Impact pathways of shocks, conflicts and crises on dietary patterns and malnutrition in low- and middle-income countries

Expert consultation report

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Knowledge and Research for Nutrition

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The project is implemented by Agrinatura - the European Alliance on Agricultural Knowledge for Development – which has established a Nutrition Research Facility, pooling expertise from European academia and having the ability to mobilise internationally renowned scientific networks and research organisations from partner countries.

The Nutrition Research Facility provides expert advice to the European Commission and to the European Union (EU) Member States and Partner Countries.

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List of Acronyms

Acronym	Description
BCC	Behaviour Change Communication
BMS	Breastmilk Substitutes
CFS	Committee on World Food Security
CHW	Community Health Worker
COVID-19	Coronavirus Disease 2019
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
HDP	Humanitarian–Development–Peace (nexus)
HLPE	High Level Panel of Experts on Food Security and Nutrition
IYCF	Infant and Young Child Feeding
LMIC	Low- and Middle-Income Countries
NRF	Nutrition Research Facility
REPRISE	Reporting guideline for Priority Setting of Health Research
SCC	Shocks, Conflicts and Crises
S-care	Supporting systems – Care
S-health	Supporting systems – Health
S-policy	Supporting systems – Policy
UNICEF	United Nations Children's Fund
WASH	Water, Sanitation and Hygiene
WFP	World Food Programme
WHO	World Health Organization

Content

List of tables

Executive summary

Background: Fragile and crisis-affected contexts are characterised by the recurrence of shocks, weak systems and structural vulnerabilities. These expose particularly women of reproductive age and young children to higher risks of malnutrition and food insecurity in Low- and Middle-Income Countries (LMIC). Despite increasing evidence on the effects of shocks, conflicts and crises (SCC) on diets and nutrition, how nutrition interventions operate through different food system pathways across contexts, crisis phases is unclear. In addition, further research is necessary to understand under which conditions they can generate sustained impacts. This study contextualises and interprets evidence on eight intervention impact pathways identified in a prior systematic review. It provides an expert-based insight to support more actionable and context-sensitive nutrition programming and policy in fragile settings.

Methods: This study consisted of an online expert consultation, held with eight senior professionals with extensive experience in nutrition, food systems and policy in fragile and crisis-affected settings. Experts replied to an online structured survey, including quantitative and qualitative questions. They assessed eight impact pathways previously identified through a systematic review, according to their perceptions on relevance, specificity to fragile contexts, timing of impact across crisis phases and geographical applicability. Experts were also asked to provide additional inputs they would find relevant, including examples of interventions considered most effective within each pathway.

Results: All eight impact pathways were considered relevant across SCC, although specific patterns were identified:

- Pathways related to economic access to food and to health and childcare systems were consistently rated as relevant, with effects perceived to extend beyond the acute phase.
- Food consumption and child feeding pathways were perceived to have more immediate protective effects during crises.
- Pathways related to food production and to consumer awareness and behaviour showed greater contextual sensitivity.
- Across pathways, integrated intervention packages, combining nutrition-specific actions with social protection, livelihood support, health services and market-oriented measures, were identified as more effective.
- Finally, experts highlighted governance capacity, coordination, financing, information systems and community trust as key enabling factors shaping pathway effectiveness.

Conclusions: The experts' insights validated the relevance of the impact pathways identified through the literature review and provided a more nuanced understanding of how nutrition interventions operate through these pathways across different crisis contexts.

The findings suggest that nutrition programming in fragile and crisis-affected settings may benefit from integrated approaches combining immediate protective actions with longer-term investments in food systems and service delivery. This also reinforces alignment with the Humanitarian–Development–Peace nexus (HDP) approach and its emphasis on sequencing and coherence.

Keywords

Fragile and crisis-affected contexts; crisis recovery; food system; low- and middle-income countries; impact pathways; nutrition programming

Background

Fragile and crisis-affected contexts present complex challenges for nutrition programming in Low- and Middle-Income Countries (LMIC). These settings are often characterised by high levels of undernutrition and food insecurity, poverty, and constrained health, care and social protection systems. Together, these increase dietary risks, particularly among women of reproductive age and young children [1]. Armed conflict, economic instability, pandemics and climate-related events frequently interact with these structural conditions, often resulting in prolonged or recurrent crises that disrupt livelihoods and food systems over extended periods [2–5].

Crises affecting food systems influence food availability, affordability and access through multiple, interconnected mechanisms. Disruptions to agricultural production, trade, logistics and markets, combined with rising food and input prices, can reduce household purchasing power and influence dietary choices, often leading to less diverse diets [3,6–8]. Recent global shocks, including the COVID-19 pandemic and the Russia–Ukraine conflict, showed that these disruptions can cross borders, with indirect effects frequently affecting fragile and import-dependent countries in Africa and Asia [9,10]. At the biological level, sustained constraints on dietary quantity and quality are associated with increased risks of child undernutrition and micronutrient deficiencies and with maternal undernutrition, which is in turn associated with adverse birth outcomes and intergenerational effects [11]. Crises also increase the pressure on health, care and social protection systems, underscoring the need to maintain access to essential nutrition services during periods of stress [4,12]. The Nutrition Research Facility (NRF) has previously synthesised evidence on the impact of the COVID-19 pandemic on diet quality, food security and nutrition outcomes in LMIC, documenting the systemic effects of income loss, food insecurity and service disruptions in crisis settings (Box 1).

Despite increasing recognition of these dynamics, it remains unclear how nutrition interventions should be designed and delivered in fragile contexts, especially after the acute phase of a crisis. Prior research has described associations between food supply, food prices and nutrition outcomes [13], notably in natural disasters [14], but less consistent evidence exists on how interventions interact with different food system components or support recovery and longer-term resilience. This gap reflects persistent methodological and operational constraints in fragile and crisis-affected settings, where insecurity, population displacement and weak information systems limit the availability of robust, longitudinal and intervention-specific evidence [15,16].

In response to the awareness that many crises are often protracted and multidimensional, the United Nations and OECD developed the HDP nexus as a framework to strengthen coordination between humanitarian action, long-term development and peacebuilding efforts [17]. This call has been echoed by other international institutions, such as the European Union, who has progressively adopted a “Triple Nexus” approach within its external policies [18]. The HDP approach emphasises coherence, sequencing across crisis phases and sustained system strengthening, aiming to concomitantly address immediate needs and reduce systemic vulnerabilities [17]. This orientation is particularly relevant for nutrition programming in fragile and crisis-affected settings, where short-term solutions must be embedded within longer-term food systems and service delivery approaches.

This study stems from an evidence-need prioritisation exercise conducted by the Nutrition Research Facility (NRF) through an online consultation with decision-makers in Asia, which identified a priority question for nutrition programming: *How do changes in food supply and food prices influence dietary patterns and malnutrition among children under five and women of reproductive age?* Stakeholders noted that this question is especially relevant in fragile and crisis-affected contexts, particularly in countries facing recurrent or protracted crises.

A systematic review was conducted to map how nutrition-specific and nutrition-sensitive interventions affect dietary patterns and malnutrition in fragile and crisis-affected settings. The analysis identified eight impact

pathways: “food consumption and child feeding”, “women’s participation in agricultural livelihoods”, “household income and purchasing power”, “consumer awareness and behaviour”, supporting systems (“health and care systems” and “food prices and trade”), “agriculture as a source of income” and “agriculture as a source of food”. Such interventions focused on food consumption, child feeding, and health and childcare systems were most consistently linked to improved nutrition outcomes, such as reduced acute malnutrition and mortality. Economic access to food and agricultural production pathways had more consistent effects on improving dietary quantity, quality, and diversity. The effects of women’s empowerment and participation in agricultural livelihoods on the food environment and broader policy interventions varied by context. Building on these findings, this study used expert consultation to further interpret the pathways, evaluate their relevance and timing in different crises, and identify the most effective intervention approaches. By integrating evidence synthesis and expert judgement, this study supports more actionable and context-sensitive nutrition programming and policy in fragile settings.

Box 1. NRF evidence on global shocks and nutrition: Systematic review on the impact of COVID-19 on diet and nutrition in LMIC (2021)

The Nutrition Research Facility (NRF) has previously carried out a systematic review and policy analysis examining the impact of the COVID-19 pandemic on diet quality, food security and nutrition outcomes across LMIC contexts, namely in Ethiopia and Guatemala [37].

According to this work, the major effects of COVID-19 pandemic and containment measures included:

- Substantial increases in moderate and severe food insecurity, particularly during lockdown periods;
- Loss of household income, as a result of unemployment and loss of income generating activities, was identified as a key driver of deteriorating food security and reduced diet quality;
- Shifts towards less diverse and less nutritious diets, driven primarily by reduced purchasing power;
- The impacts of COVID-19 on food systems and diets varied between and within countries and manifested with various intensity degrees, duration and in different forms, according to:
    - Timing, duration and stringency of national COVID-19 restriction measures and policies to mitigate their adverse impacts;
    - Context specific food value chain responses, with shorter value chains and traditional smallholder farms presenting higher resilient in the face of COVID-19 pandemic.
    - Differentiated impacts of restriction measures on different groups, disproportionately affecting women, socio-economically vulnerable populations, informal workers and young adults reliant on daily wages.
- Diverse government responses across contexts. Where existing and well-functioning social protection and public food distribution systems were in place or expanded, they helped mitigate adverse effects on food insecurity and diet quality. However, safety nets alone were insufficient, highlighting the need for broader food systems investments.

The full study and policy brief are available at: https://www.nutrition-research-facility-studies.eu/Impact-of-COVID-19-pandemic-on-diet-and-nutrition-outcomes-Systematic.

Picchioni F, Goulao F, Roberfroid D. The impact of COVID-19 on diet quality, food security and nutrition in low- and middle-income countries: A systematic review of the evidence. Clinical Nutrition. 2022;41(12):2955–2964.

Methodology

The study "Impact pathways of shocks, conflicts and crises on dietary patterns and malnutrition in low- and middle-income countries" was organised into two complementary methodological components. First, a systematic literature review synthesised existing evidence on the effectiveness of nutrition interventions in fragile and crisis-affected settings in terms of improving diet and nutrition outcomes, through the mapping of different impact pathways, linking interventions to outcomes. Second, an expert consultation was conducted to contextualise and interpret these pathways, assessing their relevance, specificity and applicability across different crisis contexts.

This section provides an overview of the methodological approach of the second component in the following subsections. To support interpretation, a set of working definitions used throughout the study is provided in Appendix 1. [19][20][19][21]

Study design

This study employed an expert consultation as a qualitative, interpretive component designed to complement the findings of the systematic review. Specifically, this consultation aimed to contextualise the evidence, assess the relevance and applicability of impact pathways across different fragility settings and regional contexts, and identify areas of convergence and uncertainty not captured in the systematic review.

The consultation was conducted using an online survey (Appendix 2). This format was selected to enable reaching a larger group of experts and to allow participation at respondents' convenience. Moreover, the structured survey format allowed for a more systematic comparison of expert assessments across the different pathways. The experts remained anonymous to one another; to reduce the risk that individual or institutional positions would dominate the consultation process, addressing common challenges identified when using other approaches for reaching expert consensus [22–24].

Panel composition and stakeholders' eligibility

Eligible participants were individuals with professional experience in the design, implementation, monitoring or governance of nutrition programmes in LMIC. Experts were identified through targeted strategic outreach, building on a pre-identified list of initiatives with similar objectives to the NRF and of relevant individuals and institutions.

To ensure diversity of perspectives across the research–policy–practice spectrum, eligibility was defined to include three main expertise typologies: i) researchers, ii) programme officers, civil society or non-governmental organisations representatives working on programme implementation and iii) local, national and regional-level policymakers.

Participants were considered eligible if they: i) belonged to one of the expertise typologies outlined above; ii) had professional experience relevant to nutrition programming in LMIC; iii) were familiar with food systems approaches and nutrition; iv) were fluent in English; v) were able to engage with an online survey platform; and (vi) provided informed consent to participate.

Sampling

A purposive sampling strategy was used to identify professionals with relevant expertise and experience, implemented in two tiers:

1. Direct invitation of individuals with relevant expertise, drawing on the previously identified lists of relevant experts and the professional networks of the NRF research team.

2. Snowball sampling, through which invited experts were encouraged to disseminate the survey to additional individuals meeting the inclusion criteria.

Eligibility and participation criteria were clearly communicated during the invitation to ensure transparency and consistency. This multi-tiered recruitment strategy aimed to ensure a diverse sample, thereby improving the relevance and applicability of the findings [22,25].

Sample size

There are no standardised guidelines for determining the sample size using this methodology, and the decision is often informed by the study objectives, scope, and methodology [22,24]. The consultation initially aimed to recruit approximately 50 experts through direct invitations and snowball sampling, including targeted outreach to strengthen representation from Asian settings. In practice, the final panel comprised 8 experts, with 4 reporting experience in Asian contexts. Potential reasons for this observed discrepancy in the number of responses are discussed in the "Strengths and limitations" section.

General approach

Survey structure

The expert consultation was carried out though an online questionnaire, designed and administered using EU Survey® (Appendix 2). Before launch, NRF team members conducted an internal pilot of the questionnaire.

A secure weblink was shared with experts. An informed consent section was embedded at the beginning of the questionnaire, which participants were required to complete before accessing the survey. The questionnaire primarily consisted of closed-ended questions using 5-point Likert scales, with an additional "unable to score" option to allow respondents to indicate uncertainty where appropriate. Open-ended questions were included to capture qualitative insights, particularly operational or contextual details not fully covered by the quantitative questions.

In addition, a short summary of the objectives and general information (Appendix 2) and the contact of the research team were made available for those seeking further details about the study.

Strategies to enhance results reliability and validity for use

All questions and key definitions were formulated in plain language, to improve clarity and consistency of responses.

The consultation initially remained open for three weeks, a timeframe commonly used in expert consultation studies involving geographically dispersed stakeholders [22–24]. The data collection period was extended by an additional two weeks to allow for further responses.

The final approved study report will be shared with participants who consented to further contact. This feedback process aims to support transparency and encourage participants to reflect on the collective responses [22–24].

Data analysis

The data was extracted from the EU Survey® platform and processed using MS Excel®. Descriptive statistics were used to summarise and present participants' responses. Responses to 5-point Likert items were treated as ordinal data.

Qualitative responses were analysed thematically. Two independent researchers (GA and LG) reviewed open-ended responses and identified key themes, with differences discussed and resolved through consensus.

Ethical considerations

Informed consent was obtained from all participants prior to their participation, ensuring they were fully informed about the study's objectives, procedures and their rights. Participation was entirely voluntary, and individuals were informed they had the option to withdraw from the study at any time without consequence.

All responses were anonymised prior to analysis, and no identifying information was linked to the data presented. Data were securely stored in password-protected files accessible only to the core research team (LG and GA) and managed in accordance with institutional data protection policies.

Given that the study did not involve the collection of personal, sensitive, or clinical data, and participants contributed in their professional capacity as experts, formal ethical approval was not required. Nevertheless, the study adhered to the reporting guideline for priority setting of health research (REPRISE) [26], thereby safeguarding the rights and integrity of all participants.

Contingency plan

The panel involved experts from diverse backgrounds and geographical sub-regions, which despite enriching the process, could also introduce varying interpretation of the ‘impact pathways framework’. To address this, clear guidance and definitions were provided within the questionnaire, and structured response formats were used to support comparability across inputs.

Given the busy schedules of participating experts, delays in response or incomplete participation were expected to occur. To mitigate this, clear expectations regarding timelines were communicated at the outset, with personalised reminders to the invitees to maintain engagement. An extended submission window of two weeks was provided, given a low response rate observed at the end of the 3-weeks deadline defined originally. No technical difficulties with the online platform were reported, but to account for this scenario, alternative formats such as email-based input was prepared to be made available.

Results

Experts' profile

A total of eight experts participated in the consultation, bringing professional experience in fragile and crisis-affected settings across multiple geographical regions. Most reported experience in sub-Saharan Africa (62.5%), followed by Europe (37.5%) and Southeast Asia (25.0%), with several experts reporting experience spanning more than one region. Overall, the panel composition provided substantial contextual and thematic expertise. Most experts had between 16 and 20 (37.5%) or over 20 (37.5%) years of professional experience, with the top three expertise areas being nutrition, food security and monitoring and evaluation (over 25% of the panel). Additional areas of expertise included policy and governance in food and nutrition, humanitarian response, health systems, agricultural economics or development. Experts predominantly worked in academia (62.5%), as independent consultants (25.0%) or in governmental institutions (12.5%).

Relevance, specificity and timing of impact across shocks, conflicts and crises' phases

Experts attributed heterogeneous relevance ratings across impact pathways. Food consumption and child feeding and health and childcare supporting systems were most consistently rated as relevant, with all experts assigning either relevant or extremely relevant ratings (100%). Household income and purchasing power and food prices and trade also received high relevance ratings, with 87.5% of experts rating them as relevant or extremely relevant. In contrast, women's participation in agricultural livelihoods, consumer awareness and behaviour, and agriculture as a source of income showed higher proportions of low or non-relevant ratings (37.5% each) (Table 1).

Considerable variation was also observed in how specifically the pathways were perceived to operate in fragile settings. Household income and purchasing power and health and childcare supporting systems showed the highest levels of perceived specificity, with 62.5% of experts rating them as clearly or exclusively specific to contexts of shocks, conflicts and crises (SCC). In contrast, food consumption and child feeding, women's participation in agricultural livelihoods, and consumer awareness and behaviour each had 50.0% of experts rating them as not specific or weakly specific, reflecting greater uncertainty regarding the extent to which these pathways are specific to fragile contexts. The agricultural pathways (Va and Vb) also displayed dispersed specificity ratings across categories (Table 1).

Experts further assessed the timing at which each pathway most significantly affects diets and nutrition across SCC phases, distinguishing between effects occurring during the SCC, in the immediate post-crisis period, in the longer-term recovery phase, and more than two years after the crisis. Overall, most pathways were not perceived to exert their primary influence exclusively during the acute phase of the shock or crisis. Instead, food consumption and child feeding and women's participation in agricultural livelihoods were most frequently reported to affect diets and nutrition during the SCC and extending into the recovery period, with 50.0% of experts selecting this timing. For household income and purchasing power, food prices and trade, and agriculture as a source of income, 37.5% of experts indicated that impacts are most pronounced more than two years after the crisis, suggesting persistence beyond the immediate SCC phase. Consumer awareness and behaviour showed the widest dispersion in timing responses, including 25.0% of experts selecting N/A, indicating limited agreement regarding when this pathway most strongly affects dietary and nutrition outcomes (Table 1).

Table 1. *Expert classification of impact pathways affecting diets and nutrition across shocks, conflicts and crises (SCC) (n = 8).*

Expert's classification	Impact pathways							
	Food consumption and child feeding (I)	Household income and purchasing power (IIa)	Women's participation in agricultural livelihoods (IIb)	Consumer awareness and behaviour (III)	Supporting systems: health and childcare (IVa)	Supporting systems: food prices and trade (IVb)	Agriculture as a source of food (Va)	Agriculture as a source of income (Vb)
Relevance for understanding how diets and nutrition are affected in SCC (n=8)								
N/A or unable to assess (%)	0.0	12.5	0.0	0.0	0.0	0.0	0.0	12.5
Not relevant (%)	0.0	0.0	12.5	12.5	0.0	0.0	0.0	0.0
Low relevance (%)	0.0	0.0	25.0	25.0	0.0	12.5	0.0	37.5
Relevant (%)	75.0	50.0	62.5	37.5	50.0	37.5	62.5	25.0
Extreme relevance (%)	25.0	37.5	0.0	25.0	50.0	50.0	37.5	25.0
Specificity to SCC contexts (n=8)								
N/A or unable to assess (%)	0.0	0.0	12.5	12.5	12.5	25.0	12.5	12.5
Not specific (%)	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Weakly specific (%)	25.0	0.0	25.0	25.0	0.0	0.0	12.5	12.5
Clearly specific (%)	37.5	37.5	37.5	25.0	37.5	25.0	37.5	37.5
Exclusively specific (%)	12.5	25.0	0.0	12.5	25.0	25.0	12.5	12.5
When do each impact pathway most significantly affect diets and nutrition (n=8)								
N/A or unable to assess (%)	0.0	0.0	25.0	25.0	0.0	0.0	0.0	0.0
During the SCC (while the shock/crisis/conflict is ongoing) (%)	0.0	0.0	0.0	12.5	0.0	0.0	0.0	0.0
During the SCC and shortly afterwards (%)	25.0	25.0	0.0	12.5	37.5	37.5	50.0	25.0
During the SCC and longer afterwards (%)	50.0	37.5	50.0	25.0	37.5	25.0	25.0	37.5
After the SCC (more than 2 years later) (%)	25.0	37.5	25.0	25.0	25.0	37.5	25.0	37.5
Geographical applicability (n=8)								
N/A or unable to assess (%)	25.0	12.5	25.0	12.5	12.5	12.5	12.5	12.5
Global	75.0	87.5	37.5	62.5	75.0	87.5	62.5	75.0
Regional	0.0	0.0	37.5	25.0	12.5	0.0	25.0	12.5
Type(s) of SCC that significantly contribute to each impact pathway's relevance (n=8)*								
Natural shocks (%)	100.0	62.5	50.0	50.0	75.0	87.5	100.0	87.5
Economic crises (%)	87.5	100.0	87.5	75.0	62.5	100.0	62.5	87.5
Armed conflicts (%)	75.0	87.5	87.5	50.0	100.0	87.5	75.0	87.5
Forced displacement (%)	87.5	100.0	87.5	75.0	100.0	62.5	87.5	87.5
Epidemics or pandemics (%)	62.5	50.0	50.0	50.0	75.0	62.5	37.5	50.0
Other (%)	12.5	0.0	12.5	0.0	12.5	0.0	12.5	12.5
None (%)	0.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0

Legend: N/A: not applicable; SCC: Shocks, conflicts and crises; * Percentages do not sum to 100% because experts could select more than one SCC type for each impact pathway.

Table 2 provides an overview of expert classifications across the rating dimensions of relevance, specificity, persistence of impact and geographical applicability, complementing the detailed distributions presented in Table 1. Pathways were classified according to the predominant direction of expert ratings, using a colour-coded scheme to reflect overall tendencies: green shading denotes pathways that were consistently rated as highly relevant and/or specific to SCC contexts; yellow indicates pathways that received generally positive ratings but with greater dispersion or contextual variation; and orange reflects pathways with a tendency towards lower relevance or higher uncertainty.

Table 2. *Summary of expert ratings on the relevance, specificity and expected persistence of nutrition impact pathways in shocks, conflicts and crises (SCC) settings.*

Impact pathways	Criteria			
	Relevance	Specificity	Persistence of Impact	Geographical applicability
Food consumption and child feeding (I)				
Household income and purchasing power (IIa)				
Women's participation in agricultural livelihoods (IIb)				
Consumer awareness and behaviour (III)				
Supporting systems: health and childcare (IVa)				
Supporting systems: Food prices and trade (IVb)				
Agriculture as a source of food (Va)				
Agriculture as a source of income (Vb)				

Legend: Green shade indicates high relevance and specificity ratings; orange indicates a tendency for low ratings; yellow reflects a tendency for positive ratings, but including some mixed classifications, thus disclosing that the impact may be more contextual.

In sum, impact pathways related to household income and purchasing power, to health and childcare supporting systems and food prices and trade, were perceived by the expert panel as having higher relevance, specificity and persistence of impact. In contrast, pathways linked to agricultural production and consumer behaviour display greater dispersion across criteria, suggesting that their influence on nutrition outcomes may be more contextual, being more sensitive to variations in crisis type, timing and geographical context (Table 2).

Relevance according to types of shocks, conflicts and crises

When the experts were asked about the types of SCC that influence each pathway's relevance, no pathway was considered irrelevant to any SCC type. Distinct patterns nevertheless emerged. Household income and purchasing power and food prices and trade were most frequently identified by experts as relevant in economic crises (100%), as well as in forced displacement and armed conflicts (87.5 – 100%). Health and childcare supporting systems were most frequently identified as relevant in armed conflicts and forced displacement (100%), alongside natural shocks and epidemics or pandemics (75%). Food consumption and child feeding and agriculture as a source of food were most consistently identified as relevant in natural shocks (100%). Women's participation in agricultural livelihoods and agriculture as a source of income presented high relevance in economic crises, armed conflicts and forced displacement (87%). In contrast, consumer awareness and behaviour displayed greater variability across SCC types, with fewer experts consistently identifying it as relevant for any single crisis category (Table 1).

Applicability and evidence strength in Asian contexts

Although the impact pathways identified in this study were, in general, considered applicable globally (Tables 1 and 2), which includes Asian contexts, only around half of the expert panel provided ratings on the strength of evidence for Asia, with 50–62.5% reporting being unable to assess it. Among the experts who provided ratings, household income and food prices, and health and childcare supporting systems received the highest high-evidence ratings (by n=3 experts). The remaining impact pathways showed more dispersed ratings across low, some and high evidence categories. None of the impact pathways was rated as having "no evidence" by any expert.

Effectiveness of interventions

The experts were also asked to identify the types of interventions most effective within each pathway, which are summarised in Table 3.

For pathways related to food consumption and feeding and health and childcare supporting systems, the most effective interventions, according to the experts are those focused IYCF support, therapeutic feeding, antenatal and postnatal care, and broader health–nutrition integration. For household income and purchasing power, experts highlighted cash-based interventions, social protection and employment schemes, and for food prices and trade they emphasised governance measures, including price stabilisation policies and market regulation. The interventions perceived as most effective for women's empowerment and participation in agricultural livelihoods and consumer behaviour were associated with gender-sensitive services, women's groups, behaviour change communication and community-based support platforms. Moreover, for the food production pathways, agriculture as a source of food and agriculture as a source of income, experts highlighted inputs distribution, home and community food production, market access and post-harvest and value-chain support.

Across pathways, experts identified several integrated intervention packages, combining nutrition-specific actions with social protection, health, and market-oriented measures. In addition, it is possible to observe that the examples provided include both short-term protective responses (e.g. food assistance and cash transfers), and longer-term measures aimed at restoring and strengthening food systems resilience, including value-chain support, market regulation, and governance interventions.

Table 3. *Perceptions about the intervention types that are most effective at protecting or improving dietary and nutritional outcomes during SCC, within each impact pathway.*

I. Food consumption	IIa. Food environment (economic access to food)	IIb. Food environment (women's participation in agri. livelihoods)	III. Consumer awareness and behaviour	IVa. Supporting systems: health, care, and IYCF	IVb. Supporting systems: food prices and trade	Va. Food production and supply: food as source	Vb. Food production and supply: food as income
IYCF & therapeutic care: - Infant and young child feeding (IYCF) support - Interventions targeting breastfeeding (including continued breastfeeding)	**Cash-based interventions** - Public works programmes (cash/food for work) - Composite cash + nutrition education models - Cash transfers - Conditional cash transfers	**Women's groups:** - Women-led cooperatives and producer groups - Community-based interventions targeting women's groups	**Behaviour change communication:** - IYCF BCC - Public BCC (including focus on adolescent girls; community, radio) -Public messaging (e.g., radio) with option for private follow up (e.g. call-in or peer group) - Mass media / mobile messaging (for rapid information dissemination during crises) - CHW/community peer support groups - Developing tools/channels to reach vulnerable groups	**Health & maternal care:** - Antenatal and postnatal counselling - Access and quality of care - Mother-baby areas - Peer counselling and peer groups	**Governance** - Support & control from government -Policy roadmaps on nutrition value chains & food safety standards - Agricultural inputs and price support policies	**Household-level food production** - Home gardens, backyard poultry, small livestock rearing - Community gardens - Home and community gardens for immediate food supply - School feeding linked to local production	**Value chains and market access** - Seeds or input distribution - Improve access to markets - Control of prices - Market-oriented agriculture
Micronutrient interventions: - Therapeutic feeding for acute malnutrition -Micronutrient supplementation - Fortified blended foods	**Employment & income** - Farmers field schools - Agricultural employment schemes - Income-generating activities (small business grants) - Grants and other targeted subsidies	**Gender-sensitive services:** - Gender-sensitive extension services - Integrated programmes addressing time burden / care trade-offs	**Food safety & regulation:** - BMS code enforcement - Food industry/trade regulation & food safety	**Health–nutrition integration:** - Health-nutrition integration (e.g., micronutrient supplementation, vaccination, hygiene promotion) - WASH services integrated with nutrition	**Price stabilisation & subsidies** - Food price regulation & subsidies - Food price stabilisation - Subsidies targeting nutrient-dense products	**Inputs & resources** - Local seed production & distribution - Free access to seeds and fertilisers - Access to land	**Post-harvest & storage** - Infrastructure development, logistics, storage - Post-harvest technologies

I. Food consumption	IIa. Food environment (economic access to food)	IIb. Food environment (women's participation in agri. livelihoods)	III. Consumer awareness and behaviour	IVa. Supporting systems: health, care, and IYCF	IVb. Supporting systems: food prices and trade	Va. Food production and supply: food as source	Vb. Food production and supply: food as income
Food assistance: - Complementary food distribution - Food voucher distribution - Food aid	**Market interventions:** - Market rehabilitation and support to small retailers/vendors - Grants/subsidies for nutrient-dense foods - Distribution, storage, logistics, value addition (shelf-stable foods) - Farmers' field schools	**Social protection:** - Social protection interventions for pregnant/breastfeeding women and U5 children - Interventions targeting breastfeeding - Safety nets and access to health services - Community-based interventions targeting women groups - Cash transfers	**Participatory education:** - Cooking demonstrations adapted to crisis contexts - Focus group discussions - Interventions targeting breastfeeding - Nutrition education actions through community health workers and peers support groups	**Strengthening health systems:** - Functionality of health facilities with appropriate staff - Access and quality of care - Access to infrastructure (e.g. potable water) and clinics - Free health services	**Value chain support** - Support for local food production and local SMEs - Improving market functionality	**Infrastructure** - Infrastructure for logistics, storage - Land use regulations	**Land governance** - Land use Act, land rights
Community & culture: - Community-based meal programmes - Focus on traditional and local foods	**Safety nets & protection** - Safety nets - Food aid and protection activities - Social protection interventions for pregnant and breastfeeding women and children under 5 years	**Other:** - Targeting nutrition value chains		**Protection services:** - Sensitisation in health centres (targeting women & 12–23 months babies) - Free protection - Control of donations of breastmilk substitutes	**Social protection:** - Safety nets - Credit and financial and social protection	**Others:** - Interventions targeting breastfeeding (as food production)	**Safety nets** - Safety nets for the most vulnerable
Access: - General "access" - Access to food, safe water, hygiene, health services	**Other:** - Alternate sources of funding			**Information systems:** - National Nutrition Information Systems			
Others: - Consumer awareness and behaviour - Subsidising							

Legend: BCC – Behaviour Change Communication; BMS – Breast Milk Substitutes; CHW – community health worker; IYCF – Infant and Young Child Feeding; WASH - Water, Sanitation and Hygiene.

Additional factors influencing how these pathways operate in contexts of SCC

When asked to provide insights about additional factors or conditions that influence how the eight impact pathways operate in fragile and crisis-affected settings, almost all experts emphasised several cross-cutting systemic enablers that determine whether interventions can achieve their intended diet and nutrition outcomes:

- The effectiveness of interventions depends on their integration within strong national and subnational governance systems capable of coordinating and sustaining action.
- Adequate financing, combined with strong governance mechanisms, is essential for effective and sustained nutrition action in SCC settings.
- Robust information systems are essential enablers, allowing interventions to be targeted, adapted, scaled and sustained throughout crises.
- Infants, young children and breastfeeding mothers are often insufficiently considered in food system frameworks, despite breastfeeding being a central source of food security and nutrition. Strengthening breastfeeding support during emergencies provides dual benefits, protecting infants in the acute phase while strengthening long-term breastfeeding practices. These groups should be systematically integrated into intervention design.
- Political economy dynamics (e.g., market power, vested interests, informal governance and the role of humanitarian actors) shape how food systems function in SCC settings and influence whether interventions reach vulnerable populations.
- Social networks act as powerful multipliers of intervention impact. This is particularly for behaviour change, IYCF, women's empowerment, and access-related pathways.

An additional point raised by several experts was the importance of operationalising the HDP nexus, linking emergency response with long-term system strengthening, resilience and sustainability. Specific considerations include:

- Prioritising prevention alongside emergency response to reduce vulnerability before shocks;
- Ensuring that investments made during crises simultaneously contribute to strengthening systems, namely health services delivery, supply chains, regulatory frameworks, and local provider capacity;
- Establishing coordinated financing windows, joint preparedness plans, strong routine data systems, and adaptive programming that bridges immediate life-saving actions with long-term capacity building.

Discussion and conclusion

In this study, a panel of experts in nutrition programming, policy and food systems in fragile contexts broadly confirmed eight impact pathways through which SCC impact diet and nutrition in LMIC and assessed their relevance, specificity and temporal persistence of impact across fragile contexts. Although most pathways were viewed as globally applicable, some were identified as highly dependent on the local context. The findings reinforce that diet and nutrition outcomes in fragile settings are influenced by multiple and interacting mechanisms, rather than by single, standalone actions or interventions.

One of the main findings is the central role played by pathways related to economic access to food, and to health and childcare systems. Existing research suggests that direct food assistance and feeding interventions are essential to prevent acute malnutrition and mortality, especially during emergencies, but their effects may lessen once the assistance ends, if underlying constraints to malnutrition and food security persist [16]. In contrast, measures that stabilise household incomes, strengthen market functioning and maintain service delivery have greater potential to influence diets and care practices over longer periods (particularly in protracted settings [5], by addressing the structural and systemic drivers of malnutrition [16,27]. Findings from cash transfer programmes and other social protection programmes suggest that protecting purchasing power and maintaining access to essential health and nutrition services can improve dietary quality, food security and nutrition in fragile and crisis-affected settings [27–30]. Cash transfer programmes can also strengthen local markets [27]. Observed household improvements include increased dietary diversity, namely increased consumption of animal-source foods, and reductions in mortality and morbidity, particularly diarrhoeal disease [28,29].

On the other hand, pathways related to food production and consumer awareness and behaviour seem to be more sensitive to context. Regarding food production, agricultural policies in many LMIC have predominantly focused on staple food production and producer support, with underinvestment in nutrition-sensitive sectors such as horticulture, fisheries and agroforestry, together with limited support to smallholders and women. This helps to explain, for example, why agricultural interventions have often improved food availability, but show more variable effects on dietary diversity and nutrition outcomes [27]. Despite women's central role in sustaining household food security during natural shocks, conflicts and displacement, when formal markets and services are disrupted and households rely more heavily on informal and unpaid care and food provisioning [31], agricultural interventions are more likely to translate into nutrition gains when they are designed to reduce caregiving trade-offs and strengthen women's access to land, credit and services [5,15,32] and build on their knowledge and resilience [5,31], barriers that often restrict their capacity to engage in agricultural work, to provide more stable income and better diets for their families. Similarly, according to evidence from more stable contexts, behaviour change and public information interventions can support improved feeding and care practices, but their effectiveness may be highly influenced by other factors such as food affordability [27]. Despite limited evidence from fragile contexts, it is likely that household constraints, food affordability and other structural factors such as access to services may act as constraining factors limiting the effectiveness of standalone behavioural interventions.

The experts' assessment aligns with and helps explain a finding from the systematic review supporting this study (to be added: link to the systematic review report, once finalised/approved) that combined interventions, including those targeting income and supporting systems, often show more sustained nutrition effects than stand-alone food or behaviour-focused actions. These insights are also consistent with evidence from protracted crises and post-crisis recovery contexts, where income shocks, food price volatility and disruptions to basic services were identified as major drivers of decreases in dietary intake and quality, and increased malnutrition [11,33,34], especially beyond the acute phase of crises, when shocks are prolonged and interact with pre-existing structural vulnerabilities [27]. In addition, both food production and behavioural interventions are expected to be more effective when implemented within multicomponent and integrated programmes that address economic, service-related and caregiving constraints [16,27]. The

diversity of effective intervention examples provided by the experts further illustrates the value added of interventions combining nutrition-specific actions with social protection, health, and market-oriented measures. These include, for example, the integration of IYCF support and therapeutic feeding with cash transfers and social protection schemes for pregnant and breastfeeding women; the combination of household-level food production (e.g. home gardens and small livestock) with nutrition education and access to health services; and of income-generating activities and agricultural support with market regulation, price stabilisation and food safety governance. These examples extend from interventions implemented at household and community level to broader systemic measures targeting markets, services and regulatory frameworks.

Another takeaway from this study is the importance of timing and persistence of impact. According to the experts, interventions focused on food consumption and on health and care systems tend to show more immediate positive effects on diet and nutrition, whereas income, market- and food production pathways are more likely to influence diets and nutrition beyond the acute phase, and into recovery. This pattern is in line with the literature from fragile and crisis-affected settings showing that food consumption, IYCF and health service interventions play a more protective role during acute phases by preventing rapid deterioration in diets, health and survival outcomes; income, market and system-oriented mechanisms, in turn, operate over longer timeframes, since their effects depend on livelihood stabilisation, market functioning and continuity of service delivery beyond the immediate crisis phase [5,27,35].

The expert panel underlined that broader structural conditions strongly influence the effectiveness of the impact pathways, also aligning with guidance for fragile and protracted crises that interventions should consider several institutional and market conditions [5]. Their emphasis on systems, coordination and enabling conditions is consistent with evidence showing that governance capacity is a critical determinant of whether integrated nutrition interventions can be sustained and scaled in fragile contexts [35]. Other authors have further suggested that the successful integration of nutrition interventions depends on political readiness, institutional capacity, coordinated financing and functional delivery systems, particularly to tackle persistent barriers such as short-term funding cycles, fragmented coordination and weak information systems [16]. These insights are closely related to the concerns expressed about the Humanitarian–Development–Peace nexus, on the need to align emergency response with recovery and system strengthening to avoid repeated cycles of vulnerability. The European Union and other international actors have already acknowledged many of the discussed operational challenges associated with implementing this framework in fragile and conflict-affected settings and have expressed commitment to advancing its practical implementation [18]. Given that nutrition interventions are most effective when embedded within longer-term strategies that address structural constraints and support resilience in fragile and crisis-affected settings [5,16,35], the key insights from this consultation help clarify some areas where operationalising the HDP could be put into practice. Operationalising the HDP nexus should therefore be understood as a practical requirement for sustaining nutrition impacts across crisis-affected settings, rather than as a conceptual policy goal.

Strengths and limitations

Some limitations should be noted. The expert consultation involved a limited number of participants, which mainly affected the quantitative interpretation of the pathway ratings; differences across pathways should therefore be interpreted with caution. Although the consultation aimed to reach a broader pool of experts through direct invitations and snowball dissemination, the final panel comprised eight experts who met the eligibility criteria and completed the consultation. The limited number of responses may reflect a combination of factors including the reliance on voluntary participation, competing professional commitments among senior experts and the consultation timeframe which, although extended, remained relatively short. Furthermore, the snowball dissemination strategy relied on participants sharing the invitation within their professional networks, and the extent of this secondary dissemination could not be assessed. This is especially relevant given the limited availability of professionals working in fragile and crisis-

affected contexts. Nevertheless, the consultation provided qualitative insights from experienced professionals working in fragile contexts, which complement and help interpret the evidence identified in the systematic review.

Experts' confidence in assessing region-specific evidence, particularly for Asia, also varied. This variability likely reflects heterogeneity in country contexts and crisis types, as well as gaps in the availability of region-specific intervention evidence, rather than disagreement on the underlying mechanisms through which the pathways operate. In line with this, greater dispersion was observed in relevance and specificity ratings for pathways related to food production and consumer behaviour. According to our interpretation, this heterogeneity reflects the context-dependent nature of these pathways, whose effectiveness is associated with complementary institutional, economic, and gender-related conditions. Generalisability across settings may be, therefore, limited. Nevertheless, it is important to note that the observed dispersion in expert ratings may reflect heterogeneity in the supporting evidence base. These are therefore topics for which further empirical research is needed.

This study adds value by bringing together contextual, operational and policy-related experience in fragile and crisis-affected settings. As with other expert consultations, the findings reflect expert judgement rather than causal evidence and should be interpreted as complementary to empirical research. The consultation supported the interpretation of impact pathways through a food systems lens, helped identify implementation constraints and trade-offs, and provided insights that are often not captured in formal evaluations. By doing so, this study contributes practical and context-sensitive evidence to inform nutrition programming beyond the acute phase of crises. This overarching study also complements a previous NRF work on the impact of global shocks on diet and nutrition, namely the COVID-19 pandemic (Box 1), as it extends the focus beyond a single shock to multiple forms of shocks, conflicts and crises and analyses intervention pathways across crisis phases. Both studies advance a more thorough understanding of how nutrition programming can mitigate the impacts of systemic disruptions in fragile settings.

Conclusion

This study contributes to a more nuanced understanding of how nutrition interventions influence, through different pathways, diets and nutrition in fragile and crisis-affected contexts. Although some pathways are consistently relevant across settings, the effectiveness of others varies across contexts, crisis type and timing. By identifying some trade-offs and constrained enabling conditions, this study can inform the design of more integrated and context-sensitive nutrition interventions, particularly beyond the acute phase of crises.

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Appendices

Appendix 1. Working definitions

Shocks, conflicts and crises: the terms shock, conflict and crisis are used to capture different forms of disruption that affect food systems. These are often interconnected [19], with one triggering or amplifying another, affecting food supply chains, food prices, purchasing power and access to services.

Shocks refer to sudden and unexpected events like natural disasters and public health emergencies (e.g., pandemics)[20].

Conflicts refer to violent struggles or oppositions among different groups or factions, often resulting in population displacement, among other impacts (e.g., international or civil wars, political upheavals) [19].

Crises refer to broader and/or prolonged disruptions characterised by profound challenges and can be precipitated by shocks or conflicts (e.g., economic recessions, climate change)[21].

Impact pathways: impact pathways describe the logical sequence through which programme activities (e.g., food provision, cash transfers or nutrition education) lead to changes in different components of the food system (e.g. food availability, household income or nutrition knowledge), and how these intermediate changes translate into final dietary and nutrition outcomes (e.g. improved diet quality, stunting reduction).

Nutrition interventions: nutrition interventions can be divided into nutrition-specific and nutrition-sensitive interventions [36]:

Nutrition-specific interventions are those that address the immediate causes of malnutrition, by improving dietary intake, nutrient adequacy and feeding practices. Examples include micronutrient supplementation, food fortification, feeding programmes, treatment of severe acute malnutrition, breastfeeding promotion, and support for Infant and Young Child Feeding (IYCF).

Nutrition-sensitive interventions are those that address the underlying and systemic causes of malnutrition, by influencing household food security, caregiving and feeding practices, access to essential services, and the socio-economic conditions that shape these factors. Examples include cash transfers, social safety nets, improvement of agricultural practices, income generation programmes, women's empowerment initiatives and behaviour change interventions.

Appendix 2. Survey

NRF Survey Impact Pathways

Fields marked with * are mandatory.

Estimated time to complete: 15 minutes

Context:

Thank you for your willingness to participate in this expert consultation developed in the context of the Nutrition Research Facility (NRF) under the Knowledge and Research for Nutrition project of the European Commission (2020-2026). The project is funded by the European Union and implemented by Agrinatura.

This questionnaire is part of a research study aiming to analyse how interventions implemented in response to shocks, crises, or conflicts (SCC) in low- and middle-income countries (LMIC) affect diets and nutrition outcomes. The study stems from an evidence needs prioritisation exercise conducted through an online consultation process with decision-makers in Asia. The analysis maps intervention impacts through food systems pathways, from their entry point to reported outcomes.

Objective:

We are seeking expert insights to assess the specificity, relevance, and geographical applicability (Asia and beyond) of these pathways in SCC contexts.

We kindly ask you to respond based on your professional experience. Your responses will help expand our understanding of how these mechanisms operate.

Informed consent:

By proceeding with this questionnaire, you confirm that:

- You are 18 years of age or older.
- You understand the purpose of the study and your role as an expert respondent.
- You are familiar with the Food Systems framework.
- You voluntarily agree to participate in this research. No financial compensation is provided for completing the study.
- You understand that your responses will be used strictly for research purposes and will remain confidential. No personally identifiable information will be disclosed in any publication or shared outside the research team.
- You may stop participating at any time without penalty.

If you do not wish to participate, you may close this form now.

Section 1: Expert Assessment of Pathways under Shocks, Crises, and Conflicts

Impact Pathways represent how broad types of interventions contribute to dietary and/or nutrition outcomes, as mapped within the HLPE food systems framework. We kindly ask you to consider **8 distinct pathways** that will be the focus of the questions:

- I. Interventions targeting food consumption.
- IIa. Interventions targeting accessibility and food environments aiming to increase income, purchasing power, or expenditure.
- IIb. Interventions targeting accessibility and food environments involving women's empowerment and participation in agricultural livelihoods.
- III. Interventions targeting consumer awareness and behaviour.
- IVa. Interventions targeting supporting systems related to health, care practices, and infant and young child feeding (IYCF).
- IVb. Interventions targeting supporting systems affecting food prices and trade.
- Va. Interventions targeting food production and supply chains where food production serves as a direct source of food.
- Vb. Interventions targeting food production and supply chains where food production serves as a source of income.

For information and visual summaries of each pathway, see this document below. It serves as a supporting resource.
Download: Background_document_expertconsultation20250731.pdf

1. To what extent are the pathways below relevant for understanding how diets and nutrition are affected in contexts of Shocks, Crises, or Conflicts (SCC)?

	Unable to assess	Not relevant in SCC contexts	Low relevance in SCC contexts	Relevant in SCC contexts	Extremely relevant in SCC contexts
* I. Food consumption	○	○	○	○	○
* IIa. Food environment, improving economic access to food	○	○	○	○	○
* IIb. Food environment, involving women's empowerment and participation	○	○	○	○	○
* III. Consumer awareness and behaviour	○	○	○	○	○
* IVa. Supporting systems: health, care, and infant and young child feeding (IYCF)	○	○	○	○	○
* IVb. Supporting systems: food prices and trade	○	○	○	○	○
* Va. Food production and supply: food as a direct source	○	○	○	○	○
* Vb. Food production and supply: food as a source of income	○	○	○	○	○

2. To what extent do you consider each pathway to be specific to contexts affected by Shocks, Crises, or Conflicts (SCC)?

	Unable to assess	Not specific – the pathway is equally applicable in stable contexts	Weakly specific – the pathway may operate differently under SCC, but evidence is limited	Clearly specific – the pathway operates distinctly in response to SCC	Exclusively specific – the pathway is only observed or relevant in SCC- affected contexts
* I. Food consumption	○	○	○	○	○
* IIa. Food environment, improving economic access to food	○	○	○	○	○
* IIb. Food environment, involving women's empowerment and participation	○	○	○	○	○
* III. Consumer awareness and behaviour	○	○	○	○	○
* IVa. Supporting systems: health, care, and infant and young child feeding (IYCF)	○	○	○	○	○
* IVb. Supporting systems: food prices and trade	○	○	○	○	○
* Va. Food production and supply: food as a direct source	○	○	○	○	○
* Vb. Food production and supply: food as a source of income	○	○	○	○	○

3. For each pathway, identify the type(s) of Shocks, Crises, or Conflicts that, in your view, significantly contribute to its relevance

(Check all that apply)

	Natural shocks	Economic crises	Armed conflicts	Forced displacement	Epidemics or pandemics	None	Other
* I. Food consumption	☐	☐	☐	☐	☐	☐	☐
* IIa. Food environment, improving economic access to food	☐	☐	☐	☐	☐	☐	☐
* IIb. Food environment, involving women's empowerment and participation	☐	☐	☐	☐	☐	☐	☐
* III. Consumer awareness and behaviour	☐	☐	☐	☐	☐	☐	☐
* IVa. Supporting systems: health, care, and infant and young child feeding (IYCF)	☐	☐	☐	☐	☐	☐	☐
* IVb. Supporting systems: food prices and trade	☐	☐	☐	☐	☐	☐	☐
* Va. Food production and supply: food as a direct source	☐	☐	☐	☐	☐	☐	☐
* Vb. Food production and supply: food as a source of income	☐	☐	☐	☐	☐	☐	☐

4. Based on your experience, when do the pathways listed below most significantly affect people's diets or nutritional status in relation to the Shocks, Crises, or Conflicts (SCC)?

	Unable to assess	During the SCC (while the shock/crisis /conflict is ongoing)	During the SCC and shortly afterwards	During the SCC and longer afterwards	After the SCC (more than 2 years later)
* I. Food consumption	☐	☐	☐	☐	☐
* IIa. Food environment, improving economic access to food	☐	☐	☐	☐	☐
* IIb. Food environment, involving women's empowerment and participation	☐	☐	☐	☐	☐
* III. Consumer awareness and behaviour	☐	☐	☐	☐	☐
* IVa. Supporting systems: health, care, and infant and young child feeding (IYCF)	☐	☐	☐	☐	☐
* IVb. Supporting systems: food prices and trade	☐	☐	☐	☐	☐
* Va. Food production and supply: food as a direct source	☐	☐	☐	☐	☐
* Vb. Food production and supply: food as a source of income	☐	☐	☐	☐	☐

5. In your view, are the pathway below relevant across all geographical contexts when affected by Shocks, Crises, or Conflicts, or only in certain regions?

	Unable to assess	Global - Relevant across all regions when affected by SCC	Regional - Relevant only in certain regions affected by SCC
* I. Food consumption	☐	☐	☐
* IIa. Food environment, improving economic access to food	☐	☐	☐
* IIb. Food environment, involving women's empowerment and participation	☐	☐	☐

* III. Consumer awareness and behaviour	☐	☐	☐
* IVa. Supporting systems: health, care, and infant and young child feeding (IYCF)	☐	☐	☐
* IVb. Supporting systems: food prices and trade	☐	☐	☐
* Va. Food production and supply: food as a direct source	☐	☐	☐
* Vb. Food production and supply: food as a source of income	☐	☐	☐

6. In the context of Asia, how would you characterise the strength of evidence that the pathways below lead to dietary or nutritional changes in situations of Shocks, Crises, or Conflicts?

	Unable to assess	No evidence of such an association in Asia	Low evidence of such an association in Asia	Some evidence of such an association in Asia	High evidence of such an association in Asia
* I. Food consumption	☐	☐	☐	☐	☐
* IIa. Food environment, improving economic access to food	☐	☐	☐	☐	☐
* IIb. Food environment, involving women's empowerment and participation	☐	☐	☐	☐	☐
* III. Consumer awareness and behaviour	☐	☐	☐	☐	☐
* IVa. Supporting systems: health, care, and infant and young child feeding (IYCF)	☐	☐	☐	☐	☐
* IVb. Supporting systems: food prices and trade.	☐	☐	☐	☐	☐
* Va. Food production and supply: food as a direct source	☐	☐	☐	☐	☐
* Vb. Food production and supply: food as a source of income	☐	☐	☐	☐	☐

7. From your experience, which intervention types (or specific programme models) are most effective at protecting or improving dietary/nutritional outcomes during Shocks, Crises, or Conflicts? *Indicate up to three (3) interventions considered to be most effective for each Impact Pathway*

* Pathway I: Interventions targeting food consumption

* Pathway IIa: Interventions targeting accessibility and food environments aiming to increase income, purchasing power, or expenditure

* Pathway IIb: Interventions targeting accessibility and food environments involving women's empowerment and participation in agricultural livelihoods

* Pathway III: Interventions targeting consumer awareness and behaviour

* Pathway IVa: Interventions targeting supporting systems related to health, care practices, and infant and young child feeding

* Pathway IVb: Interventions targeting supporting systems affecting food prices and trade

* Pathway Va: Interventions targeting food production and supply chains where food production serves as a direct source of food

* Pathway Vb: Interventions targeting food production and supply chains where food production serves as a source of income

8. Are there any additional factors or conditions that you believe influence how these pathways operate in contexts of Shocks, Crises, or Conflicts?

(optional)

9. Is there anything else you would like to add regarding the relevance, specificity, or effectiveness of these pathways in Shocks, Crises, or Conflicts-affected contexts?

(optional)

Respondent Information

Region of primary professional experience

(select all that apply)

- ☐ Sub-Saharan Africa
- ☐ Middle East and North Africa
- ☐ South Asia
- ☐ Southeast Asia
- ☐ East Asia
- ☐ Latin America and the Caribbean
- ☐ Europe
- ☐ North America
- ☐ Pacific Islands
- ☐ Global
- ☐ Others

Have you worked directly in contexts affected by Shocks, Crises, or Conflicts?

- ○ Yes
- ○ No
- ○ N/A

Main areas of expertise

(select up to 3 areas that best describe your current or past professional focus)

- ○ ☐ Agricultural economics
- ○ ☐ Agriculture and livelihoods
- ○ ☐ Development
- ○ ☐ Environmental sciences

- ☐ Food security
- ☐ Food systems
- ☐ Health systems
- ☐ Humanitarian response
- ☐ Livelihoods / Resilience
- ☐ Monitoring and evaluation
- ☐ Nutrition
- ☐ Policy and governance in food and nutrition
- ☐ Public health
- ☐ Social protection
- ☐ Others

Affiliated to institution/organisation

- Academic or research institution
- Government institution
- International organisation
- Donor agency
- NGO / Civil society
- Private sector
- Independent consultant
- Other

Years of professional experience in relevant areas of expertise

- 0-5 years
- 6-10 years
- 11-15 years
- 16-20 years
- 20+years

Name and e-mail contact

optional

Thank you for your valuable contribution!

Appendix 3. Background document supporting the survey

Expert Questionnaire: Pathways linking interventions to Diet and Nutrition Outcomes in contexts of Shocks, Crises or Conflicts (SCC) | Supporting information

Figures 1 to 5 illustrate the impact pathways of different sets of nutrition interventions on dietary and nutrition outcomes, grouped by their entry points in the food system. Figure 6 provides a consolidated overview of the main pathways.

I - Interventions targeting food consumption and child feeding

Nutrition-specific interventions targeting dietary intake, particularly supplementary feeding, consistently improved dietary and nutrition outcomes across various SCC contexts. These improvements included increased birthweight, height, and head circumference, and reductions in anaemia, wasting, stunting, and underweight. One of the main set of interventions (path A) targeted directly food consumption and child feeding, with less clear links to the food supply chain or food environment. When combined with health or behaviour change components (Composite D-intake), supplementary feeding interventions further supported positive diet and nutrition outcomes by improving caregiver knowledge and practices (paths C, D, F, G, H). The impact pathways largely centred on improved dietary intake and feeding practices, with some evidence suggesting added benefits through increased food access, affordability, or productivity in specific settings (paths B, E, F) (Figure 1).

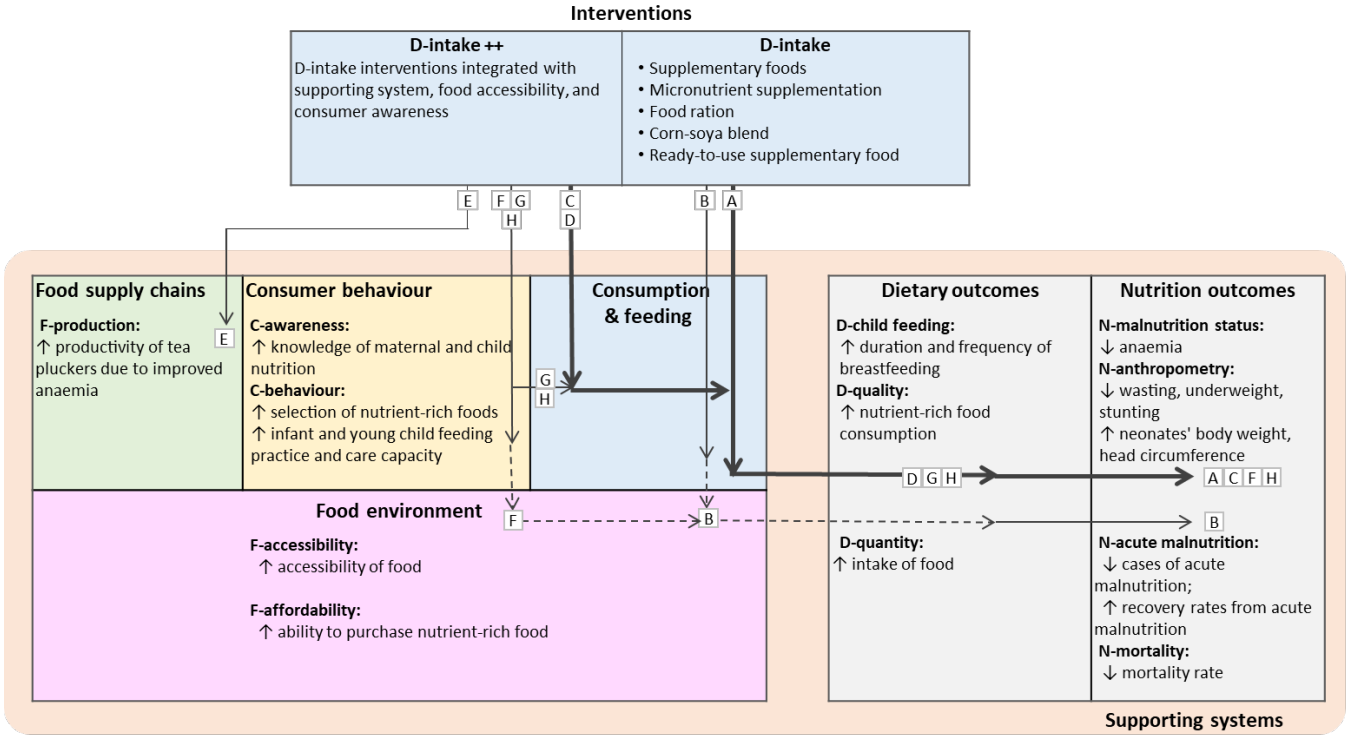


Figure 1. Impact pathways of interventions targeting direct food consumption and child feeding (I).
Solid arrows represent empirically observed pathways and dashed arrows represent theoretical links between food system components. Bold pathways indicate primary, consistently evidenced impact pathways across studies. Each of the "small boxes" (A to H) represent a cluster of interventions (more detail about these clusters is available upon request to the NRF team). "++": combined with other interventions; IYCF: Infant and young child feeding.

II - Interventions on the food environment

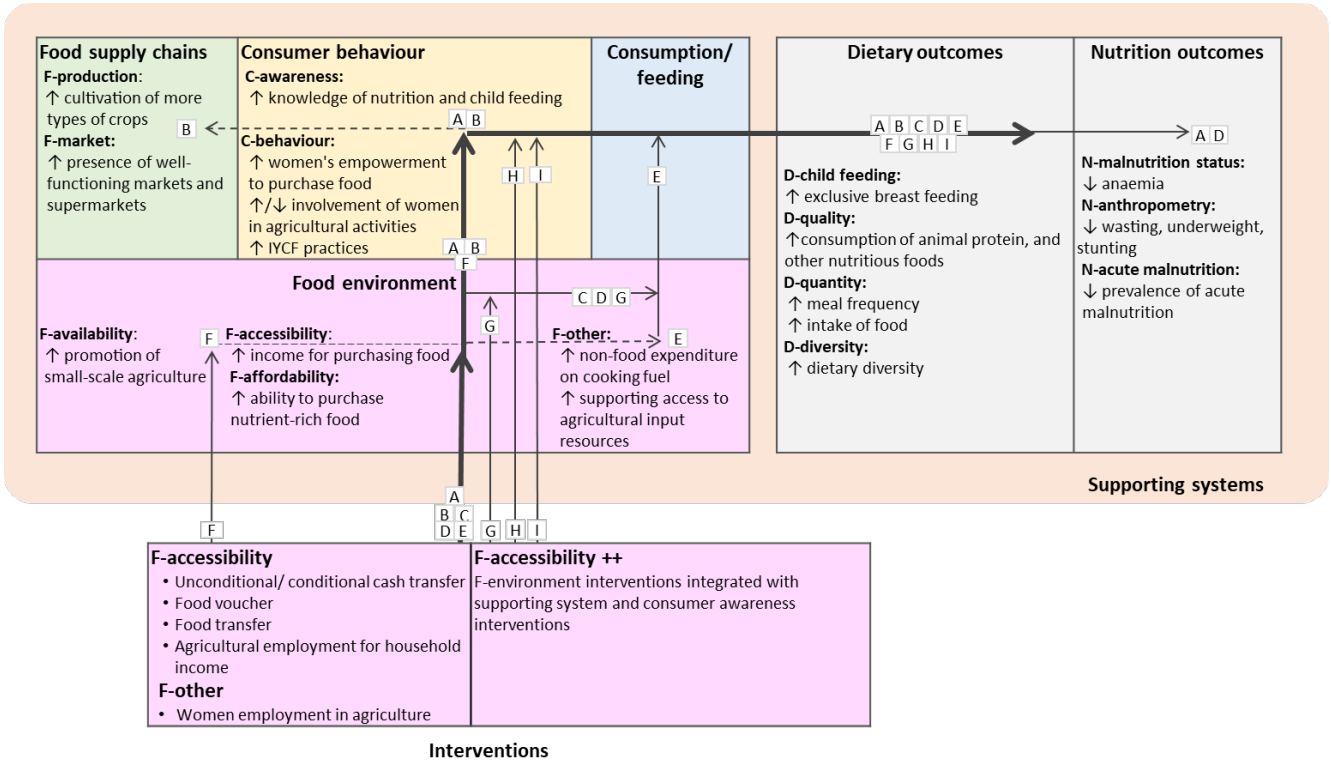
Interventions on the food environment, particularly targeting food accessibility and affordability, are the most frequently reported entry point, with consistently reported improvements in dietary outcomes. However, for nutrition outcomes, the evidence base remains more limited and often theoretical. These interventions primarily included cash transfers (conditional and unconditional), food vouchers, food

transfers, and income-generating initiatives such as agricultural employment. When integrated with supporting systems or combined with awareness-raising components (Composite F-accessibility), they further contributed to dietary improvements and, to a lesser extent, nutrition outcomes.

Two distinct but interconnected pathways were identified:

- **Pathway IIa involves increasing income and purchasing power,** which enhances access to nutrient-rich foods and raises food expenditure, later translated into increased dietary diversity, meal frequency, and intake of animal-source and other nutritious foods. Evidence suggests potential reductions in acute malnutrition, wasting, and mortality, through these impacts were often theorised rather than empirically observed (paths A to G).
- **Pathway IIb relates to interventions promoting women's empowerment and participation in agricultural livelihoods**. These can positively affect income, food availability, and dietary quality, particularly during harvest periods. However, their nutritional impact is context dependent. In some settings, increased agricultural workloads and caregiving trade-offs have been associated with reduced time for infant feeding, health-seeking behaviours, or household care. As a result, some studies reported mixed or even adverse impacts on maternal and child nutrition outcomes, particularly when seasonal food insecurity or inadequate support systems were present (paths H and I).

Figure 2. Impact pathways of interventions targeting the food environment (II).



Solid arrows represent empirically observed pathways and dashed arrows represent theoretical links between food system components. Bold pathways indicate primary, consistently evidenced impact pathways across studies. Each of the "small boxes" (A to H) represents a cluster of interventions (more detail about these clusters is available upon request to the NRF team). "++": combined with other interventions; IYCF: Infant and young child feeding.

III - Interventions targeting consumer awareness and behaviour change, through enhanced maternal care capacity, and health-seeking knowledge and practices for infant and young child feeding (IYCF)

Interventions aimed at improving consumer awareness and behaviour, particularly maternal knowledge, IYCF practices, and health-seeking behaviour, consistently led to improved dietary and nutrition outcomes. These interventions typically included nutrition education, breastfeeding promotion, and counselling, often delivered through health or care systems such as postnatal care or community health volunteers.

The most frequently observed impact pathway (Path A) links improved maternal knowledge to better feeding practices, such as longer exclusive breastfeeding and more diverse and nutrient-rich diets. Paths B and C highlight that increased maternal empowerment and behaviour change can affect food purchasing and household food production (e.g. poultry raising). Consumer behaviour interventions improved both dietary outcomes (e.g. quality, quantity, diversity) and nutrition outcomes (e.g. reduced anaemia, wasting, stunting). Effects were strongest when awareness-building was combined with supporting systems such as childcare or health services (Paths B and C) (Figure 3).

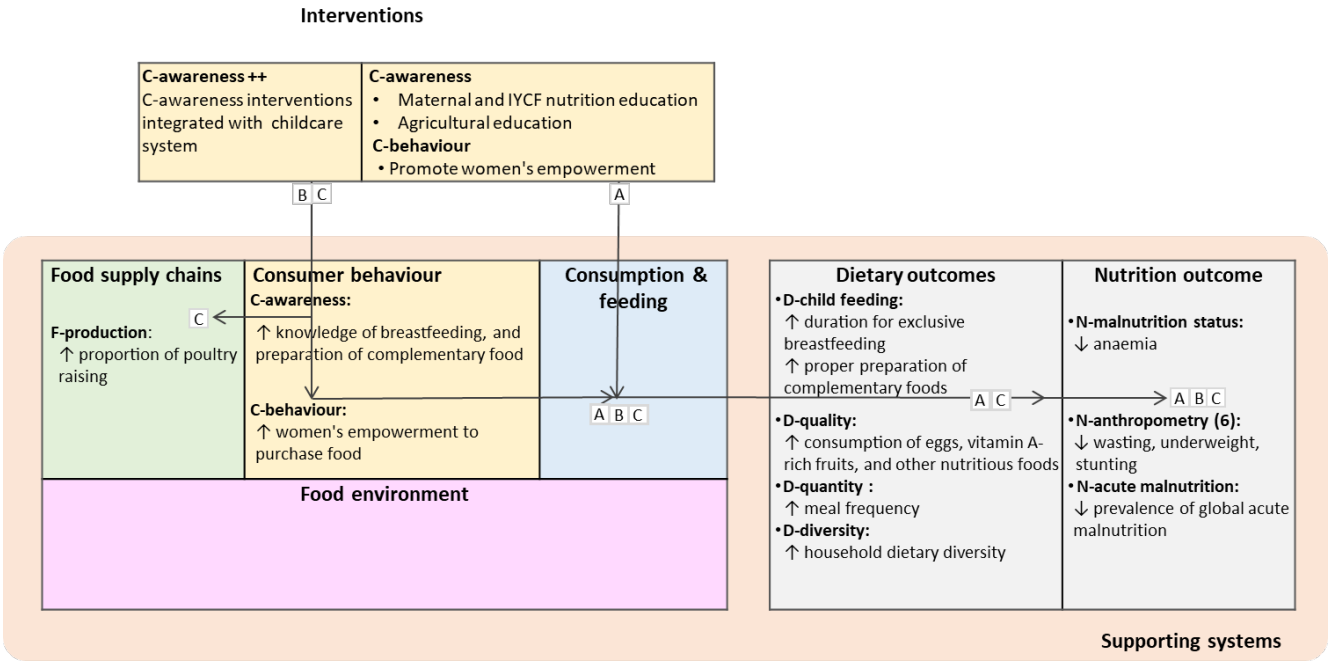


Figure 3. Impact pathways of interventions targeting consumer awareness and behaviour change (III).
Solid arrows represent empirically observed pathways and dashed arrows represent theoretical links between food system components. Bold pathways indicate primary, consistently evidenced impact pathways across studies. Each of the "small boxes" (A to C) represent a cluster of interventions (more detail about these clusters is available upon request to the NRF team). "++": combined with other interventions; IYCF: Infant and young child feeding.

IV - Interventions in supporting systems (health system, care system, policies)

These interventions influenced dietary and nutrition outcomes either by improving maternal care and feeding capacity or by modifying food affordability and accessibility through agri-food policies. Two distinct pathways were identified:

- **Pathway IVa includes interventions integrated with health and childcare systems [Supporting Systems – Health (S-health) and supporting systems – Care (S-care)].** These aimed to strengthen IYCF practices and maternal capacity through postnatal counselling, breastfeeding promotion, WASH services, and community-based health and nutrition programmes. The most prominent pathway (Path A) led to improved dietary practices through direct counselling and care. Additional pathways (Paths B and C) operated through increased knowledge and behaviour change among caregivers regarding feeding and food preparation. One further pathway (Path D) involved community health volunteers enhancing awareness and reducing acute malnutrition through home-based support.
- **Pathway IVb covers interventions implemented through broader agri-food policy mechanisms, such as price regulation and trade liberalisation [Supporting systems – policy (S-policy)].** These interventions affected food purchasing, expenditure, and consumption patterns by modifying food prices and rural wages. Although one pathway (Path E) showed a positive effect on nutrition by increasing household spending on nutritious food, others (Paths F, G, and H) improved affordability and accessibility, but without reported impacts on diet or nutrition. Some evidence pointed to negative consequences, including reduced dietary quality linked to price increases following trade reforms.

Health and care-based interventions (Pathway IVa) improved dietary and nutrition outcomes by enhancing maternal knowledge, IYCF practices, and access to counselling and community health services; in contrast, policy-based interventions (Pathway IVb) influenced food affordability and accessibility through changes in food prices, rural wages, and market conditions, but their effects on diet and nutrition outcomes were mixed and often not directly measured (Figure 4).

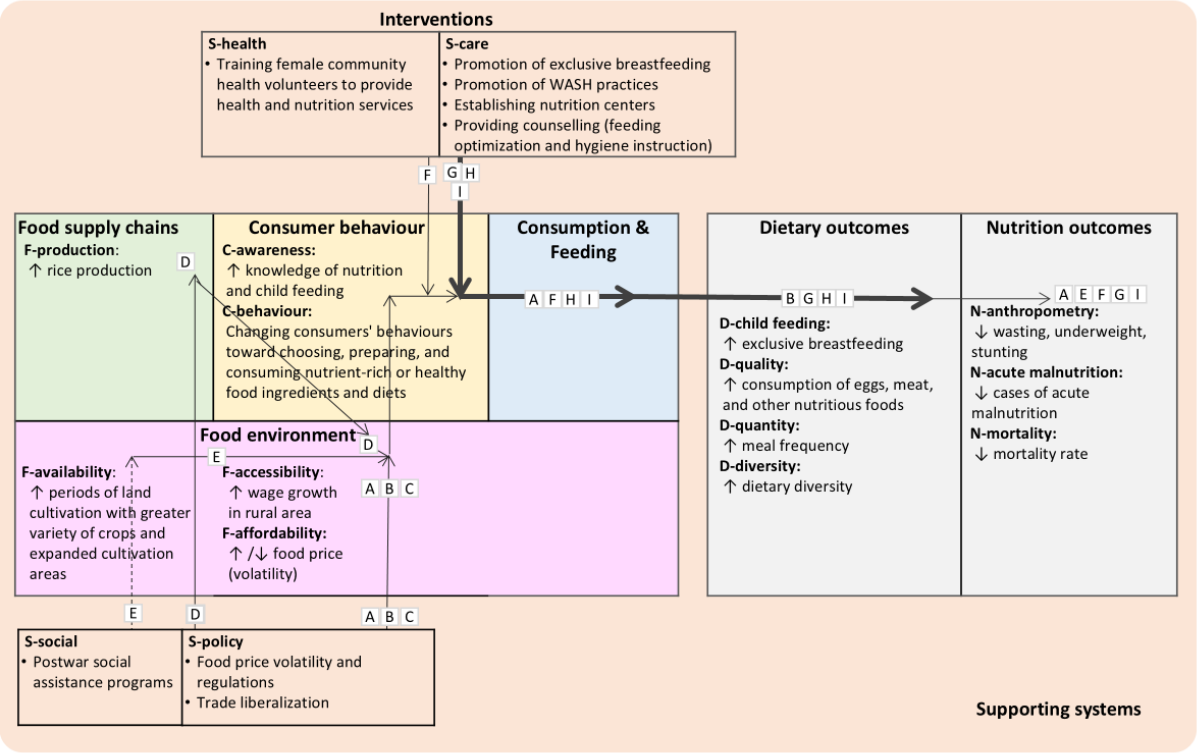


Figure 4. Impact pathways of interventions with supporting systems.
Solid arrows represent empirically observed pathways and dashed arrows represent theoretical links between food system components. Bold pathways indicate primary, consistently evidenced impact pathways across studies. Each of the "small boxes" (A to I) represent a cluster of interventions (more detail about these clusters is available upon request to the NRF team). "++": combined with other interventions; IYCF: Infant and young child feeding.

V - Interventions targeting food production and supply

Interventions in food production and supply chains contributed to dietary and nutrition outcomes via two main routes: one focused on increasing the availability and consumption of nutritious foods (Pathway Va: agriculture as a source of food), and the other on enhancing household income and food purchasing power through market participation and farm productivity (Pathway Vb: agriculture as a source of income).

- **In Pathway Va, increased food production and diversification** led to improved household diets by enhancing availability and consumption of nutritious foods. These effects were primarily observed through Paths A, B, and F, which linked production directly to improved child feeding and dietary quality. Some pathways (Paths C and D) also involved consumption and feeding improvements associated with market access or farm expansion. While most of these pathways contributed to dietary outcomes, nutrition impacts were more limited and observed only in select cases (e.g. Path B).
- **Pathway Vb operated through increased income generation, enabling greater food purchasing and influencing consumer behaviour.** Paths G, H, I, and K showed how income from agricultural activities, often involving women's empowerment, improved the quantity and quality of food purchases. These changes supported both dietary improvements and, in some cases, nutrition outcomes such as reductions in anaemia and night blindness (Paths F, I, and J). Path J highlights the added impact of combining production interventions with childcare systems.

Together, these interventions primarily acted through the food supply chains component, with several extending into the food environment (availability and accessibility) and consumer behaviour. Dietary

outcomes were frequently improved, including food quality, intake, and diversity, but only a subset of pathways (Paths B, F, I, J) demonstrated measurable effects on nutrition outcomes, underscoring the importance of integrated approaches for nutrition impact in SCC settings (Figure 5).

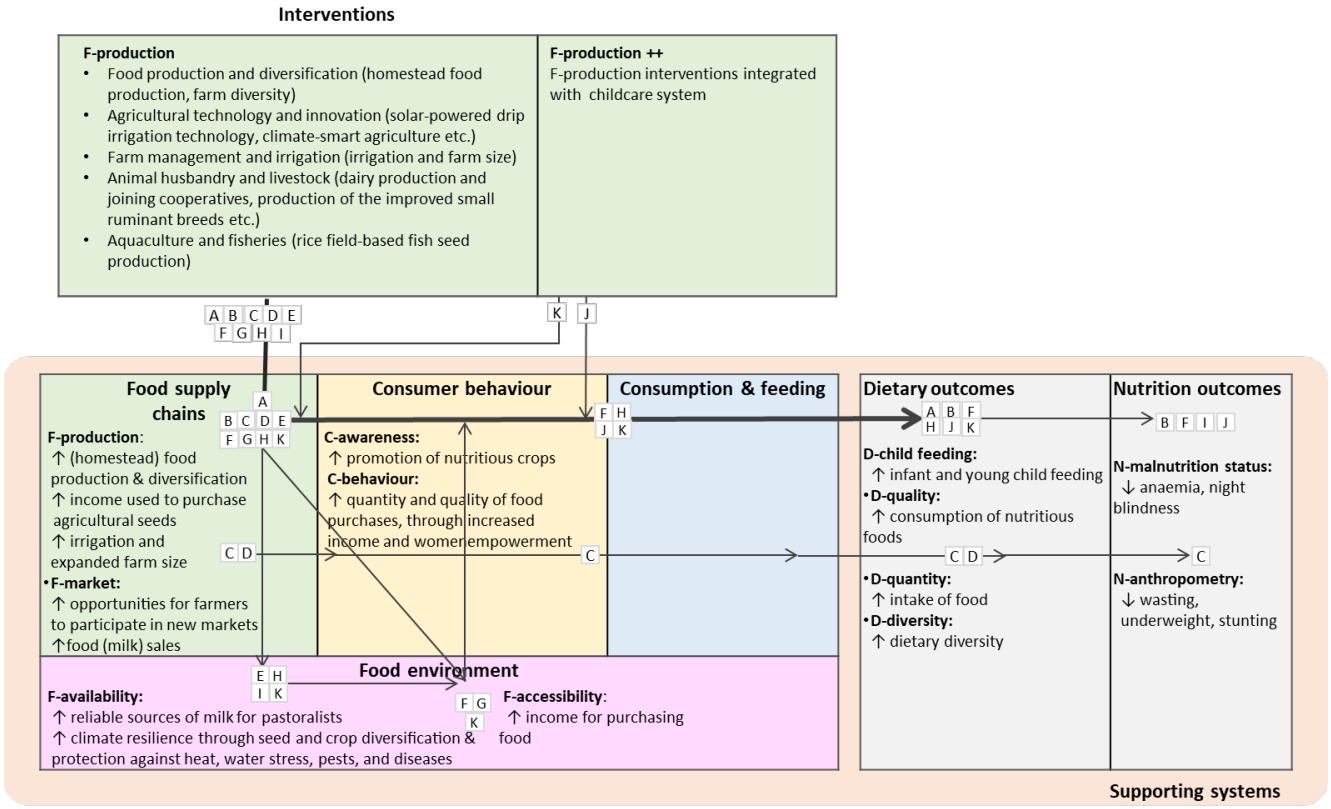


Figure 5. Impact pathways of interventions targeting food production and supply chains.
Solid arrows represent empirically observed pathways and dashed arrows represent theoretical links between food system components. Bold pathways indicate primary, consistently evidenced impact pathways across studies. Each of the "small boxes" (A to K) represent a cluster of interventions (more detail about these clusters is available upon request to the NRF team). "++": combined with other interventions; IYCF: Infant and young child feeding.

In summary, **pathways I, III and IVa**, focusing on supplementation, improving maternal capacity and child feeding with support from the health and childcare systems, are consistently associated with improved nutrition outcomes. **Pathways IIa, Va and Vb**, focusing on improving household income and purchasing power, and agriculture as a source of food or income, show consistent associations with direct food consumption and other dietary outcomes, and generally weaker, or mixed effects with nutrition outcomes. **Pathways IIb and IVb**, representing women's empowerment and participation in agricultural livelihoods and supporting systems related to food price and trade policies, demonstrate potential for improvement in dietary outcomes, though the effects are weaker and/or mixed (Figure 6).

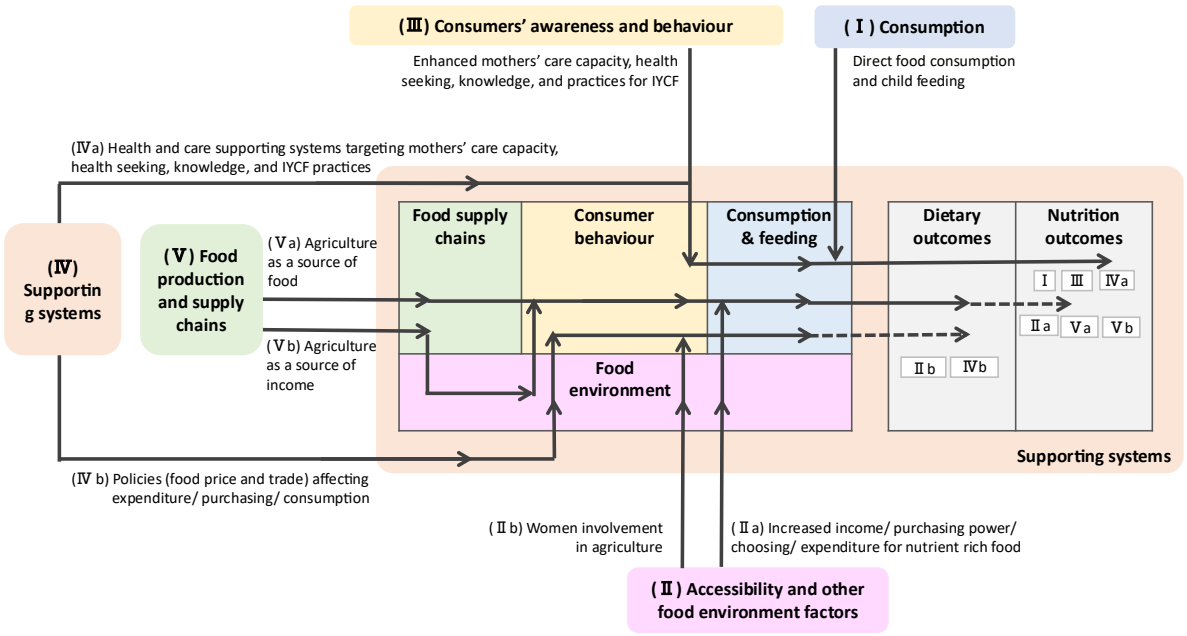


Figure 6. Impact pathways from nutrition interventions to dietary and nutrition outcomes, through the food system (overview).