Understanding persistence of malnutrition in the Sahel. Study B: Assessing designs of nutrition initiatives

Final study report

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Nutrition Research Facility
Knowledge and Research for Nutrition

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The Knowledge and Research for Nutrition project of the European Commission (2020-2026) aims to provide improved knowledge and evidence for policy and programme design, management, and monitoring & evaluation in order to reach better nutrition outcomes.

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Content

List of Tables and Figures

List of Acronyms

Acronym	Description
ACH	Action Against Hunger Spain
AECID	Spanish Agency for International Development Cooperation
AGIR	The Global Alliance for Resilience Initiative
BMZ	German Federal Ministry for Economic Cooperation and Development
C4N	Capacity for Nutrition
CLM/CNDN	Cell for Fight against Malnutrition/ National Nutrition Development Council, Senegal
CRIS	Common External Relations Information System
CRS-DAC	Common Reporting Standard - Development Assistance Committee
DHS	Demographic and Health Survey
EC	European Commission
ECHO	European Commission Humanitarian Aid & Civil Protection
EU	European Union
EUD	The European Union Delegation
EUTF	European Union Trust Fund
FAO	Food and Agriculture Organization of the United Nations
GAIN	Global Alliance for Improved Nutrition
GDP	Gross Domestic Product
GRET	Research and Exchange Group
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
INTPA	International Partnerships
IYCF	Infant and Young Child Feeding
LMIC	Low- and Middle-Income Countries
MICS	Multiple Indicator Cluster Survey
MUAC	Mid-upper arm circumference
NGO	Non-governmental organisations
NRF	Nutrition Research Facility
NRI	Natural Resources Institute
ODA	Official Development Assistance
OECD -DAC	Organisation for Economic Cooperation and Development – Development Assistance Committee
SAM	Severe Acute Malnutrition
SBC	Social Behaviour Change
SDG	Sustainable Development Goals
UN	United Nations
UNDP	United Nations Development Programme
UNHCR	United Nations High Commissioner for Refugees
UNICEF	UN International Children's Emergency Fund
USAID	United States Agency for International Development
WASH	Water, Sanitation, and Hygiene
WFP	World Food Programme
WHO	World Health Organization

Working definitions

Working definitions, frameworks, and approaches

Intervention design

To assess the designs of nutrition initiatives delivered in the West African Sahel region, we were guided by the process evaluation / project impact framework from the International Initiative for Impact Evaluation (3ie) (1). We assessed the designs using a project design gap framework (detailed) (1,2) (**Figure 1**).

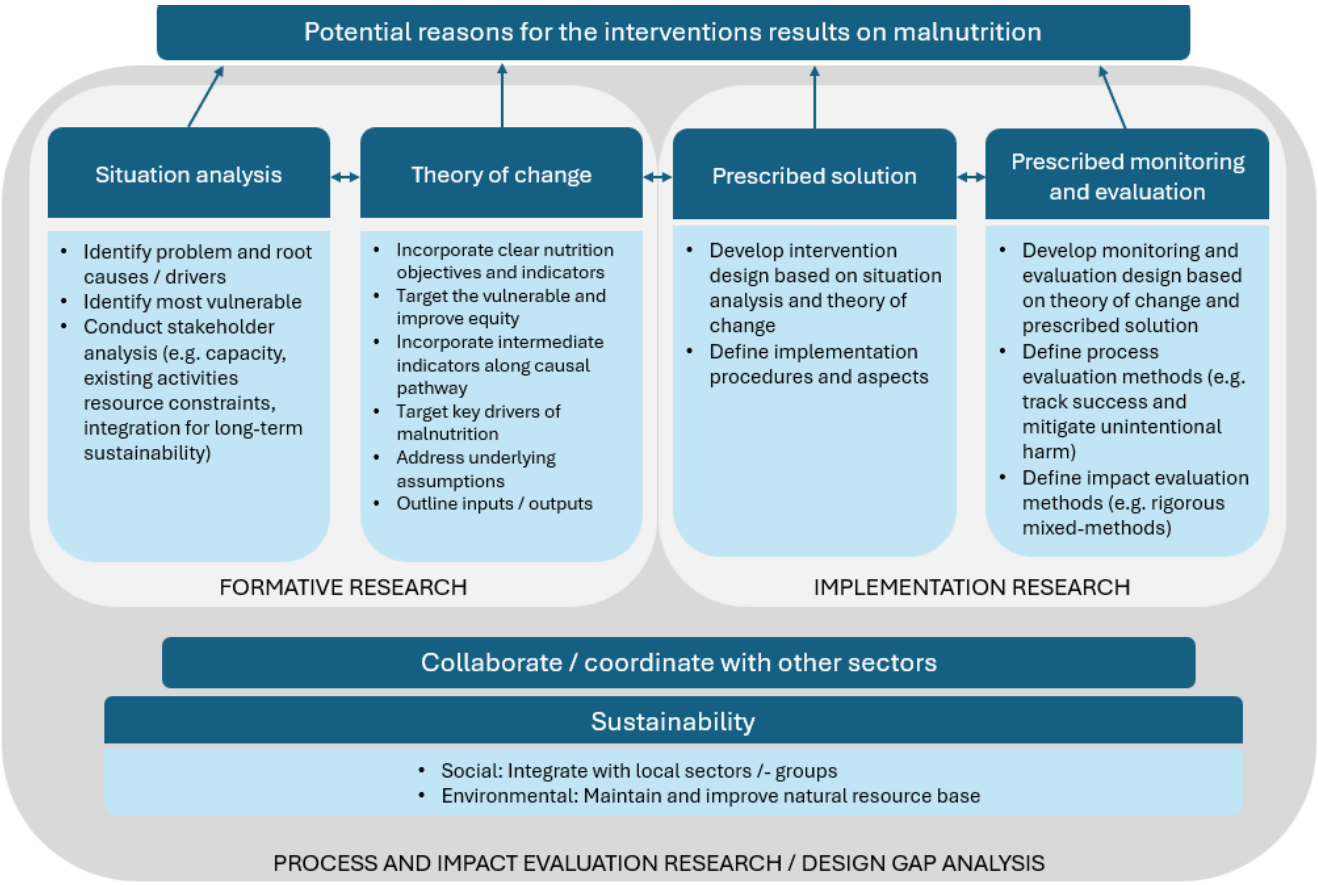

Figure 1: Conceptual framework of intervention/program design (Author's own adapted from Dixon & Bamberger 2021 and FAO 2015) (1,2)

The purpose of design gap analysis (i.e. retrospective process evaluation) is to identify the reasons behind a project's success or failure(s) which may provide crucial information for modifying current projects or designing future projects to maximise positive nutrition and health outcomes for beneficiaries (1).

Multisectoral nutrition programs

To assess the multisectoral nature of nutrition programs, it is critical to clearly define what we mean by multisectoral. The European Commission (EC) encourages nutrition programs to be multisectoral and- to incorporate key thematic areas in their aim of reducing the burdens of undernutrition, namely wasting, stunting, and micronutrient deficiencies (3). The key thematic areas they proposed were health, WASH, education, gender, social protection, food security, agriculture, the environment and the sustainable management of natural resources, governance, and human rights; many of these areas are included in the adapted UNICEF conceptual framework, published by Study A **(Figure 2**).

However, there remains a lack of a consistent definition of multisectoral nutrition programs in the literature and in the global discussions. Thus, for the purposes of the present analysis, we defined multisectoral nutrition programs relatively broadly, and on a continuum with multisectoral on one side and unisectoral on the other. Dichotomising nutrition programs as either completely multisectoral or unisectoral would hide much of the nuance of these programs. For our purposes, programs that are multisectoral contain a nutrition-specific component (e.g., the provision of food or supplements) and that engage horizontally with at least one other thematic sector and must be delivered together in one community. For example, we do not consider a program that provides a nutrient supplement in one district and a WASH intervention in another district to be multisectoral. We also consider an initiative that engages with multiple sectors vertically in each geography multisectoral, for example a nutrition program that engages both the government and the civil sector.

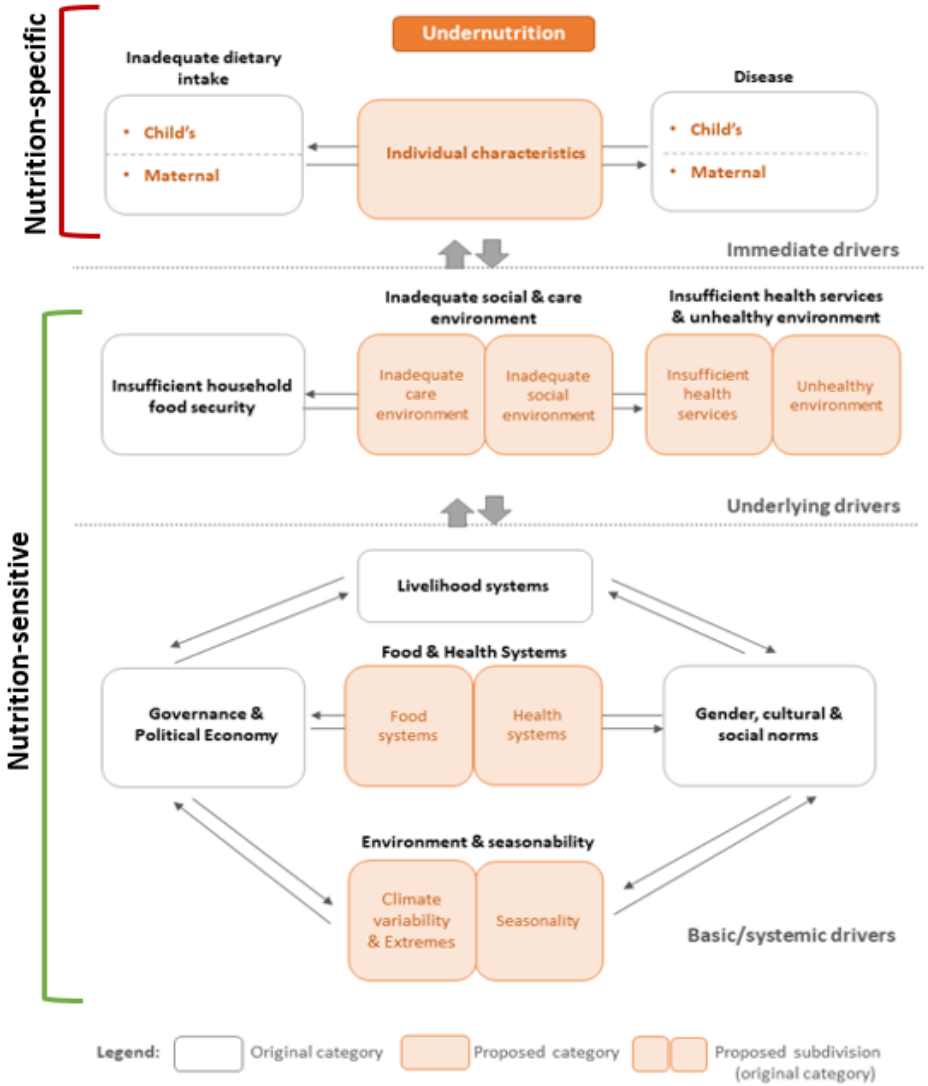

Figure 2: Proposed conceptual framework of drivers of malnutrition in the Sahel by NRF Study A: Persistence of malnutrition in the Sahel. Basic/systemic and underlying drivers were defined as nutrition-sensitive whereas immediate drivers were defined as nutrition-specific approaches

Executive summary

Background: The burden of malnutrition is highest in low- and middle-income countries, especially fragile and conflict affected countries such as those in the West African Sahel. Despite concentrated efforts to improve nutrition, malnutrition rates remain persistently high in the West African Sahel, above WHO emergency thresholds, and accelerated progress is required to achieve the SDGs in six years.

Objective: The objective of this study was to conduct a design gap analysis of multisectoral nutrition interventions in six West African Sahelian countries. Findings will inform the development of more effective interventions to improve the nutrition and health of vulnerable populations in fragile, low-resource settings where malnutrition rates are stagnant or worsening, especially for women and children under two.

Methods: We conducted a narrative literature review of English and French peer-reviewed and grey literature, with a focus on interventions with impact evaluations for the last EU funding cycle (2014-2019) for Burkina Faso, Chad, Mali, Mauritania, Niger, and Senegal. Country case studies were conducted in Chad and Senegal, including in-depth semi-structured key informant interviews (KIIs) with funders, project designers and implementers. Results were thematically analysed and mapped against two conceptual frameworks on: (i) drivers of malnutrition in the Sahel, and (ii) design elements of multisectoral nutrition interventions. Results were triangulated to elicit key design strengths and weaknesses.

Results: Twenty-nine KIIs were conducted and 64 documents representing 41 studies were included. Nearly half of the studies were EU-funded (46%) or were published in French (47%). An estimated 42% of the literature was not publicly available. There was a dearth of rigorous impact evaluations, including mixed-method and qualitative analyses, of multisectoral nutrition interventions in the region, especially for Mauritania, Chad, and Niger. Four overarching themes were identified when assessing the designs, relating to (i) situational analysis and targeting, (ii) theory of change (ToC) and formative research, (iii) monitoring and evaluation, and (iv) stakeholder analysis, implementation, and sustainability. Most studies lacked a comprehensive situational analysis or ToC and there was a distinct lack of empirical evidence for interventions targeting the basic, also known as systemic for this report, drivers of malnutrition.

Although empirical evidence was sparse, findings indicated that interventions that included homestead agriculture were overall associated with beneficial outcomes in children's anthropometrics or anaemia, and interventions targeting water and sanitation and/or social and behaviour change with beneficial outcomes in children's anthropometrics, exclusive breastfeeding rates, and maternal and child dietary quality. Many interventions reported targeting income and women's empowerment. However, only 5% of interventions assessed the impact of the intervention on one or both pathways. We found mixed effects on women's empowerment, highlighting a need for monitoring and evaluation of long causal pathways to identify best practices and enable early adaptation to mitigate against unintentional harm.

Process evaluations indicated that study designs require strong formative research and ongoing monitoring and adjustment to ensure that the intervention is culturally contextualised and targeted effectively. Formative research indicated that decision-making power was dominated by men and older-aged women meaning that interventions, especially Social Behaviour Change (SBC), need to holistically engage with whole of community.

Although fragility of these states and low stakeholder capacity were major barriers to multi-sectoral governance and coordination, results highlighted that co-designing with community and integration with civil society were critical facilitators for long-term sustainable change. Regardless, we did find several examples of interventions that were multisectoral, including several themes such as nutrition and agricultural values chains, and involving several groups of stakeholders, to be effective. While multisectorality of interventions is important, flexibility in

funding and design were key for enabling acute crisis response alongside long-term resilience building, due to societal and environmental volatility in the region. **Conclusion:** Although many projects appear to hold promise in addressing malnutrition, the lack of impact evaluations, especially lack of rigorous mixed-method evaluations, makes it difficult to determine to what extent which intervention designs affect nutrition. The design gap analysis highlighted key areas for improvement. Here, we outline 16 recommendations to develop the evidence base and, where sufficient empirical evidence exists, enhance the effectiveness of future multisectoral interventions to improve nutrition. Recommendations are listed according to the four overarching design result themes.

Situational analysis and targeting

- Improve data management processes and platforms to ensure timely and transparent **dissemination of new and existing data** so that effective situational analyses can be done.
- Contextualise and target SBC to the **whole community**, as needed**.**
- Improve targeting towards **systemic drivers** of malnutrition for sustainable change, including climate/water scarcity, governance, and women's decision-making power.

Theory of change and formative research

- Build an **evidence-based ToC** co-designed with stakeholders, including beneficiaries.
- Select **indicators based on the objectives and the targeted drivers.**
- **Protect funding and time** for key elements of design, including formative research and co-design.

Monitoring and evaluation

- **Protect funding and time for monitoring and evaluation** to ensure these are conducted and do not get lost in favour of more pressing needs.
- **Monitor** the intervention on a rolling basis, by conducting data collection and analysis to enable timely adaptation for improved effectiveness, which can also mitigate unintentional consequences.
- Safeguard funding for rigorous quantitative i**mpact evaluations** to assess the interventions and fill the empirical evidence gaps.
- Integrate **process evaluations** alongside impact evaluations to allow for validation of the ToC and qualitatively examine the benefits to the beneficiaries.

Stakeholder analysis, implementation, and sustainability

- Develop strong **governance and coordination**, along with multisectoral nutrition leadership, to maximise synergies between and within interventions and sectors (e.g., mapping of nutrition interventions).
- **Integrate the intervention into the local civil society** (particularly for fragile states) and government sectors from the outset to ensure long-term sustainability. This can be facilitated through co-design and can promote buy-in of local communities and beneficiaries.
- **Build the capacity** of key disciplines, especially the cross-cutting sectors of gender and nutrition, to develop nutrition-sensitive multisectoral interventions that holistically address the key drivers of malnutrition.
- Ensure the project's complexity matches the skill sets and capacity of the implementing stakeholders.
- Allow for **flexible timelines and funding for crisis modifiers** to maintain long-term resilience building while addressing acute emergencies.
- Foster a collegiate culture of **dissemination of knowledge**, especially lessons learnt. This will reduce duplication of effort while maximising resources and effectiveness.

Key words: multisectoral, nutrition, design, monitoring and evaluation, vulnerable groups, West Africa, Sahel, fragile states

Introduction

Background

The European Union (EU) has committed to global leadership in using multisectoral, rights-based, country-led, and locally driven approaches to reducing malnutrition, as stated in the EU Action Plan on Nutrition (2015-2025) (3). While some regions have recorded some progress on nutrition where EU programs have been implemented, progress in the Sahel Region remains slow (3). The Sahel is characterised by a semi-arid climate with sparse vegetation (4). Most Sahelian countries are fragile states, and have suffered from political unrest, economic crises, and vulnerability to climate change, with rates of food insecurity and malnutrition above the World Health Organization (WHO) critical levels and high compared with other African countries(5). As a result, malnutrition rates have stagnated or worsened and the region is off track to achieve the second Sustainable Development Goal (SDG), i.e. Zero Hunger.

Objective

This Research Study (RS) has been conducted in response to the evidence needs prioritization exercise conducted by the Nutrition Research Facility (NRF) through a consultation process with decision-makers in West and East Africa. The questions being addressed were identified as a top priority for nutrition programming during a virtual regional workshops held in Africa 29/03-01/04, 2021, and aimed to investigate the designs and effectiveness of nutrition interventions in the West African Sahel region. To this purpose a design gap analysis of multisectoral nutrition interventions in six select fragile Sahelian countries (Burkina Faso, Chad, Mali, Mauritania, Niger, and Senegal) was conducted. Findings will inform the development of more effective multisectoral interventions to improve nutrition and health of vulnerable population groups in low-resource fragile states where progress on malnutrition is stagnant or worsening, especially for women of reproductive age, pregnant/lactating women, infants, and young children.

Research questions

For this analysis, the following research questions were answered:

- Q1: To what extent do the designs of nutrition interventions implemented in the region **address the key drivers of malnutrition** along the **causal pathway**?
- Q2: What evidence exists on study designs that **reduce malnutrition rates** in this specific region?
- Q3: What are the main study design **strengths** and **weaknesses** identified in the interventions assessed?
- Q4: What **lessons** can be learnt for **improved designs** of nutrition interventions?

Relevance and timeliness of this report

The persistence of malnutrition is a problem in the Sahel, and even in Senegal, identified as an “exemplar” country in reducing stunting (6), progress is stagnating. The West African Sahel area presents specific struggles and challenges compared to other areas (e.g. tropical regions), yet most of the countries in this report are chronically underreported in the literature. For this reason, the integrated mixed-method approach in this report, triangulating design gap results from key informant interviews (KIIs) with a literature review (1) can help identify cross-lessons and evidence-based best practice approaches for this region.

Substantial funds have been invested in the West African Sahel. The EU had a focus on malnutrition in the Sahel in the 2014-19 funding cycle. However, funds are decreasing in relation to the increasing number of global and local crises, which is exacerbating food and nutrition insecurity (7,8). A recent systematic evidence gap map

indicates that although 1838 impact evaluations (IEs) from low- and middle-income countries (LMICS) were identified, only 33% of IEs were conducted on food system interventions for nutrition in sub-Saharan Africa, and only 7% were conducted in fragile countries (9). In regional African reviews (10,11), many only briefly touch on West African Sahel countries, and even then, most only refer to Senegal, indicating a gap in understanding of what interventions work and where design gaps exist for many of the Sahelian countries most affected by climate-extremes, conflict/insecurity, and high malnutrition (e.g., Mauritania, Mali, Niger, Chad). The current Sahelian landscape is one of competing emergencies and needs; therefore, effective allocation of resources is paramount. Further progress over the next 6 years to meet nutrition targets would require improved and accelerated progress, through improved design of multisectoral interventions to comprehensively address malnutrition. Also, the prevalence of multiple burdens of malnutrition are highest in LMICs, especially in fragile and conflict affected countries such as the West African Sahel region (12), and they have specific underlying and systemic drivers of malnutrition, meaning they might require a more adapted approach.

This report adds value because it is based on a prioritisation exercise conducted by the NRF in 2021 among policy and decision makers in West Africa (13), thus actively identified as a real need at this time by the intended end-users. The purpose of this report is to make existing evidence and findings available, accessible, and actionable to a variety of stakeholders. The intended audiences are: (i) the EC and other donors; (ii) West African Sahelian nation decision-makers and government officials; (iii) designing and implementing partners; and (iv) private sector actors. The assessment and recommendations in this report are oriented to align interventions with global goals (SDGs 2030, SUN programme, Decade of Action on Nutrition 2016-25, World Health Assembly targets), regional goals (African Nutrition Strategy 2016-25, Agenda 2063 of the African Union to have healthy, well-nourished citizens with a long-life expectancy, Comprehensive Africa Agriculture Development Programme) and national level development goals.

Methodology

Study setting

The six study countries (Burkina Faso, Chad, Mali, Mauritania, Niger, and Senegal) share geographical area, cultural background and climate, as well as poor malnutrition and other relevant indicators (see **Annex 1 (Tables 1** and **2**)). These countries share conditions that make them more prone to recurrent crises and to higher food and nutrition insecurity than other countries in West Africa, due to climate change, population growth, conflict, population mobility, social norms, poor governance, poor capacity, and lack of economic resources (**Annex 1**).

Study design

To ensure a rigorous design gap analysis triangulating data from multiple quantitative and qualitative sources, this study adopted an integrated mixed-methods retrospective process evaluation according to the latest International Initiative for Impact Evaluation (3ie) guidelines (1). We have conducted:

- **A Narrative literature review** including (i) quantitative pretest-post-evaluations from rigorous quantitative/mixed-method impact evaluations (i.e. Randomised controlled trial (RCTs); and (ii) qualitative evidence from previous reviews, policy effectiveness analysis, grey literature project reports, lesson learnt reports etc.
- **Key Informant Interviews**: in depth semi-structured interviews with funders and project designers and implementers of multisectoral nutrition interventions in West African Sahel, with comparative cross country case studies focused on Senegal and Chad.

The different data sources were integrated during both the design and the interpretation of the results, i.e. the draft literature review informed development of the KII questionnaire and target respondents, and in turn, KII respondents provided further non-publicly available documents for inclusion in the review. Using our selected impact evaluation and design gap frameworks (see working definitions and Figures 1 and 2), thematic analysis was used for the literature review and the KIIs separately. Finally, the thematic results were triangulated and narratively summarised.

Literature review

Identification of literature

This study was originally conceptualised as a narrative review of grey literature for the last EU funding cycle (2014-2019), complemented with other sources of literature. However, due to the paucity of documents found for the West African Sahel and the six focal countries (especially Chad, Mali, Mauritania, and Niger), and the relevance of other sources, the search strategy was expanded to include (i) non-EU funded interventions, (ii) other literature types (e.g. other reviews and capitalisation projects) and (iii) other sources of literature (e.g. scientific publications and grey literature from non-EU sources). Moreover, the search strategy was expanded to include documents from (i) hand searching reference lists, (ii) forward and backward citation searching, (iii) KII respondents, (iv) current and past EU-delegates to the Sahel, (v) funders, designers and implementers working in the Sahel, and (vi) hand searching funder websites. Inclusion criteria are presented in **Table 1** and the process of the literature review is presented in **Annex 2**.

Table 1: Identification and inclusion criteria of literature

Criteria	Inclusion
Population	Individual women of reproductive age, pregnant and lactating women, children <5 years, or households
Setting	Burkina Faso, Chad, Mali, Mauritania, Niger, and Senegal
Evidence type	Peer reviewed scientific papers Grey literature (published and unpublished)
Data sources	EU CriS database EU and other personal contacts EU websites (e.g. AGIR, EUTF) 3ie Food System and Nutrition Evidence Gap Map Regional experts Forward / backward citation search Hand search reference lists KII respondents Websites of funders/implementers (e.g. USAID, GRET)
Intervention type (exposure)	Multisectoral interventions that were nutrition-sensitive and or nutrition-specific.
Outcome indicators	Anthropometric, micronutrient status, dietary quality/adequacy, food security
Timeframe	2014-2019 EU funding cycle focused but including studies started pre 2014 or finalised post 2019 to ensure a higher number of completed studies
Languages	English and French

AGIR = the Global Alliance for Resilience Initiative, EUTF = European Union Trust Fund, USAID = United States Agency for International Development, GRET = Groupe de Recherches et d'Echange

Literature data extraction and analysis

Data was extracted according to the research questions and the corresponding conceptual frameworks, using an online data extraction form in Google Docs iteratively developed by the research team **(**Table A2.3). Data was analysed thematically within and between interventions to identify common design gap strengths, weaknesses, and gaps. Evidence was identified, extracted, and presented in narrative, tabular, and graphical formats. Preliminary findings were also used to inform identification of target KII respondents and tailoring of semi-structured questionnaires for in-depth interviews. The literature review was used to assess the initial evidence gaps and formulate strategic questions that could develop a deeper understanding of the relevant issues. This process continued iteratively as we progressed in the identification and assessment of issues.

Key information interviews

Country case study selection

For the country case study selection, we selected two countries that have taken divergent paths in their progress in reducing malnutrition: Senegal and Chad. Senegal has achieved an almost 50% reduction in the prevalence of stunting between 1992 and 2017, dropping from 35 to 16% (14), while the malnutrition rates in Chad remain high with around 38% of children stunted, and the prevalence of wasting sitting at 14% (Table A1.1).

KII - tool design and data collection

The KII tools were designed to collect data remotely based on the ongoing instability in the region and the retrospective nature of the study. A KII guide was drafted and published in the inception report, and was modified iteratively, based on the findings of our literature review, and adapted for each respondent role and expertise. The finalised guide, including the consent form and information sheet can be found in **Annex 3**. The most appropriate respondents were identified directly by each organisation after making contact with them and introducing the study, based on the expertise (all respondents had technical knowledge/managing experience of nutrition/food security projects) and their involvement in relevant/eligible projects of their staff. **Annex 4** contains a table with the summary of the 29 KIIs conducted. Some key informants were chosen at the regional level, but even respondents which were country specific had expertise and lessons learnt at the regional level.

KII - data extraction

Thematic analysis of the qualitative interview transcripts was used to identify convergent themes. The interviews were conducted in English or French and recorded in MS Teams. Notes were taken during the interview by the interviewees. English was transcribed directly by MS Teams (with corrections from researchers) and French was transcribed through MS Word dictation and analysed in French but translated by the researchers for the report. Themes and sub-themes reached saturation during this process. Divergent themes were retained to provide in-situ detail and inform a discussion of broader issues. Inductive and deductive coding was undertaken using a six-step systematic approach (15). Based on the literature and previous knowledge, the researchers discussed the coding and overarching themes for the emerging sub-themes. Sub-themes were identified based on patterns present across multiple cases. This was done as an iterative process, making refinements as needed (15). To unpack conflicting evidence, sub-themes were analysed horizontally across the data and vertically within each case. Any discrepancies/lack of clarity in the results were discussed within the wider team to maximise reliability and resolved jointly (16). Sub-themes were deductively mapped to the overarching themes of our research conceptual framework (see working definitions). Triangulation of data between the literature review and the KIIs showed a high level of consistency, supporting cross-validation and robustness of the study findings (16).

Findings

Findings from previous reviews

The literature review section of this report builds on two key reports that examined multisectoral nutrition programs in Africa, including West Africa (10,11). Both reports emphasised the need for multisectoral nutrition programs, as well as the challenges of such interventions, especially those unique to fragile states. In this report, we build on those key reviews and expand the information available by including grey literature that was not publicly available and publications in French to leverage the knowledge from a scarce evidence base.

Summary of documents included in this review

In total, 64 documents representing 41 studies were included in the literature review (**Figure 3**; Table A2.1). A major finding (and challenge) of this review was the lack of publicly available documents on multisectoral nutrition studies in the region. In particular for Mauritania, Chad, Mali, and Niger, most of the literature was published in French and was not publicly available.

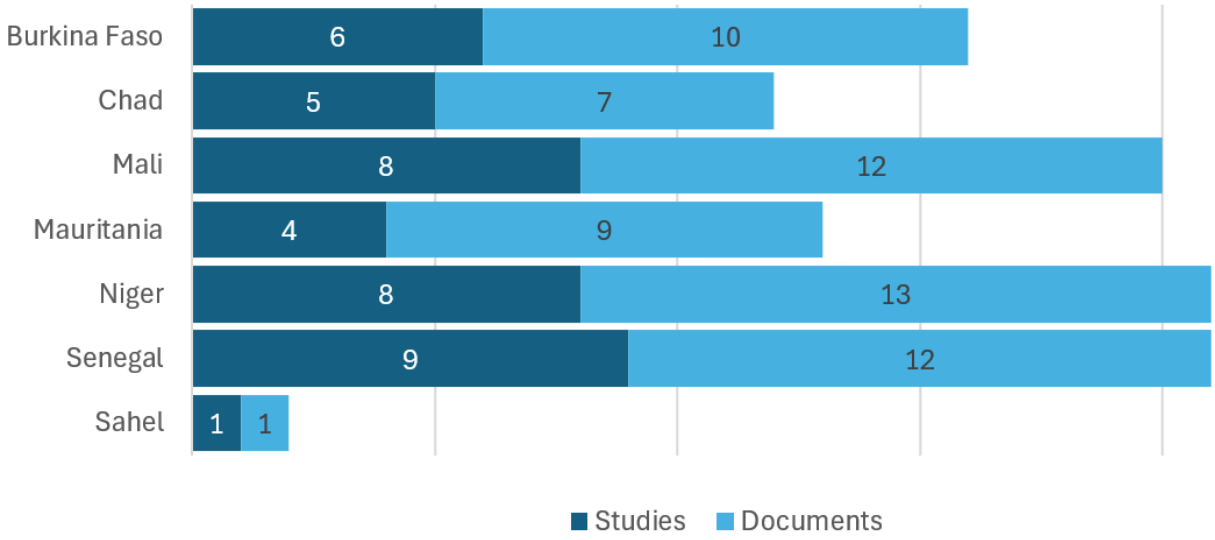

Figure 3: Total number of studies (*n*=41) and documents (*n*=64) reviewed, by country

Studies by funder

This review included an almost equal number of studies funded by the EU (*n*=19; 46%) and by non-EU funders (*n*=22; 54%) (**Figure 4;** Table A2.2). This review aimed to review an equal number of EU and non-EU funded studies in each country which was achieved for Mali and Niger. However, EU funded studies dominated in Mauritania and Chad; whereas there was a higher number of non-EU funded studies in Burkina Faso and Senegal.

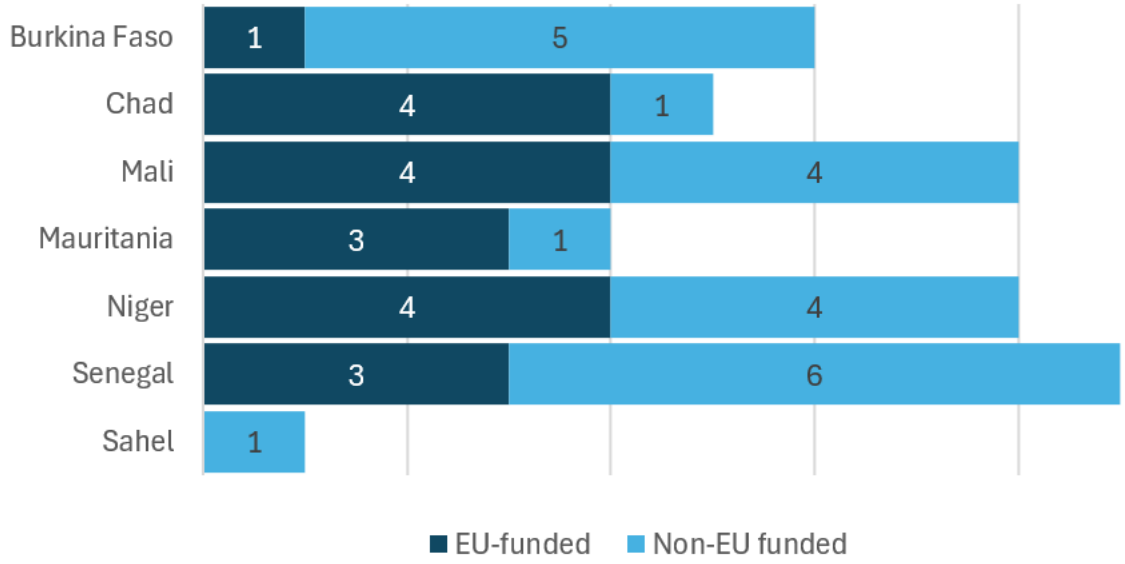

Figure 4: Total number of studies funded by EU (*n*=19; 46%) and non-EU (*n*=22; 54%), by country

Documents by type

Overall, most of the literature reviewed in this study was from the grey literature (n=43; 67%) compared with peer-reviewed (i.e. scientific) publications (33%) (**Figure 3,** Table A4.3). Due to the high percentage of grey literature, most of the included documents were technical reports (*n*=31; 48%), compared with only 25% (*n*=16) impact evaluations, 14% publications on elements of study design (e.g. theory of change, formative research), and 13% (*n*=8) other impact evaluations. Compared with the volume of end of project reports, there is a scarcity of publications on key elements of design (e.g. theory of change and formative research) and on impact evaluations. Notably, most qualitative impact evaluations were found in the grey literature while rigorous quantitative evaluations were mainly published in the academic documents. There was only one rigorous mixed-method evaluation (17).

A strength of our study is the inclusion of a high percentage of documents that are not publicly available (*n*=27; 42%) or were in French (*n*=30; 47%). Notably, no publicly available documents written in English were found for Mauritania. Over half of the included literature for Niger and Mali was also in French and sourced from local contacts. In other words, peer-reviewed English literature effectively under-represents the countries in the West African Sahel carrying the highest burdens of malnutrition (i.e. Mauritania, Chad, Mali, and Niger).

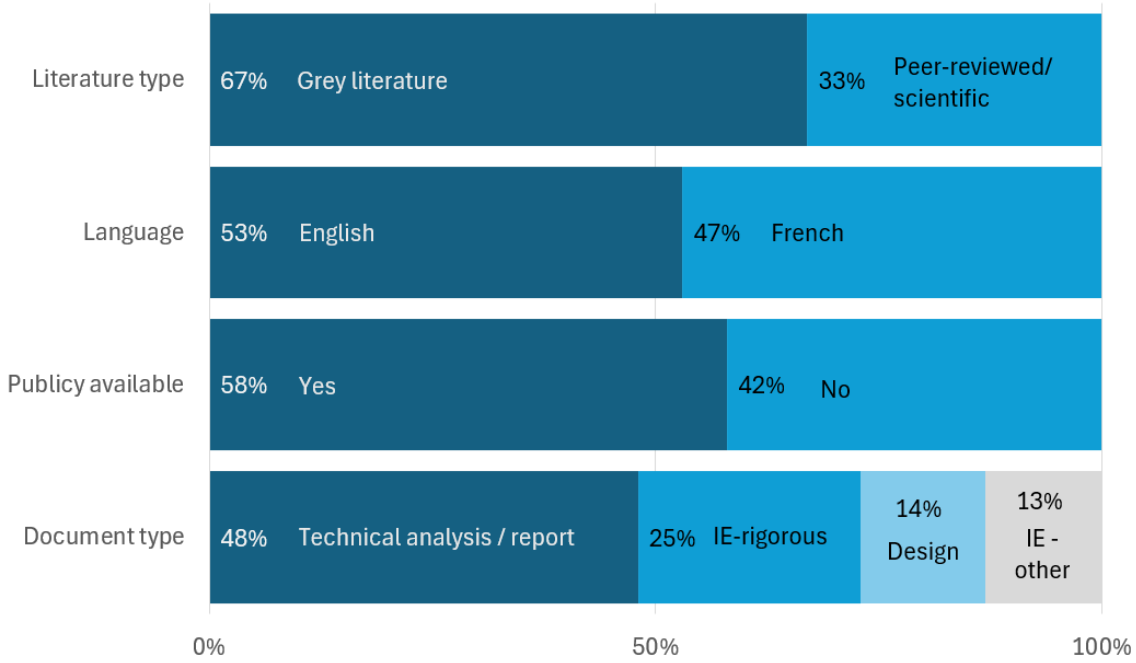

Figure 5: Percentage of documents, by type. Rigorous impact evaluations refers to scientifically rigorous quantitative/-mixed-method impact evaluations. Other impact evaluations includes descriptive statistics or qualitative only evaluations. Design refers to key elements of programme design including theory of change and formative research.

IE=impact evaluation.

Perceived definitions of multisectoral nutrition interventions

Both throughout the documents and the KIIs we found that institutions and sectors vary in their understanding of what a multisectoral intervention encompasses. Multisectorality is often perceived as nutrition-sensitive (or indirect, i.e., targeting the underlying drivers of malnutrition) combined with nutrition-specific (or direct) and/or social behaviour change (SBC) components. There is often reference to the involvement of several ministries and stakeholders representing civil society, NGOs, governments, etc. Some key informants referred broadly to 'Investments that can maximise the nutrition of women and children in the 1000 day-window,' without defining what those specific investments may be. Usual thematic sectors considered alongside nutrition are WASH, agriculture, health, education and, sometimes, social protection. Health and nutrition were often perceived as separate sectors but are sometimes undifferentiated. Agriculture was not always perceived as a separate dimension, but WASH and education were. In some countries, the areas of livestock raising was perceived as the main agricultural livelihood, and therefore was perceived as an essential dimension. Some stakeholders also referred to agroforestry, livelihoods, and systemic causes such as climate change, or legislations and jurisdiction. Researchers seemed to vary their definitions depending on the research questions asked.

There is at present many single stakeholders with different perspectives, which limits standardised approaches. From KIIs in Chad, common elements in the interventions implemented in-country tend to include nutrition and, health, (agropastoral) agriculture and transport (roads). The focus has been on addressing acute malnutrition. However, at least up to 2015 for EU-funded projects, Chad did not seem to have as much experience implementing multisectoral nutrition projects beyond the refugee packages, which are indeed multisectoral, but include emergency measures, rather than development. Senegal has more experience promoting multisectoral nutrition-sensitive approaches; however, the assessment conducted through the "Exemplar exercise" indicates

that WASH and education were instrumental areas in the previous decade, in addition to maternal and childcare (6). In these countries the focus is on undernutrition, encompassing also overnutrition and non-communicable diseases (NCDs) needs to be considered.

Q1: To what extent do the designs of nutrition interventions implemented in the region address the key drivers of malnutrition along the causal pathway?

The majority of the 41 studies included in this study (>65%) did not conduct robust impact evaluations, limiting ability to identify best practice designs (**Figure 5,** Table A4.3). Most interventions/projects targeted dietary intake (80%), food insecurity (73%), gender (71%), livelihoods (63%), inadequate care environment (63%), unhealthy environment (61%), and food systems (59%). The least targeted drivers were health systems (12%), climate (27%), governance (37%), disease (41%), health services (46%), and seasonality (46%) (**Figure 6,** Table A5.4).

Most of the IEs targeted underlying and immediate drivers (Table A5.4**).** By comparison, interventions without rigorous IEs were more likely to target the systemic or underlying drivers.

Given the complexities of designing RCTs to evaluate complex long-causal pathways between systemic drivers of malnutrition and end-stage nutrition outcomes, it is no surprise that we found that most of the IEs targeted the underlying or immediate drivers. However, it does highlight the critical need for the academic community to develop rigorous impact evaluation methods – such as refining mixed-method process and impact evaluations (1,9,18,19) for assessing effect of multisectoral nutrition interventions on more distal (e.g., systemic) drivers.

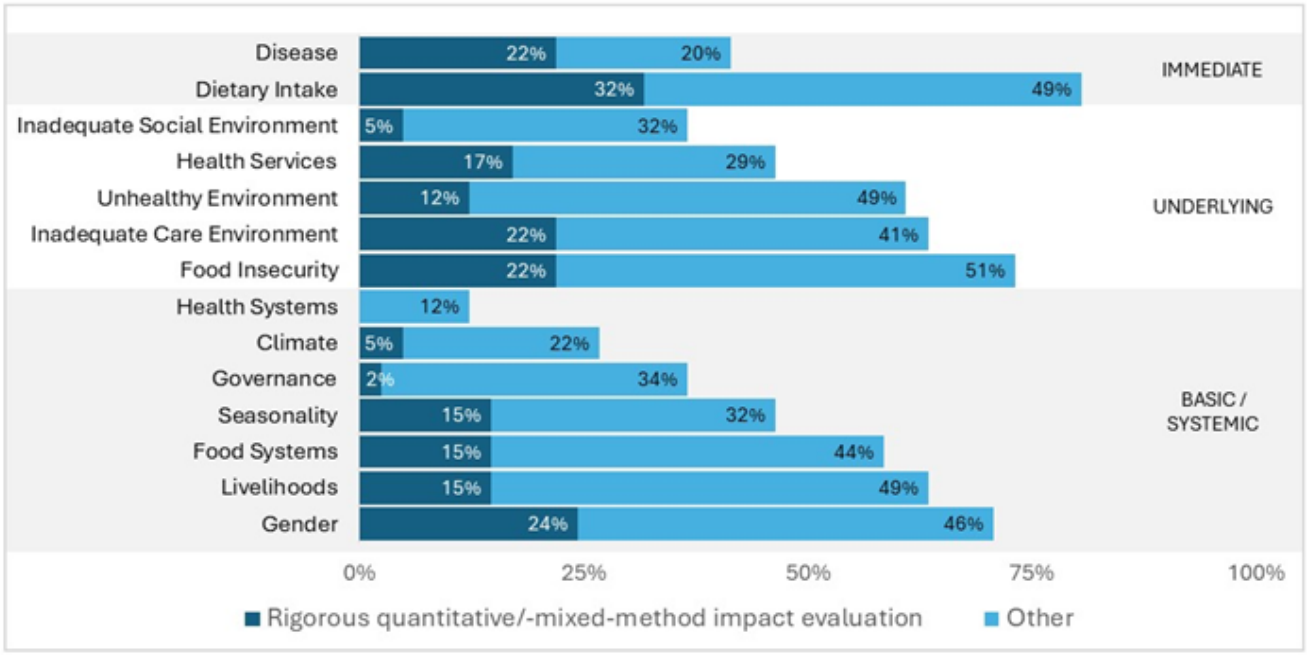

Figure 6: Percentage of studies (*n*=41) targeting drivers of malnutrition in the Sahel

Immediate drivers

Dietary intake

Over two-thirds of interventions targeted **dietary intake** (17,20–46) through the provision and the promotion of enriched complementary foods, SBC on child feeding and maternal nutrition, and nutrient-rich food consumption for the whole household. This focus was clear for both scientific and development communities. Although SBC is important, it is often not sufficient in and of itself to affect change. A lack of change in nutrition

status indicates a need to concurrently address the systemic barriers to consumption of a nutritious diet such as water scarcity, food availability and affordability, and women's decision-making power.

Disease

This domain was dominated by academic impact evaluations indicating strong bias of academic studies towards immediate drivers or underlying health service-related malnutrition drivers. Less than half of interventions targeted **diseases** that influence nutritional status (17,22,23,25,27,29–32,34,35,37,41,43,44,47,48). Of those targeting disease, the majority focused on the identification and treatment of acute malnutrition/wasting (SAM/MAM). Only a handful of interventions addressed other conditions affecting malnutrition (e.g., anaemia, parasitic infections, malaria) (27,30,35,37,41,43,48).

Underlying drivers

Food insecurity and Inadequate social environment

Over two-thirds of initiatives aimed to improve **food security** (17,20,22–26,28,30,31,33,34,37–42,44,46,49–54) by improving food production/availability and incomes. Only three studies evaluated if an increased income led to increases in food purchases (33,38,40). A quarter of initiatives targeted **inadequate social environments** (23–25,28,30,33,34,42,49–52,55) by providing temporary cash transfers (conditional and unconditional) as a short-term crisis response to improve food security during the 'lean' season or to incentivise engagement with healthcare services. Many studies indicated difficulties with beneficiary selection influenced by community power dynamics (23), meaning that targeting does not always reach the poorest of the poor. To help mitigate against these challenges, many development projects created community-based beneficiary identification and complaints committees (including women committees) (23,24,56). In fragile zones close to conflict, one project encountered challenges pertaining to a lack of financial services for delivering cash transfers (30).

Inadequate care environment and health services

Approximately half of interventions targeted **inadequate care environment** (17,20,21,24–27,30,32,34,36,38,41–46,48,50,52) and **health services** (17,22–25,27,29–32,34,40,42,44,46–48,50,52) with over half of these studies including rigorous IEs. Most of these studies included SBC components with a strong focus on child feeding practices, including exclusive breastfeeding and complementary feeding, and promoting engagement with healthcare services for regular childhood malnutrition screening. Success stories indicated that community-based care (e.g. MUAC screening/ nutrition education/support at the village level) transcends common barriers such as travel costs, time burdens, lack of formal identification/availability of male guardian and often cash required to attend a formal clinic/hospital, enhancing engagement with preventative healthcare services (31,48) while also strengthening capacity of local health staff and community volunteers. Multiple studies indicated that the long supply chains for externally produced therapeutic foods were not reliable, impairing malnutrition treatment.

Unhealthy environment

Over half of interventions targeted components of WASH (17,21–24,26–28,30,32,34,42,44,45,48,50–52). Many included SBC components encouraging positive WASH behaviours such as good handwashing practices and exclusive breastfeeding to reduce risk of contaminated water consumption by infants. However, it is worth noting that many SBC programs target WASH behaviours without addressing the systemic problem of year-round access to clean water, which could hamper efforts if not addressed holistically.

Systemic drivers

Gender, livelihoods and food systems

Over half of the studies targeted **gender** (17,22–24,26,28,30–33,37,38,40–48,50–52,54,55), **livelihoods** (22,26,30,31,33,34,36–42,44,46,48,50–55,57), and/or **food systems** (22,26,28,30,31,33,34,36–42,44,46,48,50–

55,57). Most of the studies addressed livelihoods relating to food systems with the aim of supporting food production and value chain development. Most of the agriculture for food security initiatives – especially the state-based programs – were dominated by production of food staples. While there were some innovative multi-sector value chain projects emerging such as enriched flour value chains in Chad (46,57) and Senegal (40), the majority did not provide IEs, making it difficult to assess the extent of positive impacts.

Three projects supported diversified livelihood alternative to food systems, addressing gender-based violence barriers to women's employment in healthcare in Senegal (44), skills on leadership/solar panel maintenance for women in Mali (50), and on beneficiary-directed employment in Mauritania (33).

Many studies claimed to address elements of gender. However, the majority addressed this by targeting women, such as aiming SBC programs or food system value chain development at women. We only found two studies that quantitatively measured the effect of the intervention on women's empowerment such as decision-making power and control over income (38,58). Because of the male-dominated decision-making culture (40), formative research and impact evaluations - such as an innovative video-based SBC intervention in Niger (45,59) indicate that it is not sufficient to target SBC to women alone. It is critical to also target men and other dominant decision-makers such as religious and community leaders and older women to ensure an enabling environment for positive behaviour change for younger aged women of reproductive age.

Climate and seasonality

Less than half of studies targeted **seasonality** by aiming to stabilise food production and availability or by providing cash/direct food aid during the 'lean' season (17,22–24,26,28,30,33,34,36,37,39–41,44,46,51,52,55). The majority of studies considering seasonality focused on emergency short-term cash transfers and food aid measures. However, more interventions have emerged in the last 5-years focusing on production of nutrient-rich foods such as vegetables in community and school gardens in Senegal (22) and small-businesses in Mauritania (33).

Although water scarcity is one of the largest drivers of malnutrition in the Sahel (according to Study A), only a quarter of interventions aimed to address **climate** and or improve year-long access to clean water necessary for human consumption, sanitation, and food production (17,22–24,26,28,30,33,34,36,37,39–41,44,46,51,52,55). While some studies integrated the restoration of water sources and established Water Committees to enable stable year-round clean water (17,52) and vegetable production (33), some studies noted that they had to exclude villages that did not have a stable water source from vegetable garden production interventions due to challenges such as lack of funds for water source restoration which can result in biased targeting.

Governance and health systems

Although strong governance and health systems are critical enabling environments to the success of multisectoral nutrition initiatives, these two drivers were the least targeted of all the systemic drivers at 36% for **governance** (23,24,30,31,33,34,39,42,44,46,50–52,54,55,60) and 12% for **health systems** (17,22,24,25,27,29–32,34,36,40,42,44,46,47,50,52).

Of the studies that targeted governance and/or health systems, the majority were EU-funded projects that advocated directly with governments for long-term government budget lines (30,52), financial institutional reform (42,52) and for development and adoption of health service policies such as baby friendly hospitals (46). Policy analysis (53,55) and institutional reform interventions (42,52) indicates that lack of staff/low capacity and weak states has resulted in large gaps between theory/policies and practice. Instead, many health-related interventions focus on the underlying health services, temporarily boosting staff capacity with project funds or external personnel with limited long-term sustainability due to lack of state-services/capacity and/or government budget lines.

KII perspectives on drivers

Some respondents perceived that in many areas of the region, the focus was on the immediate drivers of malnutrition than on the underlying and systemic, due to the emergency nature of the contexts. At the same time, respondents perceived the need to prioritise structural, infrastructure, security, and governance issues (i.e. systemic drivers) that require development responses in addition to the humanitarian, and which are currently not well coordinated by the donors and governments. These countries typically transition between emergency and development (and back and forth, such as Burkina Faso), with limited to non-existent governance in certain regions, and with limited resources. Therefore, respondents perceived that there is a need to match governance and capacity building to make interventions succeed. Also, it was noted that when the multisectoral approach is focused on agribusiness and economic development, that targeting does not always reach the poorest households, which could exacerbate further inequalities. Some respondents perceived that some sectors, such as forestry, have unused potential in the fight against malnutrition.

Q2: What evidence exists on study designs that reduce malnutrition rates?

There is a paucity of evidence of effectiveness on what study designs achieve a reduction in the rates of malnutrition in the West African Sahel (**Table 2**). Of the 12 rigorous impact evaluations that were included, six looked at anthropometric outcomes, and two looked at exclusive breastfeeding. Three studies investigated the effect of an intervention on anaemia, but none looked at anaemia in women of reproductive age, highlighting a large gap in the literature. Five studies looked at diets, whether directly reported or through caregiver reported feeding practices.

Table 2: Summary of impact evaluations and their findings on key nutrition outcomes. Studies are placed in descending order based on sum of thematic and implementing sectors with the most multisectoral at the top and the least multisectoral (i.e., unisectoral) on the bottom. Interventions that integrated with government sectors (i.e. more potential for long-term sustainability) were categorised as more multi-sectoral compared with interventions run solely by external agents (i.e. international NGOs)

Study	Intervention themes	Anthropometrics	Exclusive breastfeeding (EBF)	Dietary adequacy or quality	Anemia or Hemoglobin (Hb)
Becquey et al, 2022 (26). **Burkina Faso**	**Thematic sectors:**[a] agriculture, WASH, gender **Implementing sectors:**[b] iNGO[c] (Tanager), local NGOs, private sector, government			MIXED	
Le Port et al, 2017 (37). **Senegal**	**Thematic sectors:** agriculture; **Implementing sectors:** iNGO (Gret), private sector (local producers, value chain), local government				MIXED
Nordhagen & Klemm, 2018 (38). **Senegal** (SG), **Burkina Faso** (BF)	**Thematic sectors:** agriculture, health, gender **Implementing sectors:** iNGO (HKI[e]), local NGOs, government agencies, local community			MIXED	
Olney et al, 2015 (41). **Burkina Faso**	**Thematic sectors:** agriculture, health **Implementing sectors:** iNGO (HKI), local community	NULL		NULL	POS ↑
Marshak et al, 2016 (17); Marshak et al, 2020 (61). **Chad**	**Thematic sectors:** WASH, health, agriculture **Implementing sectors:** iNGO (Concern),	POS ↑	POS ↑		
Somasse et al, 2018 (43), **Mali**	**Thematic sectors:** health; **Implementing sectors:** National Institute of Public Health (government), iNGO (Red Cross), local community	NULL			POS ↑
Kungu'u et al, 2018 (47). **Senegal**	**Thematic sectors:** health; **Implementing sectors:** iNGO (Nutrition International), health sector		MIXED		

Huybregts et al, 2019 (32). **Mali**	**Thematic sectors:** health. **Implementing sectors:** iNGO (HKI), local community	MIXED	
Becquey et al, 2019 (27). **Mali**	**Thematic sectors:** health; **Implementing sectors:** iNGO (HKI), health sector	NULL	
Bliss et al, 2018 (28). **Niger**	**Thematic sectors:** health; **Implementing sectors:** iNGO (Concern)	POS ↑	POS ↑
Adubra et al, 2019 (25). **Mali**	**Thematic sectors:** health; **Implementing sectors:** International organization (World Food Programme)	NEG ↓	NULL

[a]All thematic sectors include nutrition by definition; [b]The implementing sectors are listed in order of their role in the project; based on this study authors' interpretation of the manuscript

The impact evaluations varied in the degree to which they were multisectoral. We have reported on two aspects of multisectorality in each of the nutrition interventions. We listed the *thematic sectors,* which all include nutrition, by definition, and the *implementing sectors,* which describes the level of intersectoral coordination within a given study. The interventions were organised from the most multisectoral to the least, based on our interpretation both of what the manuscript reported and our own definition of multisectoral. As such, the order is subjective, as is the definition of multisectoral itself.

The table describes a mix of outcomes, including beneficial and null findings, and two findings that may be considered 'antagonistic' (or detrimental); one in which the intervention arm had lower odds of mothers' placing the baby to the breast within one hour of birth (47) and one in which the intervention arm had higher rates of stunting (25). These inconsistent findings speak to the need for formative research, process evaluations, a robust evidence-based theory of change to guide interventions, as well as design analysis prior to the start of the study as described in Neufeld et al. (19).

(26)(17)(61)Two interventions quantitatively assessed the impact on intermediate women's empowerment indicators along the agriculture to nutrition causal pathway. Both interventions reported negative impacts on women's empowerment and mixed effects on dietary outcomes (26,38). Nordhagen & Klemm (38) outlined that supporting women's poultry production by itself was not sufficient to improve women's poultry ownership or decision-making power or control over how to spend income from sale of poultry products. Indeed, over the course of the poultry production intervention, the study documented a negative trend in women's decision-making ability in two of the four countries, suggesting male capture of income (38). Similar detrimental and mixed empowerment results were also noted in a different poultry production intervention in Burkina Faso that noted a negative trend in women's autonomy in income, and control over income with a simultaneous increase in higher rates of depression and stress over the duration of the intervention (58). Both interventions found mixed results on dietary outcomes (26,38), suggesting that a stronger focus on gender equity and wellbeing are needed for agriculture interventions to positively impact malnutrition rates via the women's empowerment pathway (38,58).

Unisectoral programs often show positive results due to their targeted nature and relatively straightforward implementation, the positive effects may be easier to see. One of the least multisectoral interventions (28) distributed cash transfers to women and showed positive effects on both child growth and child feeding indicators. Regardless, it remains clear that though multisectoral interventions may show fewer impacts, or effects of a lesser magnitude, they are needed alongside the more 'unisectoral' interventions as both fulfil an important purpose; the former to make sustainable, long-lasting changes to the food system, and the latter to urgently address child malnutrition.

There is no clear pattern of evidence that can be gained by looking at the multisectorality of the nutrition interventions and the associated impact. The study we found to be the most multisectoral (40) included thematic sectors such as agriculture, WASH, and gender, also included a mix of implementing sectors consisting of an international NGO (Tanager), local NGOs, the private sector, and government services – though which

government services were included was not clear in the manuscript. The intervention assessed was a homestead poultry production program, but the results were mixed. They found positive findings on iron intakes and egg consumption among children, but there were null findings on other nutrient intakes, and the increased egg consumption did not translate into increased child dietary diversity. While they did not measure anthropometrics, another highly multisectoral intervention did (58), and found improvements in child growth, with children who received the intervention having a lower prevalence of both stunting and wasting. These improvements in children's anthropometrics were sustained even two years after the intervention ended (77).

Q3: What are the main study design strengths and weaknesses identified in the interventions assessed?

Triangulation of the thematic results between KIIs and the literature review and mapping against the key elements of the design conceptual framework revealed four overarching design elements potentially influencing effectiveness of programs in the West African Sahel region: (i) situational analysis and targeting, (ii) formative research, (iii) monitoring and evaluation, and (iv) stakeholder analysis (**Figure 7**). Results are presented as strengths and weaknesses for each of these themes.

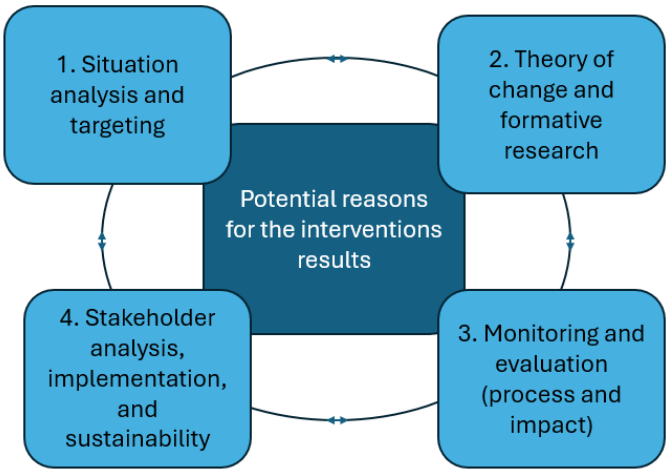

Figure 7: The triangulation of thematic results revealed four overarching design elements influencing project effectiveness in the West African Sahel region

Situation analysis/targeting

Strengths / positive deviance

In Chad and Senegal, several respondents reported that a comprehensive assessment of the extent of the malnutrition problems (situation analysis) was essential for optimal targeting. Similarly, an in-depth understanding of the causes of malnutrition in the target population was also perceived as critical. Another aspect was to effectively build on existing/ongoing investments and interventions (on nutrition, health, food security, etc), optimizing the use of scarce resources and maximizing impact by converging sectors.(42)Another good practice reported by respondents was to build on the lessons learnt from previous programs, ideally based on process and impact evaluations. This can help avoid previous weaknesses (e.g. revert to locally manufactured products when foreign machinery has been difficult to maintain, or when agricultural varieties or practices have not performed) while also informing development of new elements that can be added (e.g. identification of at-risk populations). A good example from the literature is a study in Northern Senegal (44), where there was ongoing quarterly and annual M&E to identify malnutrition hotspots and refine targeting accordingly.

Weaknesses / limitations

Respondents in both Senegal and Chad reported that there were often few resources available to do a proper situational assessment, due to both economic and time constraints. When there were specific funding calls, it is generally partners who have previous experience in the Sahel region who apply, writing applications based on prior experience. Respondents reported that these applications do not necessarily demonstrate a good understanding of the context (because causality in one area may be different to another) or thier knowledge may be outdated.

An up-to-date situational analysis requires recent data, yet large data gaps remain. Even when there are administrative data available, there is limited access and capacity, though one EU-funded program in Niger addressed the data scarcity by building government capacity to manage, analyse, collate and disseminate nutrition status and water table data for improved monitoring and targeting efforts (64). From the literature review, multiple projects noted that lack of up-to-date malnutrition data hampered targeting (23,55) and represented a common challenge. Not many studies invested in collecting up-to-date nutrition data (only some collected data at baseline, but it was often too late to meaningfully influence the design). Specific data on health, feeding practices of young children, social safety nets, and economic alternatives to agro-pastoral production have been identified as a need. Informants reported that adding a situational analysis as a first step to proposals could add up to 3-4 months. A limitation observed in the literature review was that most documents had insufficient information to determine how/if the situational analysis was done adequately. Some projects acknowledged that systemic drivers were identified – but often those projects did not address them without a clear rationale for the oversight, so it is difficult to discern whether this was due to a lack of funding, of capacity, or something else.

Key informants reported that projects were often limited to a specific geographical area (e.g. a single district) and not scaled. Further, informants perceived that coverage was often not sufficient and even in contexts with good security conditions, physical access (e.g. poor roads) was a challenge, thus remote populations, often the most vulnerable, may also be excluded due to logistic challenges. One study that focused on improving year-round vegetable production targeted villages that had existing boreholes due to budget constraints for water infrastructure, eliminating those most vulnerable to seasonal fluctuations in food supply (36). In another program, beneficiaries reported that their selection was influenced by the 'politics' of community leaders/village chiefs and that the poorest of poor were sometime excluded (this marginalisation was reportedly exacerbated for women that do not have identification documents). In some instances, there was also a community-level lack of knowledge on the complaints processes (80). In addition, the literature review revealed households were often targeted based on lowest wealth rankings or engagement with healthcare services, whose alignment with malnutrition rates was unclear.

A lack of synergy is also hampering progress. The lack of complementarity of different approaches/interventions within the same area may be related to the fact that the different nutrition interventions were not adequately mapped (i.e. who is doing what, where) at the country/regional level. This challenges a horizonal integration and avoidance of overlap, and prevents both building synergies and the planning of meaningful interventions. This limitation was reported at national level, across funders, and even within the same funder. Some respondents reported that there were also multisectoral projects where there were no integrated approaches as the different sectors were targeting separate locations (i.e. lack of geographical convergence).

Theory of change and formative research

Strengths / positive deviance

In the literature review, we observed a small trend among the scientific community to publish formative and implementation research, including evidence-based intervention design processes and protocols (59,62–65). We

found formative research reports that had not been publicly published indicating that some of this formative research is conducted, but not shared or disseminated publicly (38). A handful of explicit theories of change/causal pathways were found (17,25–27,36,41,45), and some theory of change and indicator sensitivity analyses were done retrospectively (65,66). This highlighted gaps in the situation/formative analysis that can impact implementation negatively as demonstrated by one retrospective theory of change and implementation analysis conducted in Mali (65). One program in Niger explicitly addressed the severe lack of state capacity to support the assumptions made in the project level theory of change (42). Those assumptions included conflict management, especially the conflict related to natural resource management, which was acknowledged and built into the design of the projects (39,42).

Informants in Chad and Senegal highlighted the importance of direct communication on the ground with the community through community leaders (e.g. traditional chiefs), health workers, or government extension services. Further, we found two examples in Mali of climate-smart projects that had strong community engagement/longevity approaches built into the study design. One included multiple co-applicants/collaborators of horizontal and vertical sector levels from the application level and included a participatory workshop with community stakeholders before the end of the project to develop a consensual action plan to continue the work after withdrawal of the project (50). In the other, livelihood activities were determined in collaboration with the communities, technical services, and town halls of the municipalities (34).

Weaknesses / limitations

Both from the literature and the interviews, it was clear that not many projects had explicit funding or capacity for formative research. Out of 41 studies, only 3 studies (59,62,63) explicitly published such formative research, 2 studies published design/protocol manuscripts (62,64), and another study referred to an unpublished formative research report (38). Even when conducted, most documents had insufficient information on the formative research component and some projects appeared to have missed socio-cultural bottlenecks (e.g. lack of women's decision-making power, long distances to travel to hospital) that later hindered the success of the intervention. For example, one Mauritanian government social support program was started in 2020; however, a mixed-method evaluation conducted 2 years later identified areas (e.g. need for gender-sensitive approach, lack of transparency in selection of beneficiary households) that could have been picked up in proper formative research/or rolling monitoring and evaluation efforts (36). Another retrospective mixed-method theory of change analysis found that implementation constraints related to remoteness and inaccessibility undermined the ability of mothers to access the cash (65).

Informants in Senegal mentioned that it was not always easy for program designers to lay out a rigorous theory of change and clearly establish the linkages between their program and the outcomes they were targeting, *a priori.* Indeed, this was confirmed by the literature review where less than a quarter of studies reviewed provided an explicit theory of change, impact pathway, or conceptual framework. Those who did include such theory provided insufficient detail. No study described developing a theory of change with beneficiaries/communities as key stakeholders (despite 3ie guidelines encouraging community participatory approaches to project design) (1). According to the literature, many of the theories of change were built on the assumption that the state was functional and that there was a sufficient enabling environment (see sections below on stakeholder analysis and governance). Policy analyses indicated that the main drivers were not targeted properly in government policy documents/strategies (53), and highlighted the lack of government operationalised plans, indicating a gap between theory/policy and practice required to adequately address some of the major underlying drivers of malnutrition (55). Informants reported that skipping this critical step of identifying and checking the underlying assumptions (e.g. that women have freedom of movement to leave the house and go to the market to buy food; that the income from an agricultural investment is higher than the expenditures) can lead to mistakes that can have unintended consequences. Informants reported that sometimes this assessment of underlying

assumptions was done retrospectively in evaluations. In some unfortunate cases, it highlighted an absence of a clear intervention-outcome pathway.

Monitoring and evaluation (process and impact evaluations)

Strengths / positive deviance

The informants in Chad and Senegal highlighted the importance of regular process (routine) monitoring, with specific funding and indicators that were realistic, combined with rigorous impact evaluations. Respondents reported how rolling process evaluations are critical to the adaptation and success of projects. The EU has a scheme for mini assessments that can take place throughout the project. These short assessments were reported as helpful to identify barriers to success and reorientate the project as needed. A partnership/collaboration with a research institution was reported to be helpful for achieving rigorous impact evaluations (e.g., the CRAM project in Chad). This study was also identified in the literature review as a positive example of a development project collaborating intentionally with academia to strengthen the impact evaluation of their project. The study also documented annual data collection of qualitative and quantitative data (17). Another exemplar project was an intervention in Mali, which used quarterly monitoring and evaluation meetings with community, between implementing partners and with local government, mayors, and village leaders to evaluate and adapt the project. However, it had no formal impact evaluation, and the outcome results were restricted to descriptive statistics and FGDs/KIIs undertaken by the project staff (30). A study in Niger had a strong endline mixed-method implementation evaluation, guided by the RE-AIM (Reach, Effectiveness, Adoption, Implementation and Maintenance) evaluation framework which assessed five dimensions of an intervention (i.e., adoption of the intervention by community actors, implementation or fidelity to the protocol and quality of implementation, sustainability of the intervention, scope/coverage of services, and the effectiveness of the intervention). However, there does not seem to be any evidence of a midline evaluation, which is a lost opportunity as it could have then adapted the project to help achieve more concrete outcomes (48). In terms of adaptability, a project in Mali conducted a disaster risk diagnosis (i.e. carrying out participatory studies of vulnerability and capacity) in the first year which led to the strengthening of the early warning systems and development of disaster risk reduction (DRR) plans and implementation of large-scale awareness raising and capacity building on the main risks identified (34).

Weaknesses / limitations

Respondents reported that sometimes multisectoral projects had many indicators and thus comprehensive reporting was complicated. Further, some reported that the indicators imposed by donors were sometimes difficult to measure in practice (e.g., the number of cultivated hectares or the number of vaccinated children financed by the EU). Other respondents highlighted the lack of use of indicators at the household level (i.e. macro indicators at country level, rather than micro that can assess impact at the poorest, most nutritionally vulnerable households, in terms of nutrition or health). Respondents perceived that this, in turn, does not push governments to define policies and activities that would lead to improvements at the household level. Further, process indicators or activity indicators were reportedly chosen over outcomes that show impact (possibly this is done purposely, to show project achievement, but is misleading and not good practice). There was also a perceived pressure to present only positive findings in evaluations, a bias which was also observed in the literature review. For example, we found an interesting large-scale multisectoral project which innovatively addressed systemic and underlying drivers of malnutrition, specifically climate change, water scarcity, degradation of natural resources and food insecurity through pathways to employment/income and production of nutrient-rich foods/local sale market chains, but it did not collect any nutrition indicators. Although this project was large, extremely ambitious, and beneficiary centric (using individualised pathways to employment), from a nutrition perspective it represented a missed opportunity. At a minimum, the project could have collected

some nutrition indicators such as dietary diversity of individuals to assess impact on food security/diet quality (33).

There was a lack of adequate evaluations, both to assess the sustainability of the project as well as the impact. When there was an evaluation, the dissemination of these was reported as a challenge by many informants and thought to be due to lack of capacity, time, and money allocation. In addition, respondents reported that these evaluations were not easily available, sometimes for fear that negative findings would impact their future abilities to procure funding, while positive findings might create competition against them. Indeed, an experience capitalisation exercise conducted in the Sahel also noted this culture of competition and reluctance of stakeholders in the Sahel to share lessons learnt (31). Even in long-term interventions that have subsequent steps, later phases were not taking stock from the previous ones. Some respondents reported that some funders, such as the EU, promote impact evaluation through other budget lines (i.e. horizon projects for research methods, approaches, data or frameworks, but not for development projects) or through separate stakeholders such as IFPRI, FAO, etc, which end up in some specific projects' evaluations, but this was not happening systematically.

In the literature review, most of the rigorous quantitative statistical analysis of intervention impacts on nutrition outcomes was dominated by the academic literature (n=12 RCTs). Only one development project report presented a rigorous independent impact assessment (which was incidentally written by an academic) (17). Of the rigorous impact evaluations, very few employed the mixed-method process or impacts evaluations recommended by the 3ie Dixon & Bamberger et al (1) and "RCT+" by Bamberger et al (18) (17,40,65). Only a handful of development initiatives had some independent evaluation (33,42,45,48,50,67). However, compared with the scientific evaluations, the development evaluations were more likely to employ qualitative approaches, giving a voice to beneficiaries and identifying lessons learnt and barriers to impact pathways (48,67). Often when quantitative data were used, only descriptive statistics were presented, constraining interpretation. Some projects described planning formal impact assessments, but baseline data was so poor that formal impact evaluations were not possible (23,24). Lack of capacity, skills, and funding were cited as common barriers to adequate monitoring and evaluation (53,55). Other times the mid-term evaluation was conducted at an advanced stage of the project, meaning that the mid-term/design gap analysis was not able to influence the project (36,39,42).

The lack of regular process monitoring was also raised as an issue by informants who were involved with impact evaluations. Respondents perceived that final evaluations should not find that protocols had not been followed, or that the expected coverage was not reached (e.g. not including eligible women for no clear reason, not reaching the planned villages, or not implementing all activities). Problems such as these can be detected with better monitoring. Therefore, setting up rolling monitoring systems, based on strong theories of change, from the beginning is instrumental for project success and impact.

In relation to the flexibility/adaptability, it was reported that there was limited opportunity for reassessment in projects, though it has slightly improved post-Covid. Also, the development of an Integrated Food Security Phase Classification (68) system takes crises data into account. Respondents reported that donors could contribute to improve this with a more technical management, and a closer follow up not only of processes but also of results, approach coherence, etc.

Stakeholder analysis, implementation, and sustainability

Strengths/positive deviance

Some key informants in Chad perceived that a multisectoral approach targeting all the causes of malnutrition is a strength by itself, and they advocated for the development of a complete package to address the drivers of malnutrition; however, it was reported that this needs to be considered in the scope of contextualisation and

avoidance of copy-pasting (i.e. needs to be responsive to the specific needs of the community, including livelihoods, education, capacity, and food security).

Active stakeholder participation/consultation in the design was mentioned as an instrumental design piece, as well as in the subsequent project stage by several respondents. They reported that this should include beneficiaries and government (essential for integration and buy in), with prioritisation of community level women organisations specifically. Respondents reported that this co-design and ownership helps to better understand needs, prioritise the most relevant activities (e.g. who needs the training and in which skills), promote the project within the community, and achieve better sustainability. It was also reported that it was important to build long term linkages with the government and communities through regular meetings, including at higher level. In the literature there were some strong examples of stakeholder collaboration (e.g. with women's groups, community/religious leaders, NGOs, government), including extensive capacity building activities (26,27,30,46,57). Most projects reviewed had strong integration with community level civic groups or local leadership structures, but only a few considered the beneficiaries active stakeholders (34,50). Due to a lack of state in some regions, many development projects explicitly built community-level committees for long term civic-based governance and post project continuation of activities. Community/religious leaders were often listed as key stakeholders for project success (45,46). Regarding coordination, key informants reported good examples of team coordination and integration of the different sectors (i.e. presence of experts from the different sectors discussing different activities from design to implementation, and working on the budget, procurement plan, and monitoring and evaluation plan collaboratively).

Considering the existing traditional hierarchy system, the local government and the local capacities were paramount to sustainability, according to informants. In Mauritania, one ambitious project identified in the literature included 14 different implementing agencies/partners, taking into consideration the strengths and synergies of each. However, one key concern of the evaluations was the distinct lack of state/lack of capacity of local state to continue (human resources/skills/high turnover of staff) and fund the project. The longevity of the project relied on the beneficiaries/local mayors/women's groups (e.g. civic groups) and many individuals trained were then employed by NGOs (33). One example in Mali included multiple collaborators of horizontal and vertical sector levels and, to ensure the sustainability of the energy services installed by the project, conducted a participatory workshop with community stakeholders prior to the end of the project to develop an action plan to continue the work (50). Another study in Mali contracted a local NGO (GRET) for 20 months during implementation to train and ensure capacity building of the 25 women members of the created cooperative societies in administrative and financial management and marketing techniques, as well as their craftsmen in the manufacture of improved stoves and their monitoring (50). This was done to make the five cooperative societies autonomous after the project. Many health-based projects (e.g. MUAC screening) focused on building capacity/skills training healthcare workers and community level health advocates (17,25,36,47,48).

Weaknesses / limitations

Key informants perceived that nutrition was no longer a main priority in Senegal for most funders including the EU, who were now reportedly more focused on employment, energy, climate change, etc. This might have a relation with the stagnation in the reduction of malnutrition rates, and thus a focus on nutrition might need to be reinvigorated.

Both the KIIs and the literature review concluded that most stakeholders were characterised by limited technical, organisational and/or financial capacities. Activities were subject to qualified NGOs who implemented them, and who do not always find the relevant capacity and skills in-country. This is an important point to tackle in interventions due to the established need for sustainability strategies so that trained people are retained and do not move elsewhere. For example, in Chad, according to the literature, capacity to implement policies and

coordinate multisectoral strategies in the Improving Governance of Resilience, Food & Nutrition Security and Sustainable Agriculture in West Africa project (SANAD) suffers from major shortcomings in terms of human and organisational capacities (53). The IFPRI report highlights that most sectors at all levels – state, regional, NGOs – were understaffed, and staff that were there were poorly motivated and/or not sufficiently qualified. Many organisations suffer from a lack of specialists in gender and nutrition issues. The situation was reportedly identical at the decentralised level where the staff of certain provincial and departmental services were often essentially a single person. In Chad, the temporary suspension of the recruitment of young graduates to the Civil Service also resulted in an aging of state personnel. The high mobility of executives and the appointments of managers sometimes on political and partisan biases hampered SANAD. This resulted in a governance deficit which was characterised by a dysfunction of the steering, coordination, consultation, and multi-actor and multisectoral dialogue bodies (53). In Mali, a situation was noted where the development sector was dominated by a project approach and 75% funded by external aid. Little to no governance/ coordination meant that projects overlapped, and a focus on crisis response contributed little to no long-term integration or sustainability (55). In Mauritania, the absence of a critical mass of experts who could deal with nutrition in public health and other sectors was also a significant bottleneck for promoting nutrition. Lack of resources and lack of human resources was a major barrier (39). Also, some stakeholders were absent, particularly in conflict fragile areas, making it difficult to find local financial suppliers for cash transfers or local suppliers of therapeutic foods or micronutrient powders, which also increases environmental footprints through overseas suppliers (57).

A lack of national coordination between the central and province level was highlighted by respondents. At both levels, success/failure might be based upon a single coordinator, leading to uncertainty. The central government's involvement was sometimes missing and this can create problems and friction, especially for the health sector. Problems in coordinating different ministries and sectors was also highlighted and, in some projects, the different sectors did not overlap in time. This was reportedly still a barrier, despite the numerous calls to break down silos of agriculture and health, and might be related to bureaucracy, incentive structures (performance evaluations), competing funding, etc. Small projects may have not encountered as many issues with coordination, but coordination of large projects reportedly posed a challenge. Respondents perceived that coordination does not necessarily need a lot of funding, but needs substantial built-in time, will, and collaborative spirit, which do not always exist. Coordination at the country level was also lacking to ensure adequate geographical coverage and complementarity.

Key informants in Chad and Senegal also reported that multisectoral projects can have a true impact at a national level but required a large investment. National budget lines reportedly cannot cope with the needs, and donors funding was perceived as not always complementary or integrated with other funders and/or internally. For example, a lot of the EU funding was reportedly general (i.e. higher-level budget support) that did not necessarily end up in the communities with high rates of poverty and malnutrition. On the other hand, programs objectives do not always align with national policies, partly because of the influence from donors. A lack of flexibility was also reported for some funders, where the budget was reportedly rigid from the onset, with limited to no top-up of remaining funds available to NGOs (but sometimes available to private actors), or contingency/modifier funds in a context of unpredictable crises. Regarding donors, issues with contractualization and bureaucracy with contracts were also mentioned as roadblocks (delayed implementation of some or all activities). Contracting procedures were considered complicated and can sometimes take several years. This might be problematic in some projects and was perceived as a waste of time and resources. Respondents perceived that procedures to translate proposals into action and contract the various stakeholders should be more dynamic in these settings where the situation is volatile, particularly when two years later the target prioritisation and logistical costs might have substantially changed. Most documents reviewed had insufficient information about funding but reported funding limitations constraining the study design (e.g. cutting remote provinces despite those being most vulnerable, reducing formative research and removing formal impact evaluations),

exacerbated by volatile and expensive logistics (e.g. robbed by extremist groups/ cost of replacing equipment, increased vehicle/fuel costs for remote locations, currency fluctuations) and field safety concerns around conflict (30).

Many projects and programmes were still dominated by short-term crisis response approaches. Lack of funding from states was reportedly a significant long-term barrier to sustainability addressing malnutrition. For example, for SANAD financing in Chad, the results of the 2016 Agricultural Sector Public Expenditure Review highlighted a drastic drop in public expenditure from the state budget for SANAD. The budget decreased from 229.08 billion FCFA in 2014 to 37.48 billion in 2016 (i.e. was divided by 6 in three years) due to the fall in the price of oil. Worse, the resources allocated in 2016 were mainly used to pay for the running of the administration. On the other hand, responses to food and nutritional crises benefited each year from substantial funding of more than 120 billion FCFA from technical and financial partners indicating that responses are still dominated by externally funded projects (53). (33)(31)

Due to lack of 1-year post-project evaluations it was difficult to assess sustainability, but a key barrier to sustainability was the lack of post project government budgetary lines to support continuation of any single aspect. One EU-funded project was commended for safeguarding funds for governance/ institutional reform within the Niger government. However, the attention and funds to this critical area seemed inadequate to deal with the extent and inertia of the weak governance/lack of transparency/ inefficiencies/ lack of capacity within the Niger government and state financial institutions (42). Moreover, the progress on increasing funding/expenditure transparency was limited. It was difficult, if not impossible, to determine how much of the EU funding reached local level implementation or beneficiaries.

Q4: What lessons can be learnt for improved designs of nutrition interventions?

The following key lessons are distilled and presented following the same four overarching themes from Q3.

Situation analysis and targeting

- There was agreement among informants on the need for strong situational analyses of the field (geographical, socioeconomical, nutritional, seasonality, etc.) and the specific drivers of malnutrition for each context, to adapt the approaches.
- NGOs/government departments have data but there seem to be a lack of capacity/political will to consolidate and disseminate malnutrition data. Early warning systems related to environmental indicators (e.g. water table levels, precipitation) appear to be dysfunctional most of the time, limiting targeting.
- The structural causes of malnutrition remain too often neglected in favour of short-term responses.
- The need for knowledge of the interventions and ongoing programmes (mapping) was also highlighted and needs to be considered at country level.
- Regarding the targeting, respondents advocated for linking the households more at risk not only with emergency and treatment, but more strongly with resilience follow up and prevention, integrating both. This requires better coordination between emergency and resilience.
- Respondents also discussed the issues related to interventions promoting certain foods (e.g. fortified products, animal-source foods, etc.) which are not affordable by the poorest; therefore, projects need to either aim at reducing the cost or focus on the production of food and promoting dietary diversity within what is feasible.

Theory of change and formative research

- Contextualisation is paramount as even from one country region to another; disparities might be substantial, and needs formative research, which also helps to identify obvious bottlenecks.

- A good practice is to start small (i.e. start with a small project establishing proof of concept to show impact), then approach donors with the results to get more funding and expand the project. This, however, is a challenging approach and requires amendable funding structures.
- The formative research should look deeper into several issues such as the existing social/gender norms that may need to be addressed, e.g. the decision-making power/empowerment of vulnerable populations does not automatically improve by including them in a value chain project and increasing income (i.e. benefits can be captured by men instead).
- The understanding of practices and behaviours is paramount, and essential for the success of infrastructure or production e.g. building a borehole or producing certain commodities is not sufficient to improve nutrition if not well used. Social and behaviour change should be included in most projects. Similarly, it is essential to understand who the right target of SBC is (e.g. only women of reproductive age, or also fathers, religious leaders, grandmothers, etc) which is often related to decision-making power.
- Similarly, it is not enough to simply include women in value chain development projects, existing social/gender norms means that women's decision-making power/women's empowerment does not automatically improve with income (benefits can be captured by others).
- The content of the SBC also needs consideration (i.e. direct and simple messages tailored to the right target interests may be more effective).
- Good intentions and wishful thinking are not enough for a robust intervention design, and the lack of a rigorous reflection on how 'what we want to do relates to the outcome we want to achieve' may be problematic; therefore, a well elaborated, clear, evidence-based, and participative ToC is essential at design state. This ToC cannot be a generalisation, but grounded and up to date, linking with the formative research to be realistic and effective.
- For example, one study in our review provided a clear and detailed Program Impact Pathway and the education component (WASH, nutrition and health practices) appeared to be well received by the women (36). However, majority of the gender barriers (e.g. lack of decision-making/financial autonomy, time/mobility constraints, illiteracy, lack of formal identification documentation for women) were not explicitly addressed. Specifically, men/husbands/male heads of household were not explicitly targeted (nor were mothers-in-law) and this lack of whole of household/whole of village approach was reportedly a significant barrier to success. Much of the success of addressing these barriers relied on the innovation of the volunteer 'relay' to liaise with community leaders to provide 'approval' and 'support' for the women to attend the community programs and in some cases to physically escort the pregnant women to the hospital when their husbands were out of town/they had no identification documents (36). A similar situation was also reported with a similar study design in Niger (48).
- Lack of attention to the ToC/causal pathways can also have knock-on negative effects – e.g. lack of explicit nutrition objectives and poor choice of indicators along the causal pathway to monitor changes/mitigate against unintentional harm (1). For example, this happened with the national run agriculture for nutrition program in Mauritania. The program was biased towards agricultural technical assistance/production. No nutritionists were included in the design or the mid-term review - meaning that the overall program appeared to be a missed nutrition opportunity. As per a design gap analysis conducted by NRF - the program was developed with lack of data (high risk of poor diagnosis/bad targeting), there were no explicit nutrition objectives, and in turn there was no nutrition indicators at project level (other than a mix of inconsistent food insecurity indicators) (39).

Monitoring and evaluation (process and impact evaluation)

- There was a lack of overall evidence for what works specifically in the Sahel, in fragile crises-prone states. Short funding cycles may limit ability to statistically identify change when addressing complex drivers.

- Although many non-academic initiatives were innovatively addressing some of the systemic drivers (which demonstrate great potential), lack of formal/rigorous IEs limits ability to ascertain what works and in what circumstances. The importance of learning from past successes and mistakes was flagged as instrumental for effective project design, building on what has been done already, ideally through mixed-method process and impact evaluation. This requires more transparency among stakeholders and document sharing, both for "good practices" (giving visibility to successes but with the details) and for negative lessons learnt. All the evaluation aspects of the project need to be shared with the government.
- The knowledge exchange platform of AGIR was a good example of focusing more on dissemination of lessons learnt (e.g. implementation research); potentially something to promote compared with current bias on publishing only 'significant results'
- Indicators also need to be very context specific according to what is relevant and should include household level indicators for the different sectors, along the pathways. These are also good data to collect, as a lot of gaps exist in primary data at country data, and some of the indicators reported (for example for women's anaemia) are based on modelling.
- At the development sector level, there is substantial room to improve their collaboration with academia to strengthen the research component/ rigorous M&E process (e.g. CRAM example) (17). Limited capacity of implementing partners and limited funding can result in inadequate and insufficient data collection to enable rigorous impact evaluations; however, early collaboration between implementing partners and academic institutes shows promise for producing rigorous evidence with limited resources.
- Projects might be well designed on paper, but in practice implementation can be poor. A way to track this is building-in good monitoring systems, that verify that what is happening is what should be happing, and that the product is as per specification, and that beneficiaries are reached. It is good to have a dashboard to understand what is going on in the project, potentially independently to avoid conflict of interest. Close monitoring is particularly important at the beginning, where most adjustment of delivery methods is needed. Coverage is often one of the issues, particularly where there is no pre-existing local system/network and user experience. Incentives might need to be considered.
- Technical staff from the donors need to visit projects more regularly for a better understanding of issues.

Stakeholder analysis, implementation, and sustainability

- Choosing the right partners is important. Knowing all the options of stakeholders, their strengths and weaknesses is important to select the most effective to contribute to the design and to successful implementation. An adequate selection of stakeholders, who can implement several activities/sectors, can allow for fewer contracts, facilitating the logistics. There is, however, a trade-off involving highly specialised players, which is necessary. It is also important to clarify and be explicit about what each one's role/activity should be in the project from the onset. It is good practice to allocate dedicated time/resources to train the staff and build capacity, and it becomes essential very often.
- Understanding the capacity of the people delivering the project (e.g. health/community workers) is critical and needs to be considered at design to ensure relevant training activities.
- The local capacity to supply resources (e.g. fortified therapeutic foods) also needs to be assessed. Depending on the contexts, overseas suppliers can add substantial cost and delivery time, affecting sustainability, while local sourcing can contribute to address systemic drivers such as developing livelihoods, strengthening food system, etc. Where possible, engaging local stakeholders to produce /distribute and building their capacity is an added value.
- The importance of co-design and getting all the stakeholders, including beneficiaries, involved from the onset, seemed to be of general agreement, and the need to approach the local community and local stakeholders with an open mind and a flexible mind. Beneficiaries should have a (heard) voice to express their opinion on what will work for them or not work. This does not mean always doing as requested, as it

may sometimes be problematic and this still needs to be looked through other lenses, such as cost effectiveness, ownership, technical capacity, higher level priorities, etc. but should be a red light for don'ts and a source of good ideas for dos.

- Regarding stakeholder (beneficiaries, government, etc.) engagement, it is paramount to have them involved by informing them of progress and sharing results.
- Proven effectiveness and usefulness of a coordination or governing unit that sits between all partners, ministries, etc. to run the programme with independence. This has advantages like the political economy. Multisectoral approaches require more explicit leadership, as well as specific skills. It is good practice to appoint a coordinator who has experience in this multisectoral challenge and is 'neutral' (i.e. does not belong to an agency that is part of the project). An important dimension is to strengthen the coordination teams to improve communication between the different sectors. More funds (time and resources) should be put into coordination to better integrate activities: e.g. sequence activities, coordinate activities.
- Unless the fragile state governance is addressed, the current short-term project-based approach is unlikely to achieve meaningful change in the long-term. In addition, the lack of state budget lines limits longevity and sustainability of project effects.
- More attention needs to be given to verify project sustainability, by reviewing them in the field long after they have ended to check what is left (e.g. one or several years later, depending on the nature of the project)
- In emergency interventions, it is important to draw up a plan and agree on who takes over after a few months. Emergency interventions need to have a long-term sustainability strategy by establishing strong linkages with local health systems, agricultural systems etc. to carry on the work when the project is finished. To this purpose, and to contribute to a steady transition from emergency to resilience, the integration of the humanitarian and the development sectors/actors needs to be stronger. In this respect, funding appears to be stuck cycling back to crisis management and struggling to gain traction in long-term resilience / sustainable transformation, and this needs to be addressed.
- The ambition and objectives and scale of the project need to be carefully considered when planning the staff and resources required. If these are limited, the scope may need to be reduced accordingly and it is good practice to assess that, always accounting for volatile security and prices. Where there is no funding for key elements of design from the beginning, expensive logistics can easily consume budget for formative research and formal impact evaluations, as these are often the first elements to be cut-off (difficult trade-off decisions).
- Timelines should allow for slow implementation milestones and pre-empt potential (and frequent) contextual changes with a combination of flexible and institutional funds, including a crisis modifier with a budget line for emergency response. Flexible funding schemes and adaptation from the donors are essential to help deliver the project in these complex contexts. If those are not included, certain situations can be unmanageable. Therefore, provision for contingency funds should always be considered.

Discussion

There is a dearth of data and analyses conducted in fragile states (9), which has been reflected in the findings of the present literature review. Numerous issues have been identified as hindering progress, such as a lack of measurement of nutrition indicators, monitoring of intermediate indicators along long causal pathways, robust mixed method monitoring and evaluation, coordination across sectors, and technical capacity prevent the redressing of this imbalance.

There are also several trade-offs and controversies that require further debate.

- **Multisectoral vs unisectoral:** A key challenge seems to be coordination across sectors and the difficulties of running very large comprehensive projects. Malnutrition requires interventions at multiple levels, but do

they need to be implemented jointly? It is worth considering whether complex projects covering many areas would do a better job than simpler projects focusing on one specialised sector (potentially more efficiently and with more expertise), while the target population could be receiving simultaneous improvements in other sectors. Regardless, it remains complicated to conduct evaluations of the most multisectoral programs(19). It remains to be seen if both approaches could achieve similar results. Our search identified robust impact evaluations of multisectoral programs, but future evaluations may consider more varied methods, such as conducting a design evaluation prior to program implementation intended to strengthen the theory of change and be fluid enough in the proposed theory of change to respond in real-time to the changing environment (19).

If this multisectoral work is to be promoted (and there is some evidence and general perception that this could be an effective approach (e.g, in stunting reduction) (16)), this study indicates that more work is required on capacity building and skills, bearing in mind that turnover in institutions (both in governments and non-specialised donor and non-government organisations (NGO) positions) is high.

- **Action vs evaluation:** in a context where funds are limited, are they better to be spent on the intervention or to understand whether the intervention worked? It can be argued that although both are important, in face of huge needs, investment in the interventions goes best. However, without monitoring and evaluation, we risk spending important sums on things which are not effective, or which have results, but may be sub-optimal – and in some cases, may even have unintentional negative consequences, risking disappointment and lack of donor interest.
- **Short-term project funding vs building long-term sustainability:** to address the former, significant investment needs to be made into changing the enabling policy and government-funding environment, and human capacity of the state. In addition, there is substantial conflict among development and emergency/humanitarian interventions- lack of integration/transition mechanisms.
- **Are better designs really going to make a difference with current levels of funding?** There is certainly room to improve project design, achieve better outcomes and impact, and sustainability. But it is important to consider that some communities are only food self-sufficient for approximately 3-4 months of the year (34), and never leave the “Critical” or “Extremely critical” IPC phase, thus relying on short-term emergency approaches most of the year. This raises concerns of whether long-term sustainability and lifting this population off emergency is even possible, at least at the current level of investment (chronically insufficient and decreasing) (69,70).
- **Perseverance of bottlenecks**: many of the issues raised (e.g. working in silos, contextualisation, M&E and relevant indicators, etc.) have been a priority and have been highly recommended for more than a decade or two. There seems to be a mismatch between theory (ideal situation and resources) and the quick fixes necessary in practice. Given that this is still not happening in the field, it is maybe time to take a closer look at why these recommendations are not being followed and what are the forces/bottlenecks that are preventing improvement in these aspects. Understanding these better might provide important insights on how to make it work, and what resources are needed and invest in ways to make this work. Also, Senegal and Burkina have enabling environments through their multisectorial platforms with their established ToCs, which have worked very well, but even there now progress has stagnated. The case of Burkina Faso might be due to growing political instability but in the case of Senegal might be due to their strategy not reaching important pockets of vulnerable population, or other reasons which need to be better understood.
- **Are certain projects designed in a way that generate dependence of the beneficiaries?** It is critical to bring on board the receiver views, needs and perspectives, and it is important to do so in a way that promotes beneficiary ownership and empowerment, and that is locally sustainable.

Limitations and strengths

We encountered substantial difficulties sourcing unpublished project level documents, limiting the number of documents that could be assessed and selected. Among the documents available, a scarcity of high quality, well-documented reports with transparent and detailed information existed. Most of these documents did not have sufficient detail to establish clear links of the design with the outcomes.

The KII also presented some level of bias, related with the respondent recall, as questions were mostly retrospective (i.e. about interventions finalised years earlier), and possibly with respondent subjectivity (towards either positive or negative features, according to their own experience). There might also be an associated level of positive-negative asymmetry bias. However, some of the negative experiences translate into positive approaches and lessons learnt. In addition, due to the length of time since the end of the interventions, it was not always possible to contact the most relevant respondent. Beneficiaries were not represented among the key informants, which given our finding about the importance of the community involvement, might be an important loss.

A strength of this study was the inclusion of unpublished documents and those written in French. The conduction of in-depth key informant interviews provided an opportunity for funders, designers, and implementers to anonymously report on barriers to robust project design and key bottlenecks that might otherwise not be recorded due to fear of repercussions. The inclusion of two researchers fluent in French and Spanish with field experience in the West African Sahel was instrumental to strong engagement of informants. The mixed-method design gap approach enabled a robust cross validation of the results and identification of lessons learnt for actionable recommendations. The high concordance between the triangulated sources strengthens reliability of the results.

Conclusions

The current discourse on multisectoriality has been evolving for more than a decade. However, there is still varying perceptions on how multisectoral programmes should be implemented, particularly in professionals other than nutritionists. The intuitive assumption to collaboratively work in more than one sector to address complex interconnected issues exists, but there is little clarity of whether and how this should be prioritised, and this study highlights clear challenges due to the collaborative nature of multi-stakeholder approaches (see Q3).

In this section, we have identified existing challenges that would benefit from expanded research /evidence, as well as key opportunities to leverage multisectoral interventions through several recommendations based on the current state of knowledge.

Needs for future research (along humanitarian/development projects or independently)

If there is a realistic will to develop evidence-informed best practices to optimise outcomes, cost-effectiveness and impact, then development projects should play a more central role in producing this evidence and share lessons learnt that can contribute to improvement. Even emergency projects should contribute, acknowledging that very critical situations will have more pressing priorities (yet lack of proper monitoring and evaluation may still lead to serious unintended negative-side effects and suboptimal use of scarce resources). This is important for nutrition equity (71). For this to happen, the most pressing research need at the general level is to refine novel validated (cheaper, quicker, and more user-friendly) methods and metrics for robust designs built into process and impact evaluations, in a way that minimises burdens to human and economic resources, and that does not require such high capacity, particularly for humanitarian projects. Also, improved methodologies for better integration of qualitative and quantitative data and participatory assessments could be helpful to optimise collection and interpretation of data.

Some fundamental biological aspects of malnutrition, for example of causes of stunting, the role of microbiome and epigenetics, etc. remain unclear and are being investigated. However, it is important to note that this is not the most constraining design aspect currently for this region, where a better understanding of (and easier robust methodologies for assessment) cost-effectiveness of specific multisectoral interventions for nutrition could be more helpful to support prioritisation, especially along long causal pathways (9). In addition, more efficient SBC strategies and interventions to promote faster and sustainable changes in diets and practices (hygiene, production, caregiving activities, etc), including how to optimally include a whole of community approach, are also needed. A better understanding of which food system transformations can effectively contribute to increased access and affordability of nutritious food for all would also contribute to better interventions at the food system level. Further, WASH seems to be a promising challenge to tackle to contribute to improving malnutrition, but the impact of related poor food safety in malnutrition may be an area of interest, given that we are slowly understanding the huge health burden that it poses to these populations. Finally, climate change is possibly going to be the key challenge for health over the next decades, particularly in more vulnerable regions, and the nexus of food system - climate change - conflict - limited resources - mobility - food/nutrition insecurity deserves attention. Much of the climate change research is based on high-income country data and proposes solutions adapted to their production systems and realities. Deeper contextualised understanding of exposure, mitigation and adaptation strategies for fragile countries will be instrumental in tackling some of the systemic drivers.

Our findings reveal that certain dynamics are still not well understood. For example, gender power relations are context-specific, but have some common traits that can be addressed more systematically to avoid undesirable side-effects and improve outcomes. These are complex to operationalise and need careful consideration. Other power dynamics such as between value chain stakeholders, could also shed light on more successful agricultural strategies. Similarly, research in governance specifically for fragile states, and how to improve it, linking with the whole range of basic drivers of malnutrition would also be beneficial.

Recommendations

Here we outline 16 key recommendations to enhance the effectiveness of future multisectoral interventions to improve nutrition for women and children during the first 1000 days and beyond, in these six countries of West African Sahel region (**Table 3**). Each recommendation has been mapped to the four overarching identified result themes and against the relevant actioning stakeholder.

Table 3: 16 key recommendations for improving effectiveness of multi-sectoral nutrition interventions in the West African Sahel

	Recommendation	Relevant stakeholder
Situation analysis and targeting		
1	Improve the targeting of both key drivers of malnutrition and beneficiaries by conducting robust situational analyses to maximise effectiveness of intervention design. This will require approaches at two levels: • **Existing data**: improve data management processes and platforms to ensure timely and transparent **dissemination of existing data** to avoid duplication of effort. • **New data**: collect where necessary to enable evidence-based targeting.	Designers Funders Government Implementers
2	**Beneficiary targeting**: Contextualise and target SBC for each region and target SBC to all the relevant community members with a **whole community approach**, including all household members and community leaders.	Designers

Recommendation		Relevant stakeholder
3	Improve **targeting towards systemic drivers** that strongly affect malnutrition in this region, including governance/coordination, climate/water scarcity, and women's decision-making power and control over income.	Designers
Theory of change and formative research		
4	Build an **evidence-based theory of change** co-designed with the beneficiaries, which should be published to ensure transparency and learning.	Designers Funders
5	Select **indicators based on the objectives and the targeted drivers** of the theory of change, including indicators selected by the beneficiaries. It is especially important to include **intermediate indicators** (e.g. dietary or disease indicators, or other nutrition-sensitive indicators such as income, education, food prices, etc), to address key drivers of malnutrition along long causal pathways (i.e. climate extremes/water scarcity, governance/capacity, women's empowerment).	Designers Funders
6	**Protect funding and time** for key elements of design, namely formative research, and build capacity to write up and disseminate the findings.	Designers Funders
Monitoring and evaluation		
7	**Protect funding and time for monitoring and evaluation** to ensure these are conducted and do not get lost in favour of more pressing needs.	Designers Funders
8	**Monitor** on a rolling basis throughout the intervention, by conducting data collection and analysis to enable timely adaptation for improved effectiveness and ensuring optimal targeting, as well as mitigation against unintentional consequences. This involves analysing data as closely as possible to the time of collection, which means that capacity and/or funding constraints must be addressed prior to the start of the project.	Designers Implementers
9	Safeguard funding for rigorous quantitative **impact evaluations** to assess the interventions and fill the empirical evidence gaps. To achieve this in a low-resource context, interventions could develop close collaborations between development implementers and academic researchers to leverage existing skillsets.	Designers Funders Implementers Researchers
10	Integrate **process evaluations** alongside impact evaluations provides an in-depth opportunity to validate the theory of change and qualitatively examine specific aspects in which the project benefits the beneficiaries and learning about their experience with the program, thus helping identify best practices.	Designers Funders Implementers Researchers
Stakeholder analysis, implementation, and sustainability		
11	Develop strong **governance and coordination**, along with multisectoral nutrition leadership, to maximize synergies between and within interventions and sectors (e.g., this could start with improved mapping of the nutrition interventions within a country to avoid overlap). In weak states, it is especially important that the governance aspects include civil society such as community leaders and local NGOs.	Government Funders Designers Implementers
12	**Integrate the intervention into the local civil society** and government sectors from the outset to ensure long-term sustainability. This will also facilitate co-design and buy-in of local communities and beneficiaries.	Government Funders Designers

Recommendation		Relevant stakeholder
		Implementers
13	**Build the capacity** of key disciplines, especially the cross-cutting sectors of gender and nutrition, to develop truly nutrition-sensitive multisectoral interventions that holistically address the key drivers of malnutrition.	Government Funders Designers Implementers
14	Ensure the complexity of the project matches the skill sets and capacity of the implementing stakeholders. This might require **stakeholder capacity assessment** during design and on a rolling basis throughout the intervention.	Government Funders Designers Implementers
15	Allow for **flexible timelines and funding for crisis modifiers** to maintain long-term resilience building while addressing acute emergencies as they arise in the volatile environment of the West African Sahel region.	Funders Designers
16	Foster a collegiate culture of **dissemination of knowledge**, especially lessons learnt. This will reduce duplication of effort while maximising resources and effectiveness.	Government Funders Designers Implementers

References

1. Dixon V, Bamberger M. Working Paper 50: Incorporating process evaluation into impact evaluation:what, why and how. New Delhi, India; 2021.
2. FAO. Designing nutrition-sensitive agriculture investments. 2015.
3. European Commission. Action Plan on Nutrition - Seventh Progress Report. 2022.
4. Young H. Nutrition in Africa's Drylands: A Conceptual Framework for Addressing Acute Malnutrition. 2019.
5. Global Nutrition Report. The State of Global Nutrition. 2021.
6. Exemplars in Global Health. https://www.exemplars.health/topics/stunting/senegal. 2024. Overview: Stunting Reduction in Senegal.
7. Zarocostas J. Humanitarian appeals for 2024 face severe funding losses. The Lancet. 2024 Jan;403(10421):14–5.
8. beEU. https://belgian-presidency.consilium.europa.eu/en/news/the-global-humanitarian-crisis-is-worse-than-ever-this-is-what-the-international-community-must-do-to-improve-it/. 2024. The global humanitarian crisis is worse than ever. This is what the international community must do to improve it.
9. Storhaug IG, Lane C, Moore N, Engelbert M, Sparling TM, Snilstveit B. Making the most of existing research: An evidence gap map of the effects of food systems interventions in low-income and middle-income countries. BMJ Open. 2022 Jun 1;12(6).
10. Banking on Nutrition Partnership. Synthesis of Evidence of Multisectoral Approaches for Improved Nutrition. 2017.
11. ACF. Integration de la Nutrition dans les Politiques et Programmes des Secteurs Contributeurs. 2015.
12. Development Initiatives. Global nutrition report: action on equity to end malnutrition. Bristol, UK; 2020.
13. NRF/EC. Evidence Needs to Inform Nutrition Policies and Programmes in East and West Africa and the Sahel. 2022.
14. Brar S, Akseer N, Sall M, Conway K, Diouf I, Everett K, et al. Drivers of stunting reduction in Senegal: a country case study. Am J Clin Nutr. 2020 Sep;112:860S-874S.
15. Braun V, Clarke V. Using thematic analysis in psychology. Qual Res Psychol. 2006;3(2):77–101.
16. Green J, Thorogood N. Qualitative Methods for Health Research. Fourth. Sage Publications; 2018.
17. Marshak A, Young H, Radday A. Water, Livestock, and Malnutrition Findings from an Impact Assessment of "Community Resilience to Acute Malnutrition" Programming in the Dar Sila Region of Eastern Chad, 2012-2015. Somerville; 2016.
18. Bamberger M, Tarsilla M, Hesse-Biber S. Why so many "rigorous" evaluations fail to identify unintended consequences of development programs: How mixed methods can contribute. Eval Program Plann. 2016 Apr 1;55:155–62.
19. Neufeld LM, Nordhagen S, Leroy JL, Aberman NL, Barnett I, Djimeu Wouabe E, et al. Food Systems Interventions for Nutrition: Lessons from 6 Program Evaluations in Africa and South Asia. J Nutr. 2024 Apr;

20. WFP. Final Report: Support for women producers of fortified local foods for children aged 6 to 23 months in Chad (AFORT). Chad; 2022.

21. USAID/SPRING. Learn, Do, Share: Cultivating Better Nutrition Worldwide, Snapshots from SPRING, USAI's Multi-Sectoral Nutrition Project 2015-2016. 2017.

22. ACF. Interim Narrative Report: Community Nutritional Program (PROCONU). Senegal; 2015.

23. ACF. Final Report: Strengthening the fight against Severe Acute Malnutrition in Senegal. Senegal; 2016.

24. ACF-ES. Final Report: Project to Reduce the Risks of Malnutrition in the Wilayas of Guidimakha and Hodh El Chargui. Mauritania; 2016.

25. Adubra L, Le Port A, Kameli Y, Fortin S, Mahamadou T, Ruel MT, et al. Conditional cash transfer and/or lipid-based nutrient supplement targeting the first 1000 d of life increased attendance at preventive care services but did not improve linear growth in young children in rural Mali: Results of a cluster-randomized controlled trial. American Journal of Clinical Nutrition. 2019 Dec 1;110(6):1476–90.

26. Becquey E, Diop L, Awonon J, Diatta AD, Ganaba R, Pedehombga A, et al. A Poultry Value Chain Intervention Promoting Diversified Diets Has Limited Impact on Maternal and Child Diet Adequacy during the Lean Season in a Cluster Randomized Controlled Trial. Journal of Nutrition. 2022 May 1;152(5):1336–46.

27. Becquey E, Huybregts L, Zongrone A, Le Port A, Leroy JL, Rawat R, et al. Impact on child acute malnutrition of integrating a preventive nutrition package into facility-based screening for acute malnutrition during well-baby consultation: A cluster-randomized controlled trial in Burkina Faso. PLoS Med. 2019;16(8).

28. Bliss J, Golden K, Bourahla L, Stoltzfus R, Pelletier D. An emergency cash transfer program promotes weight gain and reduces acute malnutrition risk among children 6-24 months old during a food crisis in Niger. J Glob Health. 2018;8(1).

29. Bliznashka L, Sudfeld CR, Garba S, Guindo O, Soumana I, Adehossi I, et al. Prenatal supplementation with multiple micronutrient supplements or medium-quantity lipid-based nutrient supplements has limited effects on child growth up to 24 months in rural Niger: A secondary analysis of a cluster randomized trial. American Journal of Clinical Nutrition. 2022 Mar 1;115(3):738–48.

30. Catholic Relief. Final Evaluation Report: Program to Strengthen Resilience to Food and Nutritional Insecurity in the Northern Regions of Mali. Mali; 2020.

31. Ezzan & Malick Ba. Carrying out a study to capitalize on positive experiences and good practices in nutrition, prevention and management of malnutrition, in all its forms in 5 countries in the Sahel and West Africa: (Guinea , Mali, Niger, Senegal and Togo). Senegal;

32. Huybregts L, Le Port A, Becquey E, Zongrone A, Barba FM, Rawat R, et al. Impact on child acute malnutrition of integrating small-quantity lipid-based nutrient supplements into community-level screening for acute malnutrition: A cluster-randomized controlled trial in Mali. PLoS Med. 2019;16(8).

33. ACORYS. Strategic evaluation of the resilience approach of the EUTF West Africa: Sahel and Lake Chad Basin: Mauritania. Mauritania; 2022.

34. Handicap International. Final Narrative Report: Strengthening Resilience to Food and Nutritional Insecurity in Northern Mali. Mali; 2020.

35. HC3N. 3N Initiative Action Plan 2021-2025. Niamey, Niger; 2021.

36. IFPRI. Mixed Methods Study on the Links Between the Tekavoul Cash Transfer Program and Community Nutrition Support Groups in Mauritania: A Study of the Integrated Research Partnership on Wasting and Social Protection (IRAM-SP). Mauritania; 2023.

37. Le Port A, Bernard T, Hidrobo M, Birba O, Rawat R, Ruel MT. Delivery of iron-fortified yoghurt, through a dairy value chain program, increases hemoglobin concentration among children 24 to 59 months old in Northern Senegal: A cluster-randomized control trial. PLoS One. 2017 Feb 1;12(2).

38. Nordhagen S, Klemm R. Implementing small-scale poultry-for-nutrition projects: Successes and lessons learned. Matern Child Nutr. 2018 Oct 1;14.

39. NRF. Soutien technique au suivi et à l'évaluation des programmes de nutrition (RIMFIL, RIMDIR) en Mauritanie: Leçons apprises, facteurs de succès, les échecs et les barrières du RIMRAP pour le programme SANAD – Objectif 1 – V1. Mauritania; 2022.

40. O'Brien C, Leavens L, Ndiaye C, Traoré D. Women's Empowerment, Income, and Nutrition in a Food Processing Value Chain Development Project in Touba, Senegal. Int J Environ Res Public Health. 2022 Aug 1;19(15).

41. Olney DK, Pedehombga A, Ruel MT, Dillon A. A 2-year integrated agriculture and nutrition and health behavior change communication program targeted to women in Burkina Faso reduces anemia, wasting, and diarrhea in children 3-12.9 months of age at baseline: A cluster-randomized controlled trial. Journal of Nutrition. 2015;145(6):1317–24.

42. SOGEROM. Mid-Term Evaluation of the Sectoral Reform Contract to Support the Food and Nutritional Security Sector and Sustainable Agricultural Development (CRS SANAD) in Niger. Niger; 2021.

43. Somassè YE, Dramaix M, Traoré B, Ngabonziza I, Touré O, Konaté M, et al. The WHO recommendation of home fortification of foods with multiple-micronutrient powders in children under 2 years of age and its effectiveness on anaemia and weight: A pragmatic cluster-randomized controlled trial. Public Health Nutr. 2018 May 1;21(7):1350–8.

44. USAID/IntraHealth. Annual Report: Integrated Service Delivery and Healthy Behaviors 2019-2020. Dakar, Senegal; 2020.

45. USAID/SPRING. Seeing Is Believing: The SPRING/Digital Green Experience in Niger: Evidence from a Community Video Approach for Nutrition and Hygiene Behaviors. Arlington; 2016.

46. WFP. Program Implementation Report: Local Production of Fortified Complementary Foods (PRO-FORT). Chad; 2021.

47. Kung'u JK, Pendame R, Ndiaye MB, Gerbaba M, Ochola S, Faye A, et al. Integrating nutrition into health systems at community level: Impact evaluation of the community-based maternal and neonatal health and nutrition projects in Ethiopia, Kenya, and Senegal. Matern Child Nutr. 2018 Feb 1;14.

48. IFPRI. Integrated Research on Acute Malnutrition (IRAM): Integration of Community-Based Interventions for the Prevention and Detection of Acute Malnutrition in Niger. Niger; 2023.

49. IFPRI. Mixed Methods Study on the Links Between the Tekavoul Cash Transfer Program and Community Nutrition Support Groups in Mauritania: A Study of the Integrated Research Partnership on Wasting and Social Protection (IRAM-SP). Mauritania; 2023.

50. ESE-KT. Final Evaluation of Project MLI100174 “Access to Kita Renewable Energy Services (PASER-K).” Mali; 2018.

51. FAO/IFPRI. Progress towards ending hunger and malnutrition: A cross-country cluster analysis. Rome, Italy; 2020.

52. HC3N. National Security Policy Nutrition in Niger 2017-2025: Multisectoral Action Plan 2021-2025. Niamey, Niger; 2021.

53. IFPRI. Analysis of Policy Effectiveness in Food and Nutritional Security and Sustainable Agriculture: Chad. Chad; 2019.

54. USAID/SPRING. Learn, Do, Share: Cultivating Better Nutrition Worldwide, Snapshots from SPRING, USAI’s Multi-Sectoral Nutrition Project 2015-2016. 2017.

55. IFPRI. Accelerate Progress Towards SDG2: Analysis of the Effectiveness of Policies in Mali. Washington, USA; 2019.

56. IFPRI. Final Report: Mixed Methods Study on the Links Between the Tekavoul Cash Transfer Program and Community Nutrition Support Groups in Mauritania: A Study of the Integrated Research Partnership on Wasting and Social Protection (IRAM-SP). Mauritania; 2024.

57. WFP. Final Report: Support for women producers of fortified local foods for children aged 6 to 23 months in Chad (AFORT). Chad; 2022.

58. Leight J, Pedehombga A, Ganaba R, Gelli A. Women’s empowerment, maternal depression, and stress: Evidence from rural Burkina Faso. SSM - Mental Health. 2022 Dec 1;2.

59. USAID/SPRING. Informing Video Topics and Content on Maternal, Infant, and Young Child Nutrition and Handwashing: Situation Analysis and Formative Research in Maradi, Niger. Arlington; 2016.

60. IFPRI. Integrated Research on Acute Malnutrition (IRAM): Integration of Community-Based Interventions for the Prevention and Detection of Acute Malnutrition in Niger. Niger; 2023.

61. Marshak A, Young H, Radday A, Naumova EN. Sustained nutrition impact of a multisectoral intervention program two years after completion. Matern Child Nutr. 2021 Apr 1;17(2).

62. Kung’u JK, Ndiaye B, Ndedda C, Mamo G, Ndiaye MB, Pendame R, et al. Design and implementation of a health systems strengthening approach to improve health and nutrition of pregnant women and newborns in Ethiopia, Kenya, Niger, and Senegal. Matern Child Nutr. 2018 Feb 1;14.

63. Ngure F, Gelli A, Becquey E, Ganaba R, Headey D, Huybregts L, et al. Exposure to livestock feces and water quality, sanitation, and hygiene (wash) conditions among caregivers and young children: Formative research in rural Burkina Faso. American Journal of Tropical Medicine and Hygiene. 2019;100(4):998–1004.

64. Gelli A, Becquey E, Ganaba R, Headey D, Hidrobo M, Huybregts L, et al. Improving diets and nutrition through an integrated poultry value chain and nutrition intervention (SELEVER) in Burkina Faso: Study protocol for a randomized trial. Trials. 2017 Sep 6;18(1).

65. Le Port A, Zongrone A, Savy M, Fortin S, Kameli Y, Sessou E, et al. Program Impact Pathway Analysis Reveals Implementation Challenges that Limited the Incentive Value of Conditional Cash Transfers Aimed at Improving Maternal and Child Health Care Use in Mali. Curr Dev Nutr. 2019 Sep 19;3(9).

66. Marshak A, Young H, Radday A, Naumova EN. Sensitivity of nutrition indicators to measure the impact of a multi-sectoral intervention: Cross-sectional, household, and individual level analysis. Int J Environ Res Public Health. 2020 May 1;17(9).

67. A4D. The Evidence of the SAFIRE Program 2022-2023. Mauritania; 2023.

68. IPC. https://www.ipcinfo.org/. 2024. Integrated Food Security Phase Classification (IPC).

69. Warner J, Marivoet W, Covic N, Umugwaneza M. Strategies for better integrating nutrient supplementation and dietary diversity approaches for stunting reduction and improved nutrition outcomes: A Rwandan case study. Development Policy Review. 2023 Jul 1;41(4).

70. Oxfam. Climate Finance in West Africa: Assessing the state of climate finance in one of the world's regions worst hit by the climate crisis [Internet]. 2022 [cited 2024 May 1]. Available from: https://oxfamilibrary.openrepository.com/bitstream/handle/10546/621420/bp-west-africa-climate-finance-270922-en.pdf;jsessionid=8EBAF558F43BBCDBA91DF6F14115285C?sequence=3

71. Nisbett N, Harris J, Backholer K, Baker P, Jernigan VBB, Friel S. Holding no-one back: The Nutrition Equity Framework in theory and practice. Glob Food Sec [Internet]. 2022;32:100605. Available from: https://doi.org/10.1016/j.gfs.2021.100605

72. Leight J, Awonon J, Pedehombga A, Ganaba R, Gelli A. How light is too light touch: The effect of a short training-based intervention on household poultry production in Burkina Faso. J Dev Econ. 2022 Mar 1;155.

73. ESE-KT. Mid-Term Evaluation of the Project MLI100174 "Access to Energy Services Kita Renewables (PASER-K)." 2017.

74. Plan International. Final Narrative Report: Access to Services Project of Renewable Energy from Kita (PASER-K). Mali; 2018.

75. Catholic Relief. Final Report: Program to Strengthen Resilience to Food and Nutritional Insecurity in the Northern Regions of Mali. Mali; 2020.

76. Huybregts L, Becquey E, Zongrone A, Le Port A, Khassanova R, Coulibaly L, et al. The impact of integrated prevention and treatment on child malnutrition and health: the PROMIS project, a randomized control trial in Burkina Faso and Mali. BMC Public Health. 2017 Mar 9;17(1).

77. ACF-ES. Budget Changes: Project to Reduce the Risks of Malnutrition in the Wilayas of Guidimakha and Hodh El Chargui. Mauritania; 2015.

78. NRF. Soutien technique au suivi et à l'évaluation des programmes de nutrition (RIMFIL, RIMDIR) en Mauritanie: Programmes RIMFIL /RIMDIR gérés par la délégation de l'Union européenne auprès de la République islamique de Mauritanie Première - Objectif 2 . Mauritania; 2022.

79. NRF. Soutien technique au suivi et à l'évaluation des programmes de nutrition (RIMFIL, RIMDIR) en Mauritanie: Analyse des déterminants de la malnutrition en Mauritanie et méthodologie pour orienter les programmes futurs – Objectif 3– V1. Mauritania; 2022.

80. HC3N. Initiative "3N" Pour la Securite Alimentaire et Nutritionnelle et le Developpement Agricoledurables "Les Nigeriens Nourrissent les Nigeriens": Strategic framework and estimated cost of the initiative program for the period 2012-2015. Niamey, Niger; 2012.

81. DNPGCA. Prevention and Development Strategy: 2021-2025 Food Crisis Management. Niamey, Niger; 2021.

82. INS. SMART Report 2022: Retrospective Nutritional and Mortality Survey in Niger. Niamey, Niger; 2022.

83. ACF. Budget Change: Strengthening the fight against Severe Acute Malnutrition in Senegal. Senegal; 2016.

84. USAID/SPRING. SPRING Nutrition Technical Brief: A Rapid Initial Assessment of the Distribution and Consumption of Iron-Folic Acid Tablets Through Antenatal Care in Senegal. Arlington; 2014.

Annexes

Annex 1: Study context and indicators

The study country presents several inherent challenges:

- **Climate:** Climate extremes (exacerbated by climate change, which makes extremes harder to predict and dry/wet seasons extending for longer periods of time) which result in harvest failure and increased food insecurity, water scarcity and floodings. This is contributing to a diminishing and changing natural resource base (e.g. diminishing water table, desertification, etc).
- **Population growth**: High fertility rates (one of the highest in the world), leading to exponential population growth, competition for limited resources, increasing rates of child marriage, and outward migration.
- **Conflict**: Ongoing political unrest (exacerbated by climate extremes and population growth). There is an over reliance on short-term responses (i.e. constant crises mode).
- **Livelihoods:** Lack of diversified livelihoods, particularly in arid areas, where transhumance may make it hard to engage communities' long term (e.g. keep children enrolled in SAM treatments during lean season) and tensions over land.
- **Social norms**: Highly gendered patriarchal societies with limited women empowerment (e.g. limited decision-making powder), polygamy, and early childhood marriages (leading to more children being born to underage/malnourished adolescent girls (perpetuating poverty/malnutrition cycle).
- **Poor governance** (even in Senegal which is the "exemplar" country): High turnover in local institutions (limiting continuation of knowledge / dissemination of knowledge), negatively impacts sustainability and implementation quality.
- **Lack of economic resources for government departments**: This makes it hard to integrate initiatives into local structures (e.g. basic things like SAM screening/treatment are poor due to lack of healthcare personnel to train) and retain and motivate staff. There is a reliance on external funding, which also has implications for sustainability. There is a lack of transparency in the government expenditure (e.g., inability to track where donated funds are used (42)
- **Capacity:** Limited technical capacity at all levels, including government staff, for basic practice and for monitoring and evaluation. The high staff turnover combined with low capacity and limited resources make it difficult to develop strong multisectoral collaborations required for strong governance of complex multisectoral nutrition initiatives, and appropriate monitoring and evaluation.

Table A1.1: Nutritional indicators relative to the global nutrition targets and national progress towards

Indicators (% in 2019)	Burkina Faso	Chad	Mali	Mauritania (2018)	Niger	Senegal
Stunting	23.8	37.8	26.4	22.8	47.1	17.9
Wasting	8.1	13.9	9.3	11.5	9.8	8.1
Anaemia in women of reproductive age	52.5	45.4	58.6 (2017)	43.3	49.5	52.7
Exclusive breastfeeding (EBF)	57.9	9.0	40.5	40.3	21.6	40.8
Minimum dietary diversity in young children	35.6	23.4	22.2	28.3 (2015)	17.0	19.3
Progress towards global nutrition targets NP= no progress; SP= some progress; OC= on course	NP: anaemia SP: stunting, wasting, OC: EBF	SP: stunting, wasting, anaemia, EBF	NP: anaemia, wasting SP: stunting OC: EBF	NP: wasting SP: stunting, anaemia OC: EBF	NP: anaemia, stunting SP: wasting, EBF	NP: wasting SP: stunting, anaemia, EBF

Source: Country Nutrition profiles (https://globalnutritionreport.org/resources/nutrition-profiles/)

Table A1.2. Other health indicators

Indicators	Burkina	Chad	Mali	Mauritania	Niger	Senegal
Maternal mortality rate Position	33	2	20	16	19	35
Maternal mortality rate (death/ 1000live births) 2022	264	1,063	440	465	441	261
Infant mortality rate Position	20	7	11	18	6	47
Infant mortality rate (death/ 1000live births)2022	48.2	64.0	59.0	50.0	65.5	31.8
Under-5 mortality rate (death/ 1000live births)2021	122	151	121	53	144	51
Low birthweight (%)	13	-	-	-	-	18

Source: Unicef, The State of the world 2023

Annex 2: Literature review methodology

Table A2.1: Identification and inclusion of literature.

Criteria	Inclusion	Comments
Population	Women of reproductive age, pregnant and lactating women, children <5 years, individual (adult and youth), household	The focus was to identify evidence on women and children during the first 1000 days, but due to lack of evidence, the target beneficiaries were expanded to individuals of all genders/ages and the household level.
Setting	West African Sahel region (including Burkina Faso, Chad, Mali, Mauritania, Niger, and Senegal)	
Evidence type	Peer reviewed scientific Grey literature (published and unpublished)	The study aimed to a design gap analysis, so it included design documents such as situation analysis, formative research, midway evaluations, process evaluations, budget adjustments and lessons learnt/capitalisation evaluations
Data sources	EU CriS database EU and other personal contacts EU websites (e.g. AGIR, EUTF) 3ie Food System and Nutrition Evidence Gap Map Regional experts Forward / backward citation search Hand search reference lists KII respondents Websites of funders/implementers (e.g. USAID, GRET)	Most documents were identified through EU contacts, 3ie Food Systems and Nutrition Evidence Gap Map, backward and forward citation searching, and regional experts.
Intervention type (exposure)	Multisectoral interventions that are nutrition-sensitive, or both nutrition-sensitive and nutrition-specific.	Due to a lack of multisectoral interventions with explicit nutrition indicators, some innovative interventions were included in the design gap analysis to demonstrate missed nutrition opportunities / how potentially nutrition-sensitive interventions could be made more explicitly nutrition oriented/monitored.
Outcomes	Anthropometric, micronutrient status, dietary quality/adequacy, and food security indicators	
Timeframe	2014-2019 EU funding cycle	Due to limited availability of documents (especially for underrepresented countries), prior/posterior relevant literature were also included.
Languages	English and French	

Table A2.2: Literature review process

Step 1	Step 2	Step 3	Step 4	Step 5
Identification of existing systematic reviews, where available, for LMICs and Africa.	Manually identified and sourced **country-specific design documents and impact evaluations** for the 6 selected focus countries, drawing on both published and unpublished sources.	**Reviewed literature and conducted design gap analysis** in line with objective and research questions.	Shared preliminary findings with **external experts** for vetting.	**Synthesised findings** in narrative, tabular and graphical forms.

Table A2.3. Data extraction and analysis per research question.

Research question	Data extracted	Conceptual framework
Q1: To what extent do the designs of nutrition initiatives implemented in the region address the key drivers of malnutrition along the causal pathway, and what are the key design gaps identified?	Drivers of malnutrition targeted	Study A Drivers of malnutrition in the Sahel
Q2: What evidence exists on study designs that reduce malnutrition rates in this specific region?	Rigorous pretest-posttest impact evaluations with quantitative scientific evidence on the following nutrition outcome indicators: anthropometrics, micronutrient status, dietary quality/adequacy, food security.	Study A Drivers of malnutrition in the Sahel Figure 3: Project design gap framework (Author's own adapted from Dixon & Bamberger 2021/FAO 2015)
Q3: What are the main study design strengths and weaknesses identified in the interventions assessed?	Design elements: • Situation analysis/targeting • Formative research • Theory of change / causal pathway • Stakeholder analysis / implementation • Monitoring and evaluation (impact)	Figure 2: Process evaluation / intervention impact framework (Dixon & Bamberger 2021) Figure 3: Project design gap framework (Author's own adapted from Dixon & Bamberger 2021/FAO 2015)

Research question	Data extracted	Conceptual framework
	• Funding • Sustainability / improve natural resource base • Collaboration / coordinate with other sectors	
Q4: What lessons can be learnt for improved designs of nutrition interventions in such low-resource, fragile contexts where progress on malnutrition indicators are stagnant or declining?	Summary narrative synthesis derived from the above	

Annex 3: Key Informant Interview pack, including Information sheet, consent form and interview guide

PARTICIPANT INFORMATION SHEET

Malnutrition in the Sahel - Study B (design)

Dear participant,

My name is **Aurélie Bechoff/Paula Dominguez-Salas/Lydia O´Meara**, and I am a researcher working with the Natural Resources Institute (NRI) at the University of Greenwich. Together with my colleagues, we are conducting a study for the European Commission (EC) to look at the designs of nutrition programs conducted in Senegal/Chad/Sahel (West Africa) in recent years, to understand which approaches may be more promising in terms of nutritional outcomes.

Invitation

We invite you to take part in this research study. We will ask you questions about the design of nutrition interventions that you have been involved in or are familiar with, in the past. This interview will take between 45-60 minutes to complete. The questions seek to understand as much as possible about the nature of the designs of the nutrition interventions that have been implemented in the Sahel region (West Africa) in order to improve future interventions.

If anything remains unclear or you would like more information, please do not hesitate to contact me or my supervisors.

What will happen if you take part?

If you accept to take part, a date and time for interview with you on Teams (internet platform) or telephone if your access to Teams is limited will be organised. The researchers will adapt to your busy schedule and time zone. The questions will be a mixture of your knowledge on interventions and your perceptions and thoughts. The results from your expert advice will help improve future nutrition interventions in the region.

We would ideally like to record the conversation for accurate transcription, but we also understand if you do not want to be recorded. Either way, any information you provide will be treated as confidential. You can ask the researcher questions at any time. While we hope you will participate, you are under no obligation to do so. You are also free to withdraw from the interview at any time, and do not need to give a reason why, and you can refuse to answer any question you do not feel comfortable with. If you do participate, we will send you our final report at the end of the study.

What about confidentiality?

The data you provide will only be accessed by the researchers directly involved in the study and you will not be identified in the results, at any stage. Only the ideas collected combined and your general background and role in nutrition interventions (established as a broad category of disciplines and roles) will be included in the report, in a way in which your identity cannot be established. Data that can be used to identify you or your organization will not be made public. Once the study has been completed (and any archiving responsibilities undertaken), the data will be deleted from the researchers' computers and University servers.

Who to reach in case of queries or concerns?

In case of any queries or concerns feel free to reach Paula Dominguez-Salas through their university email address **P.DominguezSalas@greenwich.ac.uk**

CONSENT FORM

UNIVERSITY *of* GREENWICH

Faculty of Engineering & Science

PARTICIPANT CONSENT FORM

Title of Project: **Malnutrition in the Sahel - Study B (design)**

Name of Researchers: **Aurelie Bechoff, Paula Dominguez-Salas, Lydia O´Meara**

To be completed by the participant.

- I have read the information about this study
- I have had an opportunity to ask questions and discuss this study
- I have received satisfactory answers to all my questions
- I have received enough information about this study
- I understand that I am free to withdraw from this study:
  - At any time
  - Without giving a reason for withdrawing
- I understand that my research data may be used for a further project in anonymous form, but I am able to opt out of this if I so wish, by ticking here. ☐

I agree to take part in this study ☐

I agree to the interview being recorded ☐

Signed (participant)	Date
Participant name in block letters	
Signature of researcher	Date
This project is supervised by: Paula Dominguez-Salas (P.DominguezSalas@gre.ac.uk) Ravinder Kumar (R.Kumar@gre.ac.uk)- +44 (0)1634 88 3054	
Researcher's contact details: Paula Dominguez-Salas (P.DominguezSalas@gre.ac.uk)	

KEY INFORMANT INTERVIEW (KII) GUIDE

KII GUIDE: Indicative questions for interviews (to be adapted accordingly)

- Biodata of respondent:
  - Job title,
  - Background/ discipline,
  - Organisation,
  - Project and role in the project,
  - Gender
- Date of interview:
- Location of interview:

The following is a preliminary list of suitable open-ended questions (and probes as relevant) for the KIIs. This may be adjusted as the narrative review progress and will be piloted prior to finalising the set of questions. For each KII the specific list of questions will be adapted to the specific role and background of the stakeholders, and the total number of questions adjusted to take around 45 mins per interview. Some of the questions will be eliminated, particularly in instances where the project documentation has already provided the relevant information; otherwise, information gaps or unclear aspects will be explored further. Also, the questions will be organised for each interview in order of importance, so that the essential questions are asked first, and other secondary questions will only be asked if time allows and they have not been covered to a certain extent in previous questions.

- What is your experience in the design of nutrition interventions for women and young children in Senegal/Chad/the West African Sahel (institution(s), discipline)?
- For how long have you been working in Senegal/Chad/the West African Sahel?

For key informants directly involved in specific interventions

For the nutrition program/project/intervention (name specific example or one where you have been involved)

- What were the pre-defined (nutritional) outcomes?
  - How were the outcomes measured?
    - Are these outcomes based on the impact on beneficiary, on other impacts or on the actual process?
  - Were you able to detect any impact on the set outcomes (positive, negative, or neutral)?
    - Would you be able to link this impact to any specific aspect of the design?
  - Have you observed any positive effect of your program (nutrition, environment, gender, …) beyond what is documented? If yes, what and why?
  - Have you observed any negative effect of your program (nutrition, environment, gender, …) beyond what is documented? If yes, what and why?

- What do you understand is the definition of/-key elements of a multisectorial nutrition intervention? Probe if any key elements that they think are essential for a multisectorial nutritional intervention

  - How multisectorial do you think is the approach of this intervention?
  - What sectors or stakeholders did the intervention involve?
  - How were results across different sectoral components monitored/reported?
  - What were, in your opinion, other sectors which might have improved the impact of the intervention?

- If the intervention took a multisectorial approach, what were the arrangements for this? (e.g. a multisectoral intervention could be a project/program with several components converging on one area and targeting the same beneficiaries while maintaining a sector specific implementation approach. In this case there is no sharing of resources or staff between the sectors but there will be coordination at implementation level (community level).
  - How were results monitored/reported across the different sectoral components?
  - How were the different sectors coordinated?

- Was the project cycle used in any way to re-inform design, i.e., was there a degree of flexibility in the design?
  - What changes were introduced? Why? And when/at what stage of the intervention?

- Can you please describe what were in your view the general strengths and weaknesses of this intervention design?
  - Were there any aspects in the design that you think were particularly conducive to achieving positive nutritional impacts? Why?
  - Were there any challenges or barriers in the design that you think hindered achieving the intervention aims? Why?
  - In your experience, how could the design of the program have been improved? Why?
  - Was there any further implementation issue that may have affected the success of the design?

- Was there any effect/influence of government support or policies to the achievement of the intervention aims? If yes, please describe.
  - How would you describe other aspects that might have affected the success of interventions (e.g. imports, transportation, approval processes, etc.)?

- From your professional experience, if you were to start this intervention again, which are other key aspects that you would consider in your design to address the identified design gaps? Probe along the design components - situation analysis, problem identification, targeting of the most vulnerable, formative analysis, theory of change
- What from your experience would you be sure to include?
- What from your experience would you avoid?
- Any additional advice on how to make those interventions more effective?
- Would you include particular stakeholders whose views/knowledge might have strengthened this study?
- What sectors (e.g. nutrition, health, WASH, agriculture-give details) would you make sure to include/tackle?

- In your opinion, how well did the intervention reach the poorest and most nutritionally vulnerable?

- How was the intervention funded? Was funding sought before or after the intervention design?

- From your experience, if you had to start another nutrition intervention today, is there anything which could have been done differently to improve the success of the intervention?

- Are there any other lessons learned from the intervention?

- Are there any specific solutions/recommendations you think could help to overcome any of the issues identified? This could be at different target levels: funders, government, implementers, designers, etc.

Additional questions?

- Do you know about any other intervention, designed to reduce malnutrition, that has achieved important scale, impact and/or sustainability, that might be relevant to consider? If so, can you provide details?

- Do you have any other comment(s) or question to the team?

For key informant with general expertise in nutrition interventions in the region

According to your experience in nutrition intervention

- What do you understand is the definition of/-key elements of a multisectorial nutrition intervention? Probe if any key elements that they think are essential for a multisectorial nutritional intervention
    - How multisectorial tend to be the approaches used in the nutrition interventions in Senegal/Chad/West African Sahel that you know?
    - What tend to be the arrangements for this multisectoriality to be successful?
- How good is the coordination across sectors implemented separately?
    - How are results across different sectoral components monitored/reported?
    - What sectors are most commonly not involved?
    - Do you think that increased investments in any specific sector could make a change in this setting?

- What do you think of the way outcomes are designed, monitored and evaluated in interventions in Senegal/Chad/West African Sahel?
    - Are these outcomes generally based on the impact on beneficiary, on other impacts or on the actual process, or all the above?
    - Do you have any recommendation on how to set better outcomes?

- What is the degree of flexibility in the design of the interventions in Senegal/Chad/West African Sahel that you know?
    - Is project cycle used in any way to re-inform design?

- Can you please describe what were in your view the general strengths and weaknesses of program design in interventions in Senegal/Chad/West African Sahel?
    - Are there any aspects in the design that you think are particularly conducive to achieving positive nutritional impacts? Why?
    - Are there any challenges or barriers in the design that you think hinder achieving intervention aims? Why?
    - In your experience, how could the design of the programs be improved? Why?
    - Is there any further implementation issue that may have affected the success of the design?

- What influence has government support or policies to the success of interventions in Senegal/Chad/West African Sahel?
    - How would you describe other aspects that might affect the success of programs (e.g. imports, transportation, approval processes, etc.)?

- From your experience on different interventions in Senegal/Chad/West African Sahel, which are key aspects that you would consider in new designs to address existing gaps and challenges? probe along the design components - situation analysis, problem identification, targeting of the most vulnerable, formative analysis, theory of change

- What from your experience would you be sure to include?
- What from your experience would you avoid?
- Any additional advice on how to make interventions more effective?
- Would you include any particular stakeholders whose views/knowledge would strengthen the ability to success?
- Would you include any particular sector that might not regularly be included?

- In your opinion, what needs to be done to reach the poorest and most nutritionally vulnerable in this setting?

- Have you identified any issues in the design related to funding schemes?

- Have you identified any issues in the design related to accountability of the process?

- Have you identified any issues in the design related to coordination of the intervention internally or with other interventions?

- Have you identified any issues in the design related to internal (project) and external (country/region/ etc) governance, that may hinder or facilitate success?

- Are there any specific solutions/recommendations you think could help to overcome any of the issues identified? This could be at different target levels: funders, government, implementers, designers, etc.

- How do you allocate budget/-funding for nutrition interventions?
  - Is there a guide that your department/organization uses to cost each component of the design process?

    Prob – is the budget based on the actual anticipated required for that component of the design or if it is influenced by any other factors (eg number of days available to fund consultant/-remaining etc).

Additional questions?

- Do you know about any specific interventions, designed to reduce malnutrition, that have achieved important scale, impact and/or sustainability, that might be relevant to consider? If so, can you provide details?
  - If not, what do you think would be needed in the designs to ensure scale, impact and/or sustainability

  a. Specific information on Mauritania and Mali

7. Do you have any other comment(s) or question to the team?

Annex 4: Summary of the KIIs conducted.

Organisation	Chad	Senegal	General
EU-Delegation	3	2	
ECHO		1	
UE- Joint Research Centre			1
USAID		2	2
AECID		1	
CLM/CNDN		3	
UNICEF	2		
FAO	1		
WFP			1
IFAD	1	1	
IFPRI			3
GAIN			1
Concern	2		
Oxfam			1
ACF		1	
Total	**9**	**11**	**9**

Annex 5: Summary of the literature review

Table A5.1: Total number of studies and documents reviewed, by country.

Country	Studies	Documents*
Burkina Faso	6	10
Chad	5	7
Mali	8	12
Mauritania	4	9
Niger	8	13
Senegal	9	12
Sahel	1	1
TOTAL	**41**	**64**

**Some studies have multiple documents.*

Table A5.2: Funding details of studies, by country (*n*=41).

Country	EU-funded	Non-EU funded
Burkina Faso	1	5
Chad	4	1
Mali	4	4
Mauritania	3	1
Niger	4	4
Senegal	3	6
Sahel	0	1
TOTAL	**19 (46%)**	**22 (54%)**

Table A5.3: Document details, by country (*n*=64). IE=impact evaluation.

	LITERATURE TYPE		DOCUMENT TYPE				LANGUAGE		PUBLICLY AVAILABLE
Country	**Grey**	**Peer-reviewed/ scientific**	**Technical analysis/ report**	**IE-rigorous**	**IE-other**	**Design**	**English**	**French**	**No**
Burkina Faso	2	8	2	6	0	2	10	0	0
Chad	5	2	4	2	0	1	4	3	2
Mali	8	4	7	3	1	1	5	7	6
Mauritania	9	0	3	0	4	2	0	9	9
Niger	11	2	8	2	2	1	6	7	7
Senegal	7	5	6	3	1	2	8	4	3
Sahel	1	0	1	0	0	0	1	0	0
TOTAL	**43 (67%)**	**21 (33%)**	**31 (48%)**	**16 (25%)**	**8 (13%)**	**9 (14%)**	**34 (53%)**	**30 (47%)**	**27 (42%)**

Table A5.4: Number of studies (*n*=41) targeting drivers of malnutrition in the Sahel, by research analysis.

DRIVERS		RESEARCH ANALYSIS				TOTAL	
Category	**Name**	**IE - rigorous (*n*=14)**		**Non-IE (*n*=27)**		**(*n*=41)**	
		Number	**Percentage**	**Number**	**Percentage**	**Number**	**Percentage**
Systemic	**Seasonality**	6	14.6%	13	31.7%	19	46.3%
	Climate	2	4.9%	9	22.0%	11	26.8%
	Governance	1	2.4%	14	34.1%	15	36.6%
	Gender	10	24.4%	19	46.3%	29	70.7%
	Food Systems	6	14.6%	18	43.9%	24	58.5%
	Health Systems	0	0.0%	5	12.2%	5	12.2%
	Livelihoods	6	14.6%	20	48.8%	26	63.4%
Underlying	**Food Insecurity**	9	22.0%	21	51.2%	30	73.2%
	Inadequate Social Environment	2	4.9%	13	31.7%	15	36.6%
	Inadequate Care Environment	9	22.0%	17	41.5%	26	63.4%
	Health Services	7	17.1%	12	29.3%	19	46.3%
	Unhealthy Environment	5	12.2%	20	48.8%	25	61.0%
Immediate	**Dietary Intake**	13	31.7%	20	48.8%	33	80.5%
	Disease	9	22.0%	8	19.5%	17	41.5%

Annex 6: Summary of the studies included (n=41 studies, n=64 documents)

#	Country	Project name short	Project name long	Duration	Start	Finish	Funder type	Main funder	Author and year	Publication type	Publication language	Publication publicly available	Literature type	UI / Reference
B 1	Burkina Faso	CHANGE	Creating Homestead Agriculture for Nutrition and Gender Equity Project (CHANGE)	3 years	2013	2016	Non-EU	Global Affairs Canada	Nordhagen & Klemm 2018	Peer-reviewed	English	Yes	Impact Evaluation - rigorous	BFA-P02 (38)
B 2	Burkina Faso (technical assistance only)	SPRING	Strengthening Partnerships, Results, and Innovations in Nutrition Globally (SPRING)	6 years	2011	2017	Non-EU	USAID	USAID/SPRING 2017	Grey	English	Yes	Annual technical report - narrative	SNG06a (54)
B 3	Burkina Faso	FIRST (SANAD)	Food and Nutrition Security Impact, Resilience, Sustainability and Transformation (FIRST) programme	6 years	2014	2020	EU	EU	FAO/IFPRI 2020	Grey	English	Yes	Technical analysis / report	C02 (51)
B 4 a	Burkina Faso	SELEVER	Poultry value chain intervention promoting diversified diets	5 years	Mar 2017	Mar 2022	Non-EU	Gates Foundation	Becquey et al 2022	Peer-reviewed	English	Yes	Impact Evaluation - rigorous (nutrition)	BFA-P01C (26)
B 4 b	"	"	"	"	"	"	"	"	Leight et al 2022	Peer-reviewed	English	Yes	Impact Evaluation - rigorous (production)	BFA-P01B (72)
B 4c	"	"	"	"	"	"	"	"	Gelli et al 2017	Peer-reviewed	English	Yes	Protocol	BFA-P01A (64)
B 4 d	"	"	"	"	"	"	"	"	Ngure et al 2019	Peer-reviewed	English	Yes	Formative research	BFA-P01D (63)
B 4 e	"	"	"	"	"	"	"	"	Leight et al 2022	Peer-reviewed	English	Yes	Impact Evaluation - rigorous (gender)	BFA-P01 (58)
B 5	Burkina Faso	PROMIS-Burkina Faso	Integrating a preventive	2 years	Oct 2014	Dec 2016	Non-EU	Global Affairs Canada	Becquey et al 2019	Peer-reviewed	English	Yes	Impact Evaluation - rigorous	BFA-P03 (27)

#	Country	Project name short	Project name long	Duration	Start	Finish	Funder type	Main funder	Author and year	Publication type	Publication language	Publication publicly available	Literature type	UI / Reference
			nutrition package into facility-based screening for acute malnutrition											
B 6	Burkina Faso	Ag-Nutr	Integrated Agriculture and Nutrition and Health Behavior Change Communication Program	2 years	2010	Jun 2012	Non-EU	USAID	Olney et al 2015	Peer-reviewed	English	Yes	Impact Evaluation - rigorous	BFA-P04 (41)
C 1	Chad	FIRST (SANAD)	Food and Nutrition Security Impact, Resilience, Sustainability and Transformation (FIRST) programme	6 years	2014	2020	EU	EU	FAO/IFPRI 2020	Grey	English	Yes	Technical analysis / report (Chad included in study but excluded from analysis due to lack of data)	C02 (51)
C 2 a	Chad	CRAM	Community Resilience to Acute Malnutrition (CRAM)	3 years	Dec 2012	Nov 2015	Non-EU	IrishAID	Marshak et al 2016	Grey	English	Yes	Impact Evaluation - rigorous (endline)	C09 (17)
C 2 b	Chad	"	"	"	"	"	"	"	Marshak et al 2020	Peer-reviewed	English	Yes	Impact Evaluation - rigorous (2 years after)	C09b (61)
C 2c	Chad	"	"	"	"	"	"	"	Marshak et al 2020	Peer-reviewed	English	Yes	Design - indicator sensitivity	C09c (66)
C 3	Chad	AFORT	Support for women producers of fortified local foods for children aged 6 to 23 months in Chad (AFORT)	5 years	Dec 2016	May 2022	EU	EU	WFP 2022	Grey	French	No	Final technical report - narrative	C04 (57)
C 4	Chad	PRO-FORT	Local production of fortified complemen	5 years	Jan 2016	Jun 2021	EU	EU	WFP 2021	Grey	French	No	Final technical report - narrative	C05 (46)

#	Country	Project name short	Project name long	Duration	Start	Finish	Funder type	Main funder	Author and year	Publication type	Publication language	Publication publicly available	Literature type	UI / Reference
			tary foods (PRO-FORT)											
C5	Chad	PEAR (FIRST-SANAD)	Accelerate progress towards SDG2: Analysis of policy effectiveness	Policy analysis (6 years)	2014	2020	EU	EU	IFPRI 2019	Grey	French	Yes	Technical report - policy effectiveness analysis	C03 (53)
MLI1	Mali	SPRING	Strengthening Partnerships, Results, and Innovations in Nutrition Globally (SPRING)	6 years	2011	2017	Non-EU	USAID	USAID/SPRING 2017	Grey	English	Yes	Annual technical report - narrative	SNG06a (54)
MLI2a	Mali	PASER-K	Kita Renewable Energy Services (PASER-K)	3 years	Mar 2015	Aug 2018	EU	EU	ESE-KT SARL 2018	Grey	French	No	Impact Evaluation – other (endline)	MLI01 (50)
MLI2b	Mali	"	"	"	"	"	"	"	ESE-KT SARL 2017	Grey	French	No	Final technical report (midway)	MLI01b (73)
MLI2c	Mali	"	"	"	"	"	"	"	Plan Intl 2018	Grey	French	No	Final technical report - narrative	MLI01c (74)
MLI3	Mali	Nutr	Strengthening resilience to food and nutritional insecurity in Northern Mali	3.5 years	Dec 2016	Jul 2020	EU	EU	Handicap Intl 2020	Grey	French	No	Final technical report - narrative	MLI02 (34)
MLI4a	Mali	PSAN	Program for Food and Nutritional Security (PSAN)	3.5 years	Dec 2016	Jun 2020	EU	EU	Catholic Relief 2020	Grey	French	No	Final technical report - narrative	MLI03a (75)
MLI4b	Mali	"	"	"	"	"	"	"	Catholic Relief 2020	Grey	French	No	Technical report	MLI03b (30)
MLI5	Mali	PEAR (FIRST-SANAD)	Accelerate progress towards SDG2: Analysis of	Policy analysis (6 years)	2014	2020	EU	EU	IFPRI 2019	Grey	French	Yes	Technical report - policy effectiveness analysis	MLI04 (55)

#	Country	Project name short	Project name long	Duration	Start	Finish	Funder type	Main funder	Author and year	Publication type	Publication language	Publication publicly available	Literature type	UI / Reference
			policy effectiveness											
MLI6	Mali	SNACK	Santé Nutritionnelle à Assise Communautaire dans la région de Kayes (SNACK)	3 years	Nov 2013	Dec 2016	Non-EU	Global Affairs Canada	Adubra et al 2019	Peer-reviewed	English	Yes	Impact Evaluation - rigorous	MLI-P01 (25)
MLI6b	"	"	"	"	"	"	"	"	Le Port et al 2019	Peer-reviewed	English	Yes	Design - Theory of Change analysis (mixed-methods)	MLI-P01b (65)
MLI7	Mali	PROMIS-Mali	Integrated Prevention and Treatment on Child Malnutrition and Health in Mali	2 years	Apr 2015	Jun 2017	Non-EU	Global Affairs Canada	Huybregts et al 2019	Peer-reviewed	English	Yes	Impact Evaluation - rigorous	MLI-P02 (76)
MLI8	Mali	MMS	Home fortification with multiple-micronutrient powders	3 months	unknown	unknown	Non-EU	Red Cross	Somasse et al 2018	Peer-reviewed	English	Yes	Impact Evaluation - rigorous	MLI-P04 (43)
MRN1a	Mauritania	Malnutrition	Reduce the risks of malnutrition in the wilayas of Guidimakh and Hodh El Chargui	6 months	May 2015	Oct 2015	EU	EU	ACF 2016	Grey	French	No	Final technical report - narrative	MRN01a (24)
MRN1b	"	"	"	"	"	"	"	"	ACF 2015	Grey	French	No	Budget changes	MRN01b (77)
MRN2a	Mauritania	IRAM-SP	Integrated Research parnership on wasting and Social Protection (IRAM-SP)	2 years	2020	2022	Non-EU	German Development Cooperation	IFPRI 2023	Grey	French	No	Impact Evaluation - other	MRN03 (36)
MRN	"	"	"	"	"	"	"	"	IFPRI 2024	Grey	French	No	Impact Evaluation - other	MRN06 (56)

#	Country	Project name short	Project name long	Duration	Start	Finish	Funder type	Main funder	Author and year	Publication type	Publication language	Publication publicly available	Literature type	UI / Reference
2b														
MRN3a	Mauritania	SAFIRE	Food Security, Training, Integration, Resilience and Employment Program (SAFIRE)	4 years	Mar 2019	Aug 2023	EU	EU	ACORYS 2022	Grey	French	No	Impact Evaluation - other	MRN04 (33)
MRN3b	"	"	"	"	"	"	"	"	A4D 2023	Grey	French	No	Impact Evaluation - other	MRN05 (67)
MRN4a	Mauritania	RIMFIL/RIMDIR (SANAD)	Technical support for monitoring and evaluation of nutrition programs (RIMFIL, RIMDIR) in Mauritania as part of the Food and Nutritional Security and Sustainable Agriculture (SANAD) program	Design gap analysis (6 years)	(2016)	(2022)	EU	EU	NRF 2022	Grey	French	No	Technical report - design analysis	MRN02a (39)
3MRN4b	"	"	"	"	"	"	"	"	NRF 2022	Grey	French	No	Technical report - design analysis	MRN02b (78)
MRN4c	"	"	"	"	"	"	"	"	NRF 2022	Grey	French	No	Technical report	MRN02c (79)
N1	Niger (technical assistance only)	SPRING	Strengthening Partnerships, Results, and Innovations in Nutrition	6 years	2011	2017	Non-EU	USAID	USAID/SPRING 2017	Grey	English	Yes	Annual technical report - narrative	SNG06a (54)

#	Country	Project name short	Project name long	Duration	Start	Finish	Funder type	Main funder	Author and year	Publication type	Publication language	Publication publicly available	Literature type	UI / Reference
			Globally (SPRING)											
N 2	Niger	FIRST (SANAD)	Food and Nutrition Security Impact, Resilience, Sustainability and Transformation (FIRST) programme	6 years	2014	2020	EU	EU	FAO/IFPRI 2020	Grey	English	Yes	Technical analysis / report	C02 (51)
N 3 a	Niger	VIDEO	Seeing is believing - Community Video Approach for Nutrition and Hygiene Behaviors	1 year	2014	2015	Non-EU	USAID	USAID/SPRING 2016	Grey	English	Yes	Impact Evaluation - other	NER02a (45)
N 3 b	"	"	"	"	"	"	"	"	USAID/SPRING 2016	Grey	English	Yes	Technical report - formative	NER02b (59)
N 4	Niger	IRAM	Integrated Research on Acute Malnutrition (IRAM)	unknown	2021	unknown	Non-EU	BMZ (German Cooperation)	IFPRI 2023	Grey	French	No	Technical report - implementation evaluation	NER03 (48)
N 5	Niger	CRS SANAD	Sectoral reform contract to support the food and nutritional security and sustainable agricultural development sectors (CRS SANAD)	5 years	2016	2021	EU	EU	SOGEROM 2021	Grey	French	No	Impact Evaluation - other	NER04 (42)
N 6	Niger	Cash	Emergency cash transfer program to reduce acute malnutrition	3 months	Jul 2012	Sep 2012	EU	EU	Bliss et al 2018	Peer-reviewed	English	Yes	Impact Evaluation - rigorous	NGR-P01 (28)

#	Country	Project name short	Project name long	Duration	Start	Finish	Funder type	Main funder	Author and year	Publication type	Publication language	Publication publicly available	Literature type	UI / Reference
N 7	Niger	PRENATAL	Prenatal supplementation with multiple micronutrient supplements or medium-quantity lipid-based nutrient supplements	1.5 years	Mar 2015	Nov 2016	Non-EU	MSF/Kavli Foundation	Bliznashka et al 2022	Peer-reviewed	English	Yes	Impact Evaluation - rigorous	NGR-P02 (29)
N 8 a	Niger	3N (SANAD)	3N Initiative (Nigerians Feeding Nigerians)	10+ years	2012	Ongoing (2025)	EU	EU	HC3N 2021	Grey	French	No	Technical report	NER07c (35)
N 8 b	"	"	"	"	"	"	"	"	HC3N 2012	Grey	French	No	Technical report	NER07b (80)
N 8c	"	"	"	"	"	"	"	"	HC3N 2021	Grey	French	No	Technical report	NER07d (52)
N 8 d	"	"	"	"	"	"	"	"	DNPGCA 2021	Grey	French	No	Technical report	NER07a (81)
N 8 e	"	"	"	"	"	"	"	"	INS 2022	Grey	French	No	Technical report	NER07e (82)
S1	Senegal	Dairy value chain	Dairy value chain to distribute a micronutrient-fortified yoghurt to improve hemoglobin and reduce anemia among preschool children in a remote area in Northern Senegal	6 months	Feb 2013	Dec 2013	Non-EU	IFPRI	Le Port et al 2017	Peer-reviewed	English	Yes	Impact Evaluation - rigorous	SNG-P01 (37)
S2	Senegal	PAGR-SANAD	Study to capitalize on positive experiences and good	Review (3 years)	Review (2017)	Review (2020)	EU	EU (URCP)/ PAGR-SANAD	Ezzan & Malick Ba (unknown)	Grey	French	Unknown	Technical report - capitalization analysis/ review	SNG01 (31)

#	Country	Project name short	Project name long	Duration	Start	Finish	Funder type	Main funder	Author and year	Publication type	Publication language	Publication publicly available	Literature type	UI / Reference
			practices in nutrition, prevention and management of malnutrition (PAGR-SANAD)											
S3a	Senegal	SAM	Strengthening the fight against Severe Acute Malnutrition in Senegal	10 months	May 2015	Feb 2016	EU	EU ECHO	ACF 2016a	Grey	French	No	Final technical report - narrative	SNG02a (23)
5S3b	Senegal	"	"	"	"	"	"	"	ACF 2016b	Grey	French	No	Technical report - extension request	SNG02b (83)
S4	Senegal	PROCONU	Community Nutritional Program (PROCONU)	Unknown	Jan 2015	Unknown	EU	EU	ACF 2015	Grey	French	No	Mid way technical report - narrative	SNG03 (22)
S5	Senegal	NEEMA	Neema - Integrated Service Delivery and Healthy Behaviors	5 years	Sept 2016	Aug 2021	Non-EU	USAID	USAID/Intra-Health 2020	Grey	English	Yes	Annual technical report - narrative	SNG05 (44)
S6a	Senegal	SPRING	Strengthening Partnerships, Results, and Innovations in Nutrition Globally (SPRING)	6 years	2011	2017	Non-EU	USAID	USAID/SPRING 2017	Grey	English	Yes	Annual technical report - narrative	SNG06a (54)
S6b	Senegal only	"	"	"	"	"	"	"	USAID/SPRING 2014	Grey	English	Yes	Technical report - narrative	SNG06b (84)
S7a	Senegal	Health systems	Integrating nutrition into health systems at community level	2.5 years	Feb 2013	Oct 2015	Non-EU	Global Affairs Canada	Kung'u et al 2018	Peer-reviewed	English	Yes	Impact Evaluation - rigorous	SNG-P03a (47)
S7b	Senegal	"	"	"	"	"	"	"	Kung'u et al 2018	Peer-reviewed	English	Yes	Design and implementation	SNG-P03b (62)
S8	Senegal	Fortified flour	Women's Empowerment,	unknown	2016	unknown	Non-EU	USAID	O'Brien et al 2022	Peer-reviewed	English	Yes	Impact Evaluation – other (mixed methods)	SNG-P02 (40)

#	Country	Project name short	Project name long	Duration	Start	Finish	Funder type	Main funder	Author and year	Publication type	Publication language	Publication publicly available	Literature type	UI / Reference
			Income, and Nutrition in a Food Processing Value Chain Development Project in Touba, Senegal											
S9	Senegal	CHANGE	Creating Homestead Agriculture for Nutrition and Gender Equity Project (CHANGE)	3 years	2013	2016	Non-EU	Global Affairs Canada	Nordhagen & Klemm 2018	Peer-reviewed	English	Yes	Impact Evaluation - rigorous	BFA-P02 (38)
Sahel 1	Sahel (Senegal, Mali, Niger, Burkina Faso)	SPRING	Strengthening Partnerships, Results, and Innovations in Nutrition Globally (SPRING)	6 years	2011	2017	Non-EU	USAID	USAID/SPRING 2017	Grey	English	Yes	Annual technical report - narrative	SNG06a (54)