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COMMENTARY OPEN ACCESS

Understanding the Evidence Gaps: Diets and Fruit and Vegetable Intake Across Five Diverse Low- and Middle-Income Countries

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Received: 16 May 2025 | **Revised:** 15 July 2025 | **Accepted:** 9 September 2025

Funding: This study was supported by the CGIAR Trust Fund.

Keywords: consumption | dietary assessment methods | dietary patterns | food-based dietary guidelines | fruit | low- and middle-income countries | vegetable

ABSTRACT

Poor dietary quality, particularly inadequate fruit and vegetable (F&V) intake, remains a significant public health challenge globally. This article synthesizes findings from scoping reviews examining diet and F&V intake, and interventions to increase F&V consumption among population groups in five countries: Benin, Fiji, the Philippines, Sri Lanka and Tanzania. Our analysis confirms previous findings of inadequate F&V intake across all five countries, with most adults consuming well below the WHO recommendations of 400 g per day. Across the five countries, the identified scientific evidence is limited due to heterogeneous dietary assessment methods, limited coverage of population groups in national surveys and smaller studies, and limited data from rigorous evaluations of interventions aiming to increase F&V intake. Although all five countries have developed food-based dietary guidelines promoting F&V intake, research on their implementation and effectiveness remains limited. To build evidence for effective programmes and policies to improve both quantity and diversity of F&V intake, we identify three priority areas for future research: standardizing dietary assessment methods for use in surveys and evaluations, understanding context-specific drivers and determinants of F&V intake and strengthening intervention research in low-resource settings.

1 | Introduction

Poor dietary quality overall contributes to the double burden of malnutrition observed in many low- and middle-income countries (LMICs): maternal and child undernutrition, including micronutrient deficiencies on the one hand, and a growing epidemic of obesity and non-communicable diseases (NCDs) on the other hand (Afshin et al. GBD 2017 Diet Collaborators 2019). A healthy diet

Summary

- Despite diverse contexts, Benin, Fiji, the Philippines, Sri Lanka and Tanzania showed consistently low fruit and vegetable (F&V) intakes, falling far below global and national recommendations.
- Cross-country comparisons were challenging due to various dietary assessment methods, inconsistent food group categorization and limited population coverage in some contexts.
- Limited research exists on drivers of F&V intake, though the availability of ultra-processed foods, affordability and food preferences appear influential across contexts.
- All five countries have food-based dietary guidelines that include F&V intake recommendations, but evidence on interventions and programmes to increase F&V intake remains limited.
- Future research should standardize methods to measure diets, explore the drivers of F&V intake and evaluate intervention strategies adjusted to the local context.

low in fat, sugars and sodium and high in fruit and vegetable (F&V) is recommended to prevent NCDs (Food and Agriculture Organization of the United Nations & World Health Organization 2024). Nevertheless, inadequate F&V intake remains one of the significant dietary risk factors for poor health outcomes globally (Woodside et al. 2023). The evidence supporting the long-term health benefits of F&V is compelling and continues to grow (World Health Organization 2024). Epidemiological studies have demonstrated their crucial role in disease prevention and in reducing the risk of coronary heart disease, stroke and some types of cancer (Huai and Ye 2021; Sakai et al. 2022; Zeraattalab-Motlagh et al. 2023; Zhan et al. 2017). Beyond individual health, increased F&V intake, particularly from seasonal and local sources, offers pathways to environmental sustainability (Gibbs and Cappuccio 2022). F&V also represents a positive dietary component that can be promoted across all contexts without concern for overconsumption. Yet, despite this evidence, F&V intake worldwide falls significantly below the World Health Organization (WHO) recommendation of consuming at least 5 servings or 400 g of F&V every day (Frank et al. 2019; Siegel 2019), with the vast majority of adults in LMICs consuming less than the recommended daily amounts of both fruits and vegetables (Global Nutrition Report 2021).

While dietary patterns across contexts remain poorly understood, particularly regarding F&V intake in low- and middle-income countries (LMICs), affordability of F&Vs is a well-known challenge (Kaur 2023; Mason-D'croz et al. 2019; Miller et al. 2016). The limited dietary data available makes it difficult to comprehensively understand consumption patterns, the drivers of dietary choices and effective solutions to improve F&V intake – all of which are essential for developing interventions that could improve nutrition and health outcomes.

The Fruit and Vegetables for Sustainable Healthy Diets (FRESH) Initiative (CGIAR 2022) addresses F&V intake challenges in LMICs using comprehensive end-to-end approaches that are designed to promote healthy choices and address affordability, accessibility and availability constraints while also promoting environmental sustainability (Olney et al. 2025). The FRESH team conducted scoping reviews in five countries – Benin, Fiji, the Philippines, Sri Lanka and Tanzania – examining across population groups: (1) overall diets; (2) F&V intake and consumption at the individual- and household-level and (3) interventions aimed at improving F&V intake (Amunga et al. 2025; Azupogo, Hess, et al. 2025; Bliznashka et al. 2025; Koyratty et al. 2025; Smith et al. 2025). These five countries were selected to represent diverse geographical contexts (West/East Africa, South/Southeast Asia, Pacific), economic contexts (lower-middle to upper-middle income) and food system characteristics.

Drawing on these scoping reviews, this article aims to:

- Summarize the types and breadth of available dietary and F&V intake data.
- Consider the evidence base for interventions aimed at increasing F&V intake, recognizing the limited nature of data both for drivers of F&V intake and from impact evaluations of interventions to increase F&V intake.
- Present recommendations for strengthening the evidence base to better inform future research and interventions to increase F&V intake.

2 | Key Patterns From Country Evidence

Our analysis of evidence from five countries builds upon the current understanding of global F&V intake patterns and challenges. Our country-specific analyses reveal both shared patterns and unique contextual factors:

- Despite variations in data collection periods and methods, all countries demonstrated inadequate F&V intake across population groups consistent with global evidence (Mason-D'croz et al. 2019; Miller et al. 2016).
- Data limitations and methodological variations in dietary assessment prevented a comprehensive understanding of F&V intake patterns across population groups and their determinants within and across countries, highlighting key evidence gaps that should be addressed.
- Dietary patterns were influenced by geography factors (including within-country regional variations) and socio-economic factors such as affordability constraints, cultural food preferences and traditional dietary practices.

The following sections examine these shared challenges identified in the five country-level scoping reviews by Bliznashka et al. (2025), Azupogo, Hess, et al. (2025), Koyratty et al. (2025), Smith et al. (2025) and Amunga et al. (2025).

2.1 | Inadequate F&V Intake Across Countries

A consistent finding across all countries was the low intake of F&V relative to national and international recommendations. Among adults included in the 2013 dietary survey in the Philippines, the mean intake of vegetables (66–70 g/day) and fruit (24–30 g/day), were far below the recommended 3 servings of vegetables and 2–3

servings of fruit per day representing only 23%–25% of the 400 g per day recommended by WHO (Angeles-Agdeppa et al. 2019), and the more recent, 2018–2019 Expanded NNS showed the mean per capita intake of vegetable and fruit was 126 and 34 g/day, respectively (Department of Science and Technology – Food and Nutrition Research Institute DOST-FNRI 2022). In Sri Lanka, 27.5% of adults reported consuming 5 servings of F&V per day according to the 2015 WHO STEPS survey and 32.2% reported in the 2021 Survey (Ministry of Health & Department of Census and Statistics 2021). A mini-STEPS survey in Western Fiji indicated that 27.6% of adults consumed the recommended five servings of F&V per day (Gyaneshwar et al. 2016). In Tanzania, studies reporting on F&V intake had small sample sizes but all found low F&V intake across regions, ranging from 3% to 61% in the previous 24 h (Amunga et al. 2025), with one study reporting only 20% of urban adults consuming 5–7 servings per day (Msambichaka et al. 2018) and in Benin, the WHO STEPS surveys showed that in 2008, 82% of adults 24–65 years consumed fewer than five F&V portions per day, and the share of adults with low F&V intake (0–1 serving/day) increasing substantially from 34% to 51% between 2008 and 2015 (Houehanou et al. 2015; Kaboré et al. 2022).

2.2 | Data Limitations and Methodological Variations in Dietary Assessments and F&V Categorization Across Countries

The availability of comprehensive dietary data at the national level is important for understanding nutrient intake and food consumption patterns, establishing associations between diet and health, and tracking dietary trends (Food and Agriculture Organization 2024). Our synthesis of the five country-level scoping reviews revealed considerable heterogeneity in survey designs and dietary assessment methods (Amunga et al. 2025; Azupogo, Hess, et al. 2025; Bliznashka et al. 2025; Koyratty et al. 2025; Smith et al. 2025).

A major challenge across countries was the use of varying dietary assessment methods and small nonrepresentative surveys. While 24-h recalls and food frequency questionnaires (FFQ) were commonly used, many studies focused on food group consumption rather than the actual amounts of food consumed. National surveys, such as the Demographic and Health Surveys (DHS) and Multiple Indicator Cluster Surveys (MICS), provided standardized data but most of them focused on dietary diversity among women of reproductive age and children under 5 years.

The methods used in the reviewed studies spanned a decade or more, reflecting the changes in dietary assessment approaches over time. Many surveys used indicators recommended by WHO that were appropriate for their time, such as the WHO Infant and Young Child Feeding (IYCF) indicators for children 6–23 months (World Health Organization 2008, 2021) and the Minimum Dietary Diversity for Women of Reproductive Age (MDD-W) indicator with its standardized 10 food groups (FAO & FHI 360 2016; Kennedy et al. 2013). Some earlier studies particularly in Benin, used the 9-food group Women's Dietary Diversity Score, which was the recommended approach before MDD-W was established. The evolution of methods and changes in food groups in these methods, although necessary for advancing nutritional assessment, added complexity to the cross-country comparisons.

Even when standardized indicators were used, the measurement of diets varied. In Sri Lanka, for example, some studies used the standardized MDD-W approach alongside other complementary measures of dietary diversity within the same research, including a 12-point Dietary Diversity Score (DDS), an 8-point based DDS on portions (DDSP) and a Food Variety Score (FVS) (Jayawardena et al. 2013).

The categorization and assessment of F&V intake also varied substantially across countries. The Philippines' national nutrition surveys provided detailed food categorization with F&V being categorized within broader food groups including tracking of indigenous varieties (Department of Science and Technology – Food and Nutrition Research Institute DOST-FNRI 2022). In Fiji, however, studies rarely focused on the detailed categorization of F&V types and instead used broad classifications. When examining how F&V intake was measured in Fiji, only three out of seven studies assessed intake quantitatively, with two using less than '5 servings per day' as a metric and one measuring frequency per week (Azupogo, Hess, et al. 2025).

In Tanzania, one specific study categorized indigenous vegetables separately from other vegetables due to their cultural importance and their significant contribution to micronutrient adequacy. The research found that women who consumed indigenous vegetables had significantly higher dietary diversity scores compared to non-consumers (Conti et al. 2021). In Benin, most studies on F&V intake did not report consumption of specific fruits and vegetables but rather reported on standardized F&V food groups. These included the DDS-10 categories for adults and older children (dark green leafy vegetables, vitamin A-rich F&V, other vegetables and other fruits) and the WHO IYCF food groups for children under 2 years (vitamin A-rich F&V and other F&V). This aggregated reporting approach limited understanding of specific F&V preferences and consumption patterns in the Beninese context (Bliznashka et al. 2024). The variation in both F&V categorization and measurement approaches complicated cross-country comparisons. Despite these methodological differences, the scoping reviews across all five countries documented consumption patterns of various F&V groups. However, most studies focused on whether food groups were consumed rather than measuring the actual quantity consumed.

2.3 | Sample Sizes, Representativeness of Surveys and Population Groups

The country-level scoping reviews revealed significant variations in study designs, sample sizes and population representativeness. Most countries have implemented nationally representative surveys through DHS that collect data on dietary diversity from young children and women of reproductive age, yet dietary data were often limited. It is worth noting that the MDD-W was only an optional module in surveys until Phase 8 (DHS-8) in 2019, when it was added to the core questionnaire, resulting in limited availability of standardized dietary diversity data for women across countries and survey rounds.

The Philippines stood out as an exception with its nationally representative nutrition surveys providing comprehensive dietary data. The National Nutrition Surveys (NNS) were initially

conducted every 5 years (2008 and 2013). In 2018, the survey was redesigned as a 3-year rolling survey, called the Expanded NNS, starting in 2018 (Department of Science and Technology – Food and Nutrition Research Institute DOST-FNRI 2022), spanning 17 regions and 80 provinces including both rural and urban areas (Patalen et al. 2020). These surveys provide nationally representative data on socioeconomic, anthropometric, biochemical and health status, as well as dietary intake, maternal nutrition, IYCF practices, food security and government program participation. These extensive surveys are mandated by law and supported by the governmental budget to ensure that the provision of updated data on the nutritional and health status of populations is available for national and regional decision-making.

Tanzania has also established the Tanzania National Panel Survey, which includes a comprehensive food consumption module that collects detailed information on household food acquisition and consumption (Tanzania National Bureau of Statistics, 2021). This provides population dietary data that complements the DHS and other national surveys. In Fiji, some nationally representative surveys provided coverage of children under 5 years of age, women of reproductive age and school-aged children, with most other studies concentrated in urban and semi-urban centres, with limited representation from rural communities (Azupogo, Hess, et al. 2025).

The temporal relevance of dietary data varied across countries, often due to typical lags between data collection and result dissemination. In Benin, studies predominantly used data from the 2011–2012 DHS and others used data from 2012 to 2019. While more recent information from 2021 to 2022 MICS became available for infant and young child feeding practices (INStaD 2023), most published data predated this release. In Sri Lanka, the 2022 National Nutrition and Micronutrient Survey provided recent data on nutritional status but not comprehensive dietary information, so many dietary patterns were described using older data from 2013 to 2016. Despite the implementation of the Expanded NNS since 2018 in the Philippines (Angeles-Agdeppa et al. 2022), most published articles relied on the 2013 NNS data, with only a small number utilizing the 2018 Expanded NNS data, with much of the recent survey data yet to be published.

Geographic representation of studies varied across countries. In Benin, the evidence was particularly limited, several studies focused on specific regions like southern Benin or rural areas (Kouton et al. 2017; Mitchodigni et al. 2017). In Tanzania, studies were also not evenly distributed across regions, with a greater concentration of research in the eastern and northern zones compared to western and southern highlands (Amunga et al. 2025). Region-specific findings demonstrated considerable heterogeneity, with variations in dietary patterns between urban and rural settings and across different agro-ecological zones that influence food availability and production systems. Sri Lanka presented unique challenges with its estate sector requiring specific sampling approaches, with studies showing distinct dietary patterns between urban, rural and estate sectors (Weerasekara et al. 2020). Beyond these three main sectors, Sri Lanka also exhibited significant variations in dietary patterns across provinces and districts, driven by diverse socio-cultural practices, the lingering effects of past conflict in northern and eastern regions, and variable agro-ecological zones that influence agricultural production activities and food availability (Koyratty et al. 2025).

Coverage of certain population groups in studies assessing overall diet and F&V intake varied considerably across countries (Figures 1 and 2). The differences between the two types of studies are primarily due to the varying inclusion criteria used for the country-level scoping reviews (Hess et al. 2023). For the diet review, we included studies that reported on any aspect of diet, while we limited studies to those reporting on F&V outcomes for the F&V review. In Benin, diet studies primarily assessed diets among

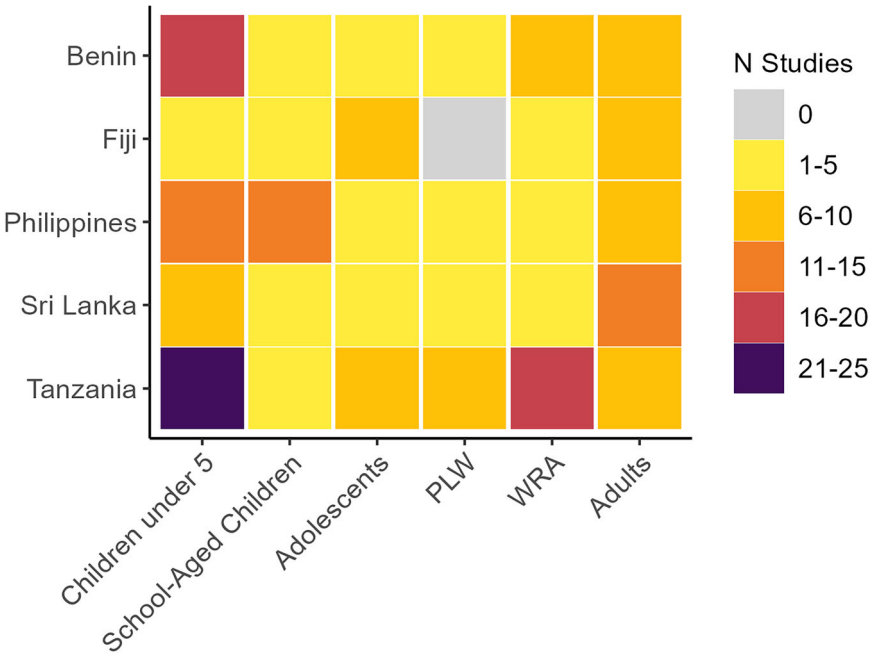

FIGURE 1 | Number of studies that assessed diets by population group and country.[1] [1]Population groups were categorized as: children < 5 years of age, school-aged children (6–12 years of age), adolescents (13–18 years of age), pregnant and lactating women, women of reproductive age (15–49 years) and adults (≥ 18 years of age).

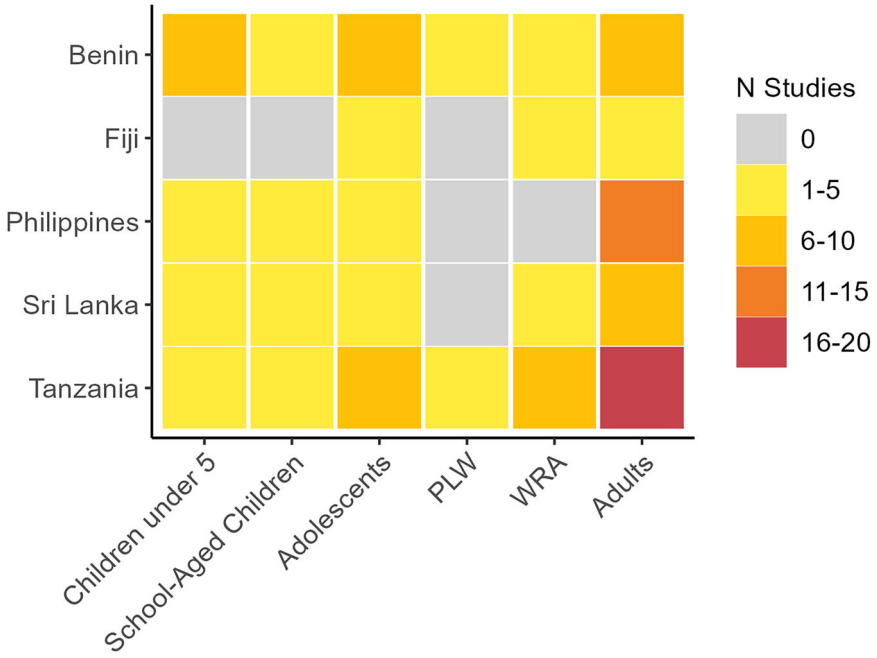

FIGURE 2 | Number of studies that assessed F&V intake by population group and by country.[11]Population groups were categorized as: children < 5 years of age, school-aged children (6–12 years of age), adolescents (13–18 years of age), pregnant and lactating women, women of reproductive age (15–49 years) and adults (≥ 18 years of age).

children under 5 years, women of reproductive age and adults, with limited data on school-age children and adolescents. In Tanzania, most diet studies were done with children under 5 years and adults, with fewer studies on school-age children and adolescents (4 and 6 studies, respectively), whereas F&V intake studies focused predominantly on adults. In Fiji, both diet and F&V studies were skewed toward adults and adolescents, with 7 studies focusing on adults and 6 on adolescents, with minimal coverage of younger children under 5 years. In Sri Lanka, dietary studies showed balanced coverage across the lifecycle from children under 5 years to the elderly, yet there was a scarcity of recent and population-representative studies on F&V intake among school-aged children (1 study), adolescents (2 studies) and pregnant women (0 studies). The Philippines had the most comprehensive population coverage for diet data and studies using that data through its NNS system, though gaps remained in F&V intake studies for pregnant and lactating women and women of reproductive age.

The timing and geographic coverage of available evidence are particularly relevant as all countries of interest are experiencing varying stages of the nutrition transition. Understanding how trends in diets and F&V intake are evolving across different regions and population groups is important to understand the nutrition, health and economic risks of dietary transitions and to design effective interventions aiming to mitigate these risks through improving diet quality, including increasing F&V intake.

2.4 | Contextual Factors Influencing Dietary Patterns

2.4.1 | Diet Quality and F&V Intake

The dietary patterns of women and adults showed similarities across all countries despite geographic and cultural differences. Diets were predominantly cereal-based, with rice being the staple in the Philippines and Sri Lanka (Koyratty et al. 2025; Smith et al. 2025), while more diverse staples like maize and cassava, were common in Benin, Tanzania and Fiji (Amunga et al. 2025; Azupogo, Hess, et al. 2025; Bliznashka et al. 2025). High intakes of oils and fats were noted particularly in Fiji, Benin and Tanzania, while in the Philippines, fat intake remained within or below the recommended range of fat contribution to total energy intake.

The dietary preferences varied across countries: in Sri Lanka, predominantly rice-based dietary patterns characterized by large amounts of rice with small amounts of F&V in curries and some fish/meat remain prevalent, though these practices are evolving due to globalization and economic changes, and there is increased consumption of ultra-processed foods (Salwathura and Ahmed 2023). In the Philippines, rice-based dietary patterns featuring fish and vegetables are largely maintained, particularly in rural areas (Lipoeto et al. 2013). In Fiji, consumption of ultra-processed foods was documented among adults, with sugar-sweetened beverages and out-of-home food consumption common among adolescents (Wate et al. 2013). There is increasing evidence for the connection between ultra-processed foods and the increasing prevalence of obesity in high-income and LMICs (Reardon et al. 2021; Wood et al. 2024). A high prevalence of overweight and obesity has been well documented in all five countries (Amunga et al. 2025; Azupogo, Hess, et al. 2025; Bliznashka et al. 2025; Koyratty et al. 2025; Smith et al. 2025).

2.4.2 | Drivers of F&V Intake

The evidence assessing the drivers of F&V was limited across the five countries. In Tanzania, some studies identified factors affecting dietary choices, such as preference for indigenous

vegetables due to 'availability, taste, and affordability' (Chacha and Laswai 2020). In Fiji, research highlighted how cultural meanings attached to different foods influenced consumption patterns, with meat especially associated with wealth and influence, leading to aspirational meat consumption over other food groups (Buksh et al. 2022). However, there were limited studies that explored the determinants of F&V intake at the individual or household level. Cultural factors appeared influential as seen in the traditional dietary patterns like vegetable-based curries in Sri Lanka and the Philippines, and affordability constraints were noted in Tanzania. Across all countries, the scoping reviews revealed significant knowledge gaps regarding the facilitators and barriers to F&V intake, how these drivers might differ across population groups, socioeconomic strata and the potential impact of the food environment and increasing availability of ultra-processed foods on F&V intake.

2.5 | Food-Based Dietary Guidelines

All five countries have established comprehensive food-based dietary guidelines (FBDG) to promote healthy eating patterns, considering locally available foods and traditional and cultural factors. The FBDG make specific recommendations on foods, food groups and portion sizes to promote overall health, and each country uses differing graphics to communicate the importance of diverse diets (Figure 3), and continue to be updated periodically (Food and Agriculture Organization 2024). In all five countries, the FBDGs recommend the regular intake of F&V (Table 1).

Despite their development, questions remain about the practical implementation of these guidelines to increase diet quality, particularly regarding portion size interpretation and adherence to recommended frequency of consumption. Moreover, the varying units of measurement (e.g., grams vs. cups) and conceptualization of what constitutes a 'serving' may also present challenges for households. Implementation challenges for FBDG extend beyond F&V to all food groups, reflecting broader systematic issues in translating policy into practice. However, F&V face unique barriers including seasonality, perishability and cost fluctuations that separate them from staple foods with more stable supply chains.

Dissemination of FBDGs to various stakeholders involved in health and nutrition areas is essential for public awareness; however, research on their implementation and their effectiveness in increasing F&V intake remains limited. Although the scoping reviews did not specifically examine FBDG implementation or effectiveness, the assessment of how these guidelines translate into actual dietary practices represents an important area for future research.

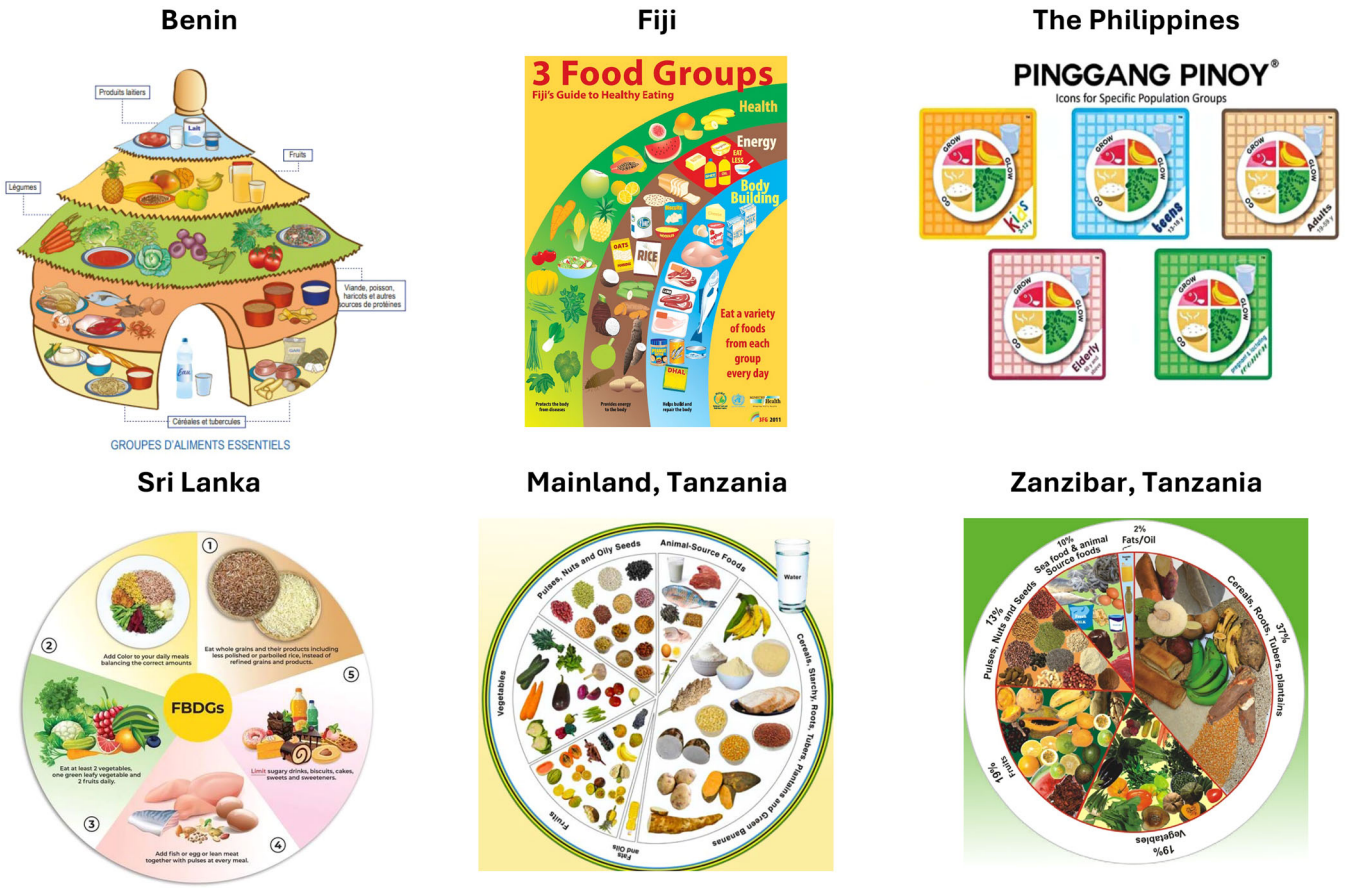

FIGURE 3 | Visualizations used in food-based dietary guidelines from Benin, Fiji, the Philippines, Sri Lanka, Mainland Tanzania and Zanzibar, Tanzania (Primary sources: Conseil National de L'Alimentation et de la Nutrition 2015; Food and Nutrition Research Institute & Department of Science and Technology 2016; Ministry of Agriculture Irrigation Natural Resources and Livestock 2022; Ministry of Health 2021; Ministry of Health of the United Republic of Tanzania 2023; National Food and Nutrition Center 2013).

TABLE 1 | Food based-dietary guideline F&V recommendations by country.

Country	Citation	F&V Recommendations	Special Features
Benin	Conseil National de L'Alimentation et de la Nutrition (2015)	2–3 portions of fruit and 4–6 portions of vegetables or vegetable-based sauces per day	The graphical representation is a traditional house with a thatch roof. There is a bottle of water at the entrance as a reminder to drink plenty of water each day.
Fiji	National Food and Nutrition Center (2013)	Consume at least 5 servings of F&V daily	The Fiji food guide is a pineapple with a recommendation to eat a variety of local foods.
Philippines	Food and Nutrition Research Institute (2016)	2–3 servings of fruit and 3 servings of vegetables daily	Pinggang Pinoy' (healthy food plate) with portion size recommendations per meal for various population groups.
Sri Lanka	Ministry of Health (2021)	Consume at least two vegetables, 1 green leafy vegetable and 2 fruits everyday	Structured as a food plate and divided into 5 sections representing recommended food groups and limited foods.
Tanzania	Ministry of Agriculture Irrigation Natural Resources and Livestock (2022); Ministry of Health of the United Republic of Tanzania (2023)	Eat at least 2 types of fruit every day Eat at least 2 servings of vegetables (280 g) every day. Choose different coloured vegetables throughout the week	Separate FBDGs for Mainland and Zanzibar to account for regional dietary differences. Messages and images field-tested before the launch.

Abbreviations: FBDG, food-based dietary guidelines; F&V, fruit and vegetable.

2.6 | Interventions to Promote F&V Intake

It is important to note that the primary focus of the scoping reviews was identifying studies that assessed dietary intake, consumption pattern determinants and barriers to F&V intake rather than comprehensively evaluating interventions or impact evaluations. Within this context, evidence on the impact of interventions to promote F&V intake was scarce across all five countries, with few rigorously evaluated intervention trials or impact programme assessments (Amunga et al. 2025; Azupogo, Hess, et al. 2025; Bliznashka et al. 2025; Koyratty et al. 2025; Smith et al. 2025).

In Benin, solar-powered drip irrigation systems were evaluated with and without women's group participation. The combined interventions (irrigation + women's groups) showed greater improvements in women's dietary diversity and household consumption of the F&V food groups compared to irrigation alone (Alaofè et al. 2019). In Sri Lanka, a 6-week randomized controlled trial tested a healthy eating intervention with family engagement among preschool children. The intervention improved children's food knowledge and health food preference scores among children but did not change dietary diversity scores (Sirasa et al. 2021). In the Philippines, health worker-promoted home gardening increased the diversity of F&V planted at home and utilization of F&V from home gardens among mothers compared to those who reported information from other sources such as mass media, friends and family (Miura et al. 2003). Similarly, in Tanzania, few studies have evaluated the potential benefits of home gardening and indigenous vegetables to improve dietary diversity among women of reproductive age (Blakstad et al. 2019; Blakstad et al. 2021).

Given the limited evidence base, findings from intervention studies implemented in other contexts, particularly countries with similar challenges, could help inform future research agendas and intervention programmes. A recent scoping review of interventions focusing on the impact on F&V intake, including those aiming to improve F&V intake specifically and those targeting diet, health, lifestyle or environment more broadly showed that the majority of intervention trials were conducted in high-income countries and only one-third of the evidence was generated in LMICs (Azupogo, Koyratty, et al. 2025). Health and nutrition communication interventions were most common and showed some success in improving F&V intake, however, the findings suggest a need for more multisectoral approaches adapted to local contexts as well as assessing strategies to sustain behaviour change over longer periods, given the declining effectiveness observed with longer intervention durations in the review (Azupogo, Koyratty, et al. 2025). Importantly, intervention strategies that focused on F&V specifically were more likely to have a significant positive impact on fruit and/or vegetable intake compared to those targeting diet and lifestyle in general (Koyratty et al. 2025).

3 | Research Priorities

Our five scoping reviews of Benin, Fiji, the Philippines, Sri Lanka and Tanzania revealed overall suboptimal dietary quality and low F&V intake among the population groups assessed, despite the diverse contexts. These findings highlight several research priorities, as described in more detail below.

3.1 | Standardizing Dietary Assessment Methods

Standardizing dietary assessment methods across countries is essential to understand dietary gaps and accurately compare F&V intake patterns. The various dietary assessment methods (i.e., 24-h recall, FFQ and food records) have strengths and limitations, and the choice ultimately depends on the research question (Bailey 2021). The NNS in the Philippines uses 24-h recall for all population groups and is conducted regularly and conducts actual food weighing of foods at the household level. While this represents an ideal model for tracking not only dietary patterns but also dietary intake over time, the collection and statistical analysis of quantitative 24 h recall is time- and resource-intense, which may not be financially or logistically feasible for all countries. Several more practical alternatives exist for monitoring diet quality, which is important for both public and planetary health (World Health Organization, Food and Agriculture Organization, & United Nations Children's Fund 2024). Details of these and other indices have recently been reviewed (Verger et al. 2023), and this remains an area of continued research and operationalization of metrics (Healthy Diets Monitoring Initiative 2025). Regardless of method chosen, standardization requires consistent interviewer training protocols, portion size estimation tools and data collection methods that account for cultural dietary patterns (Bailey 2021). Countries should select methods based on research objectives and available resources while ensuring methodological consistency within surveillance systems.

3.2 | Understanding Drivers of F&V Intake

Evidence on understanding F&V intake patterns and their determinants was limited in each of the country-level scoping reviews. F&V intake is influenced by a complex interplay of personal, environmental and behavioural factors that vary significantly across different cultural contexts (Kaur 2023). Research in this area has primarily focused on high and middle-income countries. Understanding F&V intake patterns in LMICs like Benin, Fiji, the Philippines, Sri Lanka and Tanzania requires consideration of unique contextual elements including traditional food systems, climate vulnerability and economic constraints (Fanzo et al. 2021; Turner et al. 2018).

Key areas for future research should examine: the impact of urbanization on F&V supply chains and market systems (Ruel et al. 2017); the influence of social norms, gender dynamics and roles within households on the quality of diets including F&V access and preparation (International Food Policy Research Institute. 2024); climate change implications for F&V growing seasons and promotion of climate-resilient indigenous crops (Fanzo et al. 2018); the influence of digital technology and social media on perceptions of F&V desirability compared to ultra-processed alternatives (Poelman et al. 2020); and the integration of F&V promotion strategies within existing healthcare systems (Hawkes et al. 2020). Additionally, understanding how increasing F&V intake can be combined to effectively reduce the consumption of ultra-processed foods and excessive red meat is crucial for overall diet quality improvements and health benefits (Willett et al. 2019). Lastly, despite the potential of indigenous fruits and vegetables to address climate change through local adaptation, underutilized indigenous fruits and vegetables face significant consumption barriers that need to be better understood, including limited market availability, inadequate knowledge of preparation methods and poor recognition in horticultural programmes (Chamara et al. 2021). Analysis of policy effectiveness across socioeconomic contexts also remains crucial (Global Nutrition Report 2022).

3.3 | Strengthening Intervention Studies

The scarcity of published intervention studies focusing on F&V intake in the five target countries is not unique to Benin, Fiji, the Philippines, Sri Lanka and Tanzania, but a larger reflection of limited investments in research focusing on improving F&V intake in LMICs overall (Azupogo, Koyratty, et al. 2025). Given the limited evidence on effective interventions in LMICs, more robust intervention research is needed to improve F&V intake in various contexts. Priority research areas include identifying the most promising interventions and developing targeted approaches for different population groups that recognize varying barriers and opportunities by age, gender, area of residence and socioeconomic status. Implementation research can also be helpful for translating evidence into effective programmes and policies by bridging the gap between what we know works in controlled settings and what can be implemented in real-world contexts (Warren et al. 2020).

Furthermore, there is a need to identify effective delivery platforms for different intervention strategies, understanding factors affecting intervention uptake and sustainability, document best practices for scaling successful interventions, and assess implementation challenges and solutions in different contexts. Building this evidence base will enable the design of more effective, scalable programmes and policies for improving F&V intake in these five countries and similar LMIC settings.

4 | Conclusion

Despite varying contexts and the ongoing transformation of agri-food systems, Benin, Fiji, the Philippines, Sri Lanka and Tanzania face similar challenges of low F&V intake, with populations across all age groups consuming well below WHO and national recommendations. Limited evidence on both drivers of intake and effective interventions restricts our understanding of approaches to increase F&V intake in these contexts. Future research should prioritize standardizing dietary assessment methods, understanding barriers and enablers of F&V intake, developing culturally appropriate strategies and programmes and evaluating interventions in the local context. Implementation research will be particularly valuable for identifying how promising strategies can be adapted to different contexts, addressing the specific barriers to F&V intake identified in these diverse countries.

Author Contributions

Manisha Tharaney and Sonja Y. Hess drafted the manuscript, and all other co-authors edited the manuscript. The final version of the manuscript was reviewed and approved by all co-authors.

Acknowledgements

We would like to thank all funders who supported this research through their contributions to the CGIAR Trust Fund: https://www.cgiar.org/funders.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Data sharing is not applicable to this article as no data sets were generated or analysed during the current study.

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