways to impact. This report focuses on how interventions, particularly those linked to the agricultural sector, can be strengthened and expanded to better support improved diet and nutrition status. Bundling interventions and sequencing their rollout over the short-, medium-, and long-term will maximise their impact and effectiveness and reduce overall costs.

Gaps in cost-effectiveness data

Across the evidence base, there are significant gaps in data on what interventions cost and how they are implemented. Consistent with findings from other systematic reviews in agricultural development, many studies provide limited detail on delivery mechanisms and targeting strategies, making it difficult to assess how and why interventions succeed in specific contexts (Acevedo et al., 2020; Baltenweck et al., 2020; Lipper et al., 2020).

Cost information is particularly limited. Only 11 (21 percent) of the reviews included in this synthesis reported any evidence on cost-effectiveness. This reflects a broader pattern in the literature: there is relatively little robust evidence on the cost-effectiveness of agricultural interventions aimed at improving nutrition outcomes, with the most consistent findings limited to biofortification and food fortification (Wun et al., 2022).

These gaps have important implications for donor decision-making. While many of the interventions identified in this report are supported by evidence of effectiveness, and are often grounded in strong practical logic, the lack of comparable cost and implementation data makes it difficult to assess their relative priority, particularly for governments and donors operating under tight budget constraints. In turn, this raises questions about the feasibility of delivering some interventions at scale, especially in resource-limited settings.

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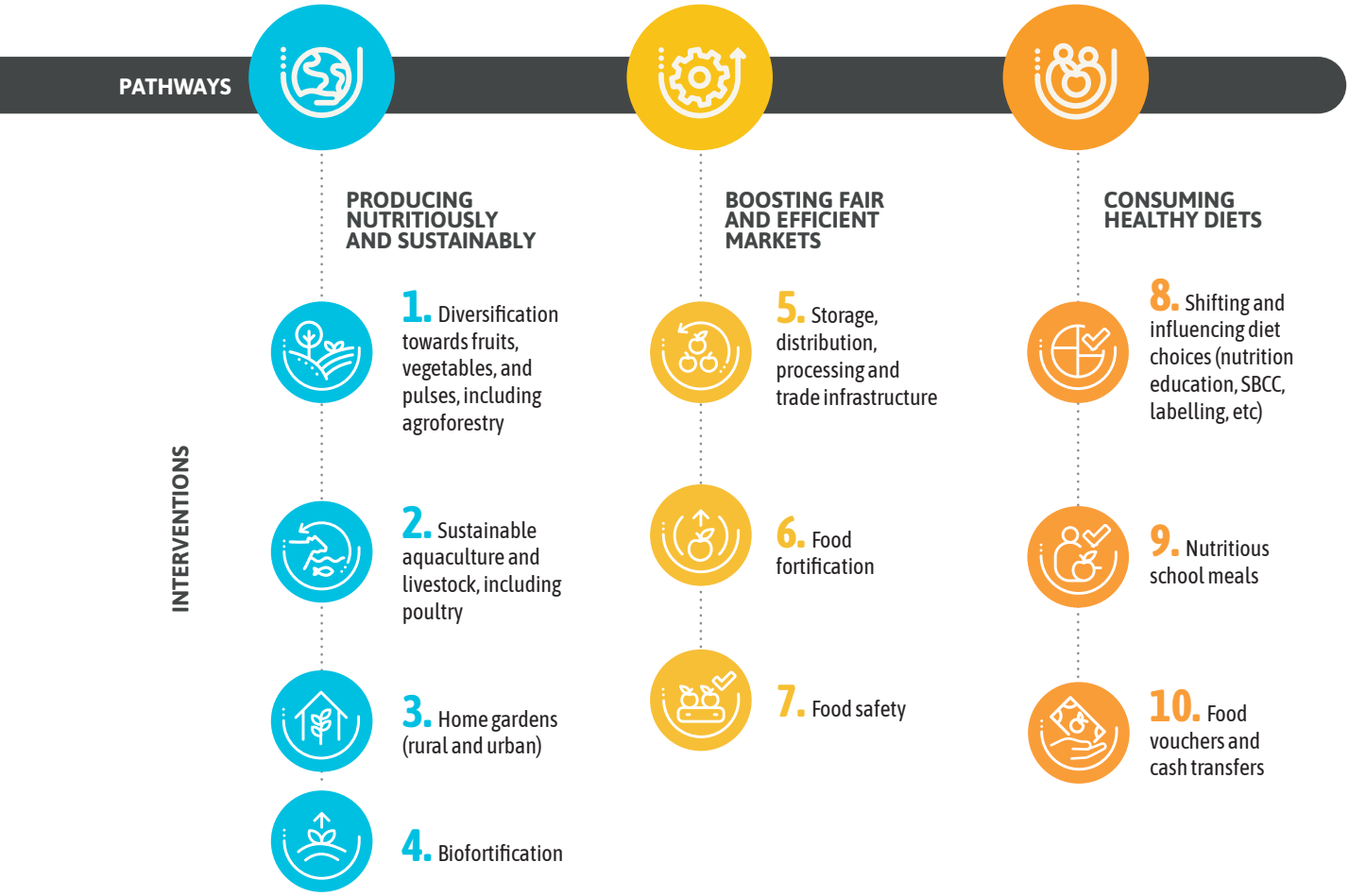
5. Ten high-impact interventions to end hunger differently

This report provides donors and governments in low-income countries with ten high-impact nutrition-sensitive interventions in agrifood system to contribute to ending hunger and all forms of malnutrition. The ten high-impact areas are: (1) diversification towards fruits, vegetables, and pulses, including agroforestry, (2) sustainable aquaculture and livestock, (3) home gardens, (4) biofortification, (5) storage, distribution, processing and trade infrastructure, (6) food fortification, (7) food safety, (8) shifting and influencing diet choices (through nutrition education, social and behavioural change communication (SBCC), labelling, etc.), (9) nutritious school meals, and (10) food vouchers and cash transfers (Figure 8). The focus is on promoting healthy diets as an essential albeit insufficient way to address each form of malnutrition. The interventions in agrifood systems need to accompany a multi-sector response in health, education, water, sanitation, and hygiene, and social protection. While social protection programmes are not strictly agrifood interventions, some of these are included in this report given the close and direct link to improve dietary outcomes, particularly for children, adolescents, and women of reproductive age.

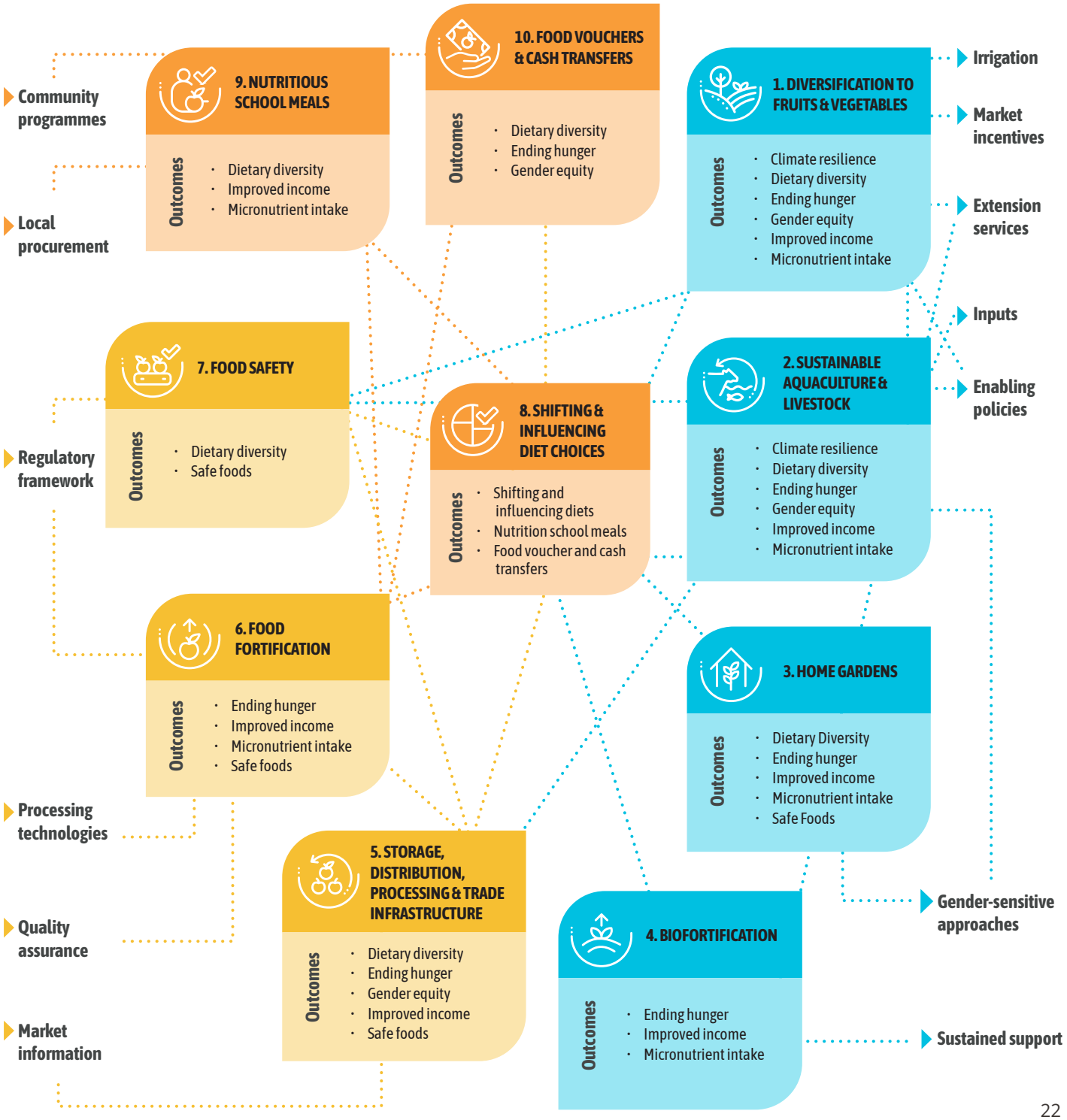
Figure 8: Ten high-impact interventions to end hunger differently



To be effective, interventions need to be implemented in bundles (Figure 9). The value of bundling a portfolio of interventions reduces overall costs and enhances effectiveness. None of these interventions work in isolation, and none produce nutritional outcomes without specific and intentional nutrition objectives in the design and implementation of the interventions. None will protect the environment unless environmental trade-offs are identified, measured, and mitigated. This requires a systems approach.

Multiple positive outcomes can be achieved by bundling interventions

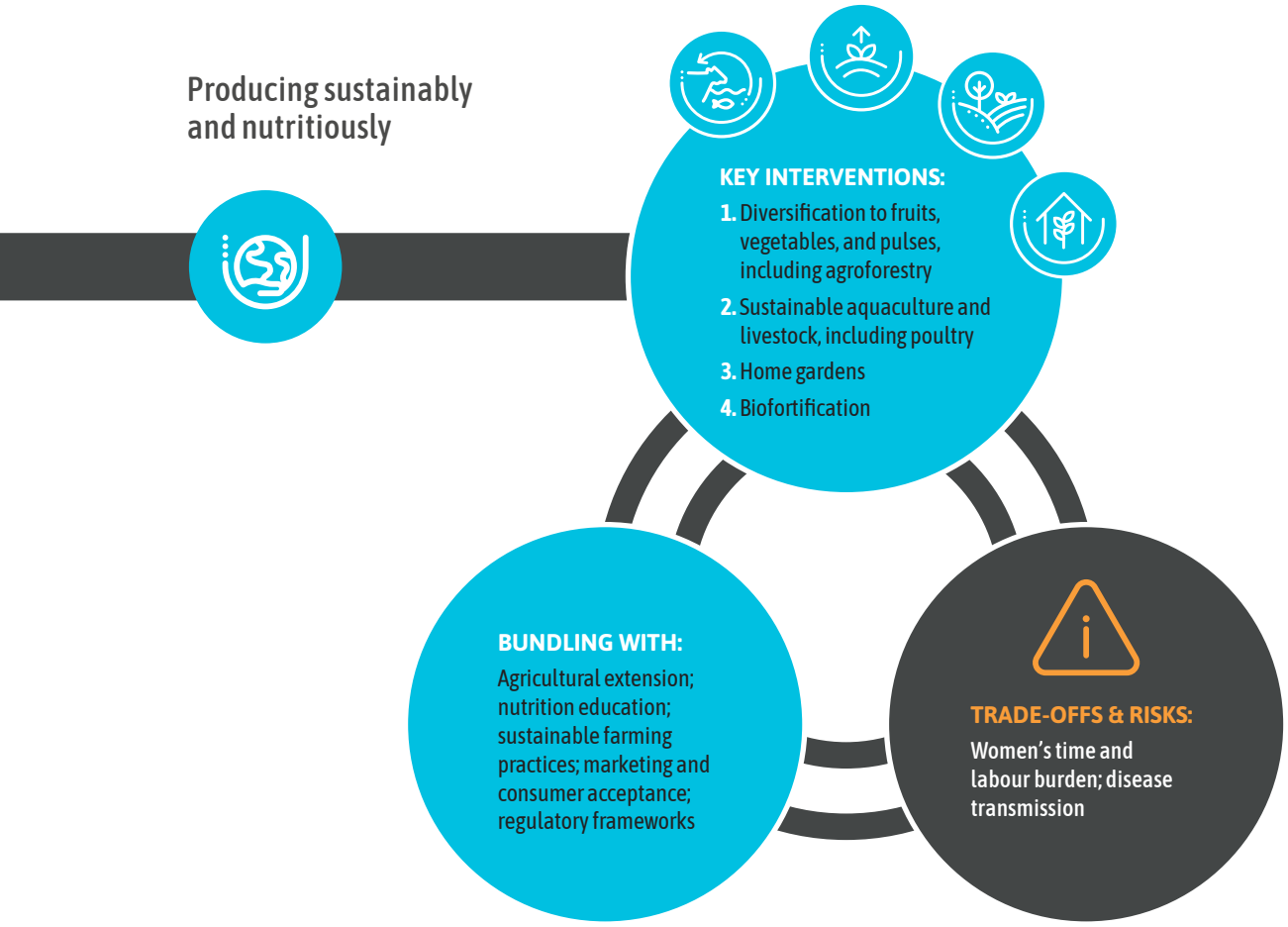
Figure 9: Bundling the ten interventions areas to achieve multiple outcomes



Producing sustainably and nutritiously

Diversification to fruits, vegetables, and pulses, including agroforestry systems that integrate tree crops into farming landscapes, are effective at improving soil health, biodiversity, and access to nutrient-dense foods. Sustainable aquaculture and livestock interventions, when bundled with training and nutrition education, have been shown to increase household dietary diversity by improving access to animal-sourced foods. Home gardens are cost-effective and have a clear and direct causal pathway to improve dietary diversity, household food security, and increased consumption of nutrient-dense foods. Biofortified crops, such as vitamin A-rich, orange-fleshed sweet potatoes (OFSP) in Mozambique and Uganda or iron-rich beans in Rwanda, offer a very affordable, cost-effective way to reduce micro-nutrient deficiencies.

Bundling is essential. When households received inputs like vegetable seeds, livestock, or fruit trees without accompanying training on production techniques, food preparation, or child feeding practices, gains in yield or income often fail to translate into improved diets or nutritional status. Interventions also operated within household power dynamics that shaped who benefits. While many programmes in low- and lower middle-income countries improved access to animal-source foods at the household level, these gains were not always shared equitably. In several cases, women did not consume more nutrient-dense foods despite greater household availability (Girard et al., 2012). This highlights the importance of gender-responsive or gender-transformative approaches that address intra-household decision-making, control over resources, and access to services (Box 2).



Box 2: Cross-cutting priorities: gender equality and climate adaptation

Interventions that involve women in decision-making, asset ownership, and training, such as targeted cash transfers, nutrition education, or home gardens, have shown stronger impact on dietary diversity, child growth, and household resilience (Girard et al., 2012; Leroy et al., 2021; Owusu-Addo et al., 2018). For instance, programmes that integrated nutrition education with home gardens or distributed fortified foods reported better outcomes when women had control over resources and participated in delivery mechanisms (Keats et al., 2021; Leroy et al., 2021).

As climate variability intensifies, agrifood systems face growing risks—ranging from shortened growing seasons to higher rates of food spoilage and infrastructure strain. Adaptation measures such as climate-resilient seeds, improved storage that withstands temperature fluctuations, and diversified production systems can buffer these shocks (Keats et al., 2021; Marion et al., 2024). Programmes that bundle fortification and processing technologies with climate-smart agriculture are better positioned to protect nutritional outcomes. For example, cold chain improvements have helped preserve nutrient quality in fortified foods under heat stress, while drought-resilient home gardens support year-round access to vegetables and vitamin A-rich crops like OFSP (Das et al., 2013; Keats et al., 2021; Leroy et al., 2021).

Climate shocks often affect women disproportionately, as they typically have fewer adaptive resources and less access to decision-making power. Gender-responsive approaches that integrate climate adaptation—such as pairing drought-tolerant crops with training and nutrition education for women—can improve food security, increase dietary diversity, and build long-term resilience (Escher et al., 2024; Leroy et al., 2021). Addressing gender and climate together strengthens the design and delivery of nutrition programmes, creating multiplier effects for equity, health, and sustainability.

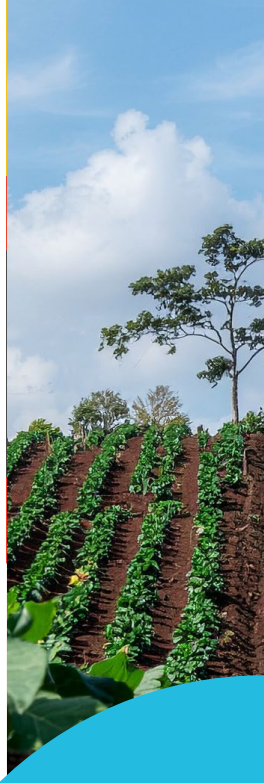
Sources: Escher et al., 2024; Marion et al., 2024; Keats et al., 2021; Leroy et al., 2021; Owusu-Addo et al., 2018; Das et al., 2013; Girard et al., 2012.

1 Diversification to fruits, vegetables and pulses, including agroforestry

Seed interventions focusing on fruit trees and nutrient-dense vegetables resulted in improvements in dietary diversity in LMICs (Nabuuma et al., 2022). In Mozambique, an intervention combining seed distribution, farmer training, and market development resulted in higher dietary diversity and improved food quality (Nabuuma et al., 2022). Input subsidy programmes like Malawi's FISP improved child weight-for-height (WHZ), particularly for boys, but showed no consistent impact on other nutritional status indicators, limiting the evidence on long-term growth (Turner et al., 2018). Similarly, in India and Bangladesh, interventions aimed at distributing fruit trees and vegetable seeds resulted in increased vegetable consumption, while cereal and pulse intake remained unchanged (Leight et al., forthcoming). However, in Bangladesh there was no improvement in dietary diversity, despite the introduction of saline- and drought-resistant seeds under a climate-smart agriculture approach, as external factors such as education, livestock ownership, and market access played a more significant role in food choices (Nabuuma et al., 2022).

Agroforestry interventions worked well when integrated with fruit tree crops. Agroforestry interventions aimed at enhancing access to tree germplasm and promoting agroforestry practices contributed to dietary diversity (Castle et al., 2021). In Kenya, receiving agroforestry advice significantly increased the household dietary diversity score (Castle et al., 2021). Several agroforestry interventions contributed to improved food security by increasing food availability and access. Farmers with less than one acre of land saw an 82 percent increase in food crop value per acre, while those with one to two acres experienced a 66 percent increase (Castle et al., 2021). These findings highlight the potential of agroforestry in enhancing food security, particularly for smallholder farmers who lack access to conventional agricultural inputs. In addition, while there is no direct link to women's empowerment, some evidence suggests indirect benefits to women such as enhancing women's involvement in decision making and increased agricultural capacity (Adu et al., 2018; Castle et al., 2021; Sharma et al., 2021). Increased tree biomass and soil conservation from agroforestry practices led to improved energy provisioning services, reducing firewood collection time by an average of 180 minutes in some areas (Castle et al., 2021). This was particularly beneficial for women, who are primarily responsible for collecting firewood (Castle et al., 2021).

However, when households simply receive inputs, such as vegetable seeds, livestock, or fruit trees, without guidance on optimal production, food preparation, or child feeding practices, improvements in income or yields do not always translate into better diets or nutritional outcomes. This is where donors can enter to finance better design and targeting. The public sector is also required to intervene through incentives for farmers, extension services, and integration with climate-resilient agricultural initiatives (Box 2). These interventions require sustained support, market incentives, and farmer buy-in to overcome adoption barriers in low-income countries.



2 Sustainable aquaculture and livestock, including poultry

Evidence from LMICs shows that aquaculture interventions boosted fish production and household income by offering training on polyculture, new breeding techniques, and pond management. Aquaculture interventions significantly increased fish consumption by approximately 200 grams per household per month (Gonzalez Parrao et al., 2021). Supporting aquaculture value chains helped reduce the length of the hungry season in some cases (Gonzalez Parrao et al., 2021). In Bangladesh, an aquaculture initiative that trained smallholder farmers in polyculture fish farming techniques improved fish yields, boosted household incomes through increased fish sales, and enhanced dietary diversity by promoting the consumption of locally produced fish (Gonzalez Parrao et al., 2021). Fish is also accessible for many households, especially in rural areas where fortified products may be less available (Bird et al., 2019; Gonzalez Parrao et al., 2021).

While not part of the systematic review of evidence, recent research highlights that the expansion of aquaculture has increased access to nutrient-dense foods, particularly in regions where capture fisheries alone are insufficient to meet demand, thereby supporting food and nutrition security (Naylor et al., 2021). Much of this contribution comes from freshwater species that are consumed domestically rather than traded globally, underscoring their importance for locally procured diets. At the same time, the nutritional potential of certain fisheries—especially low-input systems such as molluscs and seaweed—remains underutilised (Naylor et al., 2021).

Livestock interventions in LMICs, when bundled with training and nutrition education, have been shown to increase household dietary diversity by improving access to animal-source foods (Bird et al., 2019). For example, in Nepal, Kenya, Malawi, Uganda, and India, poultry and livestock components improved household dietary diversity, egg consumption, and leafy vegetable consumption (Bird et al., 2019; Poulsen et al., 2015a). In Bangladesh, Mozambique, Zambia, Burkina Faso, and Nepal, dietary diversity was improved in livestock-integrated interventions, especially among children (Sharma et al., 2021).

The height and weight growth evidence, however, is mixed, with some studies reporting modest improvements in anthropometric indicators such as height-for- age (HAZ) and weight-for-age (WAZ) (Berretta et al., 2023; Bird et al., 2019; Hansen et al., 2022; Poulsen et al., 2015a; Sharma et al., 2021). The inconsistencies in effectiveness could be attributed to differences in the intervention bundle package.

In certain areas with difficult terrain or limited veterinary support, the effect on child growth and nutritional status in those contexts can be modest (Chen et al., 2021; Zerfu et al., 2023). Beyond nutrition, investments in integrated agriculture-nutrition programmes—especially those that enhance livestock productivity—can yield economic benefits, with returns of up to 1.6 times the initial investment (Flax et al., 2023). To maximise the impact of livestock programmes, it is essential to incorporate gender-sensitive approaches and mitigate disease transmission risks, ensuring that the benefits reach all household members equitably (Berretta et al., 2023; Bird et al., 2019; Castle et al., 2021; Doustmohammadian et al., 2022; Hansen et al., 2022; Poulsen et al., 2015a; Sharma et al., 2021).

3 Rural and urban home gardens

Rural home garden interventions in low- and lower-middle-income countries, when bundled with complementary approaches such as nutrition education, agricultural extension and training, seeds for fruits and vegetables, and small-scale irrigation support, are cost-effective and can support increases in household incomes, particularly when surplus production is sold on markets. They have been shown to enhance household food security by diversifying production and improving the supply of nutrient-dense foods (Adu et al., 2018; Ahmed et al., 2023; Berretta et al., 2023; Bird et al., 2019; Daccache et al., 2024; Doustmohammadian et al., 2022; Durao et al., 2020; Girard et al., 2012; Hansen et al., 2022; Poulsen et al., 2015; Pullar et al., 2018; Sharma et al., 2021; Watson et al., 2023). Some interventions demonstrated modest gains in child micronutrient status—particularly increased vitamin A—though consistent improvements in stunting or wasting are less frequent.

Home gardens can be a cost-effective intervention, with set-up costs as low as US$23 annually per garden, although some costs are reportedly up to US$240 (Lakzadeh, 2016; Schreinemachers et al., 2018). Bundling with complementary interventions is key. In successful rural home garden projects, participants received hands-on demonstrations in seed selection, pest management, and garden layout, plus tailored nutrition education that highlighted the importance of nutrient-rich vegetables and animal-source foods (Adu et al., 2018; Ahmed et al., 2023; Berretta et al., 2023; Bird et al., 2019; Daccache et al., 2024; Doustmohammadian et al., 2022; Durao et al., 2020; Girard et al., 2012; Hansen et al., 2022; Poulsen et al., 2015; Pullar et al., 2018; Sharma et al., 2021; Watson et al., 2023).

Urban home gardens or urban agriculture, such as providing sack gardens or chickens to urban households, demonstrated positive contributions to nutrition and food security (Poulsen et al., 2015a). Dietary diversity improvements were evident in several contexts. For example, in Uganda, preschool children in livestock-rearing households had higher dietary diversity scores, while in Zimbabwe, chicken rearing was significantly associated with improved diets (Poulsen et al., 2015a). Bundling with food safety training was key to preventing the transmission of disease (Poulsen et al., 2015a). The economic impact of urban agriculture has been notable, with farming contributing over 60 percent of urban household income in Madagascar and Nigeria (Poulsen et al., 2015). In Kenya, commercial urban farmers earned a steady income, demonstrating that urban agriculture can be a valuable source of livelihood and food security.

Home gardens improve food access but rely heavily on women's time and labour, often without compensatory income or decision-making authority (Box 2). They can also increase risks of disease transmission from livestock rearing. Without sustained support or evolution toward revenue-generating activities, these interventions risk becoming burdens rather than assets. Similarly, backyard livestock programmes may raise nutrition and income but also increase disease risk if not paired with food safety training.

Home garden interventions should be time-bound and used to target low-income households who currently do not have other economic opportunities available. Home gardens are effective at a household level, but do not provide long-term structural economic changes that are necessary to improve the availability, accessibility, and affordability of healthy diets. While setup costs are modest, sustained benefits depend on addressing those trade-offs.

4 Biofortification

Biofortification improves micronutrient intake through foods that are well-known and familiar. Biofortified crops also play a role in improving food security by increasing the consumption of nutrient-dense foods. In Rwanda, high-iron beans were consumed regularly by intervention households, with a national average of 211 g per capita per day (Huey et al., 2022). In Mozambique and Uganda, adoption of vitamin A-rich, orange-fleshed sweet potatoes (OFSP) led to significant dietary shifts, with 50 percent of children in the intervention group consuming OFSP at least three times in the past week, compared to less than 10 percent in control groups (Huey et al., 2022).

Biofortification also shows promise in improving dietary quality. Consuming OFSP in Kenya, Rwanda, Mozambique, and Uganda increased vitamin A intake and reduced deficiency rates (Huey et al., 2022). Iron-rich beans improved iron intake in Rwanda and Kenya, but iron status was not observed in Kenya among pregnant and lactating women and not reported in Rwanda (Huey et al., 2022). Zinc-fortified wheat varieties showed mixed but promising effects on zinc levels. However, the extent to which these interventions alleviated broader food insecurity remains unclear, as studies focused primarily on dietary changes rather than food access or availability.

Biofortification can be very cost-effective, costing US$15–$20 for each year of healthy life they help save (as measured by DALY) (De Steur et al., 2017). This makes them a very affordable way to improve diets compared to other methods (De Steur et al., 2017). Despite the effectiveness, the long-term impact from biofortification depends on consumer acceptance, farmer adoption, and sustained policy support, which has mostly not been forthcoming. Rather than spending more money on R&D in developing new technologies, effective biofortification programmes must integrate behavior change communication and agronomic training to ensure uptake and maximize nutritional gains (Ahmed et al., 2023; Doustmohammadian et al., 2022; Huey et al., 2022; Johnston et al., 2018; Nabuuma et al., 2022; Stewart et al., 2015).

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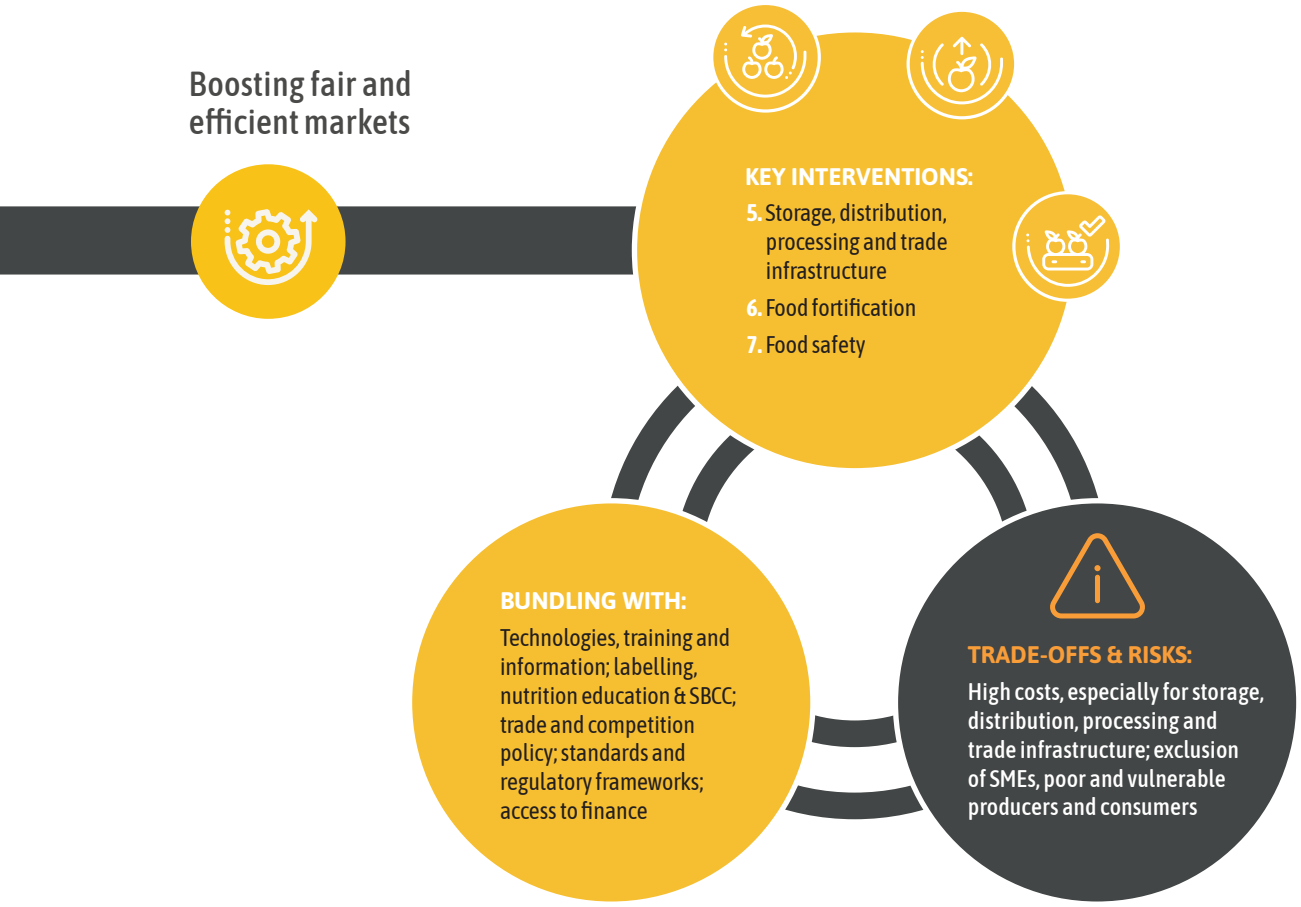
Boosting fair and efficient markets

Market-based interventions, such as storage, distribution, processing and trade infrastructure, offer strong potential to improve food security, productivity, and access to healthy diets in low-income countries, but only when designed to function within food environments that promote healthy diets. Fortifying food, particularly with multiple micronutrients, is effective for micronutrient deficiencies. Food safety interventions that focus on good agricultural practices, hazard analysis protocols, and hygiene training for food handlers, are effective in low-income countries to reduce risks associated with microbial contamination and toxin exposure.

Interventions work best when bundled with services that enable farmers and SMEs to participate fully in the market, by ensuring access to finance, technical support, and timely price or weather information (Marion et al., 2024). For example, when food fortification is paired with reliable storage and transport infrastructure, it can help preserve nutritional value and reduces losses, especially in supply chains that promote nutrient-dense foods. Similarly, combining food safety training with access to sanitation, clean water, and regulatory support increases compliance and protects public health.

However, the benefits are not guaranteed. Poorly designed interventions can reinforce existing inequities. Infrastructure investments often benefit better-connected or wealthier producers, while marginalised groups—particularly women and smallholders—remain excluded due to unequal access to land, credit, or market networks. Food safety reforms, if implemented without support for small-scale vendors, may unintentionally push them out of formal markets.



5 Storage, distribution, processing and trade infrastructure

Market-based interventions in low- and lower-middle-income countries—such as road and bridge construction, seed and crop storage systems, and mobile-based market information—have shown mixed effects across outcomes (Marion et al., 2024). Some gains in dietary quality were observed in families, such as increased consumption of maize, vegetables, and meat, though improvements in dietary diversity were inconsistent.

Investments in farm-to-market transport infrastructure showed small improvements in energy intake and anthropometric indicators in specific contexts, such as Gambia, and modest increases in dietary quality in Kenya (Marion et al., 2024). Market information services had limited impact on food security, except in the Philippines, where they modestly improved outcomes (Marion et al., 2024). Unsurprisingly, market information contributed to productivity gains, including increased maize yields in Nigeria and improved outcomes among smallholder horticultural farmers in Kenya (Marion et al., 2024).

Food processing plays a critical enabling role in the success and of other interventions. For example, food fortification requires facilities to process and fortify foodstuffs such as flour, salt, fish sauces, and grains, together with a regulatory environment that makes fortification mandatory. Processing technologies such as milling, extrusion, and drying are essential for producing foods that are shelf-stable, safe, and accessible. When aligned with public health goals, food processing can improve nutrient delivery and food safety, particularly through partnerships with small and medium enterprises.

The effectiveness of market-based interventions is under-evaluated, especially in terms of their impact on diet and nutritional outcomes. Further, market interventions are rarely delivered in a bundled manner—raising questions about whether greater spillover effects might occur when market interventions are combined with other multisectoral approaches.

6 Food fortification

Food fortification is effective at addressing multiple micronutrient deficiencies—vitamin A, iron, iodine, zinc, and folic acid. Evidence from multiple systematic reviews shows that fortification—particularly of staple foods and condiments—can improve key indicators of nutritional status in children and women of reproductive age. Multiple micronutrient powder interventions improved weight-for-height (WHZ) and weight-for-age (WAZ) in children aged 6–59 months (Das et al., 2013; Jalal et al., 2023).

Iron fortification consistently reduced anaemia prevalence and improved haemoglobin levels across a wide range of contexts, including in India, Cameroon, Guatemala, and Kenya (Centeno Tablante et al., 2019; Csölle et al., 2022; Das et al., 2013; Eichler et al., 2019; Jalal et al., 2023; Keats et al., 2021). Fortified condiments such as soy and fish sauce were particularly effective, showing reductions in anaemia of up to 47 percent (Jalal et al., 2023). Fortified staples, such as rice and wheat flour, also improved serum ferritin concentrations in children and women of reproductive age. Iodine fortification through iodised salt improved urinary iodine levels and reduced goitre prevalence. Folic acid fortification of wheat flour in women of reproductive age was associated with reduced folate deficiency and a lower incidence of neural tube defects. Vitamin A fortification demonstrated moderate improvements in serum retinol, though findings were less consistent when delivered as part of multi-nutrient packages. Zinc fortification showed strong results in school-aged children, but limited impact in infants at risk of undernutrition.

While some forms of fortification are feasible in low-income settings (e.g., iodised salt), fortification is unlikely to be viable for the very poorest countries and their consumers today. Fortification becomes cost-effective with industrialisation. Broader fortification efforts are most effective where industrial capacity exists, making this a highly effective strategy for middle income countries. However, the rise of ultra-processed foods raises concerns about the long-term dietary impacts of poorly regulated processing. As low- and lower-middle-income countries undergo dietary transitions, balancing the benefits of nutrient-preserving food processing with the risks of promoting unhealthy diets is an urgent policy challenge so as not to contribute to increased consumption of saturated fat, sugar, and salt. It is also important to ensure equitable access through the thoughtful selection of food vehicles and market reach which can help extend benefits to the most vulnerable populations. Furthermore, strengthening compliance, quality assurance, and monitoring systems will further support programme impact. It is crucial to tailor approaches to better reach young children, who often consume less (fortified) food than adults, to improve outcomes across age groups.

7 Food safety

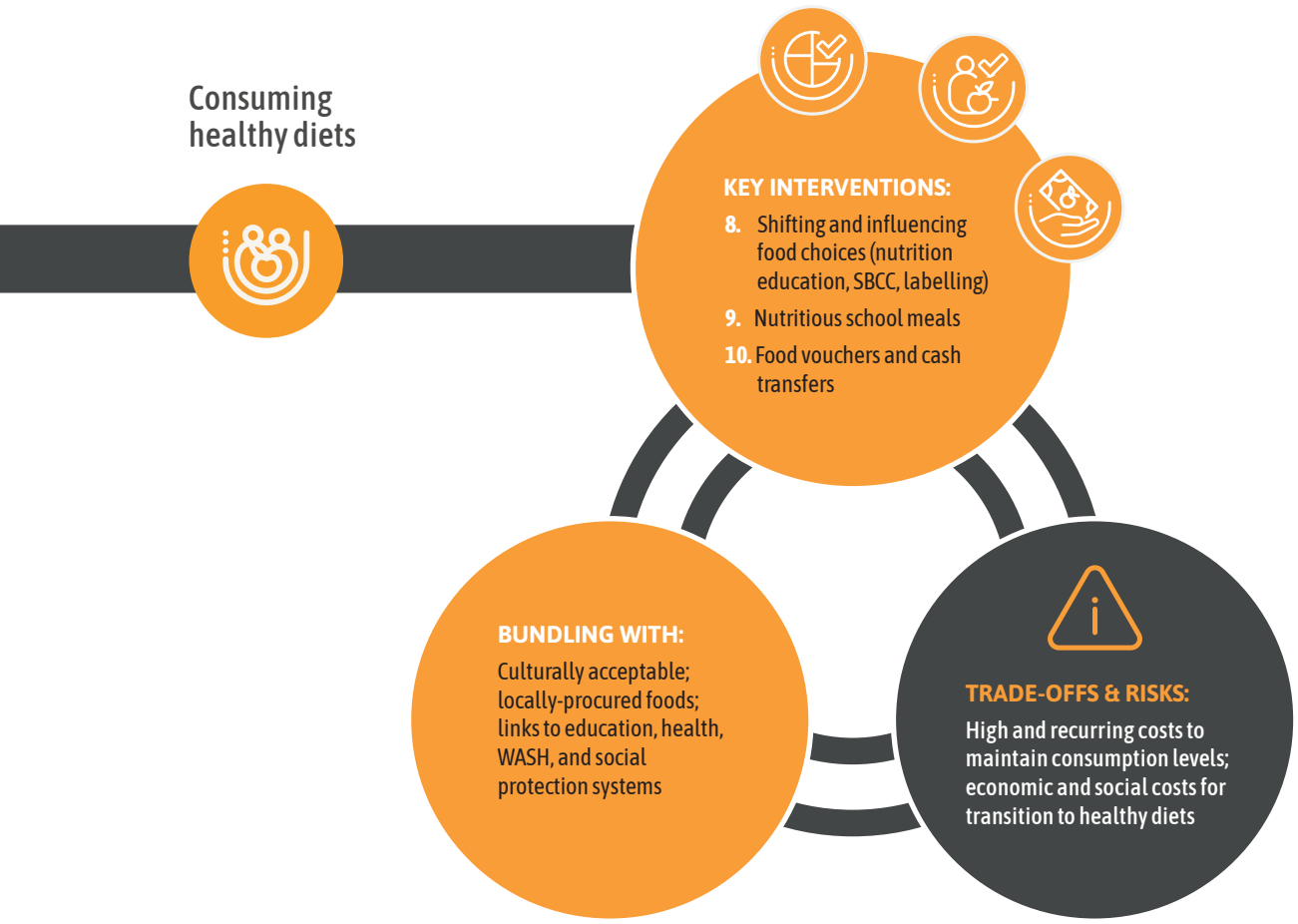
Food safety interventions play a critical role in reducing foodborne illnesses, ensuring product quality, and preserving the nutritional integrity of foods throughout the supply chain. By promoting good agricultural practices, hazard analysis protocols, and hygiene training for food handlers, these programmes effectively reduce risks associated with microbial contamination and toxin exposure (Kwoba et al., 2023). In East Africa, dairy value chain programmes that combined pasteurisation equipment with frequent food safety training significantly reduced microbial contamination, leading to safer milk products, reduced foodborne illnesses, and improvements in child health outcomes (Mahumud et al., 2022; Visser et al., 2020). Similarly, food safety education targeted at caregivers in Vietnam and India led to a notable reduction in diarrheal disease among children aged 6–24 months. In Kenya, Tanzania, and Zimbabwe, aflatoxin-reduction programmes that combined training for maize farmers with proper storage practices resulted in a 7 percent reduction in underweight infants (Visser et al., 2020). Vaccination and chemotherapy interventions led to a measurable decrease in the prevalence of disease-causing organisms.

Food safety is a critical but under-resourced area requiring sustained public investment and enforcement. Without routine inspection systems, maintaining these gains over time remains a challenge. Ensuring safe food across complex supply chains is politically and operationally challenging, particularly in low- and lower-middle-income settings. Weak systems disproportionately affect vulnerable populations. Food safety systems must evolve alongside broader food system transformation. Food safety interventions require strong regulatory frameworks, consistent enforcement, and public awareness campaigns to be effective. More advanced infrastructure requires strong institutional capacity and large upfront capital investment, particularly for smallholder inclusion. Strengthening food safety systems through standards, inspection, and cross-sector coordination should be treated as a core policy priority and aligned with One Health approaches.

Consuming healthy diets

Shifting and influencing diet choices through different food environments and reframing food choices by linking healthy diets to things that consumers care about is a critical connector between production, markets and consumption. Interventions such as nutrition education, social and behaviour change communication (SBCC), and labelling, which focus on improving knowledge, attitudes, and practices around diet choices, child feeding, and hygiene, are effective when bundled with other interventions. Social protections programmes, such as food vouchers, cash transfers, and school meals, are important enablers. While these are not strictly agrifood interventions, they are included in this report given the close and direct link to improve dietary outcomes, particularly for children, adolescents, and women of reproductive age.

School meals are cost-effective and can improve dietary diversity and household food security, when designed with nutrition objectives. Well-targeted cash transfers can stabilise household access to food and dietary diversity. Their effectiveness depends on size, regularity, and integration with complementary programmes like nutrition education and SBCC. For example, pairing cash transfers with nutrition education has been associated with greater dietary diversity gains than cash or food transfers alone (Leroy et al., 2021). Similarly, integrating school meals with local procurement and agricultural support can generate both nutritional and economic benefits (Hassanally et al., 2020; Leight et al., forthcoming; Wang et al., 2021). Bundled approaches are particularly important where single interventions may not sufficiently influence complex outcomes like child growth or dietary quality.



However, several trade-offs emerge across intervention types:

- **Implementation quality** significantly affects the impact. School meals depend on design, stable funding, reliable supply chains, local procurement, and community ownership. Without these, diet outcomes are limited, and food safety may be compromised.
- **Targeting and conditionality** in social safety nets can produce unintended effects. Conditional cash transfers tied to pregnancy or child benefits may inadvertently shorten birth spacing, while facility-based delivery requirements can strain public health systems or shift care away from preferred providers (Escher et al., 2024; Leroy et al., 2021).
- **Programme design may influence dietary diversity**. While food vouchers and subsidies improve access to targeted foods, overreliance on subsidised staples may reduce overall dietary diversity if household purchasing shifts away from nutrient-dense options (Andreyeva et al., 2022).
- **Cash transfers**, especially when unconditional, may be used to meet urgent non-food needs such as healthcare or debt repayment. While these uses improve overall well-being, they may dilute direct nutritional benefits unless paired with complementary services (Pega et al., 2022).
- **Behaviour change interventions**, while cost-effective and scalable, often yield modest nutrition gains in isolation. SBCC efforts have shown improvements in dietary diversity but remain insufficient to reduce stunting and wasting without concurrent investments in food access, healthcare, and sanitation (Mahumud et al., 2022).

8 Shifting and influencing food choices through nutrition education, SBCC, and labelling

These interventions are necessary for all other interventions to work but depends on other factors for success, such as local relevance of the messages, the frequency and duration of contact with participants, and the general food environment. A recurring finding is that well-structured education, counselling, and social and behaviour change communication (SBCC) interventions in all settings—covering topics like complementary feeding for young children or the importance of dietary diversity—often lead to measurable improvements in child feeding practices and, in many cases, moderate gains in child growth indicators (e.g., weight-for-age or height-for-age) (Mahumud et al., 2022). But, programmes that rely solely on messages without addressing underlying resource constraints—such as income or food availability—have limited impact on actual diets and nutritional status (Mahumud et al., 2022).

While SBCC is cost-effective and scalable, it often yields modest nutrition gains in isolation. SBCC efforts have shown improvements in dietary diversity but remain insufficient to reduce stunting and wasting without concurrent investments in food access, healthcare, and sanitation (Mahumud et al., 2022). Without concurrent improvements in food availability and affordability, changes in knowledge do not always translate into better diets.

Examples from South Asia and sub-Saharan Africa show that even short-term nutrition SBCC for caregivers can reduce underweight and stunting when it includes practical demonstrations (e.g., cooking sessions) and frequent follow-up (Mahumud et al., 2022). For example, training on improved farming techniques increases crop diversity and yield, supporting both household diet quality and income generation. Workshops that guided communities in poultry raising and traditional vegetable gardening led to measurable improvements in dietary diversity scores and minimum dietary diversity for women. These programmes work best when they include hands-on training, peer learning, and culturally relevant food production strategies.

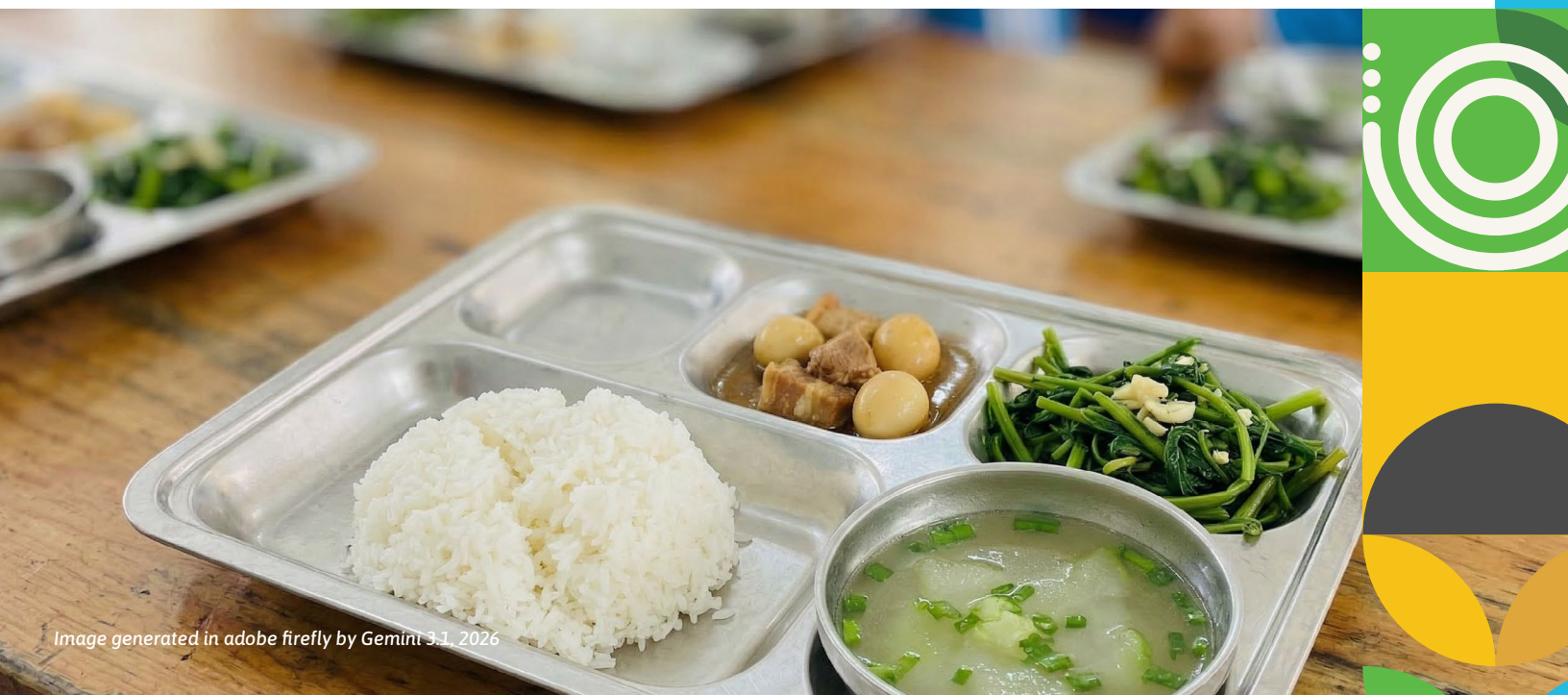
9 School meals

Overall, school meals are more effective at improving education outcomes than nutrition or diet outcomes. However, when they are designed with nutrition objectives, they can also enhance children's diet quality and dietary diversity, particularly in low-income countries (Leight et al., forthcoming; Wall et al., 2022; Wang et al., 2021). This is especially the case when designed with fortified and nutritious foods and/or informed by strong community engagement and/or local food procurement (Wang et al., 2021; Wall et al., 2022; Leight et al., forthcoming). School meals deliver a high return on investment, with US$7 in benefits for every US$1 spent (Gonzalez Parrao et al., 2021; Verguet et al., 2020).

Some evidence suggests that these programmes can improve children's dietary diversity and iron intake, particularly when meals are fortified with iron or other vitamins. In some cases, school meals have modestly reduced the prevalence of underweight or improved height-for-age scores, but evidence is stronger on dietary diversity (Hassanally et al., 2020; Wang et al., 2021; Yussif et al., 2020). Importantly, school meals often increase school attendance and may improve cognitive outcomes over time (Wang et al., 2021). For instance, an analysis of multiple school-based programmes initiatives in sub-Saharan Africa and South Asia found that children receiving a regular meal at school were more likely to maintain consistent attendance and perform better in class (Hassanally et al., 2020; Wang et al., 2021).

School meals are most effective when designed with fortified foods or where local food procurement and community engagement are strong (Leight et al, forthcoming). Evidence from Nepal and Bangladesh demonstrate that simple, standardised menus using locally available staples and vegetables, combined with basic nutrition analysis, can substantially improve dietary diversity at low cost. However, nutrient gaps remain, especially for iron and quality protein, pointing to the need to combine "fresh and local" with fortification or specifically nutrient-dense crops (Hassanally et al., 2020 and Wang et al., 2021).

However, school meals alone are often not sufficient to fully address nutrition gaps, especially when it comes to iron and high-quality protein. This suggests the importance of carefully composed menus that may include fortified or biofortified ingredients. This can be addressed at the design phase.



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10 Food vouchers and cash transfers

Food vouchers and subsidies—often delivered as in-kind transfers or support for staple food purchases—contributed to improved dietary diversity and protein intake. In India, subsidies for pulses increased total protein consumption beyond what was attributable to pulses alone (Leroy et al., 2021). Pregnant women who received cash combined with nutrition education had greater improvements in dietary diversity than those who received food instead of cash (Leroy et al., 2021). In contrast, food transfers were associated with improvements in child weight-for-age in some contexts, such as Nepal, even when they did not lead to gains in women's dietary indicators (Ahmed et al., 2023; Doustmohammadian et al., 2022; Huey et al., 2022; Johnston et al., 2018; Nabuuma et al., 2022; Stewart et al., 2015).

Social protection interventions, especially well-targeted cash transfers, can stabilise household access to food. Effectiveness depends on size, regularity, and integration with complementary programmes like nutrition education and SBCC. Like market infrastructure, social protection programmes (e.g., cash transfers, food vouchers) are essential for structural transformation but depend on resource availability, high-level coordination and are often multi-sectoral in nature.

Cash transfers, both conditional and unconditional, have been widely implemented to improve household food access and dietary outcomes. These programmes consistently led to increased dietary diversity across different contexts. Evidence shows that cash transfers improved household consumption of diverse food groups, including proteins, among children, women, and men (Andreyeva et al., 2022; Leroy et al., 2021; Manley et al., 2022; Owusu-Addo et al., 2018; Pega et al., 2022b). Conditional transfers in Niger and Tanzania supported the consumption of key food groups (Onwuchekwa et al., 2021), while unconditional transfers were associated with improved dietary diversity among children, women, and men (Pega et al., 2022).

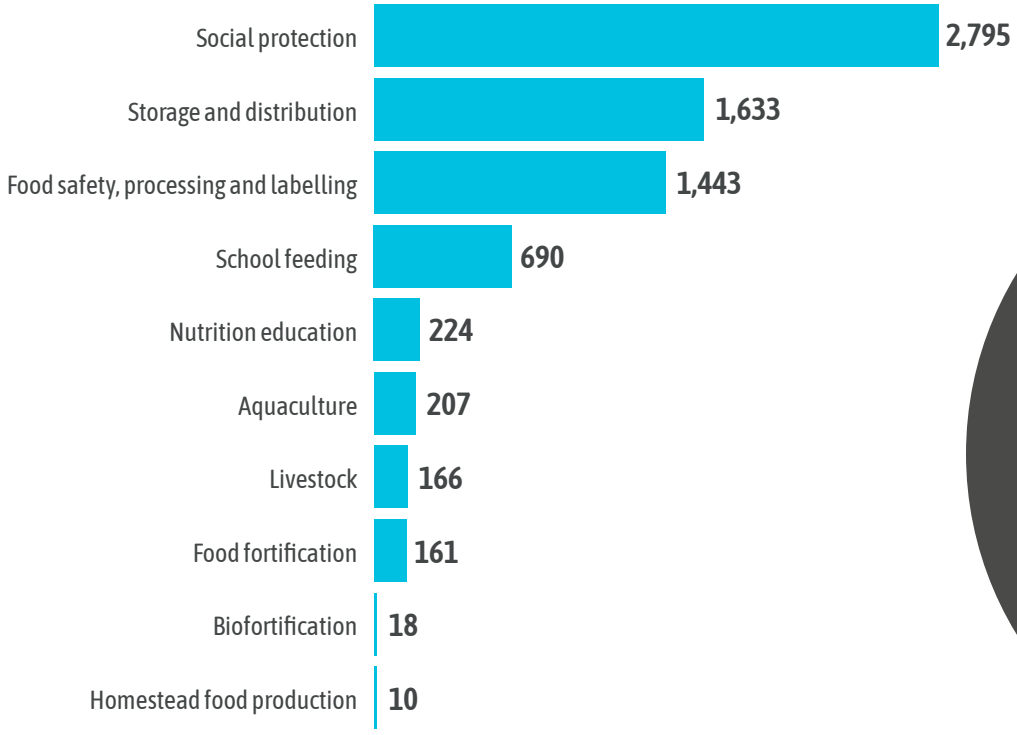
In Nepal, community-based learning and action programmes paired with cash transfers increased dietary diversity and meal frequency among pregnant women (Leroy et al., 2021). Evidence from multiple reviews suggests that cash transfers also contributed to food security, particularly for children (Pega et al., 2022). Some studies reported increased eating occasions among pregnant women, especially when programmes included cash rather than food transfers (Leroy et al., 2021). However, effects on adults' food security were less consistent (Leroy et al., 2021; Owusu-Addo et al., 2018). And, while improvements in dietary diversity and food security are well documented, effects on nutritional status were more limited. A meta-analysis found that combined cash and food transfers had a small but significant effect on reducing stunting (Little et al., 2021), and limited effectiveness in addressing micronutrient deficiencies such as vitamin A, suggesting the need for complementary interventions such as supplementation or food fortification (Little et al., 2021).

Overall, cash transfers had some positive effects on women's economic empowerment, including increased savings and livestock ownership in contexts such as Zambia and Kenya (Owusu-Addo et al., 2018). Some programmes reported increased women's participation in household decision-making and reductions in early marriage and adolescent pregnancy, although results were not consistent across studies (Owusu-Addo et al., 2018).

6. Current donor spending on the 10 nutrition-sensitive agrifood system interventions

Current donor investments in nutrition-sensitive agrifood system interventions vary significantly, with social protection programmes receiving the highest funding at US$2.8 billion per year on average, followed by storage and distribution infrastructure (US$1.63 billion) and food safety, processing, and labelling (US$1.44 billion) due to their high capital costs and large-scale impact (Figure 10). School meals programmes receive US$690 million annually, while nutrition education ($220 million), aquaculture (US$210 million), livestock interventions (US$170 million), and food fortification (US$160 million) receive comparatively lower funding (Figure 10). Biofortification (US$20 million) and homestead food production (US$10 million) receive the least investment (Figure 10).

Figure 10: Official development assistance (ODA) to a set of nutrition-sensitive interventions in agrifood systems, 2020 – 2022 (annual average)

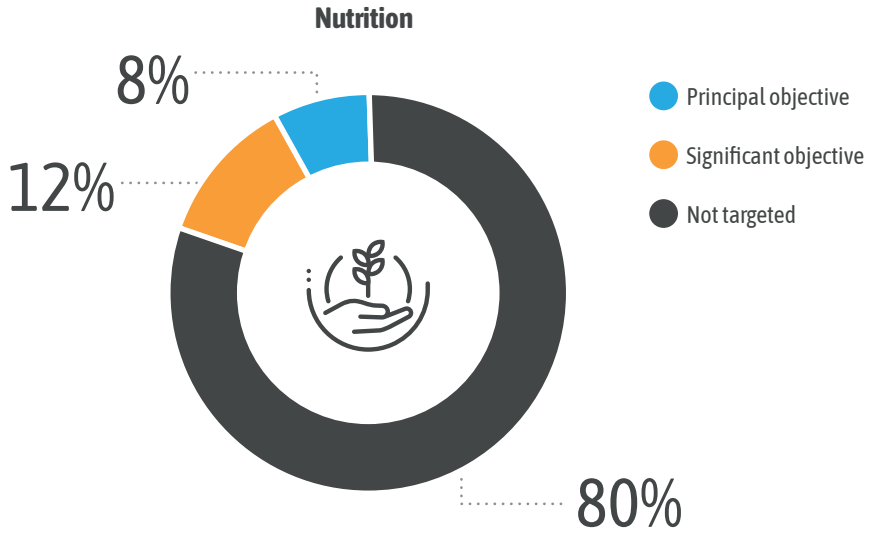


Source: Authors' computation based on the OECD DAC database

Social protection programmes receive the bulk of the funding for nutrition-sensitive interventions in agrifood systems

More importantly, is how well donors are integrating nutrition objectives in their agriculture and food security projects. We found that 80 percent of the agriculture and food security projects that had been screened with the OECD nutrition policy marker did not target nutrition, with only 20 percent of projects including a significant or principal nutrition objectives in their projects (Figure 11). Analysing the use of the OECD nutrition policy marker gives an indication for how much of the ODA going to agriculture and food security targets nutrition. Donors mark projects using a 0-2 classification system whereby 0 = not targeted, 1 = significant objective, and 2 = principal objective (Figure 11).

Figure 11: Screening agriculture and food security ODA with the OECD nutrition policy marker



Source: Hesat2030 Food Security and Nutrition Aid Analyser (Accessed March 2026)

Only 20% of donor-funded agriculture and food security projects that are screened with the OECD nutrition policy marker, include a nutrition objective

Given both the relatively low level of aid going to nutrition-sensitive agrifood investments, and how poorly nutrition objectives are integrated into agriculture and food security project, there is significant opportunities to do more with the current aid budgets to improve nutrition outcomes.

7. The potential of blended finance

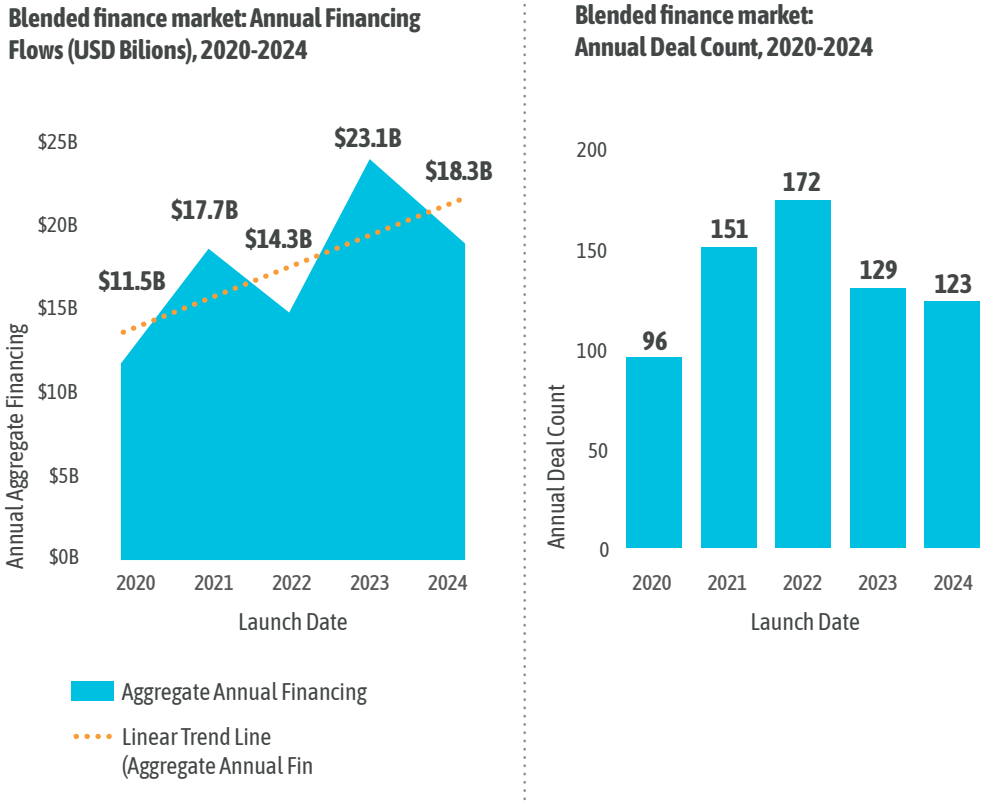
Currently US$8 billion of ODA is allocated to these interventions per year (Figure 10). But aid can no longer serve as a gap filler. Instead, it should be used to catalyse much larger resource flows from the domestic public and private sectors. To achieve this shift requires a change in mindset by focusing on financial and business models that can effectively use small amounts of aid to catalyse larger capital flows. To finance the ten high-impact intervention areas requires co-investment among donors, development finance institutions (DFIs), and private sector investors. Blended finance – the use of catalytic capital from public or philanthropic sources to increase private sector investment in sustainable development – is a way to scale capital flows into investments that prioritise nutrition outcomes (Convergence, n.d.).

Blended finance investments are on the rise, growing from US$11.5 billion in 2020 to US$18.3 billion in 2024 (Figure 12). Blended finance targeted to agriculture has also increased, from an average of US$ 700 million in 2015–2017 to an average of US$2.1 billion in 2022–2024 (Figure 13). This trajectory signals a growing appetite among DFIs and private investors to engage in food and agriculture, and a rising comfort with the specific risks and structural challenges these sectors entail.

Nutrition could be the next frontier within this evolving landscape. This section presents five financial strategies that are being used to crowd in different sources of finance and that are explicitly designed to enable healthy diets and nutrition outcomes, while optimising on the momentum in blended finance for food and agriculture.

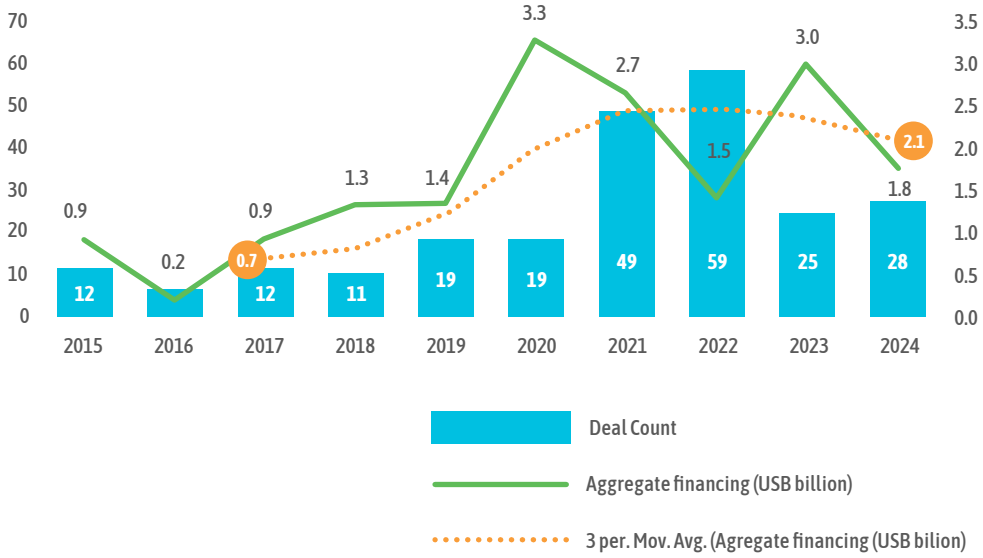
Blended finance investments are on the rise

Figure 12: Blended finance markets, 2020 - 2024



Source: (Convergence, 2025b)

Figure 13: Blended finance in the agriculture sector, 2015 - 2024



Source: (Convergence, 2025a)

Blended finance in the agriculture sector has increased threefold over the past decade

Strategy 1: Blended funds that target healthy diet outcomes

One approach is to explicitly target healthy diets as a core focus in an investment fund or facility. The most notable example of this is the Nutritious Foods Financing Facility (N3F), which provides local currency loans ranging from US$500,000 to 1 million to SMEs producing affordable, safe, and nutritious food. In addition to financing, investees receive technical assistance to strengthen operations and meet quality standards.

In its first year, the facility deployed over US$4 million across five SMEs (Bove, 2024). One such investment is Shalem Investment Ltd in Kenya, which aggregates produce from smallholder farmers and manufactures fortified maize and wheat flour.

Managed by Incofin with support from GAIN, N3F uses a tiered capital structure designed to reduce risk and attract a range of investors. This structure includes:

- First-loss backed by US$1 million commitments to absorb initial losses and reduce risk.
- Redeemable shares for short-term investors seeking liquidity.
- Locked-in shares for long-term investors providing stable capital.

With an initial capitalization of US$10 million, the N3F aims to scale to US$50–60 million within five years, with the goal of financing 45–60 agrifood SMEs that demonstrate strong potential for both financial performance and nutritional impact (Lee, 2022).

An innovative feature of the N3F is its Monitoring, Evaluation, and Learning (MEL) component, which assess the fund's overall impact and develops investment metrics that define nutrition-sensitive investments. The absence of standardised metrics remains a key barrier to attracting investment in this space. By establishing and validating clear benchmarks, the facility aims to demonstrate that financing SMEs producing nutritious foods can generate measurable impact while remaining commercially viable, thereby encouraging greater participation from private investors (Kwizera, 2023).

Strategy 2: Social bonds focused on nutrition outcomes in developing countries

Multilateral Development Banks (MDBs) and DFIs are also well positioned to issue social bonds focused on nutrition outcomes with the use of proceeds earmarked for SMEs in developing countries. In so doing, they can also aggregate the demand for low-cost loans from SMEs. The agrifood sector is dominated by SMEs, and their demand for low-cost loans is too small and scattered to attract bond issuers individually. This limited size also prevents such bonds from meeting the minimum issuance thresholds required for inclusion in environmental, social, and governance (ESG) indices—where size and liquidity are key eligibility criteria—thereby restricting access to large pools of institutional capital (Jain, 2022).

MDBs and DFIs can address this constraint through aggregation. By pooling multiple small-scale projects into a single, larger bond issuance, MDBs and DFIs can create investment opportunities that meet the size and liquidity requirements of institutional investors, while at the same time helping SMEs access finance. Given their strong credit ratings and established market presence, these institutions are well placed to structure and issue social bonds tied to nutrition outcomes, and to channel the proceeds efficiently across a portfolio of eligible projects in the region (OECD, 2023). The World Bank through the International Bank for Reconstruction and Development (IBRD), issued a US$250 million Sustainable Development Bond in December 2021 to raise awareness of health and nutrition of women, children, and adolescents. The bond attracted Japanese investors including Nippon Life Insurance Company in 2020 and Meiji Yasuda and Taiju Life Insurance ahead of the Tokyo Nutrition for Growth Summit in December 2021 (World Bank, 2021).

Strategy 3: The public purse can increase both demand and education on nutrition

The purchasing power of government is a common thread that can increase financing across all ten high impact intervention areas. Public procurement accounts for around 12–13 percent of GDP and roughly 30 percent of total government expenditure across OECD countries (OECD, 2025). This gives governments considerable influence to steer markets towards sustainability (OECD, 2025). This purchasing power can be used deliberately to promote diverse, healthy diets and more sustainable agrifood systems (FAO et al., 2021).

In practice, however, many public procurers still interpret value for money (the core principle of public procurement), as the lowest price at the time of purchase. This narrow focus overlooks wider social, health and environmental benefits that are often undervalued by markets, including nutrition education and dietary diversity (FAO et al., 2021; WHO, 2022). Moving towards a whole-life or life-cycle value approach is therefore critical to unlock greater investment in the types of nutrition-sensitive interventions discussed in this report (CMS, 2017; Tenderwolf, 2025).

To maximise the effectiveness of public procurement, nutrition is best embedded in a "whole-of-government" strategy. Applying dietary diversity and nutrition standards in food and catering contracts for school meals, public hospitals; government canteens and eateries; universities and training institutes; military and police facilities; public events and conferences; and state-owned enterprise catering can significantly increase the visibility and demand for diverse, nutritious foods (WHO, 2022; WHO, 2024a). Aggregating the demand for healthy diets also crowds in domestic investors and suppliers, who benefit from more predictable volumes and can reduce unit costs through economies of scale, while receiving a strong signal that healthy diets is a public policy priority (FAO et al., 2021; WHO, 2022).

The first step towards such a whole-of-government nutrition strategy is to integrate minimum standards on diet diversity, nutritional quality and, where appropriate, local or regional sourcing into existing green and sustainable public procurement guidelines. Sustainable public food procurement can influence both food consumption and production patterns, and deliver multiple social, economic and environmental benefits (FAO et al., 2021). Building on these guidelines, nutrition experts should work alongside public procurers to co-design framework agreements for catering services and school meals that progressively raise requirements over time. These framework agreements can include targets for more diverse and nutritious menus, lower-carbon meal options, and greater use of seasonal and locally sourced foods, while also ensuring that food safety and affordability are respected (FAO et al., 2021). They can additionally be structured into lots or reserved segments to facilitate participation by SMEs, farmer organisations and smallholders, strengthening territorial food systems and linking public demand to local producers (CECOP, 2025; FAO et al., 2021).

Strategy 4: Investment screens are increasing investor interest in nutrition

Investors need more comparable, predictable links between the healthiness of foods and their financial performance (Access to Nutrition Initiative, 2025; GAIN, 2024; Nutrition Connect, 2004). However, most existing nutrient profiling models are designed for regulation, labelling or marketing restrictions, rather than for estimating company-level default risk, cash-flow resilience or credit risk, so they do not yet provide the level of risk-relevant certainty that investors require (Nutrition Connect, 2004).

The Nutrition-Lens Investing Framework and tool is amongst the first to address this gap. The framework helps development finance institutions and impact investors screen deals for nutritional relevance and quality (GAIN, 2024; Wellspring Development Capital, n.d.). The framework was tested with investors on real transactions and is now being designed by GAIN into an online tool - NutrInvest - to support investment officers and fund managers in applying a consistent nutrition lens (GAIN & NutrInvest, 2025).

Investment screens matter as they help investors distinguish between investments that simply grow in volumes and those that improve diet quality and reduce malnutrition. They also uncover the upside such as new demand segments and the downside such as the regulatory tightening on unhealthy foods. Investment screens also complement ESG matrixes by encouraging investors to look beyond high-level commitments (e.g. SDG 2) into deal-level impact: which foods, for which populations, with what affordability and marketing practices.

Investing within and across the bundles requires guidance on the explicit classification of foods by nutritional quality coupled with data on who benefits (e.g. women of reproductive age, young children, urban poor); who can afford it and how convenient it is to access and use. In time, investors will also seek filters on unintended consequences such as promoting high sugar, salt or fat intake.

Strategy 5: Development Impact Bonds

Development Impact Bonds (DIBs) are a strategy to align actors around shared outcomes on nutrition. By linking financing directly to measurable outcomes rather than to the activities used to deliver programmes, this approach can strengthen accountability, improve collaboration, and attract increased investment in nutrition. Under this model, private investors provide upfront capital to finance nutrition interventions. Outcome funders—typically governments or donors—repay investors only if agreed nutrition outcomes, such as reductions in stunting, anaemia, or mortality, are achieved, thereby shifting performance risk away from governments and incentivising efficiency and innovation.

To advance the use of impact bonds for nutrition, Instiglio developed a detailed concept note for a Development Impact Bond to address child malnutrition (Instiglio, 2021). The model outlines how investors would finance proven interventions, such as micronutrient powders, breastfeeding promotion, complementary feeding, and community management of acute malnutrition. Outcome funders then repaid investors based on verified reductions in stunting and other nutrition outcomes (Instiglio, 2021).

These strategies collectively demonstrate that financing nutrition-sensitive interventions in agrifood systems can attract private sector investment alongside public sector investment. The rise of blended finance, alongside innovation in nutrition-focused funds, social bonds, public procurement strategies, investment screening tools, and impact bonds, shows that capital can be effectively mobilised to deliver both financial returns and measurable dietary outcomes. These strategies also address key barriers such as risk perception, fragmented demand, and lack of standardized metrics, while aligning incentives across public, private, and philanthropic actors.

Scaling these and other financing strategies required strengthening coordination, improving data and impact measurement, and embedding healthy diets and nutrition more explicitly into investment decision-making frameworks. This reinforces the overriding arguments in the report on the institutional, regulatory, and nutrition education improvements that need to take place to deliver improved nutrition at scale.

8. Conclusion

The findings from this report show that the agricultural development community can end hunger differently. It shows how this can be done through investment in ten high-impact nutrition-sensitive interventions in agrifood systems that improve food security and dietary outcomes while safeguarding the environment. The evidence points to significant value when integrating nutrition-sensitive interventions across the full agrifood system—from production to markets to consumption—and bundling components to improve dietary outcomes.

Over the past two decades, while progress in reducing hunger has been significant, other forms of malnutrition—particularly overweight, obesity, and micronutrient deficiencies—have persisted or worsened, while current food production systems accelerated climate change, biodiversity loss, and soil degradation. A focus on staple crop production has not delivered healthy diets, resilient food systems, or sustainable environmental outcomes. In a context of constrained aid budgets and rising global needs, continuing along this path is neither effective nor viable.

The evidence presented in this report offers an alternative path. Ten proven, nutrition-sensitive interventions can deliver multiple benefits when implemented together. However, their effectiveness depends on a systems approach. Interventions must be designed with explicit nutrition objectives, implemented in coordinated bundles, and accompanied by deliberate efforts to identify and manage environmental trade-offs.

At the same time, the role of aid must evolve. While current allocations to these interventions remain modest relative to total aid spending, ODA should no longer be viewed primarily as a gap-filling mechanism. Instead, it must be used strategically to catalyse larger flows of domestic public and private investment. This requires a shift towards outcome-oriented financing, stronger incentives for impact, and business models capable of leveraging limited concessional resources.

Ultimately, the choice facing the donor community is to continue to pursue incremental reductions in hunger through fragmented and resource-intensive approaches, or to embrace a more integrated, evidence-based strategy that addresses all forms of malnutrition while protecting the planet. The latter is not only more cost effective, it is also essential for achieving lasting food security and nutrition in an increasingly constrained world.

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Annexes

I. Interventions and outcomes

Outcome domain	Specific outcome if applicable	Outcomes to be extracted. Report up to four, choosing in the order they appear. If any of these are not present but related outcome(s) are present, report only one of the unlisted
Food security	Food access at household level	▶ Food insecurity experience scale (FIES) ▶ Household food insecurity access (Scale) ▶ Food consumption score (FCS)
Food security - diet	Dietary composition	▶ Consumption of 400 g fruits and vegetables per day ▶ Consumption of specific target foods and/or nutrients e.g. vitamin A or iron ▶ Proportion of the diet consisting of processed / ultra-processed foods
	Protein intake	▶ Consumption of animal source foods ▶ Total protein intake ▶ Consumption of plant-based protein ▶ Percentage of energy from protein ▶ Dietary diversity score related to protein sources
	Individual dietary quality	▶ Minimum dietary diversity for women (MDD-W) ▶ Minimum dietary diversity for young children (6-23 months) ▶ Individual dietary diversity score (IDDS)
	Household dietary quality	▶ Household dietary diversity score (HDDS)

Food affordability		▶ Consumer prices for food items in the local market
		▶ Percentage of food expenditures to total HH expenditures, including proportion of household consumption spent on:
		  ○ food and beverages
		  ○ staples
		  ○ fruits and vegetables
		  ○ meat and fish
		▶ Availability and prices of targeted nutrient-rich foods in local markets at different times of the year

Nutritional status (note, these may also be outcome, for breastfeeding related interventions)	Stunting	▶ Prevalence of stunting (length/height-for-age Z-score (HAZ) < -2 SD) and /or prevalence of severe stunting (HAZ < -3 SD) ▶ Proportion of stunted children who recover over time ▶ Mean HAZ ▶ Linear growth velocity (change in height or length per time)
	Wasting	▶ Prevalence of wasting (weight-for-height Z-score (WHZ) < -2 SD) and /or prevalence of severe wasting (WHZ < -3 SD) ▶ Proportion of wasted children who recover over time ▶ Mean WHZ
	Underweight	▶ Prevalence of underweight (weight-for-age Z-score (WAZ) < -2 SD) ▶ Mean WAZ ▶ Severe underweight prevalence: Proportion of children with WAZ < -3 SD
	Obesity	▶ Prevalence of obesity (e.g. BMI-for-age Z-score > +2 SD, WHZ > +2 SD) ▶ Prevalence of overweight (e.g. BMI-for-age Z-score > +1 SD) ▶ Mean BMI-for-age Z-score ▶ Percentage of adults/children with waist-to-hip ratio above the threshold ▶ **BMI-for-age Z-score is preferred but where unavailable use BMI
	Iron deficiency/ anaemia	▶ Prevalence of anaemia (e.g. low haemoglobin or low "respective indicator") ▶ Iron-deficiency anaemia prevalence ▶ Mean haemoglobin concentration ▶ Ferritin concentration ▶ Transferrin receptor levels
	Vitamin A deficiency	▶ Prevalence of vitamin A deficiency (e.g. low serum retinol/ low retinol-binding protein) ▶ Mean serum retinol concentration ▶ Night blindness prevalence ▶ Retinol-binding protein concentrations
	Zinc deficiency	▶ Prevalence of zinc deficiency (e.g. low serum zinc) ▶ Mean serum zinc concentration ▶ Plasma zinc levels ▶ Dietary zinc adequacy estimates ▶ Hair zinc concentration
	Iodine deficiency	▶ Proportion with urinary iodine concentration ▶ Mean UIC ▶ Mean urinary iodine concentration ▶ Proportion of households consuming iodised salt ▶ Goitre prevalence (clinical or ultrasound-detected)

Nutritional status (note, these may also be outcome, for breastfeeding related interventions)	Vitamin D deficiency	▶ Prevalence of vitamin D deficiency (serum 25(OH)D < 50 nmol/L) ▶ Mean serum 25(OH)D concentration ▶ Prevalence of severe vitamin D deficiency (serum 25(OH)D < 30 nmol/L) ▶ Parathyroid hormone levels ▶ Dietary vitamin D adequacy Prevalence of rickets in children
	Calcium deficiency	▶ Prevalence of low serum calcium (< 2.1 mmol/L or < 8.5 mg/dL) ▶ Mean serum calcium concentration ▶ Prevalence of hypocalcaemia (< 2.0 mmol/L) ▶ Dietary calcium adequacy ▶ Bone density measures in at-risk groups ▶ Prevalence of fractures or other calcium deficiency-related conditions
	Folate deficiency	▶ Prevalence of folate deficiency (serum folate < 10 nmol/L or red cell folate < 340 nmol/L) ▶ Prevalence of neural tube defects in newborns ▶ Mean serum folate concentration ▶ Mean red cell folate concentration ▶ Dietary folate adequacy
	Breastfeeding	▶ ** make a note if the study mentions it ▶ Proportion of children receiving exclusive breastfeeding ▶ Duration of exclusive breastfeeding
Women's empowerment		▶ Women's Empowerment in Agriculture Index (WEAI) Gender Inequality Index ▶ Number women making crop-production and food purchasing decisions jointly ▶ Women's engagement in agriculture and related economic activities ▶ Women's access to decent labour and other resources ▶ Time-use for women and men for domestic chores, care, and employment activities.
Income		▶ Agricultural labour force participation rate (disaggregated by men/ women) ▶ Income generated by on-farm and off farm economic activities (disaggregated by gender)
Productivity		▶ Production of target nutrient rich foods (e.g. fruits and vegetables) ▶ Diversity of crops and livestock produced

II. Results from appraising the quality of the 116 reviews

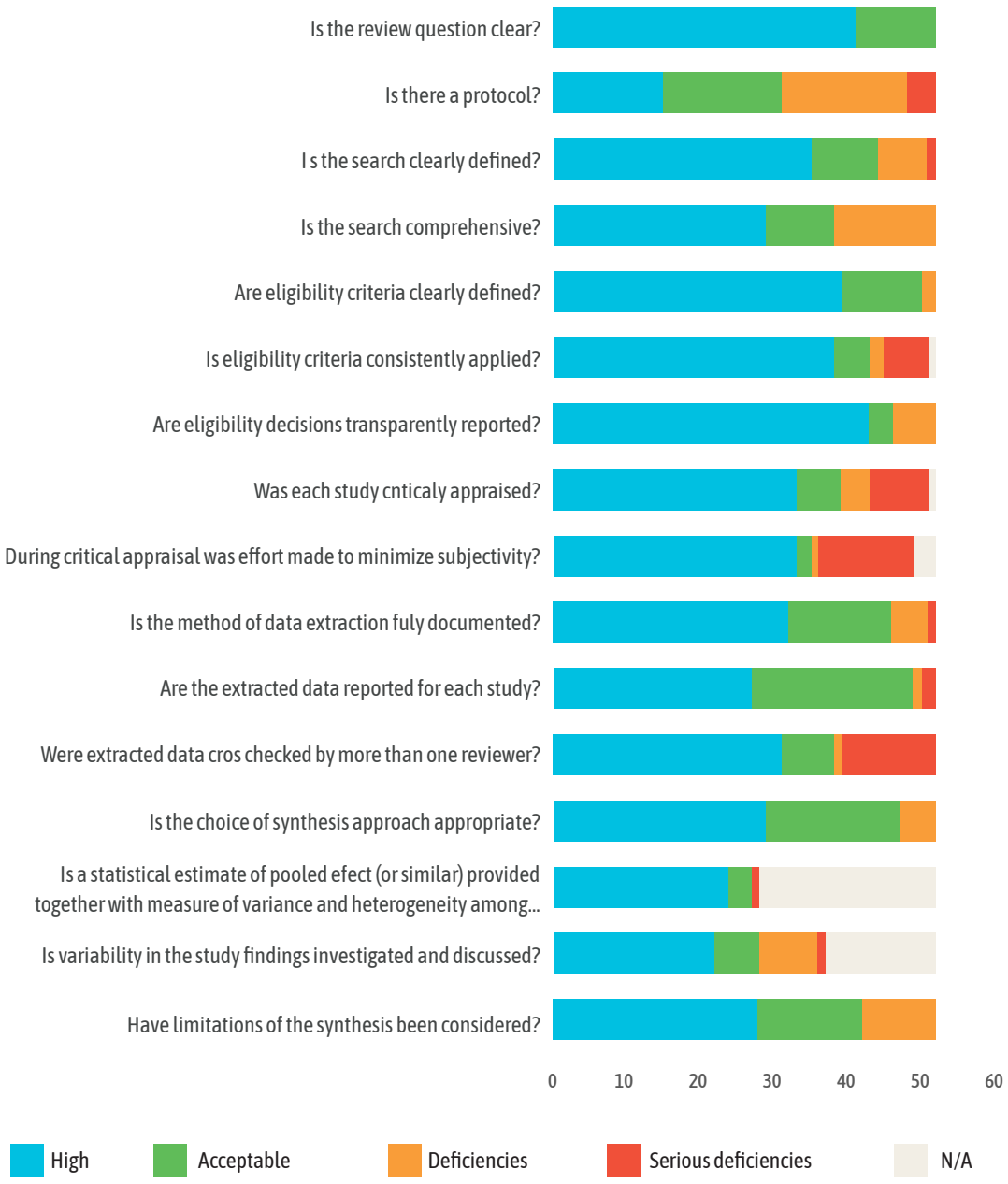
Each of the 116 reviews was subjected to independent critical appraisal to assess methodological rigour and reporting transparency, using the Collaboration for Environmental Evidence Synthesis Assessment Tool's (CEESAT) criteria for Evidence Overviews. Two members of the research team conducted appraisals independently, with ten reviews double appraised at the outset to calibrate consistency before the remainder were assessed. All uncertainties were resolved through discussion.

The results of the appraisal process are shown in Figure 14 which presents each CEESAT domain as a horizontal bar, with reviews rated across four categories: blue (high quality), green (acceptable), orange (deficiencies), and red (serious deficiencies). Reading across the domains, a number of patterns emerge. The most consistently well-performed areas were clarity of the review question and definition of eligibility criteria — the majority of reviews scored blue or green on these dimensions, reflecting that the field has matured in how it frames and scopes systematic reviews. Similarly, most reviews demonstrated an appropriate choice of synthesis approach.

However, performance was considerably weaker in several other domains. Cross-checking of extracted data by more than one reviewer was a common point of failure, with a substantial proportion of reviews rated orange or red, sometimes indicating that data extraction was often conducted without independent verification. Transparency around eligibility decisions and the documentation of data extraction methods also showed notable deficiencies across a meaningful share of reviews. The domain relating to statistical estimation of pooled effects, variance, and heterogeneity showed the highest proportion of amber and red ratings alongside a large share of N/A responses, reflecting the fact that many reviews did not attempt quantitative pooling, and where they did, reporting was often incomplete. Consideration of limitations was another area where many reviews fell short, with orange and red ratings together accounting for a significant share of responses.

Two specific quality thresholds were applied as non-negotiable pass criteria. First, reviews were required to have searched grey literature. It was essential given how much relevant unpublished agricultural research from LMICs would otherwise be omitted. Second, reviews could not rely on vote counting, a method of tallying positive and negative findings that is widely regarded as inadequate for drawing reliable policy conclusions because it ignores effect size and study quality. Of the 116 reviews, 64 did not meet these standards and were excluded from the synthesis, 36 for failing to search grey literature, 18 for using vote counting, 1 for both, and 9 for broader methodological weakness across multiple CEESAT domains. The remaining 52 reviews passed critical appraisal and form the evidence base on which this report's findings are built.

Figure 14: Results from applying CEESAT Evidence Overview criteria



HESAT2030

Ending Hunger Sustainably, Nutritiously, and Equitably

Hesat2030 is supported by the German Federal Ministry for Economic Cooperation and Development (BMZ) and the Gates Foundation, and builds on the findings of Ceres2030 – Sustainable solutions to end hunger, jointly published in 2020 with Nature Research. Ceres2030 provided a high impact roadmap for donors to effectively end hunger and double the incomes and productivity of small-scale producers while protecting the climate. Hesat2030 expands the focus of Ceres2030 to show the donor community the value of integrating nutrition-sensitive interventions across the agriculture and food (agrifood) system—from production to markets to consumption—and bundling components, as a better pathway to improving diet quality, and contributing to ending hunger and all forms of malnutrition.

Hesat2030 partners are Centre for Agriculture and Bioscience International (CABI), Food and Agriculture Organisation of the UN (FAO), International Food Policy Research Institute (IFPRI), and the Shamba Centre for Food and Climate. Funding support comes from Geman Federal Ministry of Economic Cooperation and Development (BMZ) and the Gates Foundation.

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