



THE EFFECTS OF CAPACITY STRENGTHENING INTERVENTIONS ON FOOD SECURITY AND NUTRITION

*Evidence Synthesis of Development Cooperation
in Sub-Saharan Africa*

2025



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This study provides a synthesis of rigorous impact evaluations on the effectiveness of capacity strengthening interventions in the area of food security and nutrition with a regional focus on sub-Saharan Africa. Overall, the results of the study show that realising the right to food is a complex objective of development cooperation. The meta-analyses confirm the positive effects of capacity strengthening interventions on food security and nutrition. While for supply chain interventions, there is more evidence of positive effects on food availability and access, consumer-side interventions come into play for the other dimensions, especially food agency. Combining different components – for example, introducing capacity strengthening interventions with cash transfers or seed inputs – can offer a more comprehensive approach to improving food security and nutrition across several dimensions. Furthermore, this approach is especially important for providing vulnerable population groups with necessary resources and rights as well as for increasing the resilience of food systems.

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IMPRINT

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EXECUTIVE SUMMARY

Background

Food insecurity and malnutrition remain a global challenge, with poverty being a main cause. Recent events with global repercussions, including the COVID-19 pandemic and Russia's war of aggression in Ukraine, have created shock waves that disrupt global food trade and inflate prices worldwide. Regional conflicts and environmental megatrends exacerbate the fragility of food systems. Extreme weather events such as floods, droughts and heatwaves create a demanding environment for agricultural production and livelihoods alike. In sub-Saharan Africa, droughts and armed conflicts are especially challenging.

Recent international reports have confirmed that the path to achieving Sustainable Development Goal 2 (Zero hunger) is off course. While in some regions, such as Latin America and Asia, hunger and food insecurity are gradually decreasing or staying at the same level, in Africa, levels are on the rise and moderate or severe food insecurity reached 59% in 2024, more than double the global average of 28% (FAO et al., 2025). It is projected that this development will accelerate and by 2030, 60% of the chronically undernourished people worldwide will live in Africa.

International development cooperation organisations and bilateral donors distribute about 20 percent of official development assistance (including humanitarian aid) to food security and nutrition (FAO et al., 2024; OECD, 2023). In this regard, German development cooperation also spends approximately 20 percent of its total funding channelled through the Federal Ministry for Economic Cooperation and Development (Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung – BMZ) on food security, agriculture and rural development (BMZ, 2025). Therefore, a study of the internationally available evidence on effects related to development cooperation interventions was included in the evaluation programme of the German Institute for Development Evaluation (Deutsches Evaluierungsinstitut der Entwicklungszusammenarbeit).

Study focus

The present study synthesises evidence from rigorous international impact evaluations, providing German and international development cooperation actors with key findings from these reliable analyses to inform future decision making. Rigorous impact evaluations are based on experimental or quasi-experimental methods that allow for causal connections to be made between the intervention and the identified changes in outcomes.¹ The study was designed to address stakeholder interests and existing gaps in evidence synthesis. Therefore, the study focuses on the effectiveness of **information, capacity strengthening and behaviour change (ICSBC)** interventions. These interventions play an important role in increasing the agency of individuals and communities. Agency – that is the capability to make independent decisions and take action to shape their own lives in line with their goals and values – has only recently been added by the Food and Agricultural Organization of the United Nations (FAO) as one of (now) six dimensions in the definition of food security and nutrition.

In addition, the increasing impact of environmental crises on food security and nutrition highlights the importance of gaining further insights on how interventions can strengthen the **resilience of food systems**. This study uses the FAO et al.'s (2021) definition of food systems resilience: “the capacity over time of agrifood systems, in the face of any disruption, to sustainably ensure availability of and access to sufficient, safe and nutritious food for all, and sustain the livelihoods of agrifood systems' actors”. This definition highlights stability of access and sustainability, which are analysed in depth in this study.

Further, assessment of both the evidence from and the focus of food security and nutrition interventions indicates the value of a regional study focus on **sub-Saharan Africa**. This region faces huge challenges in terms of malnutrition, which is why many development cooperation activities target it. In addition, studies were available for sub-Saharan African countries that had not been synthesised in earlier reviews.

¹ Other research designs cannot rule out that any positive effect found is due to a general positive development beyond the scope of the intervention.

Based on these considerations, the following research questions were formulated:

- What are the effects of ICSBC interventions on food security and nutrition outcomes in sub-Saharan Africa?
- How do these interventions enhance the resilience of food systems against climate change risks and crises?
- How do the effects vary depending on the context, intervention features, vulnerable population groups or other influencing variables?

Approach

The overarching impact envisaged by any intervention in the field of food security and nutrition is to fulfil the fundamental **human right to adequate food**. This goal is achieved when **six dimensions of food security and nutrition** complement each other (CFS, 2009; FAO, 1996):

1. The **availability** of food
2. The physical, economic and social **access** to food
3. The knowledge and means to consume food that is safe and sufficient to meet physiological needs (**utilisation**)²
4. The ability of individuals and communities to secure nutritious food for current and future consumption (**stability**)
5. The capability to make decisions about food production, consumption and related activities (**agency**)
6. The food systems' ability to sustain food security and nutrition without compromising future needs (**sustainability**)

Information, capacity strengthening and behaviour change

(ICSBC) interventions – the focus of this evidence synthesis – can contribute to these six dimensions. Therefore, these dimensions serve as outcome areas in this study. This study is embedded in the FAO's **Sustainable Food System Framework** (see Figure 1 in the report) and focuses on two of the three pathways identified in the framework through which actors can contribute to food security and nutrition: the food supply chains (for example, food storage and distribution activities) and consumer behaviours and diets (for example, the individual's nutrition decisions). The third pathway, food environment (physical, economic, socio-cultural and policy conditions that shape access, affordability, safety and food preferences), and external drivers like political or demographic circumstances are not covered by this synthesis as the rigorous evidence identified has a strong focus on producers and consumers.

Within the two pathways, this study identified 13 intervention types evaluated in rigorous quantitative studies. These include farmer field schools, agricultural extension services and peer-to-peer support. The intervention types represent the various ways in which knowledge can be conveyed and capacities strengthened. For these 13 intervention types, the reported effects on the six outcome areas of food availability, access, utilisation, stability, agency and sustainability were analysed.

² As **food utilisation** indicators vary strongly, for the analysis, these were further differentiated as **food diversity** indicators (measures of food composition) and **anthropometrics** (physical measurements of the body – for example, regarding a healthy body weight or growth).

Methods

For this evidence synthesis, a rapid evidence assessment (a form of systematic review) was conducted, applying both quantitative and qualitative analysis methods.

One of the quantitative methods used was **meta-analysis of effects**, which combines the effects reported in rigorous quantitative studies and calculates a weighted average effect. The meta-analyses included only those studies that applied statistically rigorous (experimental or quasi-experimental) research designs (n = 53). They were identified using the International Initiative for Impact Evaluation's (3ie's) Living Food Systems and Nutrition Evidence Gap Map (EGM) for the years 2000 to 2024. For ICSBC interventions in the food supply chains pathway (targeting producers), most of the identified studies were available. In the meta-analyses, a statistically significant weighted average effect means that the intervention type can be assumed to be effective for the outcome area across different settings. Additionally, a **moderator analysis** was conducted to examine whether effects vary by contextual factors like the duration of exposure to an intervention, the implementation region or the vulnerability of the implementation country to environmental crises.

The **qualitative analysis** comprised of document analysis (n = 192) of: (i) qualitative information on the programmes included in the quantitative studies; and (ii) qualitative information from other relevant documents (for example, evaluation reports and studies by German and international development cooperation and other scientific literature). The purpose was to add in-depth insights on: (i) the role of multicomponent interventions in the effectiveness of capacity strengthening interventions; (ii) the effectiveness of interventions for vulnerable population groups; and (iii) the effect of interventions on resilience. The meta-analyses and moderator analyses were conducted in partnership with 3ie (Lwamba et al., 2025, 2026).

Findings

Overall, the evidence synthesis confirms the **positive effects of ICSBC interventions on the six food security and nutrition outcome areas**. However, the synthesis does not provide evidence of a single intervention being effective for all outcome areas. Instead, it shows that each intervention type achieves positive effects in distinct outcome areas.

For **food supply chain interventions**, the evidence synthesis shows the following:

- Food supply chain intervention types are associated most often with positive effects on food **availability and access**. This might not be surprising given the strong connection between food supply chains and availability and access. However, the analysis also shows that ICSBC interventions in these pathways do not necessarily contribute to other outcome areas, such as sustainability, agency and utilisation.
- **Farmer field schools** and **agricultural extension services** intervention types are most often found to be effective across the different outcome areas. This justifies the common use of these two intervention types.

For **consumer behaviour interventions**, the evidence synthesis shows the following:

- Consumer behaviour intervention types are most often associated with positive effects on the outcome areas of **food utilisation** – specifically for food diversity – and **agency**. This highlights that consumer-side interventions are more effective than food supply chain interventions for improving food diversity and agency.
- **Community meetings** and **media campaigns** that provide nutrition-related information are the two intervention types which most often show positive effects across the different outcome areas and settings. This highlights the importance of these two very different approaches – one based in the community and the other using media to spread information broadly.

The following table outlines the intervention types that show positive effects on the outcome areas across different settings, as found by the meta-analyses.

Table 1 Evidence for positive effects of ICSBC interventions by outcome area

Outcome area	Intervention type with positive effects
Food availability	Food supply chains: Farmer field schools, agricultural extension services, capacity strengthening in storage and distribution
Food access	Food supply chains: Farmer field schools, agricultural extension services, capacity strengthening in storage and distribution Consumer behaviours: Community meetings
Food utilisation: diversity	Food supply chains: Farmer field schools, agricultural extension services Consumer behaviours: Community meetings, healthy eating media campaigns
Food utilisation: anthropometrics	No conclusion possible
Food agency	Food supply chains: Workshops and short trainings, farmer peer-to-peer learning Consumer behaviours: Peer support and counselling, community meetings
Food stability	No conclusion possible
Food sustainability	Food supply chains: Farmer field schools, agricultural extension services

Source: DEval, own visualisation

When it comes to the anthropometric measurements within food utilisation outcomes, as well as for food stability, only few studies were available for analysis. Therefore, meta-analyses could not be conducted for all intervention types. Those meta-analyses which were possible did not generate conclusive findings on intervention effectiveness across settings for these two dimensions.

For intervention types/outcome combinations not presented in the table, single studies often showed significant effects, but the meta-analyses did not confirm these across diverse settings. This highlights that caution is needed when relying on single studies to design interventions. Meta-analyses provide more reliable findings as they combine results across different settings. Moreover, the findings of the meta-analyses show that different ICSBC intervention types are needed to achieve food security and nutrition effectively across dimensions.

ICSBC interventions are often combined with additional components like seed provision or cash transfers. The quantitative analysis did not find any significant results in terms of different effects of **multicomponent interventions** in comparison with single-component interventions. The qualitative analysis, however, shows that combining at least two different components can create more benefits than single-component interventions. These benefits present in three different ways: (i) sometimes, interventions only show a positive effect when combined with other components; (ii) on other occasions, individual components contribute to different areas of food security and nutrition – this supports a combination approach for a more systemic improvement in food security and nutrition; and (iii) there can be efficiency gains from multicomponent interventions – for example, through joint project administration.

Therefore, combining ICSBC interventions with other interventions increases the range of food security and nutrition issues addressed and makes it more likely that positive effects will be observed. However, there is no evidence on whether multicomponent interventions are more effective due to the specific combination of interventions or whether the effects are merely additive. This is due in part to the impact evaluations not disaggregating estimates by components. More differentiated evidence is needed in this respect.

The qualitative analysis also finds that **vulnerable population groups** can only benefit from ICSBC interventions if the root causes of vulnerabilities – in terms of rights, resources and representation – are addressed. One way to achieve this would be to combine ICSBC interventions with in-kind inputs, cash transfers or infrastructure. Consequently, multicomponent interventions play an important role for ICSBC interventions targeting vulnerable population groups. The extent to which ICSBC interventions are beneficial for these groups remains under-examined in rigorous quantitative studies, especially for people with disabilities, older people and indigenous peoples, and in terms of the lack of disaggregated estimates for all groups in impact evaluations.

When it comes to **food system resilience**, the quantitative analysis provides evidence of ICSBC interventions having positive effects on food sustainability (for farmer field schools and agricultural extension services). However, the meta-analyses do not find positive effects for food stability, partly because fewer studies are available. What the analysis does show, though, is that a country's vulnerability to environmental crises reduces the effectiveness of ICSBC interventions for food security and nutrition outcomes and, therefore, diminishes the positive effects on resilience. The analysis also shows that multicomponent or

cross-sectoral approaches increase an intervention's ability to strengthen food system resilience. Enhancing social capital – for example, through building networks – and the perceived strength to cope with the crisis are other important approaches to increasing food system resilience.

Implications

Overall, the results of the study affirm that realising the right to food is a complex objective of development cooperation. The meta-analyses show the positive effects of ICSBC interventions on food security and nutrition. Moreover, the results across the different dimensions of food security and nutrition highlight that different types of ICSBC interventions complement each other. While for supply chain interventions, there is more evidence of positive effects on food availability and access, consumer-side interventions come into play for the other dimensions, especially food agency. The agency dimension – reflecting the capability of people to take their own decisions regarding the food they consume and produce – is rooted in the principles of the Human Rights-Based Approach.

Combining different components – for example, introducing ICSBC interventions with cash transfers or seed inputs – can offer a more comprehensive approach to improving food security and nutrition across several dimensions. This is especially important for vulnerable population groups. For them, access to resources but also other fundamental rights are prerequisites for ICSBC intervention effectiveness. Additionally, multicomponent and multisectoral approaches stand out as being important for increasing food system resilience. The successful inclusion of vulnerable population groups supports resilience as well. In terms of food stability, a crucial aspect of resilience, the synthesised evidence reveals a lack of rigorous research.

Four implications were derived from these results.

Implication 1: ICSBC interventions do not equally show effects across all dimensions of food security and nutrition. Therefore, when planning interventions, development cooperation actors should determine which dimensions of food security and nutrition they prioritise. They should then choose the most suitable type of intervention or a combination thereof for the targeted outcome area. The results of this study can serve as guidance in this regard.

- For example, to achieve a higher availability of and access to food, actors could plan interventions along the food supply chain, such as agricultural extension services or farmer field schools.
- Especially those intervention types which target consumers, such as community meetings or media campaigns providing nutrition-related information, can improve food diversity; peer support, counselling and community meetings primarily improve agency.

Implication 2: Since food security and nutrition are comprised of six dimensions, multicomponent interventions and multi-sectoral approaches have proven to be effective for promoting systemic change, especially for vulnerable population groups.

- For example, ICSBC interventions could be combined with financial or in-kind resources; on-farm activities could complement off-farm activities.
- To be more effective, ICSBC interventions for vulnerable population groups should be complemented by activities strengthening their rights and resources, for example through cash transfers, the provision of seeds, and counselling on land rights.

Implication 3: To improve food system resilience, the context and design of the ICSBC interventions are key. According to the findings of this study, development cooperation actors should prioritise the following when planning and implementing interventions specifically intended to increase resilience:

- Plan multicomponent interventions or multisectoral approaches. For example, provide the required material and equipment for production like drought-resistant seeds, water and storage facilities.
- Enhance the social capital and agency of individuals and communities. For example, support their capability to decide on food production and consumption. In addition, target the inclusion of marginalised groups to strengthen their social network.

Implication 4: Development cooperation actors who commission or conduct rigorous impact evaluations, as well as researchers in the field should increase their focus on food stability. This means they should strive to generate additional knowledge on the effectiveness of ICSBC interventions regarding strengthening the capacity of actors to ensure food security and nutrition in the event of sudden shocks or cyclical/seasonal events.

CONTENT

Acknowledgements	v
Imprint	iv
Executive summary	vi
Abbreviations and acronyms	xiv
Glossary	xv

1. Background and focus	1
--------------------------------	----------

1.1 Background	2
1.2 Aim and focus of this study	3

2. Approach	5
--------------------	----------

2.1 Right to food and food security	6
2.2 The food system	7

3. Methodology	9
-----------------------	----------

3.1 Study design	10
3.2 Quantitative analysis	11
3.3 Qualitative analysis	15
3.4 Methodological reflections	16

4. Findings	17
--------------------	-----------

4.1 The underlying ToC	19
4.2 Food supply chain interventions	22
4.3 Consumer behaviour interventions	30
4.4 Multicomponent interventions	34
4.5 Vulnerable population groups	37
4.6 Food system resilience to environmental crises	42

5. Discussion and implications	46
---------------------------------------	-----------

5.1 Summary and discussion	47
5.2 Conclusions and implications	50

6. References	52
----------------------	-----------

7. Annex	66
-----------------	-----------

7.1 Intervention types	67
7.2 Moderators	68
7.3 Overview of quantitative studies	69
7.4 Further meta-analyses with insignificant results	71
7.5 Moderator analyses:	
Environmental crises moderators	73
7.6 Food security and nutrition in the 2030 Agenda	74
7.7 Study schedule	75
7.8 Evaluation team and contributors	75

Figures

Figure 1	Sustainable Food System Framework	8
Figure 2	Study design	10
Figure 3	Filtering process for quantitative studies	11
Figure 4	Geographical distribution of the evidence base for sub-Saharan Africa	13
Figure 5	ToC of ICSBC interventions for food security and nutrition	21
Figure 6	Summary of results	48
Figure 7	Refined ToC	49

Tables

Table 1	Evidence for positive effects of ICSBC interventions by outcome area	ix
Table 2	The six outcome areas of food security and nutrition	7
Table 3	Studies researched in the qualitative analysis	15
Table 4	Outcome areas and exemplary indicators	19
Table 5	Intervention types researched in this study	20
Table 6	Farmer field schools: Meta-analyses results	23
Table 7	Agricultural extension services: Meta-analyses results	24
Table 8	Workshops and short trainings: Meta-analyses results	26
Table 9	Farmer peer-to-peer learning: Meta-analyses results	27
Table 10	Storage and distribution: Meta-analyses results	29
Table 11	Peer support and counselling: Meta-analyses results	31
Table 12	Community meeting: Meta-analyses results	32
Table 13	Healthy eating media campaigns: Meta-analyses results	33

Table 14	Meta-analyses results: Effect of ICSBC interventions on food sustainability	44
Table 15	Promising interventions and design elements targeting vulnerable population groups	48
Table 16	Intervention types in the quantitative analysis	67
Table 17	Moderators included in the moderator analyses	68
Table 18	Overview of quantitative studies per intervention type	69
Table 19	Information and guidance by phone: Meta-analyses results	71
Table 20	Healthy eating classes: Meta-analyses results	71
Table 21	Nutrition advisory services: Meta-analyses results	72
Table 22	Door-to-door campaigns: Meta-analyses results	72
Table 23	Meta-analyses results: Effect of ICSBC interventions on food stability	72
Table 24	Influence of environmental vulnerability on effectiveness	73
Table 25	Influence of ongoing crisis on effectiveness	74

Boxes

Box 1	Definition: Food security and nutrition	6
Box 2	How to read the results of the quantitative analyses	18
Box 3	Cash transfers and ICSBC interventions for women	40
Box 4	Food security and nutrition in the 2030 Agenda	74

ABBREVIATIONS AND ACRONYMS

3ie

*International Initiative
for Impact Evaluation*

BMZ

*Federal Ministry for Economic
Co-operation and Development
(Bundesministerium für
wirtschaftliche Zusammenarbeit
und Entwicklung)*

CFS

*Committee on World
Food Security*

DEval

*German Institute
for Development
Evaluation (Deutsches
Evaluierungsinstitut der
Entwicklungszusammenarbeit)*

EGM

Evidence Gap Map

FAO

*Food and Agriculture
Organization of the
United Nations*

GIZ

*Deutsche Gesellschaft
für Internationale
Zusammenarbeit GmbH*

GVI

*Global Data Lab
Vulnerability Index*

HLPE

*High Level Panel of Experts on
Food Security and Nutrition*

ICESCR

*International Covenant
on Economic, Social and
Cultural Rights*

ICSBC

*information, capacity
strengthening and
behaviour change*

KfW

*KfW Development Bank
(Kreditanstalt für Wiederaufbau)*

ND-GAIN

*Notre Dame Global
Adaptation Initiative*

PANTHER

*participation, accountability,
non-discrimination,
transparency, human dignity,
empowerment and rule of law*

SDG

Sustainable Development Goal

ToC

Theory of Change

WRI

World Resources Institute

GLOSSARY

Evidence gap map

Evidence gap maps provide a visual representation of systematic reviews and single scientific studies (often impact evaluations) available in a certain sector or field, structured around a framework of interventions and outcomes. They are visual compilations of (rigorous) evidence on the impact of policies and programmes in a specific sector or thematic area. They are designed to make it easy for decision makers to get an overview of where evidence is already available for use and where evidence needs to be generated because of gaps.

Food security

Food security is regular physical, social and economic access to sufficient, safe and nutritious food for an active and healthy life.

Meta-analysis

In a meta-analysis, the results of different single scientific studies (for example, impact evaluations) are combined in a newly calculated analysis (to give a weighted average effect). Meta-analyses of impact evaluations allow researchers to draw conclusions about the effects of an intervention type across different settings. For example, if there are ten impact evaluations available on one intervention type, the individual results are weighted by their precision and combined to derive a summary effect size. Generally, results of meta-analyses can be interpreted as follows:

- If the meta-analysis shows positive significant results, the intervention type seems to be effective across the different analysed study settings.
- If the meta-analysis shows negative significant results, the intervention type seems to be detrimental across the different analysed study settings.
- If the meta-analysis brings no significant results, it does not mean that the intervention type is not effective; rather, evidence might be lacking, methodological limitations might lead to those results or the effectiveness might be highly dependent on the context.

Moderator analysis

After meta-analyses, moderator analysis can be used to examine whether the effects of an intervention systematically vary based on specific factors – the moderators. Examples of moderators are the design of the studies (such as the methods), the specific population groups (for instance, the gender and age groups) or the settings (such as the geographic region or areas with environmental vulnerability). Moderator analyses help to identify when, where or for whom the intervention is most (or least) effective and which of these factors significantly influence the overall effect size.

- If a moderator is significant, it means that the effect of an intervention type is dependent on this factor (moderator), creating larger or smaller effects.
- If a moderator is not significant, it means that the effect of the intervention type does not depend on this factor.

Rapid evidence assessment

Rapid evidence assessment is a type of evidence synthesis that addresses policy and programming questions when time and resources are limited. In comparison to a systematic review, a rapid evidence assessment is limited in scope and follows less rigid methodological requirements, meaning it can be implemented more quickly.

Resilience

Resilience of the food system has been defined as “the capacity over time of agrifood systems, in the face of any disruption, to sustainably ensure availability of and access to sufficient, safe and nutritious food for all, and sustain the livelihoods of agrifood systems’ actors” (FAO et al., 2021).

Rigorous impact evaluation

Rigorous impact evaluation is an evaluation design that measures the causal effect of an intervention (for example, a microcredit programme) on an outcome of interest (for example, household income). This is done by using experimental or quasi-experimental techniques to create a control or comparison group that is as similar as possible to the group that received the intervention. While the results of these experimental or quasi-experimental research designs can provide reliable information on causality, impact evaluations often lack external validity – that is, transferability of results to a different setting. A meta-analysis of several impact evaluation overcomes this challenge and creates external validity.

Risk of bias

Risk of bias is the potential for systematic errors in primary study results arising from flaws in study design, conduct, analysis, or reporting, which may compromise the validity of the estimated intervention effect.

Vulnerability

Vulnerability is the physical, social, economic and environmental conditions that make individuals, communities or systems more likely to be harmed by external challenges and shocks (for example, conflict, climate change and economic recession).

1.

BACKGROUND AND FOCUS

This chapter introduces the background and reasoning behind this study. It starts by outlining global challenges in tackling food insecurity and malnutrition worldwide. Then, concentrating on international development commitments, it maps out the study's scope, focus and research questions.

1.1 Background

Realising the right to adequate food has been a long-standing commitment of the international community. The most prominent current reflection of this commitment is the 2030 Agenda's Sustainable Development Goal (SDG) 2 (Zero hunger), which covers achieving food security, improving nutrition and promoting sustainable agriculture. Achieving global food security and nutrition remains a challenge, however. The Food and Agricultural Organization of the United Nations (FAO) concludes that "the persistent high levels of hunger, food insecurity and malnutrition [...] have put the world off track to meet the SDG 2" (FAO et al., 2024).

Between 2002 and 2017, the share of the world population facing food insecurity and malnutrition decreased. However, the COVID-19 pandemic and other crises interrupted this progress, and the situation has not reverted since (FAO, 2025a). The FAO estimates that 673.2 million people (around 8.2% of the global population) faced hunger³ in 2024. In the same year, an estimated 2.3 billion people – 335 million more than in 2019 – were moderately or severely food insecure⁴ (FAO et al., 2025). The highest level of hunger and malnutrition persist in low- and middle-income countries and, in geographical terms, in sub-Saharan Africa, where more than 20% of the population are undernourished – more than double the global average of 8% (FAO et al., 2025).

The drivers for hunger, food insecurity and malnutrition are manifold and embedded in geopolitical, economic, social and ecological complexity. While fragility and conflict are major causes (Delgado and Tschunkert, 2022; Shah et al., 2023; World Bank, 2024), economic downturns and crises, shocks to global markets, soaring food prices and persistent social and economic inequality also continue to drive global food insecurity and malnutrition (FAO et al., 2024). In addition, climate change and weather extremes, which affect agricultural production directly, are increasingly highlighted as key drivers (Hendriks et al., 2022; Mbow et al., 2019; Sparling et al., 2024; Swinnen and Barrett, 2025; Tirado and Raj, 2023; UNIDO and FAO, 2024; WHH et al., 2024; World Bank, 2025).

Within international cooperation, the question is not whether this sector should play a role in achieving food security and nutrition, but how. Global strategies underline the need to strengthen resilience and equity in food systems so that they can react to the drivers of food insecurity and malnutrition (UNFSS, 2025; United Nations, 2024; WFP, 2024). At the same time, shocks to the global food system, such as those brought about by the COVID-19 pandemic and the war in Ukraine – a major grain exporting country – add to the compounded protractedness of global food insecurity and malnutrition, particularly for vulnerable population groups.

In response, international donors distribute about one-fifth of their funds to food security and nutrition (FAO et al., 2024; OECD, 2023). In German development cooperation, for example, food security and nutrition play a pivotal role. The Federal Ministry for Economic Cooperation and Development (Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung – BMZ) core area strategy titled

³ The FAO defines hunger as "an uncomfortable or painful physical sensation caused by insufficient consumption of dietary energy. It becomes chronic when the person does not consume a sufficient amount of calories (dietary energy) on a regular basis to lead a normal, active and healthy life." Hunger is a form of severe food insecurity and is also referred to as "undernourishment" (FAO, 2025b).

⁴ This means they did not have regular access to adequate food (moderately insecure) or had run out of food at times or gone an entire day or more without eating (severely food insecure).

“Transformation of agricultural and food systems” (BMZ, 2021) prioritises three fields of action: food security and nutrition; rural development; and sustainable agriculture. Its implementation is guided by the right to adequate food, biodiversity conservation and climate adaptation (BMZ, 2021). The BMZ directs 2 billion euro per year (BMZ, 2025) to global food security and nutrition, agriculture and rural development, representing around one-fifth of its overall budget. Around one-quarter of the funding is channelled through “Transformation of agricultural and food systems”,⁵ which has a geographical focus on sub-Saharan Africa. It aims to foster sustainable agriculture to benefit vulnerable population groups in particular. In line with the 2021 core area strategy, this long-standing initiative has expanded its activities to take a more multisectoral approach, integrating activities to support political framework conditions as well as the rights and interests of producers and consumers within their food systems (BMZ, 2023).

1.2 Aim and focus of this study

The present study is part of the German Institute for Development Evaluation (Deutsches Evaluierungsinstitut der Entwicklungszusammenarbeit – DEval) evaluation programme for 2024–2026. It is based on a proposal from a member of the DEval advisory board to evaluate the effects of development cooperation on food security and agriculture. DEval deemed a synthesis study on the effects of interventions valuable and of interest to stakeholders. Understanding the impacts of development interventions is important for designing food security and nutrition programmes, for policy makers and development practitioners alike. Yet the field of food security and nutrition is characterised by a large amount of evidence that can be difficult to navigate without synthesis.

The format and scope of this study differ from DEval's strategic evaluations of German bilateral cooperation, as it does not seek to provide accountability for German international cooperation. Rather, by means of an evidence synthesis, it aims to deepen understanding of which types of intervention have been shown to be effective in the long term, regardless of the funding or implementing institution, and to derive implications for development cooperation actors.

The research team conducted a scoping study to understand the research landscape and gaps in existing evidence synthesis.⁶ This identified two prominent research gaps: how interventions can strengthen the resilience of food systems; and how interventions can support communities and individuals dealing with environmental shocks to the food system. This was confirmed in stakeholder consultations with German development cooperation actors.

The right to adequate food is a universal human right. As such, and within the framework of the Human Rights-Based Approach, the principles of empowerment, participation and agency of rights-holders offer the basis for development cooperation – both international and German development cooperation – to realise this right. This prompted the research team to focus on interventions that explicitly aim to empower individuals and groups to play an active and decisive role in their food system – namely, those that aim to provide information or capacity strengthening or support positive behaviour change (ICSBC). These include trainings, workshops, advisory services and knowledge dissemination by different means.⁷ No evidence synthesis is available that covers the effect of several ICSBC intervention types on the full spectrum of food security and nutrition outcomes (see Table 2) applying methodologically rigorous methods.

⁵ This special initiative was launched in 2014 with the name “ONE WORLD – No Hunger”; it was reframed as the “Transformation of agricultural and food systems” special initiative in 2021, following the change in government in 2019 (BMZ, 2025).

⁶ Further information on the research landscape and evidence synthesis gaps can be found in a search protocol for the meta-analysis included in this study (Lwamba et al., 2025).

⁷ The body of evidence on food security and nutrition encompasses a lot of non-ICSBC intervention types that are not part of this study, such as food vouchers or provision of agricultural inputs.

Further assessment of evidence in the field of food security and nutrition indicated that there are many studies available for programmes in sub-Saharan Africa; thus, a specific focus on sub-Saharan Africa was warranted, and this was echoed by the study stakeholders. Within this focus, stakeholders noted a specific interest in intervention outcomes for vulnerable population groups and the effects of multicomponent interventions – for example, interventions combining an ICSBC activity with cash transfers or seed provision.

Consequently, the study synthesises impact evaluations on ICSBC interventions in sub-Saharan Africa. Furthermore, it analyses the contribution of the interventions to increasing the resilience of households and individuals in the food system in terms of food stability and food sustainability. Moreover, the effects of ICSBC interventions for vulnerable population groups specifically were researched.

The following research questions were developed:

- What are the effects of ICSBC interventions on food security and nutrition outcomes in sub-Saharan Africa?
- How do these interventions enhance the resilience of food systems against climate change risks and crises?
- How do the effects vary depending on the context, intervention features, vulnerable population groups or other influencing variables?

Stakeholders also expressed an interest in how conflict affects food security and nutrition interventions. This was taken up in the analysis by means of a “moderator”. However, adding an additional conceptual focus would have exceeded the analytical scope of this study and introduced undue complexity. Understanding the relationship between food security and nutrition, conflict, war and fragility is highly relevant but also means that questions of humanitarian aid, international humanitarian law and disaster relief need to be considered. A dedicated study on these aspects was deemed more appropriate to address these aspects.

This report is structured as follows. Chapter 2 (Approach) and Chapter 3 (Methodology) describe the study design. Chapter 4 presents the findings of the analysis, and Chapter 5 offers conclusions and implications based on the findings.

2.

APPROACH

This chapter outlines the main theoretical concepts used in this study. This includes defining the right to food, food security and nutrition, and the Sustainable Food System Framework.

2.1 Right to food and food security

In this study, analysis is embedded in international and German conceptual frameworks on the right to adequate food. The right to adequate food is a human right under the Universal Declaration of Human Rights, which stipulates that “everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food” (art. 25(1)). It is also enshrined in the International Covenant on Economic, Social and Cultural Rights (ICESCR), which includes the right to be free from hunger (art. 11.2) and the right to adequate food (art. 11.2) (ICESCR, 1966). This right is also guaranteed by several regional and group-specific human rights instruments, like the Convention on the Elimination of All Forms of Discrimination against Women. The right to food is crucial to and dependent on the enjoyment and realisation of other human rights, including the right to health, life, water, adequate housing and education (OHCHR, no date).

To realise the right to food, both international and national actors need a clear understanding of what food security and nutrition encompasses and the ways in which international cooperation can contribute to achieving this. Early definitions of food security focused solely on the availability of basic food (FAO, 2006; World Food Conference, 1974). Over the last decades, however, there has been a growing realisation that there are other dimensions of food security and nutrition. The current definition by the FAO and its Committee on World Food Security (CFS)⁸ is given in Box 1:

Box 1 Definition: Food security and nutrition

“Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. The four dimensions of food security are availability, access, utilisation and stability. The nutritional dimension⁹ is integral to the concept of food security.” (CFS, 2009; FAO, 1996)

Food availability, food access, food utilisation and food stability are the four dimensions which were first highlighted in the CFS’s High Level Panel of Experts on Food Security and Nutrition (HLPE)¹⁰ reports (HLPE, 2017, 2018). From 2020, the HLPE made the case to include two other dimensions – namely, sustainability and agency (Clapp et al., 2022; HLPE, 2020). Agency reflects the role of rights-holders and their meaningful participation and inclusion in realising the right to food.¹¹ Sustainability extends beyond short-term disruptions to food supply, which are included under stability, and focuses on the interconnectedness of ecosystems, livelihoods, society and political economy to ensure food security and nutrition for decades to come (Clapp et al., 2022; Clapp and Moseley, 2021). The definition highlights the nutritional dimension, which is why the more comprehensive term “food security and nutrition” is used throughout this report.

The six dimensions form this study’s framework for analysing the effects of ICSBC interventions on food security and nutrition; they are the outcome areas that were examined (see Table 2). Measured indicators in individual studies were assigned to each of these outcome areas (see Table 4).

⁸ The CFS was established in 1974 and reformed in 2009 as an international and intergovernmental platform for different stakeholders to work together to ensure food security and nutrition.

⁹ The nutritional dimension of the concept refers to having access to a nutritionally adequate diet that includes foods that provide necessary micronutrients to maintain essential bodily functions. This ensures that people can grow, have children and develop their full potential.

¹⁰ The HLPE is composed of a steering committee of 15 internationally recognised experts in a variety of fields related to food security and nutrition, project teams selected to analyse/report on specific issues and a secretariat hosted by the FAO.

¹¹ One of the key aims of the Human Rights-Based Approach is to empower individuals and communities as rights-holders to know, claim and realise their human rights. The FAO devised a set of principles – referred to as the PANTHER principles – to reinforce the process of realising the right to adequate food, based on the Human Rights-Based Approach. The PANTHER mnemonic refers to participation, accountability, non-discrimination, transparency, human dignity, empowerment and the rule of law within food systems (FAO, 2013), which are required for agency to exist.

Table 2 The six outcome areas of food security and nutrition

Dimension	Definition
Food availability	The quantity and quality of food sufficient to satisfy the dietary needs of individuals
Food access	The personal or household financial means to acquire food for an adequate diet
Food utilisation ¹²	An adequate diet, clean water, sanitation and healthcare to reach a state of nutritional well-being where all physiological needs are met
Food stability	The ability to ensure food security in the event of sudden shocks or cyclical/seasonal events
Food agency	The capacity of individuals or groups to make their own decisions about their engagement with food systems
Food sustainability	The long-term ability of food systems to provide food security and nutrition for current and future generations

Source: DEval, own visualisation adapted from HLPE (2020)

2.2 The food system

Conceptualising the entire food system is useful for understanding where action is needed and which pathways may be taken to realise the right to food. This systems thinking has been emphasised as a crucial instrument in achieving food security and nutrition (Cherney and Head, 2011; Dekeyser et al., 2020; FAO, 2025b; Lane et al., 2023; WHH, 2023). It considers the interconnectedness of food supply chains, consumer behaviours and the physical, economic, political and socio-cultural settings shaping food production and consumption – for example, climate change, conflicts and markets (Brauw et al., 2019; Hanke et al., 2023; Nguyen, 2018; OECD, 2021). This approach is also reflected in food security and nutrition being at the centre of SDG 2 and its close linkage to achieving other SDGs (see Box 4).

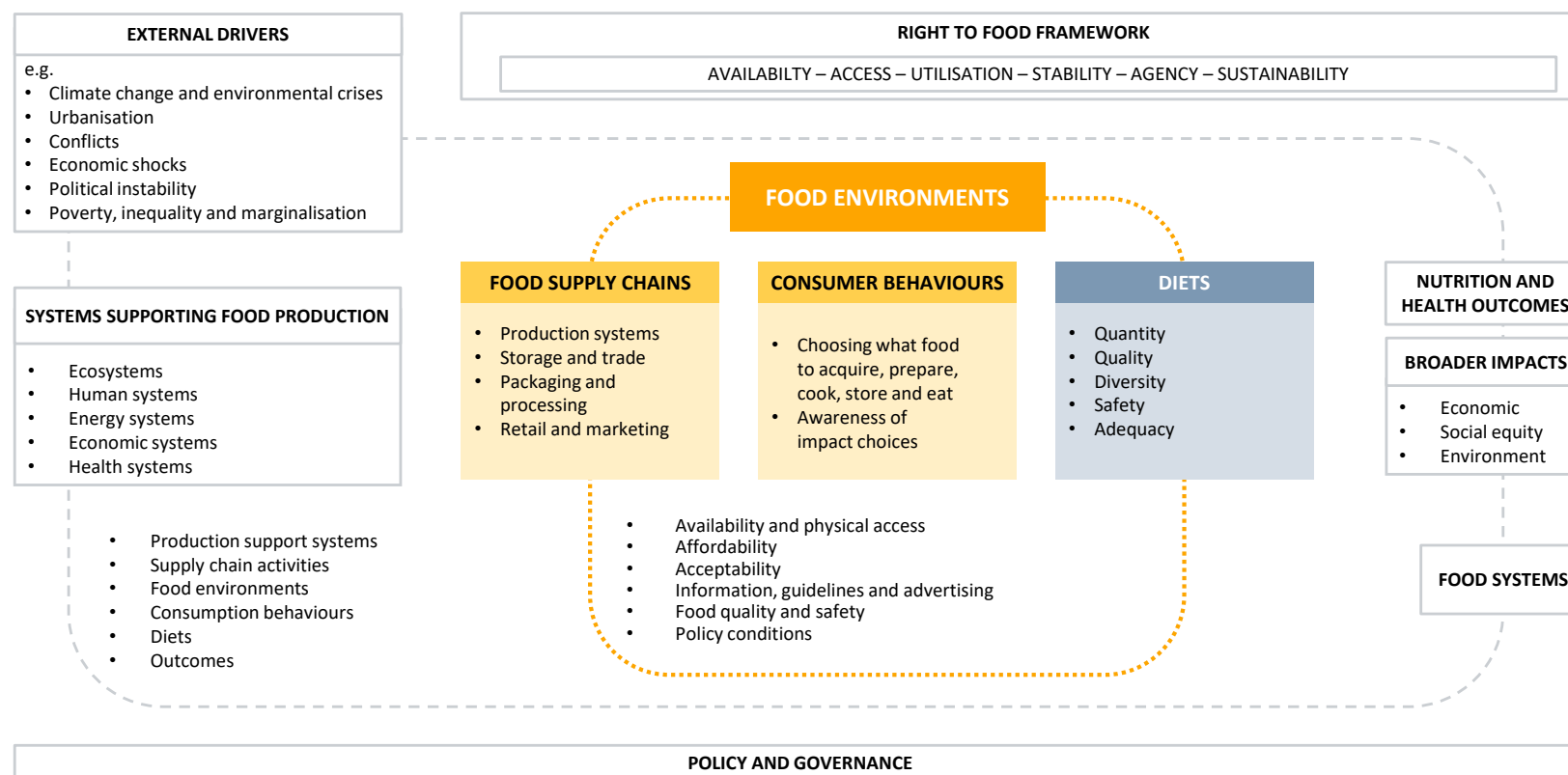
The food system encompasses the entire set of actors and actions through which we produce, acquire, process, consume, distribute and dispose of food (HLPE, 2020; Nguyen, 2018). This study adopts the widely used Sustainable Food System Framework from the FAO's HLPE (Brauw et al., 2019; HLPE, 2014).

At its centre, the framework identifies the three key pathways of the food system – food supply chains, consumer behaviours and diets, and food environments (see Figure 1). External drivers can significantly affect food systems by altering food production and demand. Among these drivers are the environmental setting, the existing infrastructure, the political context and the demographic characteristics. External drivers might also be one-off shocks, such as a conflict or the COVID-19 pandemic.

This study focuses on ICSBC interventions that focus on two pathways at the very core of the framework: food supply chains and consumer behaviours (highlighted in colour in Figure 1). It analyses the effects of ICSBC interventions in these pathways on the six outcome areas (see Table 2). The food supply chains pathway encompasses all activities in production, storage and distribution, processing and packaging, and food loss and waste management. The consumer behaviours pathway refers to all choices on what food to acquire, prepare, cook, store and eat, whether the choices are based on individual preferences or due to other factors, such as societal norms.

¹² For this analysis, as indicators vary considerably, the study differentiates **food utilisation** indicators further into **food diversity** (indicators on food composition) and **anthropometrics** (physical measurements of the body).

Figure 1 Sustainable Food System Framework



Source: DEval, own visualisation adapted from HLPE (2020)

3.

METHODOLOGY

This chapter describes the study design and discusses the quantitative and qualitative methods used. It outlines the data collection process and summarises the evidence base. Finally, the chapter presents and reflects on strengths and weaknesses of the methodology.

3.1 Study design

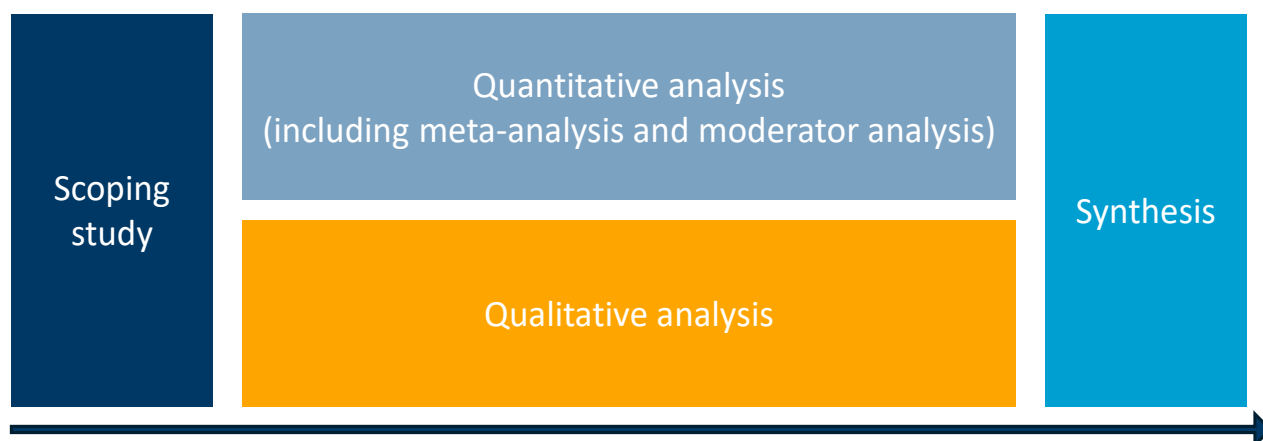
The study is a literature synthesis of rigorous impact evaluations; as such, it analyses secondary data, and no primary data was collected. It is theory based and combines quantitative and qualitative synthesis methods in a mixed methods design to answer the research questions (see Figure 2). A Theory of Change (ToC) was derived from literature (see Section 4.1). A ToC illustrates the main pathways of effect assumed for an intervention: activities of an intervention lead first to outputs, then to outcomes and lastly to impacts. The ToC serves as an important tool for comparing observed effects with the intended “optimal” scenario. Where observed effects and intended effects diverge, evaluators can offer conclusions

and recommendations on how to make adaptations for future interventions (von Werthern, 2019).

The quantitative components are meta-analyses of effects in rigorous impact evaluations – that is, studies applying experimental or quasi-experimental research designs.¹³ This is complemented by moderator analyses. While the first calculates the overall average effect of ICSBC interventions across studies, the latter aims to identify context factors that potentially influence the effectiveness of ICSBC interventions. The meta-analyses and moderator analyses were conducted as a rapid evidence assessment in partnership with the International Initiative for Impact Evaluation(3ie) (Lwamba et al., 2025, 2026).

The qualitative analysis comprised qualitative document analysis of: (i) qualitative information on the programmes included in the quantitative studies; and (ii) qualitative information from other relevant documents (for example, evaluation reports, studies by German and international development cooperation actors, additional scientific studies). All results were triangulated and contextualised with further scientific literature and exchanges with experts during synthesis.

Figure 2 Study design



Source: DEval, own visualisation

¹³ There are different types of literature synthesis. The general design of this literature synthesis is a rapid evidence assessment (a form of a systematic review). An evidence synthesis can take the form of a qualitative assessment (collecting written information from the different studies), vote counting (counting how many studies show effects of an intervention) or a quantitative meta-analysis (calculating an overall average effect). The latter is the most rigorous way of synthesising findings from different impact evaluations across different settings.

As noted, the study is based on secondary data. Main data sources were rigorous impact evaluations from 3ie's Living Food Systems and Nutrition Evidence Gap Map (EGM)¹⁴ and documents from German and international development cooperation actors (evaluation reports, research studies), complemented by additional scientific literature. Figure 3 provides a full overview of the studies screened and included.

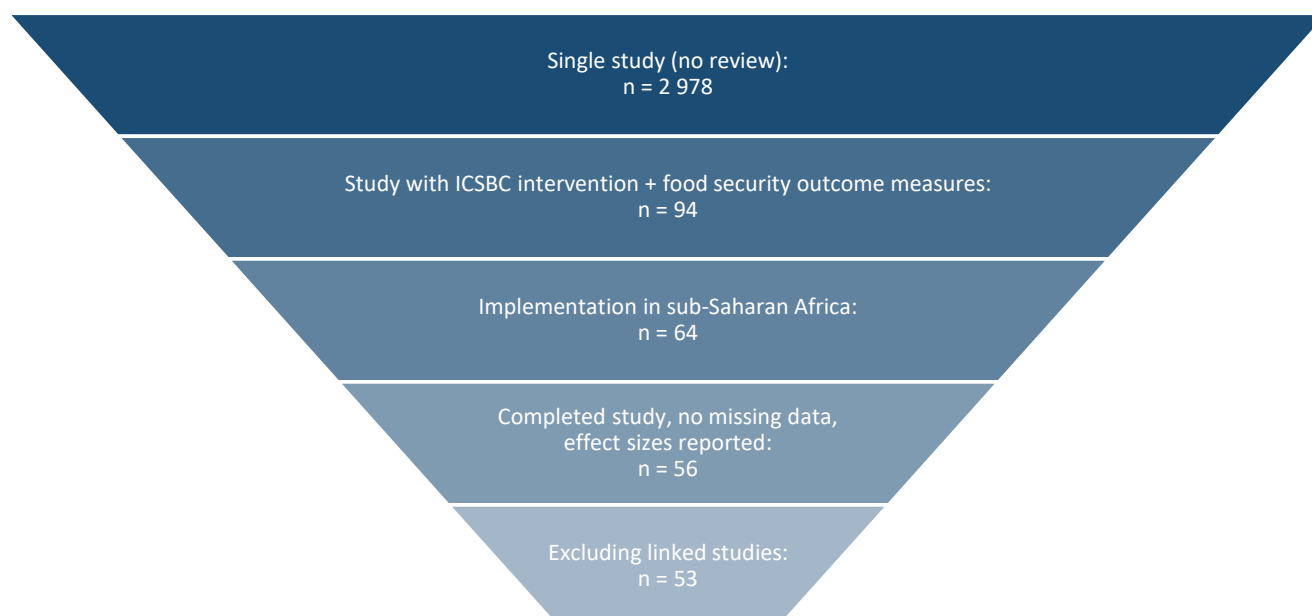
3.2 Quantitative analysis¹⁵

Data basis and extraction

Quantitative meta-analyses and moderator analyses of existing scientific evidence were conducted to identify effects of ICSBC interventions within the food supply chains and consumer behaviours pathways. The data for these analyses

stem from 3ie's Living Food Systems and Nutrition EGM (3ie, 2022a), which was commissioned through Deutsche Gesellschaft für Internationale Zusammenarbeit's (GIZ's) Knowledge for Nutrition program. This EGM compiles the available rigorous evidence (that is, impact evaluations using randomised control trials and quasi-experimental study designs as well as systematic reviews) in the field since 2000 and maps it according to intervention types and outcomes. The EGM was last updated in 2024. Therefore, it represented the most recent evidence base for analysis, save for a new search for evidence. Within this body of evidence, studies were identified that fulfilled the following criteria: (i) a single study (not a review); (ii) a focus on food security and nutrition, examining the effects of ICSBC interventions; and (iii) a study of interventions in sub-Saharan Africa. In total, 64 rigorous impact evaluations (hereafter: studies) were identified fulfilling these criteria (see Figure 3).

Figure 3 Filtering process for quantitative studies



Source: DEval, own visualisation adapted from Lwamba et al. (2026)

¹⁴ EGMs are thematic collections of information about impact evaluations and systematic reviews that measure the effects of international development policies and programmes. They present a visual overview of existing and ongoing studies or reviews in a sector or subsector in terms of the types of programmes evaluated and the outcomes measured.

¹⁵ For further details on the methodology, please see Lwamba et al. (2025, 2026).

After identifying the studies, data on the intervention type, outcome area and methods applied were extracted. Data extraction was performed by one coder, following detailed data extraction guidance. The extraction was reviewed by one other team member. If there was any disagreement, the issue was discussed within the team. If data was missing, the study authors were contacted and asked for the data. If the missing data could not be obtained, the study was excluded from the analysis. To evaluate the quality of the studies, all underwent a “risk of bias” assessment, which was carried out individually by two researchers. Three-quarters of the included estimates were rated as having high risk of bias, mostly due to spillovers or risk of contamination between treatment and control groups (see Lwamba et al., 2026).

After the data extraction and critical appraisal, eight studies were removed from the body of evidence due to poor or missing data. Additionally, three linked studies were identified and two of the publications were removed.¹⁶ The final number of studies used for the quantitative analysis was 53. The process of selecting the studies for the quantitative analysis is depicted in Figure 3.

Study characteristics

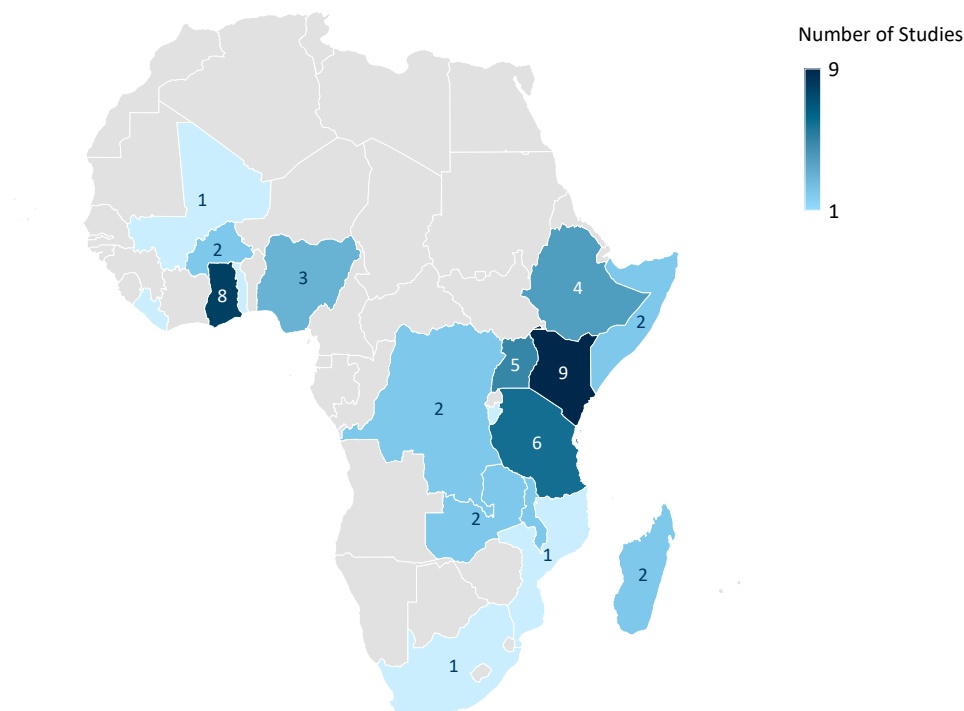
Most of the identified studies focused on food production; fewer studies were found for storage and packaging, marketing and distribution, and consumer behaviour interventions on food security and nutrition. This might be due to the longer scientific tradition of agricultural research, which has focused on the producer side since the early 1900s (Jones and Garforth, 1997). With the broadening of the definition of food security and nutrition and the adoption of the food system approach, the consumer side has increasingly been studied too (Watson et al., 2023).

While the Living Food Systems and Nutrition EGM includes studies from 2000, all the literature on ICSBC interventions in sub-Saharan Africa was published between 2010 and 2024, with a steep increase from 2015. This reflects the general development of more rigorous evidence after 2015, coinciding with the launch of the 2030 Agenda – including SDG 2 – and political traction highlighting the need for action to realise the right to food (HLPE, 2017, 2020).

Most of the identified studies concentrated on interventions in Eastern Africa (64% of the included studies; see Figure 4). The countries with the highest number of studies in this region were Kenya (n = 9), Tanzania (n = 6), Uganda (n = 5) and Ethiopia (n = 4). Another focus region was Western Africa, with 32% of the evidence. Here, Ghana stood out, with eight studies conducted there, followed by Nigeria (n = 3). Central and Southern Africa were under-represented in the evidence base (n = 2 and n = 1, respectively).

¹⁶ Linked studies are those that analyse the same intervention, relying on the same data. In these three cases, the most recent publication was kept and the others were excluded from the meta-analyses to prevent double counting.

Figure 4 Geographical distribution of the evidence base for sub-Saharan Africa



Source: DEval, own visualisation based on Lwamba et al. (2026)

Meta and moderator analysis

A meta-analysis combines standardised effect sizes from relevant studies and calculates the weighted average effect of an intervention for a specific outcome. In doing so, a meta-analysis provides a synthesis of available rigorous evidence by generating a single estimate of an intervention's effectiveness across studies. A meta-analysis was conducted for each combination of intervention type and outcome area for which there was sufficient data (56 of 104 possible intervention type/outcome combinations). Analysing effects was possible if at least two comparable estimates from different studies were available for the specific intervention type/outcome pair. For example, a meta-analysis was conducted

for the effects of farmer field schools on food availability, and another was carried out for the effects of healthy eating classes on food sustainability. The meta-analyses were at study level, meaning that one estimate was chosen per intervention type/outcome area in each study.¹⁷ The tables at the beginning of each findings section show where a meta-analysis was carried out and presents the results (see, for example, Table 6).

The effects of each study were standardised and included in the meta-analysis to calculate weighted average effects across studies.¹⁸ The standardised mean difference was selected

¹⁷ If there were several estimates per study on one intervention type/outcome combination, either the preferred estimate of the study author(s) was selected, if mentioned, or the analysis team selected the most precise estimate (for example, the estimate with the smallest standard error).

¹⁸ The study acknowledges that using different units of analysis (household versus individual) could create variation in the meta-analysis results, but after testing for this through moderator analysis, no evidence was found that this difference actually explained the variations in effect sizes.

as the effect size measure because it allows for pooling of results from studies using different indicators.¹⁹ The joint estimates were assessed with common statistical indicators.²⁰ The effect sizes can be grouped into four categories: very small (< 0.1), small (< 0.2), moderate (< 0.37) and large (> 0.37) effects.²¹ Still, these categories should be interpreted with caution, as causal chains are longer for development cooperation interventions than, for example, interventions providing medicine, and several other factors influence the outcome. Furthermore, even very small effects can have a large impact at the population level when interventions are scaled up, especially if they are low cost and, therefore, cost-effective.

In addition to the meta-analyses, moderator analyses were conducted. This type of analysis identifies if and how effects of interventions differ depending on additional variables (moderators).²² Moderators can be related to either the context or the intervention design and its implementation. Intervention-related moderators include the length of exposure or the follow-up period. Context-related moderators include the specificities of the socio-economic context in the implementation setting or the geography – for example, the area's vulnerability to environmental crises or an ongoing crisis in the area. Moderator analysis is an important tool to better understand the impact pathways of an intervention.²³

The information on moderators was extracted from the same publications used for the meta-analyses, additional qualitative studies and descriptive documents on the interventions that were analysed quantitatively, and secondary data (for example, resilience indices). To incorporate environmental vulnerability and climate resilience, data from six indices – including the Notre Dame Global Adaptation Initiative (ND-GAIN) index – was used. A list of the moderators presented in this study can be found in Annex 7, and further moderators are outlined in Lwamba et al. (2026).

Furthermore, when presenting the quantitative results, a general overview of identified positive significant effects in individual studies is also included. This is called “vote counting”, and it is a common and simple way of synthesising effects across different studies.²⁴ However, vote counting ignores effect size magnitude, methodological quality, risk of bias and study sample size, and it might give weight to very context-specific effects. We have included vote counts in this study as it is an often-used tool, even though a meta-analysis is methodologically more rigorous and more reliable for telling if an intervention type is effective across different settings. Therefore, this is used also as a way of emphasising the risk of using vote counting when meta-analysis often does not confirm the positive conclusions drawn from vote counting analysis.

¹⁹ The standardised mean difference across estimates was calculated, and outliers were removed. Outliers are estimates that vary significantly from the others and might strongly influence the results of the meta-analysis without being a typical case.

²⁰ The reliability of the estimates was described by two statistical indicators: the confidence interval and the p-value. The confidence interval gives an upper and a lower value of the estimated effect in a pre-set range. For this study, the confidence interval was set at 95%, meaning we can be 95% confident that the true value lies in this range. The smaller the actual range, the better, because it implies a more exact estimation. The p-value in turn describes the value at which the effects are statistically significant. It was set at $p < 0.05$ in this study. The p-value indicates the probability of the effect not being present; a value of 0.05 means that there is a 5% probability that the effect is non-existent.

²¹ These categories are based on the GRADE categorisation (Schünemann et al., 2013), but they have been adapted to reflect the relatively small effects in international cooperation.

²² The effect of moderators was modelled with a random effects meta regression, which was possible for 34 intervention type/outcome combinations.

²³ Further details on methods can be found in the search protocol published online (Lwamba et al., 2025).

²⁴ Vote counting is simple and accessible to diverse audiences, requires minimal data (needs effect direction and significance only, rather than detailed effect sizes) and can include a broader range of studies with different designs and incomplete reporting. It also avoids the need for complex statistical assumptions about effect distributions, making it useful for rapid evidence assessment when time or resources are limited.

3.3 Qualitative analysis

The qualitative analysis aimed to complement the meta-analysis with findings on effects for multicomponent interventions, vulnerable groups and food system resilience. The analysis used three types of literature.

First, literature directly related to the interventions included in the quantitative analysis was identified.²⁵ To find relevant studies, a citation search was performed, and the project names were searched for in suitable databases (for example, databases of implementing organisations). For all studies, except project documents, 3ie's critical appraisal tools were used to examine rigour and credibility of the data and methods used. Of the 131 qualitative studies undergoing critical appraisal, 111 were excluded due to methodological issues.²⁶ The remaining 20 studies were included in the analysis, alongside 63 project documents. 3ie applied the same approach for the qualitative studies as for the quantitative data extraction: one person coded, one reviewed, and disagreements were discussed within the team.

Second, the evaluation team received and searched for project evaluations and other studies by German implementing organisations and international actors. In total, 110 evaluations and studies were included in the qualitative analysis. These included evaluation reports by the GIZ (n = 20) and the KfW Development Bank (n = 15) as well as relevant evaluative studies commissioned or conducted by those organisations (n = 14). Not all studies and evaluations by the GIZ and the KfW Development Bank were included in the analysis, but all were screened for relevant background information.²⁷

Third, (strategic) evaluations (n = 16) by other bilateral and multilateral actors – such as the Dutch Policy and Operations Evaluation Department, the International Evaluation Group of the World Bank, and the International Fund for Agricultural Development – were covered. The qualitative analysis further included previous systematic reviews or rapid evidence assessments (n = 8) and other scientific studies (n = 36).

Last, other documents, such as strategies, scientific and grey literature and publicly available project documents were screened for relevant background information but not analysed systematically.

Table 3 Studies researched in the qualitative analysis

Types of documents	Subcategory
Programme documents from quantitative impact evaluations (n = 83)	- Qualitative and process evaluations (n = 20) - Qualitative descriptive documents (n = 63)
Evaluations and studies by German implementation organisations (n = 49)	- GIZ evaluations (n = 20) - KfW Development Bank evaluations (n = 15) - Other relevant evaluative studies by GIZ/KfW Development Bank (n = 14)
Further evaluations, systematic reviews and other scientific studies (n = 60)	- Evaluations by other donors (n = 16) - Pre-existing systematic reviews or rapid evidence assessments (n = 8) - Other scientific studies (n = 36)

Source: DEval, own visualisation

²⁵ This included studies collecting primary data using mixed methods or qualitative methods, descriptive quantitative studies and process evaluations.

²⁶ For more information on the criteria applied for the critical appraisal, please refer to the search protocol (Lwamba et al., 2025).

²⁷ The reasons for non-inclusion were that they did not directly relate to the focus of this study. For example, they considered interventions in geographical areas outside sub-Saharan Africa or capacity strengthening measures in outcome areas other than food security and nutrition. Especially within the sphere of financial cooperation for food security and nutrition, capacity strengthening measures are not usually part of interventions and, thus, are not part of respective evaluations, unless they are directly related to technical cooperation measures – for example, within development cooperation programmes (German: EZ Programme).

Each document was coded line by line with either EPPI-Reviewer or MAXQDA 2020 software. A thematic synthesis approach was applied with an inductive coding technique to synthesise the qualitative evidence. Codes with common descriptive themes were grouped into higher-level analytical themes. For project evaluations, other dimensions of interest were the factors enabling and hindering the success of interventions. Thematic synthesis involved grouping codes by frequency and thematic proximity to identify patterns and overarching themes.

3.4 Methodological reflections

This evaluative study has strengths and weaknesses in terms of its design, evidence base, data quality and chosen methods.

Using the EGM to identify the rigorous evidence on ICSBC interventions has many advantages, such as a thoroughly developed classification of studies, easy exploration of the data base for relevant synthesis gaps and time-efficient identification and searching of studies. However, this source also comes with some constraints. The EGM comprises evidence from 2000 to summer 2024 and has not been updated since. Therefore, this analysis reflects the state of research as of summer 2024. Reliance on the EGM also affected the study design conceptually, as the team used the intervention and outcome areas defined by the EGM – these could not be changed or adapted. As the EGM focuses on English-language publications only, it is possible that publications in other languages were missed out.

Most of the studies included in the meta-analyses are at high risk of bias. This might be due to spillover effects, where positive effects on the treatment group spill over to the control group through communication between neighbours or within a community, for example. While this leaves some concern about the reliability of results, this risk of bias is not uncommon and the level of risk was consistent with other assessments (Basak et al., 2024; Berretta et al., 2023). Furthermore, published rigorous evidence often suffers from a positive reporting bias, where evaluations of successful interventions are more likely to be published and be publicly accessible. Project documents and documents provided by the implementing organisations were not assessed by Jie's critical appraisal tool.

Many rigorous impact studies implement multicomponent interventions with several components operating simultaneously – for example, an ICSBC component combined with cash transfers, food aid or provision of seeds. However, these studies often only measure the overall impact of the components combined, not showing how strongly each individual component worked. Of the 36 studies that included multiple components, only 13 calculated the effects of individual components separately. This is a common problem in systematic literature reviews, as it is difficult to determine the effectiveness of ICSBC alone for food security when it is combined with other components. Nevertheless, the meta-analyses assume that results from combination programmes can still provide insights about ICSBC interventions.

4.

FINDINGS

This chapter presents the findings of both quantitative and qualitative analysis. First, to guide the reader unfamiliar with terminologies of quantitative meta-analysis and moderator analysis, Box 2 offers an explanation on how to interpret the most important parameters presented. The chapter then provides the ToC to be tested. It continues by presenting the results of the meta-analyses and moderator analyses, for food

supply chain interventions and then for consumer behaviour interventions. Finally, the chapter offers a deep dive into three topics that have been deemed particularly relevant for policy makers and implementers alike: multicomponent interventions; targeting vulnerable population groups; and intervention effects on food system resilience.

Box 2 How to read the results of the quantitative analyses

- **Effect (weighted average effect):** A weighted average effect in meta-analysis is the overall effect size calculated by combining individual study effect sizes. Each study's contribution is weighted by factors such as sample size or precision to give more reliable studies greater influence on the final estimate. For this study, the weighted average effects are categorised as very small (< 0.1), small (< 0.2), moderate (< 0.37) and large (> 0.37). For simplicity, the term “effect (size)” is used instead of “weighted average effect” when presenting the meta-analysis results. Very small or small effects should not be dismissed, as causal chains are long in development cooperation interventions and small effects can still have an important impact when interventions are implemented at large scale. Especially low-cost interventions can, then, be very cost-efficient.
- **Confidence interval:** A confidence interval provides a range within which the true effect size is likely to lie, with a given level of certainty (for example, 95%). A narrow confidence interval suggests more precise estimates, whereas a wide confidence interval reflects greater uncertainty.
- **Significance:** The statistical significance of a result indicates how likely it is that the observed effect is attributable to the intervention. In this study, this is measured by the p-value. A lower p-value means higher statistical reliability of results. The threshold for statistical significance in this study was set at $p = 0.05$. This means there is a 5% chance that the observed result would occur if there was actually no true effect. A p-value of 0.1 would mean that there is a 10% chance of observing such results under the null hypothesis, and so forth. While p-values close to 0.05 (that is, values up to 0.1) might become more significant when an additional study is added, p-values above 0.1 represent highly non-significant results. The fact that a result is insignificant does not necessarily mean that there is no effect. It might be that more data is needed, for instance.
- **Number of estimates:** While a meta-analysis can be conducted with two estimates, further estimates increase the reliability of results. However, other characteristics come into play when assessing reliability: the risk of bias of the studies (the lower the risk, the higher the reliability); and the sample size (the larger the sample, the higher the reliability). If only two estimates are included in the analysis, the results must be interpreted with caution. Regardless of the number of estimates, the results of the meta-analysis show the current state of research – that is, what we know.

4.1 The underlying ToC

This study developed a ToC for ICSBC interventions in the field of food security and nutrition derived from international and national strategies as well as relevant literature.²⁸ The ToC follows the following structure: the intended impact at the top, followed by outcomes, outputs and activities at the bottom (see Figure 5). Chapter 5 discusses the findings of this study in relation to the underlying ToC.

This ToC takes realising the right to food, as represented by SDG 2 (Zero hunger), as the overarching intended impact and the common denominator of developmental goals in the consulted strategies and literature. Positive effects on the six dimensions of food security and nutrition are the intended intermediate outcomes to achieve SDG 2 (see Section 2.1). The dimensions serve as the outcome areas framing the analysis of this study. The indicators measuring achievement in these areas are listed in Table 4. As food utilisation can relate to both food diversity and nutritional health (anthropometrics), these are shown separately.

Table 4 Outcome areas and exemplary indicators

Outcome area	Exemplary indicators
Food availability	Agricultural productivity, production and yields, crop losses
Food access	Number of meals per day, days without food, Food Consumption Score, Household Food Insecurity Access Scale, consumption of a certain food type in the last days/week, Household Hunger Scale, expenditure for food, length of hunger spell, Minimum Meal Frequency, Multidimensional Poverty Index, Value of consumption
Food utilisation	Food diversity: Minimum Dietary Diversity, Household Dietary Diversity Score, number of food groups eaten, Minimum Acceptable Diet, Global Diet Quality Score, Food Group Diversity Score, quantity of all foods consumed, Food Variety Score Anthropometrics: height-for-age score, stunting, weight-for-height score
Food stability	Coping Strategies Index, food insecurity in last year/month, Months of Adequate Household Food Provisions, other resilience indices, worrying about food
Food agency	Women's Empowerment in Agriculture Index, attendance of meetings, crop commercialisation index, transformative index, women's decision-making power
Food sustainability	Crop diversification, adoption of new seed varieties, minimum soil disturbance, crop rotation, pest management practices, pre-harvest losses, community attitudes to new practices

Source: DEval, own visualisation adapted from Lwamba et al. (2026)

This study analyses the two main pathways: (i) ICSBC interventions targeting actors (producers and processors) in **food supply chains**; and (ii) ICSBC interventions on **consumer behaviours**. For ICSBC interventions in the food supply chains pathway, the intermediate outcomes can be translated as increased food production capacities and improved storage, distribution and processing of food supply. For ICSBC interventions in the consumer behaviours pathway, the intermediate outcomes are to improve consumers' food choices, preparation and consumption. In order to achieve these intermediate outcomes,

behaviour change for both producers and consumers is necessary, meaning that both groups adopt new practices or the best-suited practices, independent of whether these are sustainable farming storage practices (food supply chains) or healthy eating habits (consumers). A prerequisite for any behaviour change is knowledge about new or preferred approaches for both food producers and consumers. For example, farmers might strengthen their knowledge about sustainable cultivation methods, while consumers might broaden their knowledge about how to diversify their diet and increase nutritional value.

²⁸ The literature comprised quantitative studies included in the analysis, international and national strategy documents (for example, on the 2030 Agenda, the Malabo target and the BMZ core area strategy titled "Transformation of agricultural and food systems") and academic literature on behaviour change and the Sustainable Food System Framework.

However, achieving behaviour change is a specific challenge and depends on several factors, such as motivation, opportunity and knowledge, as highlighted in the behaviour change wheel by Michie et al. (2011). Knowledge alone (capability) is not enough to achieve behaviour change; motivation and opportunity have to be fostered as well. ICSBC interventions have a focus on capacities and/or motivation. Creating opportunities in the sense of providing access to financial or in-kind resources is not a given. Therefore, merely combining ICSBC components with other components might lead to the intended effects. As many interventions in this evidence synthesis combine several components, an analysis of these is presented in Section 4.4.

There are several possible actors that can be targeted to take part in activities. In food supply chains, ICSBC interventions target farmers, agricultural extension officers, farmer groups, pastoralists, companies or public officials. Interventions aiming to encourage positive consumer behaviours target the general population, households or individuals, independent of their profession. The meta-analyses cannot differentiate between different actors, however, as it is a method for generalising results.

For both pathways, there are several types of interventions. The available evidence in the EGM suggests seven main intervention types within the food supply chains pathway and six in the consumer behaviours pathway, as outlined in Table 5 (see Annex 7.1 for detailed descriptions).

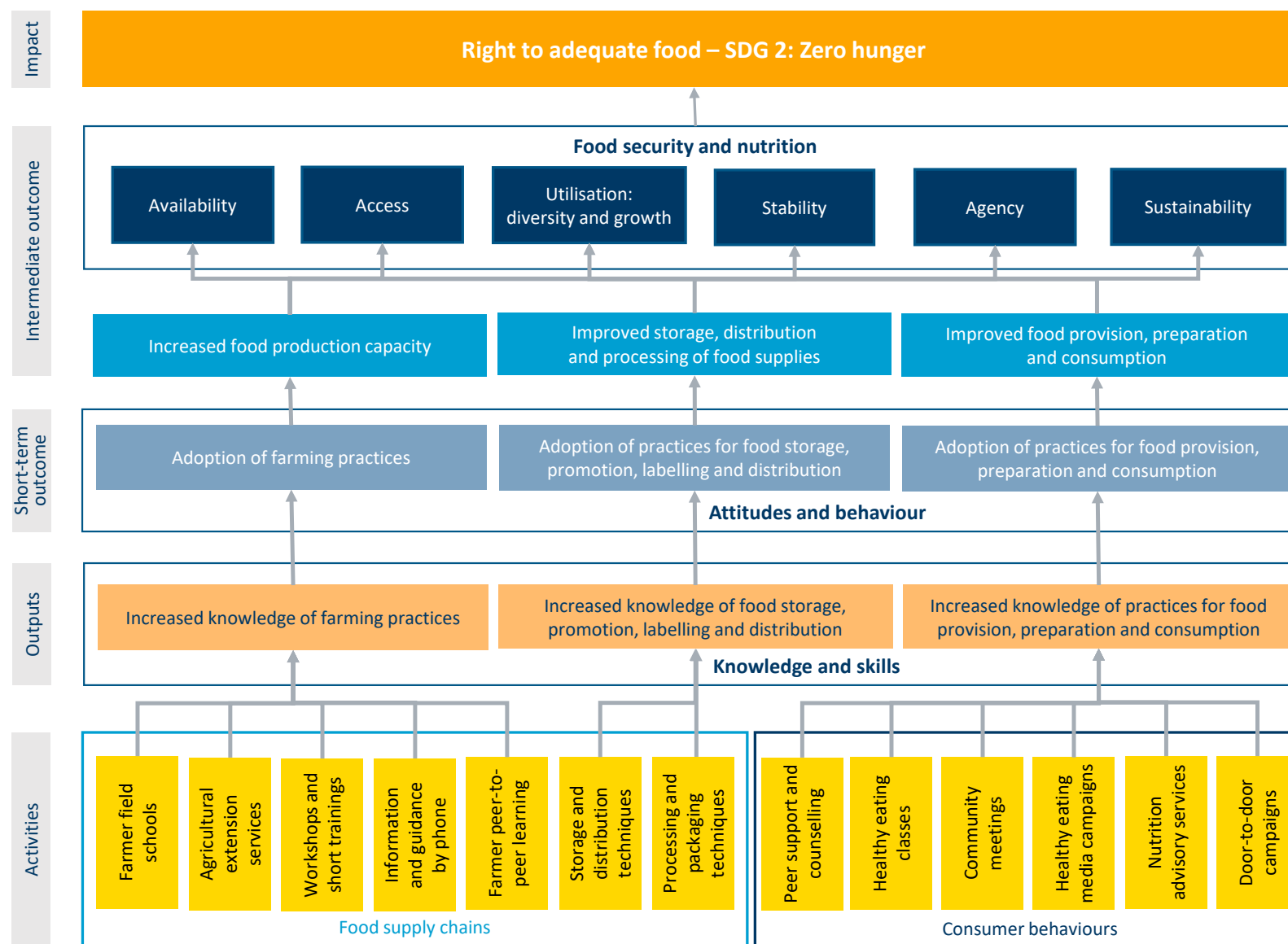
Table 5 Intervention types researched in this study

Food supply chains	Consumer behaviours
- Farmer fields schools - Agricultural extension services - Workshops and short trainings - Farmer peer-to-peer learning - Information and guidance by phone - Capacity strengthening in storage and distribution - Capacity strengthening in marketing and processing	- Peer support and counselling - Healthy eating classes - Community meetings - Healthy eating media campaigns - Nutrition advisory services - Door-to-door campaigns

Source: DEval, own visualisation

What follows from these considerations on the chain of effects initiated by ICSBC activities is the ToC in Figure 5. ToCs naturally cannot include all aspects that might be relevant to individual projects. Instead, the ToC serves as an overarching, theoretical depiction of intended effects, used to frame the analysis in this chapter.

Figure 5 ToC of ICSBC interventions for food security and nutrition



Source: DEval, own visualisation adapted from Lwamba et al. (2026)

Sections 4.2 and 4.3 present the results of the quantitative analyses along the **two pathways – food supply chains and consumer behaviours** – and the intervention types categorised under these respective headings (see Table 5), according to the results provided by Lwamba et al. (2026). The Annex provides an overview of the number of studies, countries studied and references per intervention type (see Table 18). Each section that follows focuses on one intervention type and lists the results of the meta-analyses for each of the outcome areas in order of observed effect size (from large to very small).

4.2 Food supply chain interventions

Most of the selected studies focused on food supply chain interventions (38 studies, 72%) and farmers, especially smallholders. Food supply chain interventions aim to improve food production, storage, distribution or marketing. Seven intervention types were identified in the quantitative studies on the food supply chains: farmer fields schools, agricultural extension services, workshops and short trainings, farmer peer-to-peer learning, information and guidance by phone, capacity strengthening in storage and distribution, and capacity strengthening in marketing and processing (see Annex 7). The following sections consider each of these intervention types in turn, starting with farmer field schools and agricultural extension services, which are the intervention types most studied in the sub-Saharan African context.

Farmer field schools

Farmer field schools offer hands-on agricultural training and facilitate a group learning process among farmers. During regular group meetings, participants experiment with agricultural practices, adapt them to their context and share their knowledge and practices within the group. Waddington et al. (2014) found that farmer field schools might enhance yield, farming practices and incomes in low- and middle-income countries. Others have stated that they might not be successful in targeting vulnerable population groups, but rather tend to reach those groups that already dispose of relevant networks and resources (IFAD, 2021a; IOB, 2017).

Main findings:

- In general, farmer fields schools were found to be an effective tool to improve food security and nutrition, with evidence for effects in four outcome areas

According to the meta-analysis, farmer field schools:

- consistently, across diverse settings, showed **positive effects on food availability, food access and food diversity** outcomes (very small or small positive effects)
- were promising for contributing to **food sustainability** outcomes (moderate effects) – here, effects were context-specific and particularly dependent on a country's environmental vulnerability.

Within the sample of studies in the meta-analysis, 15 (28%) analysed the effects of farmer field schools on food security and nutrition outcomes (see Table 18). Estimates were available for all outcome areas, with estimates for food access, food availability and food utilisation being the most common. The countries with the highest numbers of studies were Kenya (4) and Tanzania (3). The interventions included but were not limited to targeting farmer livelihoods in rural settings. More specifically, there were efforts by research institutes to develop and disseminate low-cost technologies – for example, providing low-cost integrated soil fertility management technologies to smallholder farmers in Kenya (Wanyama et al., 2010) or developing methods and practices that not only involve participatory approaches (Santoso et al., 2021) but also address the problem-solving capacities of farmers through “mentor farmers” or highly trained facilitators working with farmers (Larsen and Lilleør, 2014; Santoso et al., 2021).

When analysed individually, all 15 studies showed at least one significant positive effect on food security and nutrition outcomes.²⁹ When synthesised, the meta-analysis of study results showed positive significant effects on food availability, access, diversity and sustainability (see Table 6). The effects of farmer field schools on agency were very small and only significant at a 10% level, meaning that they had a higher probability of not being effective. The findings for food stability were insignificant (only two estimates), and evidence was not sufficient (one study only) for a meta-analysis on the effects of farmer field schools on food utilisation in terms of anthropometric measurements.

²⁹ This vote counting, which summarises the positive effects across studies (explained in more detail in Section 3.2), is presented for illustrative purposes only and is not interpreted. The results of the meta-analyses have greater validity.

Table 6 Farmer field schools: Meta-analyses results

Outcome area	Effect	95% confidence interval	Significance of effect (p-value)	Number of estimates
Food availability	0.09	0.02, 0.17	.002	5
Food access	0.11	0.01, 0.21	.03	7
Food utilisation: food diversity	0.07	0.01, 0.12	.04	5
Food utilisation: anthropometrics	Not enough evidence			
Food stability	0.08	-0.04, 0.19	.19	2
Food agency	0.11	-0.01, 0.23	.06	4
Food sustainability	0.23	0.10, 0.35	< .001	3

Source: DEval, own visualisation based on calculations by Lwamba et al. (2026)

Notes: Rows in **bold** indicate a statistically significant effect. At least two studies are necessary to run a meta-analysis. Any outliers or overly influential estimates, if they existed, were removed. Estimates with high risk of bias were not removed. Effects can be categorised as very small (< 0.1), small (< 0.2), moderate (< 0.37) or large (> 0.37).

Food sustainability: Farmer field schools showed a moderate and statistically significant increase in food sustainability. The moderator analysis showed that farmer field schools have on average a smaller intervention effect in the context of projected higher vulnerability compared to lower vulnerability contexts, according to the INFORM Climate Change Risk Index (projection for 2050).

Food access: The meta-analysis showed a small and significant positive effect of farmer field schools on food access. Moderator analyses were not significant and therefore the meta-analysis showed an effect valid across the different analysed settings.

Food availability: The meta-analysis showed significant very small positive effects of farmer field schools on food availability. Moderator analysis is not significant, and therefore the meta-analysis showed an effect valid across the different analysed settings.

Food diversity: Participation in farmer field schools led to very small, statistically significant increases in food diversity, presenting as a promising tool to improve food utilisation. Moderator analyses were not significant and therefore the meta-analysis showed an effect valid across the different analysed settings.

Food agency: Despite none of the meta-analyses having significant results, several moderators show varying effects for farmer field schools on agency. While there were smaller effects with higher vulnerability measured by the WRI's vulnerability index and the INFORM Climate Change Risk Index (projections for 2050 and 2080), effects were larger for countries with a higher environmental vulnerability measured by the ND-GAIN index.

Agricultural extension services

Providing agricultural extension services means that trained agents visit communities and provide training on up-to-date agricultural practices, support the organisation of cooperatives, or provide other technical services as needed. Agricultural extension services often also include (subsidised) in-kind support like seed or pesticides, or financial services such as access to credit and markets. Agricultural extension programmes have a long history in development cooperation (Jones and Garforth, 1997). Previous evidence syntheses cited mixed results on their effects. Murphy et al. (2024) found that private sector-led agricultural extension services can have a positive effect on production, savings, income, food security and nutrition, and the household's ability to deal with shocks, while there was mixed evidence on traditional public agricultural extension programmes (Ahmed and Getahun, 2019; Getahun and Fetene, 2018; Murphy et al., 2024).

Main findings:

- In general, agricultural extension services were an effective intervention type to improve food security and nutrition, with evidence for effects in four outcome areas.
- Evidence showed significant effects on **food access, availability, sustainability and diversity**.
- However, the effectiveness of agricultural extension services was **highly dependent on the context** – for example, vulnerability and exposure to environmental crises.

There was a comparatively large body of rigorous evidence for this intervention type in sub-Saharan Africa (n = 12, 23%) (see Table 18). Estimates were available for all outcome areas,

with most for food access, food availability and utilisation. There was no country-specific focus in the published studies. However, there were programmes in close coordination with national actors that aimed to enhance social economic development and poverty alleviation through agriculture and livestock development (Deschamps-Laporte, 2013). In some cases, interventions went beyond trainings that come with extension services (Sakketa et al., 2022) and focused on strengthening the extension services through institutional set-up (at local and/or grass-roots level, then focusing on the sustainability of such services) (Deschamps-Laporte, 2013).

All individual studies demonstrated at least one significant positive effect on food security and nutrition. When data was pooled for meta-analysis, positive significant effects emerged only for food availability, access, diversity and sustainability (see Table 7).

Table 7 Agricultural extension services: Meta-analyses results

Outcome area	Effect	95% confidence interval	Significance of effect (p-value)	Number of estimates
Food availability	0.12	0.05, 0.19	<.001	6
Food access	0.08	0.01, 0.15	.03	11
Food utilisation: food diversity	0.14	0.06, 0.22	<.001	6
Food utilisation: anthropometrics	Not enough evidence			
Food stability	Not enough evidence			
Food agency	0.05	-0.14, 0.23	.62	4
Food sustainability	0.13	0.02, 0.24	.02	5

Source: DEval, own visualisation based on calculations by Lwamba et al. (2026)

Notes: Rows in **bold** indicate a statistically significant effect. At least two studies are necessary to run a meta-analysis. Any outliers or overly influential estimates, if they existed, have been removed. Estimates with high risk of bias were not removed from the estimates. Effects can be categorised as very small (< 0.1), small (< 0.2), moderate (< 0.37) or large (> 0.37).

Food availability: According to the meta-analysis, agricultural extension services contributed to a small and statistically significant increase in food availability. Environmental vulnerability and crisis influenced the size of this effect. On one hand, interventions implemented in areas with higher environmental vulnerability (Global Data Lab Vulnerability Index – GVI) had on average smaller effects than studies in contexts with lower environmental vulnerability.

This might suggest deeper structural environmental challenges that could limit the success of interventions. On the other hand, agricultural extension services implemented in areas of ongoing environmental crises showed on average larger effects than those where environmental crisis was not immediate. This suggests that agricultural extension services can be useful for agricultural production specifically in ongoing environmental crisis.

Food diversity: The meta-analysis showed statistically significant small increases in food diversity as a result of agricultural extension services. The moderator analysis revealed no significant findings.

Food sustainability: Agricultural extension services resulted in a small and statistically significant increase in food sustainability. The positive effects became smaller on average in contexts of high environmental vulnerability compared to those with lower vulnerability. Effects were larger in Eastern Africa compared to Western Africa. This showed that the regional context is an important influencing factor on the effectiveness of interventions.

Food access: The meta-analysis showed that agricultural extension services had a very small positive significant effect on food access. Moderator analyses showed some differences in the size of effects. Agricultural extension services interventions that were implemented more recently had on average larger effects than interventions implemented further in the past (comparing studies from 2001, 2003, 2008, 2011, 2013, 2014, 2016 and 2017).³⁰ This means that either the context or the implementation design has changed over time. Further, interventions with longer exposure to intervention activities had larger impacts than interventions with shorter exposure.

Workshops and short trainings

For the purposes of this study, ad hoc or short training sessions for food producers on farming techniques, use of equipment or best practices are subsumed under the intervention type “workshops and short trainings”. Previous evidence synthesis indicated that short trainings tend to produce smaller effects, especially in the long term (Anderson and Feder, 2007; Davis et al., 2012).

Main findings:

The meta-analysis found that workshops and short trainings:

- showed significant positive effects only for **food agency**
- worked consistently across diverse settings for **food agency**

For several outcome areas, effects were slightly above the significance threshold of $p = 0.05$.

Within the sample underlying this study, available evidence on workshops and short trainings comprised 12 studies (21%), making it the third-largest evidence base (see Table 18). Estimates were available for all outcome areas, but especially food access, availability and utilisation. The largest number of the available studies were conducted in Ghana (4) and Ethiopia (3). Workshops and trainings were organised with communities and in accordance with local actors, like seed companies or government agricultural extension officers (Biggeri et al., 2018). They were also more context-specific in certain cases – on certain types of fertilisation, appropriate farming practices (Boucher et al., 2022) or specific crop-based certifications, for instance (Iddrisu et al., 2020).

When analysed individually, 8 out of 12 studies demonstrated at least one significant positive effect of workshops and trainings on food security and nutrition. The meta-analysis, however, revealed significant positive effects only for food agency (see Table 8). Results for food access, diversity, stability and sustainability achieved significance only at the 10% significance level, which means that these findings were statistically less reliable. For food availability, the meta-analysis results were insignificant.

³⁰ This moderator includes the first year of the intervention on the analysis. Therefore, the timespan analysed depends on the set of studies included in the analysis.

Table 8 Workshops and short trainings: Meta-analyses results

Outcome area	Effect	95% confidence interval	Significance of effect (p-value)	Number of estimates
Food availability	0.005	-0.08, 0.09	.90	4
Food access	0.38	-0.003, 0.75	.052	7
Food utilisation: food diversity	0.12	-0.01, 0.24	.07	5
Food utilisation: anthropometrics	Not enough evidence			
Food stability	0.08	-0.01, 0.17	.09	3
Food agency	0.11	0.01, 0.21	.02	3
Food sustainability	0.05	-0.004, 0.12	.06	3

Source: DEval, own visualisation based on calculations by Lwamba et al. (2026)

Notes: Rows in **bold** indicate a statistically significant effect. At least two studies are necessary to run a meta-analysis. Any outliers or overly influential estimates, if they existed, have been removed. Estimates with high risk of bias were not removed from the estimates. Effects can be categorised as very small (< 0.1), small (< 0.2), moderate (< 0.37) or large (> 0.37).

Food agency: Workshops and short trainings produced a small, statistically significant increase in food agency. Moderators did not denote significant results.

Food diversity: Meta-analysis showed insignificant effects of workshops and short trainings on food diversity. However, the moderator analysis indicated on average smaller effects of workshops and short trainings when these were implemented in countries with a higher environmental vulnerability compared to in those with lower vulnerability contexts (based on the World Resources Institute's – WRI's – vulnerability index). Therefore, workshops and short trainings might be more effective on food diversity in settings of lower environmental vulnerability.

Food sustainability: Also, for food sustainability, only the moderators were significant. On average, smaller effects were observed for programmes that were initiated more recently compared to those initiated further in the past (comparing studies from 2001, 2011 and 2015). This means that either the context or the implementation design has changed over time, making workshops and short trainings less effective tools in terms of sustainability.

Farmer peer-to-peer learning

Peer-to-peer-learning among farmers refers to meetings between food producers to share their knowledge and practices and to connect with professionals in the same sector. This is usually facilitated or otherwise supported by implementers.

Main findings:

- Peer-to-peer learning among farmers worked consistently on **food agency** across diverse settings.

The sample of studies underlying the meta-analysis contained eight studies on interventions that facilitate farmer peer-to-peer learning among producers in sub-Saharan Africa (see Table 18). Estimates were available for all outcome areas, but especially food access, utilisation and sustainability. There was no country-specific focus in the published studies. With a focus on social relationships and collective action to foster this type of intervention, examples included farmers becoming a member of a cooperative that, for example, provided them with direct access to certain technology which then indirectly influenced their adoption of farming practices (Biggeri et al., 2022).

Seven out of eight studies on farmer peer-to-peer learning demonstrated at least one significant positive effect on food security and nutrition across all outcome areas. However, meta-analysis revealed positive significant effects only for **food agency** (see Table 9). Here, a small, statistically significant increase was observed. However, the small number of studies (two) limits the conclusions that can be drawn from this finding.

Table 9 Farmer peer-to-peer learning: Meta-analyses results

Outcome area	Effect	95% confidence interval	Significance of effect (p-value)	Number of estimates
Food availability	Not enough evidence			
Food access	0.07	-0.22, 0.35	.64	4
Food utilisation: food diversity	0.07	-0.04, 0.19	.21	4
Food utilisation: anthropometrics	Not enough evidence			
Food stability	Not enough evidence			
Food agency	0.15	0.02, 0.28	.02	2
Food sustainability	0.34	-0.08, 0.77	.11	3

Source: DEval, own visualisation based on calculations by Lwamba et al. (2026)

Notes: Rows in **bold** indicate a statistically significant effect. At least two studies are necessary to run a meta-analysis. Any outliers or overly influential estimates, if they existed, have been removed. Estimates with high risk of bias were not removed from the estimates. Effects can be categorised as very small (< 0.1), small (< 0.2), moderate (< 0.37) or large (> 0.37).

Moderator analysis indicated that even though no results were significant in the meta-analysis for food access, farmer peer-to-peer learning showed on average a larger effect on improving food access, implemented in Eastern Africa compared to Western Africa.

One study pointed towards the relative effectiveness of farmer peer-to-peer learning compared with other ways of teaching. In Malawi, BenYishay and Mobarak (2019) found that if in-kind incentives were given, peer farmers were more successful in encouraging uptake of practices and generating knowledge in their villages than non-peers or government agents. They also pointed out that this approach might be more cost-effective than a travelling extension officer.

Information and guidance by phone

Interventions in which agricultural information/reminders are provided over the phone, such as via voice message or SMS, have been categorised as “information and guidance by phone”.

Main findings:

- There were **only two studies** available analysing the intervention type of information and guidance by phone.
- Because of the small number of studies, **meta-analysis** was only possible for availability and sustainability, but this did **not** provide **significant results**.

Only two studies analysed the effects of information and guidance by phone, highlighting an evidence gap for this intervention type (see Table 18). Estimates were available for all outcome areas, except stability. One intervention took place in Mali and one in Ghana. When analysed separately, these studies showed at least one significant effect on food security and nutrition, and effects were seen for each dimension, except for stability and agency.

As little evidence was available, meta-analysis was only possible for availability and sustainability where the number of individual estimates allowed for such analysis.³¹ However, effects on sustainability were not significant (see Table 19 in Annex 7),

³¹ With two studies underlying the meta-analysis, the number of estimates for meta-analysis was limited. In this case, meta-analysis was not possible for the other outcome areas because (i) only one study reported on the outcome (for example, on food access) or (ii) both studies reported on an outcome with each showing effects in the opposite direction, which would cancel each other out and show a misleading zero effect.

while effects on availability only showed significance at the 10% level and were statistically weak. The single studies in this sample found the following: Osei et al. (2018) showed significant positive effects on reducing crop losses before harvest (availability), reducing food shortages (access) and pre-harvest losses (sustainability). Tambo et al. (2023) identified positive significant effects on maize yields (availability), the household hunger scale (access) and the adoption of integrated pest management practices (sustainability).

Fabregas et al. (2019) in turn identified modest but relatively consistent effects in a meta-analysis concerning information and guidance by phone in Rwanda and Kenya. Their underlying large sample size might have increased the power of regression and was therefore able to show an effect, unlike this meta-analysis.

Capacity strengthening in storage and distribution

Storage and distribution of food is an important part of food supply chains. Capacity strengthening activities regarding food storage and distribution have been categorised as such but not differentiated into further subtypes like workshops, counselling or phone messages. The intervention type describes educational programmes to support storage and distribution techniques. An evidence synthesis by Murphy et al. (2024), which did not include meta-analysis, observed the effectiveness of storage activities.

Nine studies assessed the effectiveness of capacity strengthening in storage and distribution (see Table 18). Estimates were available for all outcome areas, but especially food access, food availability and food utilisation. Examples of studies included the work from Brander et al. (2021) in Tanzania, who analysed the effects on post-harvest losses of the provision of Purdue Improved Crop Storage hermetic bags and three training sessions covering improved on-farm storage techniques. Another example evaluating the impact on food availability was the work by Pretari (2019) in Ghana, who analysed the effect of a project promoting climate change awareness on the amount of food in store from the previous harvest.

When analysed individually, all studies demonstrated at least one significant positive effect on one of the six food security and nutrition outcome areas. Furthermore, at least one positive significant result in each outcome area was observed, especially for availability and access.

The meta-analysis found positive significant effects for two outcome areas: food availability and access (see Table 10). Moderator analyses were run for availability and agency but did not reveal differences showing that capacity strengthening on storage and distribution worked across different settings.

Main findings:

- Capacity strengthening in storage and distribution showed positive effects for two outcome areas in the meta-analysis: **food availability** and **food access**. However, these effects depended on the context – for example, the vulnerability to environmental crisis.
- Capacity strengthening in storage and distribution might only be effective for improving **food diversity** and **sustainability** dependent on the context – for example, in the context of relatively low environmental vulnerability.

Table 10 Storage and distribution: Meta-analyses results

Outcome area	Effect	95% confidence interval	Significance of effect (p-value)	Number of estimates
Food availability	0.13	0.07, 0.19	<.001	6
Food access	0.16	0.07, 0.26	<.001	7
Food utilisation: food diversity	0.09	-0.003, 0.14	.18	5
Food utilisation: anthropometrics	Not enough evidence			
Food stability	Not enough evidence			
Food agency	0.11	-0.01, 0.23	.06	4
Food sustainability	0.12	-0.05, 0.29	.16	4

Source: DEval, own visualisation based on calculations by Lwamba et al. (2026)

Notes: Rows in **bold** indicate a statistically significant effect. At least two studies are necessary to run a meta-analysis. Any outliers or overly influential estimates, if they existed, have been removed. Estimates with high risk of bias were not removed from the estimates. Effects can be categorised as very small (< 0.1), small (< 0.2), moderate (< 0.37) or large (> 0.37).

Food availability and access: In the meta-analysis, capacity strengthening in storage and distribution led to a small and statistically significant increase in food availability and food access. Effects were smaller on average in contexts of higher environmental risk for food availability.

Food diversity: While the meta-analysis did not reveal significant effects across the researched settings, the moderator analysis showed on average larger effects according to the ND-GAIN index in contexts with a higher vulnerability compared to contexts of lower vulnerability. Capacity strengthening in storage and distribution were on average smaller in higher vulnerability contexts compared to lower vulnerability contexts when measuring environmental vulnerability with the GVI and the INFORM Climate Change Risk Index (projections for 2050 and 2080).

Food sustainability: With insignificant results in the meta-analysis, the moderator analysis for storage and distribution interventions showed that they were less effective in contexts of higher environmental vulnerability (WRI vulnerability index score) and when recently implemented, compared to those completed some time ago (comparing studies from 2013, 2016 and 2017).

Capacity strengthening in processing and packaging

This intervention type stands for different types of educational programmes and capacity strengthening to support processing and packaging at the end of the food supply chains. There was no rigorous study in this synthesis available for sub-Saharan Africa, highlighting an evidence gap for this intervention type. Studies noted expected effects like increased output quality, increased yields, reduced (price) risk and enhanced collective action as a result of example interventions – for instance, improved storage facilities, improved processing and marketing through cooperatives (Biggeri et al., 2022) or working closely with farmer organisations in order to enhance assistance packages, building extension services' capacity to deliver packages and facilitating access to finance the purchase of packages (Rutherford et al., 2016).

Main findings:

- This evidence synthesis found a **gap of rigorous evidence** on the effects of capacity strengthening in processing and packaging in sub-Saharan Africa.

4.3 Consumer behaviour interventions

Food security and nutrition do not depend only on the food supply chains. Consumer behaviour is equally important, especially for the outcome areas of food utilisation, agency and sustainability. In a previous evidence synthesis, Murphy et al. (2024) found evidence of positive effects of nutrition campaigns on dietary diversity and anthropometric measurements in children. However, they did not conduct a rigorous meta-analysis. Majamanda et al. (2014) conducted a systematic review (without a meta-analysis) that revealed a positive effect of nutrition education programmes on anthropometrics of young children. Murphy et al. (2024) stated there was a lack of evidence on overall agricultural productivity, income and climate resilience. This lack of evidence was not confirmed by the present study, as included studies on consumer behaviour interventions also measured non-nutrition outcomes.

Consumer behaviour interventions were categorised into six intervention types: peer support and counselling, healthy eating classes, community meetings, healthy eating media campaigns, nutrition advisory services and door-to-door campaigns. In the following, each of these intervention types is considered, starting with peer support and counselling, healthy eating classes and community meetings, for which most evidence was available. These types of intervention mostly aim at giving information on nutrition to improve the nutritional status.

Peer support and counselling

This intervention type summarises activities that facilitate peer support or counselling to increase healthy eating habits.

Main findings:

- While single studies often showed a significant effect of peer support and counselling, the meta-analysis provided only two significant effects – namely, on **food agency**.
- Peer support and counselling worked across diverse settings for **food agency** outcomes and led to small positive effects.
- Peer support and counselling might only be effective for improving **food access** and **food utilisation** dependent on the level of environmental vulnerability.

A total of 16 studies (30%) analysed the effects of this intervention type on food security and nutrition, with a notable geographic coverage of 11 countries, including one study that implemented the same intervention in four countries (see Table 18). The studies analysed all outcome areas, but especially food utilisation and access. Three interventions were implemented in Kenya. For example, Galasso et al. (2019) analysed the effect of nutritional supplementation and home visits on household food security scores in Madagascar. Banerjee et al. (2017) analysed the effects of the graduation from ultra-poverty programme on the food security index, including access to enough food every day, skipped meals and days without food for adults and children.

When analysed individually, 13 of 16 studies demonstrated at least one significant positive effect on food security and nutrition, most often for utilisation. A previous meta-analysis by Dewidar et al. (2023) found significant impact of peer support on breastfeeding practices in low- and middle-income countries, including eight studies in Africa, demonstrating effects on food utilisation. Still, this meta-analysis showed positive significant effects only for food agency (two studies only) (see Table 11). Peer support and counselling showed positive effects for food access only at the 10% significance level. Meta-analyses for other outcome areas yielded highly insignificant results.

Table 11 Peer support and counselling: Meta-analyses results

Outcome area	Effect	95% confidence interval	Significance of effect (p-value)	Number of estimates
Food availability	0.09	-0.09, 0.26	.33	2
Food access	0.07	-0.001, 0.14	.07	7
Food utilisation: food diversity	0.03	-0.05, 0.11	.47	6
Food utilisation: anthropometrics	0.01	-0.06, 0.08	.48	6
Food stability	0.03	-0.03, 0.08	.33	3
Food agency	0.13	0.05, 0.20	.001	2
Food sustainability	Not enough evidence			

Source: DEval, own visualisation based on calculations by Lwamba et al. (2026)

Notes: Rows in **bold** indicate a statistically significant effect. At least two studies are necessary to run a meta-analysis. Any outliers or overly influential estimates, if they existed, have been removed. Estimates with high risk of bias were not removed from the estimates. Effects can be categorised as very small (< 0.1), small (< 0.2), moderate (< 0.37) or large (> 0.37).

Food agency: The meta-analysis showed small positive significant effects of peer support and counselling on food agency. However, the small number of studies limited this finding. Moderator analyses were not significant.

Food access: Although the meta-analysis did not reveal any significant results for food access outcomes, when considering the moderators, some results became significant. Peer support and counselling showed on average larger effects in areas of higher environmental vulnerability (based on the WRI vulnerability index). Peer support and counselling' effects were, on average, less effective when interventions were implemented in the context of ongoing drought, relative to those not facing droughts. Additionally, interventions were less effective when initiated in more recent years in comparison to interventions initiated further in the past (comparing studies from 2011, 2013, 2014, 2015, 2016, 2017 and 2022).

Food utilisation: Even though overall effects of peer support and counselling were not significant, moderator analyses revealed some nuances. Interventions were on average less effective on food diversity when implemented in contexts of higher vulnerability compared to lower vulnerability contexts, according to the GVI, and when combining the ICSBC components with cash transfers (conditional or unconditional) compared to interventions not including this component. This finding is rather surprising but as the results on vulnerable groups in Section 4.5 show, sometimes household dynamics trigger unexpected results. For anthropometric measurements,

while not significant in the meta-analysis, environmental vulnerability (WRI vulnerability index) led to interventions being less effective, while using the ND-GAIN index revealed higher effectiveness in more vulnerable settings.

Healthy eating classes

This intervention type summarises activities that use a classroom structure to provide messages regarding healthy eating; these are classes outside of the school environment (for example, cooking demonstrations).

Main findings:

- There was no evidence from this study that healthy eating classes are an effective tool to contribute to the six outcome areas.
- For achieving **food diversity** and **food access**, such classes might work in specific settings – for example, in countries with relatively low environmental vulnerability.

Nine studies (17%) provided rigorous evidence of consumer-side classroom interventions on food security and nutrition (see Table 18). Estimates were available for food access, availability, utilisation and stability but not for agency and sustainability. There was no regional focus for this type of intervention. Targeting the lack of nutrition knowledge as a hindering factor, studies included examples of this intervention type,

such as participatory workshops to disseminate nutritional information on healthy food items and diets, that were sometimes aimed at vulnerable groups (Fongar et al., 2023; Grijalva-Eternod et al., 2023). Other examples, as noted in Uganda, included fliers or voice recordings with detailed information on healthy diets (Fongar et al., 2023).

When taken individually, six of the nine studies demonstrated at least one significant positive effect on food security and nutrition, but only in terms of utilisation (Table 20 in Annex 7). The meta-analysis, in turn, did not find significant positive effects across different settings.

The moderator analysis provided some insights. For **food diversity**, healthy eating classes were less effective in drought-affected settlements compared to unaffected areas. Healthy eating classes were also less effective for **food access** when implemented in contexts of higher vulnerability compared to lower vulnerability contexts, according to the WRI vulnerability index. Furthermore, interventions initiated in recent years were less effective for food access compared to those implemented further in the past (comparing studies from 2005, 2013, 2015, 2017 and 2022).

Community meetings

Community meetings aim to disseminate messages on healthy eating informally to the community. Several types of activities classify as a community meeting, and some might already be established for other purposes (such as women's self-help groups or microfinance groups). Generally, these meetings are open to the public.

Main findings:

- Community meetings worked consistently across diverse settings to improve **food agency**.
- Community meetings showed context-dependent results for **food access** and **food diversity**.

There were eight studies (14%) on this intervention type in the sample (see Table 18). Estimates were available for all outcome areas, but especially for food access and food utilisation. Focused on the needs of beneficiary groups, examples of this intervention usually included meetings that also aimed to facilitate participation at the village level. In the case of Tanzania, for instance, community members were encouraged by mentor farmers to attend these meetings in order to be more involved, and they were an effective measure of lessons learned at the household level (Santoso et al., 2021). Also in the case of South Africa and a study based on multiple countries, meetings of community members were aimed at motivating participation (Steinke et al., 2023; Tesfamariam et al., 2018).

When taken on their own, seven out of eight studies demonstrated at least one significant positive effect on food security and nutrition, and several positive significant results were available for each dimension of food security and nutrition, except stability. The meta-analysis revealed positive significant effects for food access, diversity and agency, which were either small or very small (see Table 12).

Table 12 Community meeting: Meta-analyses results

Outcome area	Effect	95% confidence interval	Significance of effect (p-value)	Number of estimates
Food availability	Not enough evidence			
Food access	0.15	0.01, 0.31	.04	5
Food utilisation: food diversity	0.14	0.02, 0.25	.02	5
Food utilisation: anthropometrics	-0.01	-0.06, 0.04	.60	3
Food stability	Not enough evidence			
Food agency	0.09	0.02, 0.16	.01	3
Food sustainability	Not enough evidence			

Source: DEval, own visualisation based on calculations by Lwamba et al. (2026)

Notes: Rows in **bold** indicate a statistically significant effect. At least two studies are necessary to run a meta-analysis. Any outliers or overly influential estimates, if they existed, have been removed. Estimates with high risk of bias were not removed from the estimates. Effects can be categorised as very small (< 0.1), small (< 0.2), moderate (< 0.37) or large (> 0.37).

Food access: Community meetings led to small positive effects on food access. Effects of community meetings on food access were on average smaller for interventions implemented recently compared to interventions implemented further in the past (comparing studies from 1997, 2013, 2014, 2016 and 2022). Effects were also smaller on average when interventions took place in areas that are environmentally more vulnerable compared to less vulnerable areas, based on the WRI vulnerability index and the GVI, and in regions experiencing droughts compared to non-affected regions.

Food diversity: Community meetings contributed to small, statistically significant increases in food diversity. Community meeting interventions showed on average larger and statistically significant effects on greater food diversity for those targeting rural communities. The effects on food diversity were smaller in contexts of higher environmental vulnerability.

Food agency: According to the meta-analysis, community meetings were associated with very small positive effects on food agency. The moderator analysis did not find moderators significantly influencing a difference in effects by specific subgroups.

Healthy eating media campaigns

(Social) media campaigns that promote healthy eating in newspapers, social media, radio and TV are classified as healthy eating media campaigns. This also includes campaigns in magazines and newsletters, movies and multimedia, text messages, newsletters, posters and games.

Main findings:

- **Evidence was limited** for meta-analyses on the healthy eating media campaign intervention type.
- Healthy eating media campaigns might work consistently across diverse settings to increase **food diversity**, but more evidence is needed.
- They might be less effective on **food access** when implemented in areas of relatively low environmental vulnerability.

Five studies in the sample included this intervention type (see Table 18). They provided estimates for food access, food utilisation and stability. With a lot of importance placed on the receiving end and how consumer behaviours are shaped, it was seen in a study on Uganda that fliers handed out to households as well as voice messages were rather successful in terms of getting information on healthy eating through to community members (Fongar et al., 2023).

Only three out of the five studies demonstrated at least one significant positive effect on food security and nutrition. At least one positive significant effect was documented for each dimension. In the meta-analysis, positive significant results were only presented for food diversity (see Table 13). Effects on food access were significant at the 10% level only.

Table 13 Healthy eating media campaigns: Meta-analyses results

Outcome area	Effect	95% confidence interval	Significance of effect (p-value)	Number of estimates
Food availability	Not enough evidence			
Food access	0.07	-0.005, 0.15	.07	3
Food utilisation: food diversity	0.29	0.11, 0.48	<.01	2
Food utilisation: anthropometrics	0.05	-0.06, 0.16	.35	2
Food stability	Not enough evidence			
Food agency	Not enough evidence			
Food sustainability	Not enough evidence			

Source: DEval, own visualisation based on calculations by Lwamba et al. (2026)

Notes: Rows in **bold** indicate a statistically significant effect. At least two studies are necessary to run a meta-analysis. Any outliers or overly influential estimates, if they existed, have been removed. Estimates with high risk of bias were not removed from the estimates. Effects can be categorised as very small (< 0.1), small (< 0.2), moderate (< 0.37) or large (> 0.37).

Food diversity: Healthy eating media campaigns contributed to a moderate and statistically significant increase in food diversity. However, only two studies were available, so no conclusions can be drawn. Effects did not vary by any moderators.

Food access: Without significant effects in the meta-analysis, the moderator analysis on food access showed effectiveness under certain conditions. Healthy eating media campaigns had on average larger effects when they were implemented further in the past compared to those more recently implemented (comparing studies from 2005, 2014 and 2019). The interventions might also be only effective in settings of lower environmental vulnerability, based on the ND-GAIN index and the INFORM Climate Change Risk Index (projection for 2050).

Nutrition advisory services

Food and nutrition advice by trained health professionals, such as dietitians or nurses, are classified under nutrition advisory services. Advice is given one-on-one or in a group. It is important to note that general information provision is not qualified as nutrition advisory service; rather, advice is based on the provider's professional training and education.

Main findings:

- The meta-analysis did not find any significant effects for nutrition advisory services, even though single studies showed positive significant effects.

Among the studies underlying this meta-analysis, five studies examined this type of intervention (see Table 18), with estimates available for all outcome areas except food availability and food sustainability.

Four of five studies demonstrated at least one significant positive effect on food security and nutrition, more specifically on food access, utilisation and agency. However, when data was combined for meta-analysis, no significant effects were evident (see Table 21, Annex 7.4). At the 10% significance level, effects were significant on food access and were more effective when participants had longer exposure to the intervention activities and these were followed up over a longer time, as revealed by moderator analysis.

Door-to-door campaigns

Door-to-door campaigns aim to provide messages regarding healthy eating directly and personally (excluding home visits).

Main findings:

- Apart from single studies showing significant effects, there was no evidence from the meta-analysis that door-to-door campaigns are effective.

Four studies analysed this intervention type (see Table 18), offering estimates for food access, utilisation and agency. Three of four studies demonstrated at least one significant positive effect on food security and nutrition – namely, for food access, utilisation and agency. Meta-analysis, however, did not produce any positive significant effects (Table 22, Annex 7.4), neither were any moderators relevant for this intervention type.

4.4 Multicomponent interventions

Main findings:

This evidence synthesis finds no significant results from the moderator analyses, providing no evidence for general differences in effectiveness of multicomponent interventions in comparison to single-component interventions.

The qualitative analysis shows that compared to using single-component interventions, combining at least two different components may be beneficial in **one of three ways**:

- Only** the multicomponent intervention shows an effect; single components do not show an effect.
- Different components contribute to **different areas of food security and nutrition**, supporting a combination approach.
- As well as intervention effects, there may be **efficiency gains** – for example, through joint project administration – making the implementation of multiple components more beneficial.

More evidence with single estimates for different treatment arms is needed to fully understand the specific benefits, synergies and risks of multicomponent interventions.

Multicomponent interventions have a long-standing tradition in development cooperation, especially in the agricultural sector. Often, ICSBC interventions are not implemented as stand-alone activities but in combination with other components that address underlying structural problems within the food system, as illustrated by the behaviour change wheel (Michie et al., 2011). Two main types of multicomponent interventions are observed:

1. ICSBC components can be combined with components that provide in-kind inputs, financial assistance or construction/infrastructure work. For example, in addition to taking part in capacity strengthening activities, farmers might receive inputs like seeds or manure or they might receive community storage, and mothers might receive additional cash transfers or nutritious food for their children.
2. Several ICSBC components can be combined – for example, training and awareness raising campaigns.

In the quantitative evidence for this study, 36 of 53 studies included more than one component. Use of ICSBC activities with in-kind support – such as provision of seeds, fertiliser, machinery and children's toys – was the most prominent combination (16 studies). Nine studies analysed interventions with conditional or unconditional cash transfers, while five studies considered direct, in-kind food support or nutritional supplementation alongside ICSBC interventions.

Qualitative evidence from German development cooperation confirmed that the BMZ funds many multicomponent interventions. Especially in financial cooperation, sustainable use of infrastructure (for example, irrigation facilities) was facilitated by accompanying training measures (D11, D24, D28). For technical cooperation, it worked the other way around, with capacity development supported by provision of agricultural inputs (D39, D40). DEval's evaluation of interventions for climate change adaptation showed that agricultural interventions with a focus on climate adaptation were more effective when combined with components based on nature-based solutions³² (Noltze et al., 2023).

The effect of multicomponent interventions was analysed using moderator analysis to test for differences in effects from

multicomponent versus single-component interventions, and specifically if there were differences where a cash transfer was one of the interventions used alongside an ICSBC intervention. The first of these moderators was not significant in any study; the cash transfer moderator was significant in only one study. Thus, effects seem diverse and not generalisable. However, there may be methodological challenges, as studies often only reported on the effect of the interplay of components and did not provide data on individual components separately. In the quantitative analysis, only 13 studies provided such data. Therefore, the following provides a qualitative overview of information on the effectiveness of multicomponent interventions in the food supply chains and consumer behaviours pathways.

Some studies showed that multiple components led to effects, while single components were not effective. Mpiira and Okello (2020) studied a combination of seed provision, agricultural extension services, agricultural credit or vouchers, insurance and health services. They noted that the intervention package with seeds, training, health services and agricultural credit was the only combination to significantly increase household food access. Boucher et al. (2022) combined seed provision with training and insurance provision. They found that the additional insurance component had a positive effect on reducing yield shocks compared to training only (food availability). Datta et al. (2021) noticed a large and significant effect on short- and long-term food security based on cash transfers combined with peer support for mothers, but cash transfer alone was not significant. Biggeri et al. (2022) studied a combination of workshops, peer-to-peer learning and storage provision in addition to providing farmers with a quality premium for their produce. They found that compared to the control group and households with partial treatment, only households receiving the full intervention package had significantly better food utilisation outcomes (for example, dietary diversity).

In another set of studies, multicomponent interventions had additive effects. Dzanku and Osei (2018) studied the effects of agricultural training combined with phone reminders. They found that the training component had a positive impact on food availability, but there were slightly stronger effects when both components were combined. Boucher et al. (2022)

³² Nature-based solutions are activities that make use of ecosystems and biodiversity as well as sustainable management, conservation and restoration of ecosystems, such as forest restoration, conservation agriculture or restoration of rivers and wetlands (Noltze et al., 2023).

noted an “excess mitigation” effect for the combination of drought-resistant seeds and insurance technology, which appeared once farmers witnessed the benefits of these technologies in the face of real crisis. They subsequently increased their investment in them. Biggeri et al. (2022) also reported an additive effect and found that the first training component was the most important. This finding was supported by Fongar et al. (2023).

The question remains whether multicomponent interventions are more effective than the sum of their parts, as the examples mentioned in this study showed only additive effects. According to Steinke et al. (2023), each added activity increased the probability for food security and nutrition gains by about 1%. The mixed results and diverse effects of components on effectiveness show that multicomponent interventions are dependent on context and need to be adapted to local conditions; even if a combination has proven to be effective in one setting, it may not work elsewhere. This was highlighted by Banerjee et al. (2017), and more research is needed to be able to disaggregate the effects of individual components.

It is possible to implement different components sequentially, as in Sakketa et al.’s (2022) study. The programme consisted of three phases, each with a different agricultural focus. The authors found that the first phase had significantly higher impacts on the adoption of agricultural practices, but productivity was higher in the follow-up period. Furthermore, a warehouse built in the initial phase of the programme contributed to positive impacts at a later stage but would need continuous support (Sakketa et al., 2022).

On the consumer side, the combination of ICSBC interventions with cash transfers has shown mixed results. In most individual quantitative studies, significant positive effects were found. For example, Datta et al. (2021), Grijalva-Eternod (2023) and Premand and Barry (2020) found positive effects of multicomponent interventions compared to cash transfers alone. Two studies presented somewhat different results. First, Gilligan et al. (2020), while finding a positive effect on food utilisation and stability when cash transfers and healthy eating classes were combined, as opposed to cash transfers only, found no significant effect compared to the control group, so the study was inconclusive regarding the overall effects (Gilligan et al., 2020). Second, Ali et al. (2022) found no significant effect on

food utilisation of a counselling component and the combined intervention arms that included cash transfers. The moderator analysis could also not confirm a positive effect of cash transfers in combination with ICSBC interventions. Indeed, the opposite was found in our analysis: the only time the moderator of cash transfers was significant, the combination of peer support and counselling with cash transfers returned smaller effects on food utilisation than peer support and counselling alone (see Section 4.3). This surprising result is not directly explainable, but the findings on vulnerable groups show that household dynamics can sometimes trigger unexpected results. As such, the benefit of additional cash transfers remains inconclusive.

The results of the quantitative studies show that different components in multicomponent interventions contribute to different food security and nutrition outcome areas. Together, they contribute to improving food security and nutrition overall. Sakketa et al. (2022) examined marketing support in combination with agricultural extension services and the provision of inputs. They concluded that different components have effects on different outcomes, and while the marketing component mostly improved market access and productivity (food availability), the training component mostly improved sustainable land management practices and nutrition (food utilisation and sustainability). Premand and Barry (2020) analysed an intervention consisting of cash transfers and healthy eating classes, community meetings and door-to-door campaigns. They reported a positive effect of the multicomponent intervention, as compared to cash transfers only, on breastfeeding and children’s dietary diversity. However, stand-alone cash transfers led to an increase in parents’ dietary diversity only, indicating that training affected spending behaviour and food utilisation for children.

Even though multicomponent interventions may not always create additional positive effects in comparison to implementing single components, other benefits might arise in terms of cost-efficiency and organisational advantages. Datta et al. (2021) found that interventions with behaviour change components performed better than cash transfers alone, thus increasing cost-effectiveness. Furthermore, MacPherson and Sterck (2021) found that a development approach consisting of cash transfers and ICSBC performed better, and had lower cost, than in-kind food rations – that is, there was increased efficiency.

Alongside these benefits, operational synergies may occur which also contribute to cost-effectiveness (Steinke et al., 2023). Premand and Barry (2020) observed that operational synergies between the components were possible – for example, by enabling implementation at a larger scale than would have been possible for an ICSBC component alone. Furthermore, compared to separate individual components, combining interventions can reduce the opportunity and transaction costs of participation per beneficiary. However, there are nuances. Steinke et al. (2023) identified that while effects on food security and nutrition outcomes initially increased when participants took part in several activities, participation in more than 20 activities was the tipping point where effects started to decrease. They concluded that fewer, carefully selected interventions may be the best strategy.

4.5 Vulnerable population groups

Main findings:

- ICSBC interventions that directly address vulnerable population groups can improve equity in food security and nutrition outcomes, confirming the effectiveness of the Human Rights-Based Approach to development.
- The root causes of vulnerabilities – in terms of rights, resources and representation – must be addressed before vulnerable population groups can benefit from ICSBC interventions. One way to achieve this is through the combination of ICSBC interventions with in-kind inputs, cash transfers or infrastructure.
- Rigorous evidence is limited when it comes to differentiated effects of ICSBC interventions for vulnerable population groups, especially for people with disabilities, older people and indigenous people.

Targeting vulnerable population groups³³ is the cornerstone of many of the development cooperation interventions that are designed to realise the right to adequate food. This right is rooted in global and national strategies like the 2030 Agenda, with the principle of leaving no one behind; the Human Rights-Based Approach; the BMZ's quality criteria of human rights, gender equality, inclusion and reducing inequalities; and the PANTHER principles of participation, accountability, non-discrimination, transparency, human dignity, empowerment and rule of law. These principles highlight the role of inclusion, participation and empowerment and the need to tackle structural inequalities for sustainable and inclusive development. Implementing targeted approaches for vulnerable population groups is, therefore, central in realising the right to right to adequate food.

This section summarises this study's findings on the effects of ICSBC interventions for food security and nutrition of vulnerable population groups in sub-Saharan Africa. It relies mainly on qualitative analysis and narration of individual study results, as quantitative meta-analysis was subject to data availability constraints. Although almost half of the studies included in the quantitative analysis assessed interventions that primarily targeted vulnerable population groups (n = 23),³⁴ few studies provided subgroup data on outcome levels. Instead, these studies aggregated indicators at general population level. This might be one of the reasons why moderator analysis for specific subgroups was not significant. Data on women was the most readily available (n = 12). In addition, not all groups that can be considered vulnerable were considered in the available studies. What can be drawn from the quantitative analysis is that when subgroup data on effects were available, there were meaningful differences in the size, direction and statistical significance of programme impacts for vulnerable population groups and other beneficiaries.

The qualitative findings help to understand why effects might differ and what implementers need to consider in interventions to improve food security and nutrition for vulnerable population groups. Interested readers may also consult a discussion paper accompanying this study (Coogan et al., 2026), on which this section is based.

³³ Two terms could be used in this regard: "vulnerable population groups" and "groups in vulnerable situations". While the first highlights that individual characteristics can create vulnerability, the second emphasises that structural and situational factors also play a crucial role. Individual characteristics can particularly contribute to a person's vulnerability regarding food security and nutrition. Therefore, the term "vulnerable population groups" is used throughout this study. However, the reader should always be aware of the different structural causes of vulnerability.

³⁴ This comprised girls, women and mothers (n = 12), children and youth (n = 7 and n = 2, respectively) and displaced populations (n = 2). No impact data was found for other key vulnerable population groups, such as persons with disabilities, marginalised communities, those with limited education or income, or older age groups.

Vulnerabilities in the food system

Vulnerability is a highly contextual and theoretical concept that is defined differently by various actors. It is typically described as a combination of exposure, sensitivity and adaptive capacity that makes it more difficult for certain groups to react when exposed to external challenges or shocks – such as climate change, conflict or economic downturn (Paloviita et al., 2016). The analysis here focuses on the vulnerabilities of individuals and communities in the food system. Within a food system, vulnerabilities present for both individual and structural reasons (Montalbano and Romano, 2023), and these often overlap and intersect. People can be more vulnerable because of specific nutritional needs that worsen the effects of malnutrition. Examples of vulnerable population groups are people of younger or older age, pregnant or breastfeeding women and people with illness or disability (Abdullahi et al., 2024; Devine and Lawlis, 2019). Other vulnerabilities exist because of systemic inequalities at a legal, economic, cultural or societal level that prevent some groups from fully engaging with and benefiting from food systems (Abdullahi et al., 2024; HLPE, 2023; Onyeaka et al., 2024). In the quantitative analysis, socio-economic inequalities were highlighted as major contributing factors for inhibiting resilience in the food system, with poor farmers particularly affected (Lwamba et al., 2026).

Within food supply chains, vulnerabilities can negatively affect food production (HLPE, 2023; May et al., 2025). They prevent vulnerable population groups from interacting with modern value chains – stemming from impeded access to equipment, agricultural inputs, markets, storage, processing and distribution systems (HLPE, 2023). As consumers, vulnerable population groups may be unable to afford healthy diets or lack access to markets (Cook et al., 2024). They tend to spend a larger portion of their incomes on food, and their food access disproportionately reduces during periods of inflation (FAO et al., 2025). In addition, vulnerable population groups are often surrounded by unhealthy food environments, live in areas with limited access to healthy diets and are commonly targeted by marketing campaigns for unhealthy foods (HLPE, 2023). Across all domains of the food system, unequal power dynamics within households, communities or countries can limit vulnerable population groups' bargaining power, preventing them from realising the full benefits of their contributions to food systems (Abdullahi et al., 2024; Coogan et al., 2026; FAO, 2025b; HLPE, 2023).

Generic food system interventions, which target the general population and do not account for vulnerable population groups, often fail to achieve their intended effects. This can inhibit the development of a resilient food system (Schipanski et al., 2016). However, it has been highlighted that vulnerable population groups are in fact difficult to reach – precisely because of their vulnerability (Ofosu-Ampong et al., 2025; Waddington et al., 2014). Evaluations by the Dutch Policy and Operations Evaluation Department and the International Fund for Agricultural Development found that agricultural interventions tend to primarily reach those farmers that are already better off and can use networks and resources to access (ICSBC) interventions (IFAD, 2019, 2021a; IOB, 2017). Similarly, a DEval evaluation on the promotion of agricultural supply chains found that chronically poor people are especially difficult to reach due to their lack of land, knowledge and capital (Kaplan et al., 2016).

ICSBC interventions for vulnerable population groups

A consistent theme of the qualitative analysis is that many vulnerable population groups lack access to basic rights, services, security and resources to fully benefit from ICSBC interventions as a stand-alone activity. Inequalities regarding access to tools, financial capital and technical skills are constraints that limit the effects of ICSBC efforts (Lwamba et al., 2026). Poverty, in particular, is a central barrier to food security and nutrition in sub-Saharan Africa (Abdullahi et al., 2024; Onyeaka et al., 2024). While poverty is considered a vulnerability in itself, in most cases it overlaps with other vulnerabilities. Much of the disparity in food security, stunting and child dietary diversity in sub-Saharan Africa is driven by differences in socio-economic status, including wealth (Headey et al., 2018). Poor households have limited productive and financial assets, meaning they are unable to afford a diverse, nutritious diet and are vulnerable to food price shocks (OECD and FAO, 2025).

The qualitative analysis shows that a combination of interventions (see Section 4.4) that provide cash transfers, tangible inputs or infrastructure that directly mitigate vulnerabilities are particularly important for reaching vulnerable population groups. This combination of assets, education and economic resources can empower vulnerable population groups and improve productivity, sustainability, food security, economic and rural development, and equity (Ofosu-Ampong et al., 2025). How interventions combining the provision of assets with capacity strengthening interact has

been studied for the ultra-poor in particular.³⁵ Those studies provide strong indication that a combination of cash transfers and ICSBC interventions leads to larger and more long-term effects on food security and nutrition for vulnerable population groups than providing cash or training only (Bouguen and Dillon, 2024; Fahey, 2015; Hoddinott et al., 2024).

Equally important in this respect is the negative influence of legal, societal and political power imbalances on food security and nutrition. In particular, indigenous, displaced populations and women often need to secure other rights before ICSBC interventions for food security and nutrition can be expected to succeed (Coogan et al., 2026). In some cases, this extends to other fundamental human rights – beyond the right to adequate food – such as land rights, working permits and voting rights.³⁶ They are important in achieving several food security and nutrition outcome areas, particularly agency and access. For example, ICSBC interventions aiming to empower women can positively affect food security and nutrition outcomes (Jie, 2022b; Berretta et al., 2023; IFAD, 2017; Murphy et al., 2024). In turn, improved food security and nutrition can positively affect empowerment of women and other vulnerable population groups (D38, D39) (Jie, 2022b; Basak et al., 2024; IFAD, 2017, 2019; IFAD IOE, 2024; IOB, 2017; Murphy et al., 2024).

Overall, the analysis confirms the role of the Human Rights-Based Approach in ICSBC intervention design and implementation for vulnerable population groups. The findings suggest that interventions centred around the principles of participation, ownership, inclusion and cultural sensitivity as well as gender transformative approaches can increase ICSBC intervention effects (Lwamba et al., 2026) (D13, D37, D38, D39, D40). Not considering cultural and societal norms can lead to an intervention having negative effects. For example, one intervention faced such strong backlash against its gender messaging that the success of the intervention suffered (Santoso et al., 2021). This means, however, that there is no one-size-fits-all approach and that contextually relevant communication that resonates with diverse local cultures and

groups is key. Accordingly, the available evidence on the effects of ICSBC interventions on specific vulnerable population groups is discussed next. This includes differentiated effects, factors that influence effectiveness and possible risk of unintended intervention effects. However, for some vulnerable population groups, no relevant evidence was found.

Group-specific considerations

Legal and social norms restrict **women's** power, roles and responsibilities at both the household and community levels. Often, this makes them more likely to experience poorer food security and nutrition than men (Mbow et al., 2019; Schipanski et al., 2016). This is the result of, for example, women's lack of rights to access land to produce food, limited control over financial resources to spend on food or restricted decision-making powers over which foods to consume (Mbow et al., 2019; Onyeaka et al., 2024; Schipanski et al., 2016). In addition, they are typically the first to reduce consumption in times of scarcity. This becomes particularly problematic during pregnancy and breastfeeding, which place additional demands on food and nutrition on mothers (Mbow et al., 2019). Adequate nutrition during a child's first 1 000 days, between conception and completion of their second year of life, has a direct and long-standing effect on their health and development (Draper et al., 2024; Kinshella et al., 2021; Likhar and Patil, 2022). According to UNICEF (2021), undernutrition in pregnancy is still a major driver of stunting.

These structural constraints may limit women's chances to meaningfully engage in agricultural interventions, even when they are motivated or included in programming, thereby impeding ICSBC intervention success. Across sub-Saharan Africa, there is great gender variability in the adoption of climate-smart agricultural practices (Ogisi and Begho, 2023). Where ICSBC interventions require upfront investment, women's restricted access to finances and resources can be a limiting factor. Mnukwa et al. (2025) controlled for women's access to resources when examining intervention effects and found that their greater access to resources made them more likely than men to adopt certain climate-smart agricultural

³⁵ This has been called the "graduation approach", designed to graduate people out of poverty. Cash transfers, capital transfers, skills development and financial services are sequenced to make sustainable improvement in the livelihoods of the ultra-poor. The graduation approach was initiated and piloted by BRAC in Bangladesh in 2002 and has been scaled up and expanded to various countries ever since. See, for example, Sulaiman (2016) and Tambe (2022) and face disadvantages across multiple dimensions. We compare the cost-effectiveness of three strands of social protection interventions: livelihood development programs, lump sum unconditional cash transfers (the transfer of a large sum of cash with no restrictions on use.

³⁶ Examples here refer to the right to work/decent work (art. 6, 7: ICESCR), non-discrimination (art. 2, 3: International Covenant on Civil and Political Rights) and electoral rights (art. 25: International Covenant on Civil and Political Rights). This does not preclude the relevance of other human rights, such as the right to adequate housing, which includes an appropriate place to prepare food (art. 12: ICESCR) and the right to water (art. 12: ICESCR, in combination with General comment No. 15 [2002] on the right to water, para. 3 [UN CESCR, 2003]).

practices as a result of training. Other impeding factors include women's societal standing and the need to obtain their husbands' permission to participate in activities (Awoke et al., 2025; Fakhi and Sikira, 2018; Mnukwa et al., 2025). Either of those factors or their combination may lead to lower adoption rates among women after ICSBC interventions (Awoke et al., 2025; Mnukwa et al., 2025; Ogisi and Begho, 2023). In addition, Awoke et al. (2025) highlighted the importance of representation of female extension workers to enhance knowledge dissemination among female farmers.

The relationship between women's empowerment and ICSBC interventions on food security and nutrition is complex. In Tanzania, for example, farmer field schools increased women's membership in influential community-level groups and their access to land and resources, but this had no statistically significant effect on their input into productive decisions at

the household level (Garbero and Chichaibelu, 2018). In turn, a sustainable agriculture and livelihoods diversification programme in Ghana improved group participation among female-headed households but had no effect on food stability and reduced food agency despite overall programme success (Pretari, 2019).

Men's support is key to intervention success (3ie, 2022b). In Ghana for example, pest management information provided to women led to higher rates of adoption but had no effect on yield or dietary diversity unless men were also provided with the information (Tambo et al., 2023). When both men and women received information, adoption, yield and dietary diversity all improved, suggesting that men's buy-in was needed for women to convert their improved agricultural practices into improved outcomes. This was confirmed in an evaluation synthesis highlighting the role of male champions (GIZ, 2023).

Box 3 Cash transfers and ICSBC interventions for women

Cash transfers are not an ICSBC intervention, but these are often combined to mitigate economic inequalities (see Section 4.4). They can, however, lead to mixed results in terms of women's empowerment (Mnukwa et al., 2025). A government project combined unconditional cash transfers for women with a package of community behaviour interventions on nutrition. On a positive note, the project increased food diversity and nutritional value, led to better health outcomes for children and increased women's nutritional knowledge. However, the authors observed that the cash transfers affected women's empowerment negatively, as their husbands started engaging more in decision-making about childcare because of the cash transfers, reducing the women's ability to make independent decisions (Briaux et al., 2020). In Nigeria, on the other hand, due to the societal context, women were able to maintain control over cash transfers provided to them. Demographic data from Nigeria showed that while husbands in the country typically control decisions on fertility, healthcare and household purchases, wives retain strong agency in one key area: spending their own earnings. Over 90% of women reported they alone decide how to spend the money they bring into the household – including cash transfers (Carneiro et al., 2021; Glover and Sumberg, 2020). This highlights the importance of understanding local customs and social norms prior to implementing an intervention.

Children and youth have specific food utilisation requirements, including breastfeeding, heightened hygiene needs and specific care practice needs (UNICEF, 2019, 2020). Especially during a child's early years of life, adequate nutrition plays a vital role in ensuring lifelong health and development (Schwarzenberg et al., 2018). As outlined earlier, children's food security and nutrition is closely tied to that of their mothers (UNICEF, 2020). In food-secure contexts, breastfeeding promotion and complementary ICSBC interventions can effectively improve child nutrition, but in food-insecure contexts, these may need

to be bundled with food supplementation (Keats et al., 2021). Maternal and child health interventions that include the provision of food effectively reduce undernutrition, but may increase overnutrition (Escher et al., 2024). In contrast, maternal and child health interventions that focus only on behaviour change seem to be effective at reducing the double burden of malnutrition (Escher et al., 2024).³⁷

For children and youth, school-based nutrition programmes can be effective in improving nutrition outcomes. These programmes

³⁷ The double burden of malnutrition refers to a growing phenomenon in which overnutrition and undernutrition is observed within the same country, community, household or even individual. It is often characterised by a pattern of overweight or obese adults and stunted children existing within the same households.

often combine ICSBC approaches with in-kind food support (Escher et al., 2024; Keats et al., 2021; Kyere et al., 2020; UNICEF, 2019). Peer-led, school-based ICSBC interventions have been shown to be effective at improving a variety of nutrition outcomes among youth aged 10–19 years in low- and middle-income countries. Ekubagewargies et al. (2025) looked at eight such interventions, seven of which achieved positive effects on diet. A combination of ICSBC interventions and in-kind food support or cash transfers tends to increase effects on food security and nutrition (Briaux et al., 2020; Ekubagewargies et al., 2025; Escher et al., 2024; Keats et al., 2021; Kyere et al., 2020; UNICEF, 2019). However, the evidence on generalised, school-based nutrition education and behaviour change programmes is less clear (Escher et al., 2024; Kyere et al., 2020). One review found that these programmes improved nutrition knowledge but did not consistently improve nutrition behaviours (Kyere et al., 2020), while another found consistent positive effects on the double burden of malnutrition (Escher et al., 2024). In both cases, the evidence base was small.

Children and youth in sub-Saharan Africa contribute to food production on family farms, as do other family members (Glover and Sumberg, 2020; Nchanji et al., 2023). However, when children become youth, they also increasingly go to stores, engage with external food environments and may even be given responsibility for procuring food when outside the home. However, they do not control financial resources to purchase food, rarely control land or agricultural resources and have little control over food access and household decision-making (UNICEF, 2020).

The scoping study of this synthesis showed that the evidence base regarding **people with disabilities** is especially scarce, and within the scope of this study, no conclusive evidence on impactful interventions to support people with disabilities was identified. This confirms a mapping review that sought evidence on interventions to support nutrition among people with disabilities in low- and middle-income countries; this identified only ten relevant studies, none reaching a minimum level of quality and none in sub-Saharan Africa (Saran et al., 2020). This is despite studies showing that people with disabilities are very likely to experience food insecurity. For people with disabilities, social exclusion and discrimination seem to be major factors hindering their food access (Awuviry-Newton et al., 2022; Onyeaka et al., 2024).

For **older people**, too, evidence on differentiated intervention effects is very limited, despite their high degree of vulnerability. Older adults often experience reduced digestive efficiency, loss of appetite and taste, musculoskeletal limitations and comorbidities that affect food utilisation (Audain et al., 2017). At the same time, their food access is often hindered, as farming, foraging and collecting firewood becomes more difficult with age (Braimah and Rosenberg, 2022). The relationship between age and the adoption of climate-smart agricultural practices after training has been shown to be variable. Older individuals may have better access to information through interventions and agricultural outreach programmes, causing them to be more likely to adopt climate-smart agricultural practices. However, youth may be able to increasingly access agricultural information through information and communications technology and phone-based applications. In addition, older individuals may have more traditional preferences, reducing the likelihood that they will adopt climate-smart agriculture (Coogan et al., 2026; Mnukwa et al., 2025; Nchanji et al., 2023; Ofosu-Ampong et al., 2025).

There is a similar lack of evidence when it comes to **indigenous groups**, and no studies in the meta-analyses disaggregated for this vulnerable population group. In general, loss of land, lack of formal land rights and exclusion from government structures can negatively affect food security among indigenous groups (Dawson et al., 2021; Errico, 2021; Kuhnlein, 2015). In addition, indigenous groups may be more vulnerable to a loss of ecosystem services, such as through forest loss, soil deterioration and climate change, which limit access to foraged foods and wild game (Kuhnlein, 2015). On the other hand, indigenous populations should be advantaged in the food system as some native and underutilised crops have been shown to be more resilient to climate change than modern varieties (Mbow et al., 2019); recently, this has led to growing efforts to re-mainstream the use of indigenous crops (Mabhaudhi et al., 2018).

ICSBC interventions to support food security and nutrition for indigenous populations may empower their stewardship and management of ecosystems, using or reviving their traditional knowledge with support from external partners (Dawson et al., 2021; Kuhnlein, 2015). Conservation agriculture interventions empowering local institutions resulted in better outcomes for people and the environment as opposed to market-based

interventions for conservation (for example, supporting agricultural development), which increased inequality (Dawson et al., 2021).³⁸ Some interventions provided education on traditional foods and nutrition (Kuhnlein, 2015; Onyeaka et al., 2024).

Forced displacement is both a cause and a consequence of acute food insecurity and malnutrition (FSIN and GNAFC, 2023, 2025; Onyeaka et al., 2024; Vos et al., 2020). Displacement-affected people are particularly vulnerable to food and nutrition crises, as they often lack basic rights – through their displacement, households lose their land and access to food production resources. In their new communities, they are often prevented from legal employment and financial services, leading them to adopt harmful coping strategies such as increased debt, child labour and the forced sale of sexual services (FSIN and GNAFC, 2023, 2025; Onyeaka et al., 2024). In addition, they may also be subject to a lack of social standing within host communities. Therefore, for communities affected by displacement, ICSBC interventions may be a particularly important accompaniment to interventions that aim to realise their human rights (Coogan et al., 2026).

Therefore, effective ICSBC interventions supporting displaced populations extend beyond direct information provision to facilitate integration, establish local support and mitigate hostilities with **host communities** (Nisbet et al., 2022; Vos et al., 2020). Such hostilities can arise from a perception that aid organisations prioritise those affected by displacement over host community members (Nisbet et al., 2022). Including host communities in targeting criteria can mitigate this. Interventions that work with host communities to help refugees access documentation and secure the same rights as citizens can be an important component of food security, as they help secure access to education, healthcare and employment (Nisbet et al., 2022). These interventions often require a behaviour change component to reduce discrimination against displaced populations, causing host communities to legalise their status. They can also require a capacity strengthening component to support document processing. Integrating displaced people into local economies and food systems through livelihoods and land interventions can enable self-sufficiency and the development of durable solutions for all (Nisbet et al., 2022; Vos et al., 2020).

4.6 Food system resilience to environmental crises

Main findings:

- Farmer field schools and agricultural extension services lead to improvements in the outcome area of food sustainability and can, therefore, play an important role in increasing resilience. For food stability, evidence is too scarce to provide conclusive findings.
- A country's vulnerability to environmental crises reduces the effectiveness of the ICSBC interventions on food security and nutrition outcomes.
- Multicomponent or cross-sectoral approaches increase an intervention's ability to strengthen food system resilience, especially for vulnerable population groups.
- Social capital leads to a higher level of resilience against crises for individuals, emphasising the relevance of community-based approaches and approaches that include marginalised groups.
- Higher perceived resilience increases actual resilience, highlighting the importance of resilience interventions with a specific focus on agency.

In times of growing environmental, political and economic crises, strengthening the resilience of the food system is a main objective to mitigate the negative consequences on food security and nutrition and secure the right to food in the long term (HLPE, 2020). Therefore, most food security and nutrition interventions including ICSBC components aim to increase the resilience of the food system in low- and middle-income countries.

The definition of resilience is subject to discussion in the literature, and a variety of definitions exists (FAO et al., 2021; HLPE, 2020; Tendall et al., 2015). While some definitions mostly focus on “bouncing back from shocks” (Tendall et al., 2015), others, like the latest definition by the HLPE (2025), suggest framing resilience much more broadly as equitable transformative resilience – that is, where “institutions, policies,

³⁸ This review focused on conservation and biodiversity, not agriculture. However, because natural resources are a key component of food security and nutrition for indigenous communities (Kuhnlein, 2015), this is considered to be relevant.

people, ideas and practices uphold the capacity of individuals, communities, nature and socioecological processes to prevent, absorb, adapt and transform in the context of multiple uncertainties compounded by structural and contingent shocks, stresses and differential vulnerabilities". In this understanding, most interventions in the field of development cooperation will contribute to improving resilience.

In their 2021 *State of Food Security and Nutrition in the World* report, FAO et al. (2021) defined resilience as "the capacity over time of agrifood systems, in the face of any disruption, to sustainably ensure availability of and access to sufficient, safe and nutritious food for all, and sustain the livelihoods of agrifood systems' actors". This opens up the definition from a focus on bouncing back to take a longer-term perspective, and it especially highlights stability of access to food and sustainability, though different dimensions also contribute to resilience.

Therefore, this study analyses the outcome areas food stability and sustainability as proxies to understand the effects of ICSBC interventions on resilience. These outcome areas are relevant as food stability focuses on the ability of a food system to maintain food access, availability and diversity in the face of risks and crises (HLPE, 2020). Food sustainability, on the other hand, refers to a food system's ability to provide long-term food security and nutrition. This includes practices to ensure long-term regeneration of natural, social and economic systems (HLPE, 2020). This goal is also reflected in the SDG 2 target on sustainable food production and resilience of agricultural practices.³⁹ Both outcome areas are considered in the following. This section continues by outlining how vulnerability and exposure to environmental shocks and stressors affect the effectiveness of ICSBC interventions on food security and nutrition outcomes. Furthermore, the analysis points to key elements of project design for achieving resilience, as identified in the quantitative studies that explicitly reference resilience.

Food stability

Twelve studies, covering ten countries, measured food stability outcomes. Four intervention types were prominent in the studies: farmer field schools and workshops and short

trainings (both food supply chain interventions) as well as peer support and counselling and healthy eating classes (both consumer behaviour interventions). Commonly reported measures included anxiety over food availability and access (for example, worry about a household's food intake). Other studies used dedicated resilience indices (for example, the index of absorptive capacity). For example, Pretari (2019) analysed a project in Ghana that aimed to build resilience by promoting resilient livelihood activities, improving the food supply and regenerating the natural resource base. The study included indicators that collectively gauged household stability and preparedness against economic and environmental shocks in the form of an absorptive index measure assessing factors related to household resilience and well-being.

Eleven positive effects were identified in the six studies, most prominently for workshops and short trainings and agricultural extension programmes. The meta-analysis result was based on a few studies, and the calculated results were not significant (see Table 23). Based on the limited available evidence, moderator analyses were not possible.

Food sustainability

Evidence for food sustainability outcomes was found for eight countries, presented in 12 studies. The studies on food sustainability mainly assessed intervention types in food supply chains: farmer field schools, agricultural extension services, workshops and short trainings, and farmer peer-to-peer learning; most of the available estimates were for farmer peer-to-peer learning interventions and workshops. Commonly reported measures included pollution and soil deteriorating practices (for example, use of pesticides, pollution), adoption of climate-resilient or sustainable practices (for example, adoption of soil and water conservation practices) and institutional adoption of sustainable food production policies (communal soil and water conservation policies). Garbero and Chichaibelu (2018), for example, assessed the effects of two farmer field school interventions on the adoption of improved sustainable practices in Tanzania. In Zambia, Sibhatu et al. (2022) evaluated the effect of the Smallholder Productivity Promotion Programme on the Gini-Simpson index, which measures crop diversification.

³⁹ SDG target 2.4 reads "ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality" (United Nations, 2024).

Eleven studies reported at least one positive effect on food sustainability. However, in the meta-analyses, effects were significant for only two intervention types. A moderate and statistically significant increase in food sustainability was revealed for farmer field schools, while agricultural extension

services resulted in a small and statistically significant increase in food sustainability. No other interventions showed statistically significant results, as shown in Table 14. Workshops and short trainings were on the margin of significance.

Table 14 Meta-analyses results: Effect of ICSBC interventions on food sustainability

Domain	Intervention type	Effect	95% confidence interval	Significance of effect (p-value)	Number of estimates
Food supply chains	Farmer field schools	0.23	0.10, 0.35	< .001	3
	Agricultural extension services	0.13	0.02, 0.24	.02	5
	Workshops and short trainings	0.05	-0.004, 0.12	.06	3
	Farmer peer-to-peer learning	0.34	-0.08, 0.77	.11	3
	Information and guidance	0.14	-0.09, 0.37	.22	2
	Storage and distribution capacity strengthening	0.12	-0.05, 0.29	.16	4

Source: DEval, own visualisation based on calculations by Lwamba et al. (2026)

Notes: Rows in **bold** indicate a statistically significant effect. At least two studies are necessary to run a meta-analysis. Any outliers or overly influential estimates, if they existed, have been removed. Estimates with high risk of bias were not removed from the estimates. Only intervention types for which a meta-analysis was possible are shown. Effects can be categorised as very small (< 0.1), small (< 0.2), moderate (< 0.37) or large (> 0.37). For consumer behaviour interventions and capacity strengthening on processing and packaging, not enough evidence was available to run meta-analyses.

Environmental crises affecting intervention effectiveness

According to the moderator analyses, for several intervention types, the observed effects on food sustainability varied by a country's environmental vulnerability. For **farmer field schools**, smaller effects of interventions were observed in the context of projected higher vulnerability compared to lower vulnerability contexts, according to the INFORM Climate Change Risk Index (projections for 2050 and 2080). **Agricultural extension programmes** had smaller effects on food sustainability in areas with higher levels of environmental vulnerability compared to areas with lower vulnerability, based on the WRI vulnerability index. This shows that interventions that aim to increase resilience were hindered by a higher vulnerability to the very crisis they were addressing, perpetuating the effects of the crisis (for example, by limiting community participation due to extreme weather events; Gilligan et al., 2020). **Capacity strengthening for storage and distribution** was more effective in lower vulnerability contexts compared to contexts of higher environmental vulnerability, but meta-analyses did not show an effect.

In fact, environmental vulnerability was the moderator that led to the most significant differences in effect across the different intervention type/outcome combinations (see Table 24 in the Annex). For 13 intervention type/outcome combinations, the meta-analyses observed smaller effects in a context of higher environmental vulnerability,⁴⁰ showing that this reduced the effectiveness of ICSBC interventions on food security and nutrition outcomes.

Moreover, one-quarter of the included studies reported an **ongoing risk or crisis** in the context of the intervention, like floods, droughts and epidemics. On several occasions, this explained a difference in intervention effectiveness (see Table 25 in the Annex). Yet, the direction of the effect varied and left room for different interpretations. Some studies described recurring droughts, erratic rainfall, floods, water shortages and pollution disrupting planned activities and limiting community participation (Biggeri et al., 2018; Gilligan et al., 2020; Millennium Promise, 2010). Even beyond that, participants in the Millennium

⁴⁰ Only on one occasion we find the reverse connection: an increase of the effectiveness for the intervention type peer support and counselling when the vulnerability of the country to environmental crises was higher (based on the ND-GAIN index), while for the same intervention type, vulnerability measured by GVI reduced effectiveness (see Section 4.3).

Village Project expressed a desire to abandon farming entirely due to unpredictable weather, escalating costs and degrading soils (Millennium Promise, 2010). In other cases, interventions were able to provide immediate support during crisis. This mixed influence of environmental shocks has been confirmed by evaluation reports and studies by German and international development cooperation (D33) (IFAD, 2021a; Noltze et al., 2023).

Project design for increasing resilience

To identify lessons for project design, 9 out of 53 quantitative studies explicitly mentioning resilience as one of the targets of the ICSBC intervention were studied.

While capacity strengthening play an important role in strengthening resilience – for example, via increasing knowledge about agroecological practices – ICSBC interventions as a stand-alone activity might not be able to increase food system resilience. For example, the availability of water and climate-adapted seeds were found to be critical for resilient agricultural production (Abate et al., 2021; Boucher et al., 2022; Issahaku and Abdulai, 2020). Deschamps-Laporte (2013) pointed out that the availability of drought-resistant crops and storage facilities can improve farmers' resilience. Therefore, **multicomponent interventions** are an important tool for increasing the resilience of the food system (see Section 4.4).

Furthermore, expanding these to **multisectoral approaches** is an additional leverage for strengthening resilience. For example, the Millennium Village Project in Kenya supported diversified livelihoods, offering small livestock, tractor services, cooperative support and microenterprise promotion, which allowed households to absorb climate shocks more effectively (Masset, et al., 2018). The importance of a diverse livelihood base was also highlighted by Fuller (2012), because it left households with a fall-back option in case income sources are negatively affected by crises and enabled them to reinvest in their assets (Walton, 2012). Blending ICSBC with climate interventions can also help address the underlying drivers of extreme events – for example, by combining ICSBC, activities with an adaptation focus and complementary mitigation action (IFAD, 2021b). One option to foster resilience is the landscape approach, which integrates all parts of the biosphere in project design and management (for example, a watershed management system, where water resources, land use and urban consumption are considered).

On an individual level, structural issues like **power imbalances**, cultural norms and traditions can create vulnerabilities and affect individual resilience capacities. Pretari (2019) found that vulnerabilities differed between persons depending on their age, gender, disability, income, religion and so on, which in turn made them more or less susceptible to adverse impacts of environmental risk and crises. For example, access to resources has been found to be unequally distributed, making vulnerable population groups more susceptible to environmental risks and crises, as they lack the financial and technical resources to react to them (Carneiro et al., 2021; Fuller, 2012; Kangmennaang et al., 2017; Pretari, 2019; Walton, 2012; Wanjala and Muradian, 2013). That means that to increase food system resilience, the group-specific considerations with regard to multicomponent interventions mentioned in Section 4.5 should also be considered.

Some studies highlighted that **social capital and collective action** can provide support and protection for individuals in crisis situations (Biggeri et al., 2022; Fuller, 2012). However, as with in-kind resources, social capital has been shown to be unequally distributed (Woodson et al., 2016). In instances where these social support systems were not available or sufficient, they needed to be accompanied by emergency services and humanitarian aid (Fuller, 2012). This highlights the importance of community-based approaches but also approaches dealing with marginalisation of specific population groups.

Furthermore, the ability of people to deal with crises depends on their **perception of their own capability**. Households aware of their own resilience are less likely to resort to negative coping mechanisms (like reducing food consumption). This also depends on their pre-existing experience with similar shocks. If they have recovered well in the past, they will more likely do so in the future and vice versa (Béné et al., 2016). Therefore, investing in supporting people to deal with crises will increase their success when dealing with them in the future, making this an important investment. Moreover, approaches focusing on people's agency to make their own decisions are promising. Furthermore, Boucher et al. (2022) highlighted that farmers who experienced drought and had already witnessed the beneficial effect of crop insurance were more likely to adopt it for future crises.

5.

DISCUSSION AND IMPLICATIONS

This final chapter first discusses the results against the ToC and then summarises the relevance of this study for the 2030 Agenda. Finally, implications are derived to provide policy makers and implementers with hands-on advice.

5.1 Summary and discussion

This study is intended to inform both German and other development cooperation actors to help them choose ICSBC interventions that are more likely to achieve food security and nutrition in sub-Saharan Africa. It also sheds light on relevant contextual factors and other important aspects that development actors need to consider when designing projects. Contributing to global food security and nutrition and realising the right to food for all is a strategic priority for German development cooperation; it is likely to remain high on the agenda. Germany is one of the largest donors in the field of food security and nutrition (BMZ, 2021), and capacity strengthening interventions are widely implemented by German actors (D8, D27, D39, D11).

To support future programming, the previous chapters synthesised rigorous evidence on the effectiveness of ICSBC interventions on food security and nutrition in sub-Saharan Africa. This is the first evidence synthesis covering a broad range of ICSBC activities together over the whole spectrum of food security and nutrition – the six outcome areas food availability, access, utilisation, stability, agency and sustainability. The study synthesises the evidence using meta-analysis, as opposed to providing a narrative summary or applying vote counting methods that are less rigorous and can result in misleading conclusions.

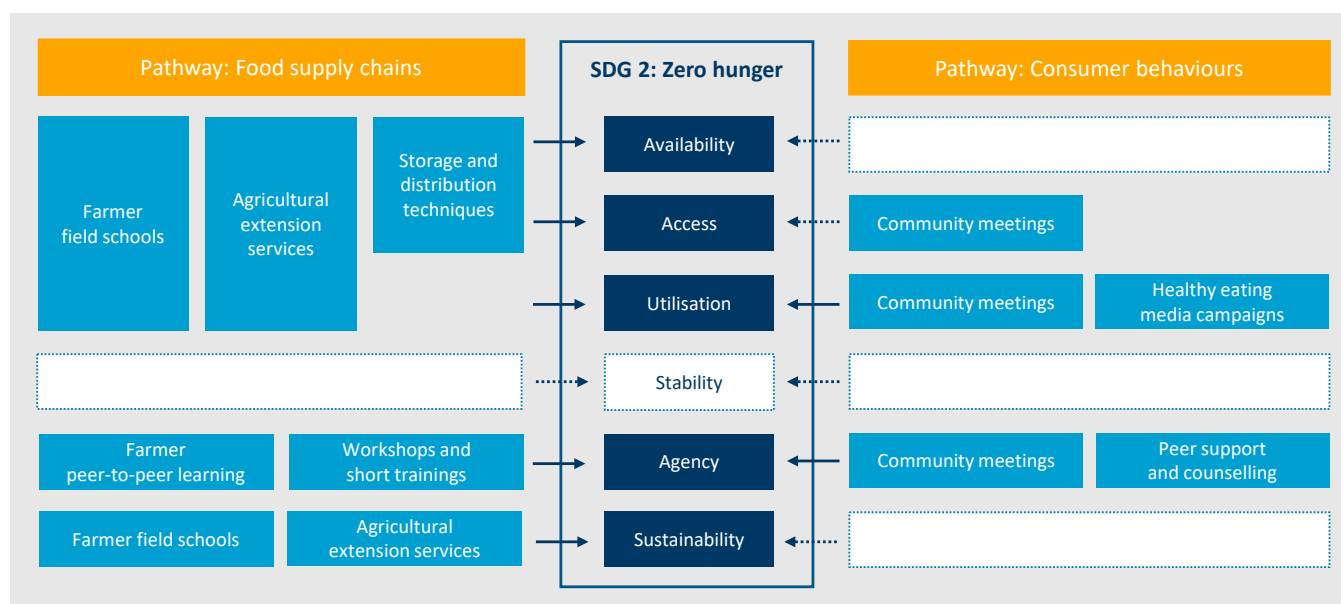
Overall, the results of the meta-analysis show positive effects of ICSBC interventions on the intended outcome areas, while no negative effects were observed. However, **none of the studied intervention types shows positive effects on all outcome areas**. This shows the higher methodological rigour of meta-analysis in contrast to vote counting, where it is often possible to identify positive effects but these might not be valid across different settings. This evidence synthesis could not identify positive effects of ICSBC interventions on food stability or for the intervention types **process and packaging, door-to-door campaigns and information and guidance**.

Most rigorous studies are available for the **food supply chains pathway**. It is also here that most observed positive effects of ICSBC interventions present, overall confirming the ToC in this respect. There are nuances, however, which transpired during the analysis. There is more positive evidence for effects on **food availability and access** compared to food utilisation, agency and sustainability. In contrast, the evidence synthesis for **consumer behaviour** interventions most often finds positive effects on **food access, food utilisation**, specifically on food diversity, and **food agency**, complementing food supply chain interventions. Interventions showing effects on food agency are particularly important within the Human Rights-Based Approach, which focuses on the empowerment of individuals and communities to claim their human right to food.

Figure 6 summarises the results of the analysis. It shows which interventions in this study confirmed the assumed and intended effects on the outcome areas. This does not mean that other intervention types cannot lead to positive effects, but that this is not shown by the meta-analyses in this study. There might be single studies providing positive evidence that cannot be transferred to other settings. However, often the body of rigorous studies analysed is small, so further research might change the picture.

The study concludes that the 13 ICSBC intervention types work differently across the six outcome areas, with rigorous evidence supporting the positive effects of some intervention type/outcome combinations, while other combinations lack evidence on positive effects across studies when analysed by meta-analysis. In addition, combining ICSBC interventions with other components, like in-kind input or financial resources, is highlighted as a means to contribute to several outcome areas, jointly improving overall food security and nutrition.

With regard to vulnerable population groups, such a combination of activities is essential. They need to be equipped with the necessary rights and resources to fully benefit from ICSBC interventions – this is the threshold that needs to be reached for the intended effects to materialise. For these groups, in particular, the combination of ICSBC interventions with in-kind support or financial assistance is of particular importance to realise their right to food. Further conclusions on the design of interventions targeting specific vulnerable population groups are shown in Table 15 on the following page.

Figure 6 Summary of results

Source: DEval, own visualisation based on calculations by Lwamba et al. (2026)

Table 15 Promising interventions and design elements targeting vulnerable population groups

Vulnerable population group	Effective interventions	Design elements
Women	No specific ICSBC intervention design elements	- Including men and decision makers - Investing in women's leadership
Children and youth	- School-based interventions, including peer learning - Traditional nutrition and breastfeeding education may be appropriate as a stand-alone activity in contexts that are more food secure, and they may need to be supplemented by in-kind food provision in others.	- Ensuring that schools provide a supportive food environment, not just nutrition education - Ensuring innovative, fun, memorable, and engaging communication strategies
People with disabilities and older adults	Support for social inclusion and accessible livelihoods	Accommodation of the physical constraints of these populations and their elevated risk aversion
Indigenous populations	- Strengthening of indigenous governance systems and indigenous inclusion in local governance - Support for land rights and transparent collaboration with conservation groups	Respecting and incorporating traditional knowledge
Displaced populations	- Support for displaced populations, establishing similar rights to host community members and ensuring equal access to services - Consideration of the use of cash transfers over in-kind food aid	Including host communities in intervention design and targeting

Source: DEval, own visualisation based on Coogan et al. (2026)

The synthesis further analysed how ICSBC interventions perform with regard to increasing food system resilience in terms of food stability and sustainability outcomes. The synthesis provides evidence across different settings that the ICSBC intervention types farmer field schools and agricultural extension services in particular lead to improvements in food sustainability. They can, therefore, play an important role in increasing food system resilience. For food stability, meta-analyses do not find positive effects across settings, probably because of a low number of studies included. For some outcome areas, a meta-analysis for stability could not be implemented because there was a lack of studies. It stands out that a country's vulnerability to environmental crises reduces the effectiveness of ICSBC interventions on food security and nutrition outcomes. This shows that interventions aiming to increase resilience to environmental crises are hindered by these very crises.

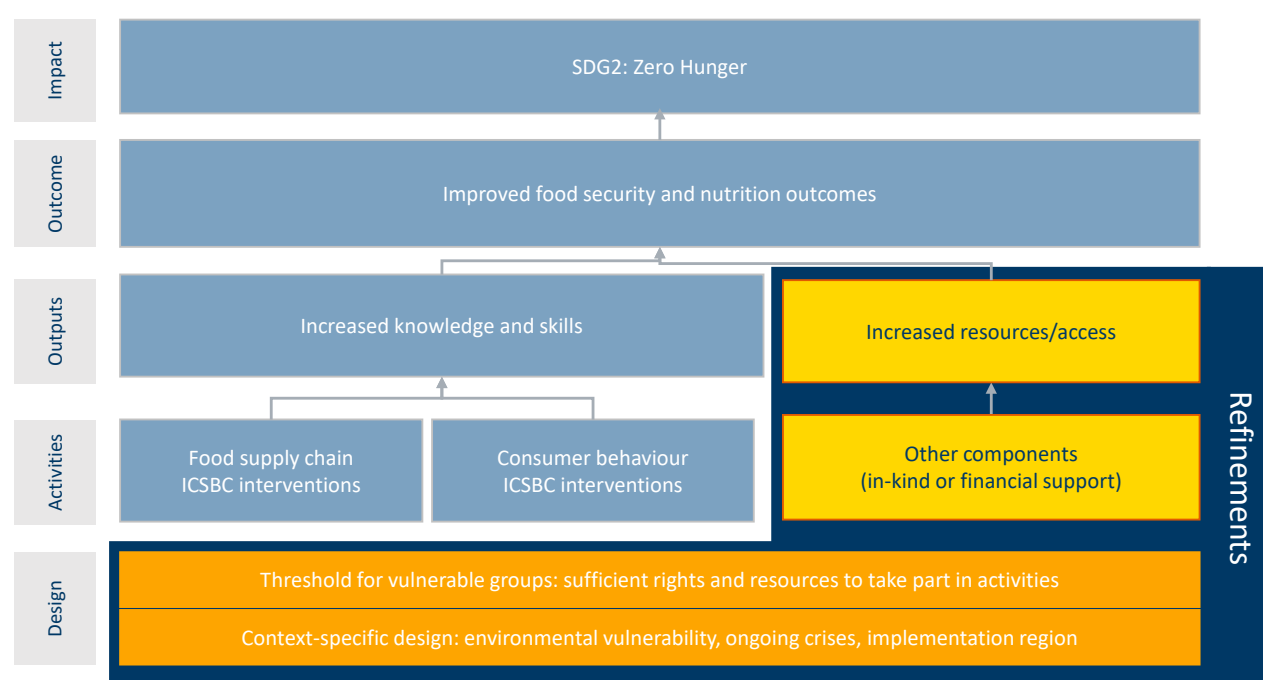
Also, in terms of resilience, multicomponent or cross-sectoral approaches increase the interventions' ability to strengthen

food system resilience. Furthermore, the need for social capital highlights the importance of community-based approaches and for approaches reducing the marginalisation of specific population groups – in line with the Human Rights-Based Approach. Given that effective crisis response relies on past experience and understanding one's strengths, interventions that build agency for addressing food security and nutrition shocks are especially promising.

Therefore, stand-alone and isolated ICSBC interventions do not appear to be useful when they are intended to improve all six outcome areas of food security and nutrition, target vulnerable groups or when increasing resilience is the goal. They always need to be integrated into comprehensive approaches.

These nuances warrant adaptations to the ToC as presented in Section 4.1, underscoring the importance of theory-testing approaches. The initial ToC for ICSBC interventions needs to be refined to depict the necessary interplay of ICSBC interventions within their context and their target groups.

Figure 7 Refined ToC



Source: DEval, own visualisation

5.2 Conclusions and implications

First, overall, this evidence synthesis proves that ICSBC interventions are effective for improving food security and nutrition in sub-Saharan Africa. When analysed rigorously, most intervention types show a positive effect on at least one food security and nutrition outcome area. There is no intervention type, however, that leads to effects on all outcome areas of food security and nutrition in sub-Saharan Africa. Intervention types are

not equally effective across outcome areas; therefore, selecting an intervention type based on the envisaged outcome area is important. The intervention types which have shown significance in the meta-analyses for specific outcome areas are illustrated in Figure 6. Farmer field schools and agricultural extension services show the most consistent effects. For food stability and anthropometrics, meta-analyses findings do not show significant positive results. This leads to the following implication.

Implication 1: ICSBC interventions do not equally show effects across all dimensions of food security and nutrition. Therefore, when planning interventions, development cooperation actors should determine which dimensions of food security and nutrition they prioritise. They should then choose the most suitable type of intervention or a combination thereof for the targeted outcome area. The results of this study can serve as guidance in this regard.

- For example, to achieve a higher availability of and access to food, actors could plan interventions along the food supply chain, such as agricultural extension services or farmer field schools.
- Especially those intervention types which target consumers, such as community meetings or media campaigns providing nutrition-related information, can improve food diversity; peer support, counselling and community meetings primarily improve agency.

Second, the practice of combining ICSBC components with other components may lead to diverse benefits. They can

- address multiple drivers of food insecurity at the same time;
- lead to positive effects only when implemented together;
- have benefits in terms of efficiency.

There is positive evidence for combinations with in-kind inputs, cash transfers or other ICSBC interventions.

Especially for vulnerable population groups, ICSBC interventions might not be effective as a stand-alone activity. They may only be

appropriate once minimum thresholds for rights and resources have been met. In some cases, only a combination of activities allows vulnerable population groups to act on the information and capacities shared by these interventions, as investment in input or equipment is necessary for the adoption of new practices. The specific needs of vulnerable population groups need to be considered in intervention design (see Table 15).

Also, in terms of resilience, applying multicomponent and multisectoral approaches might increase the positive effects on food system resilience by creating fall-back options – for example, by diversifying income sources and livelihood strategies.

Implication 2: Since food security and nutrition are comprised of six dimensions, multicomponent interventions and multi-sectoral approaches have proven to be effective for promoting systemic change, especially for vulnerable population groups.

- For example, ICSBC interventions could be combined with financial or in-kind resources; on-farm activities could complement off-farm activities.
- To be more effective, ICSBC interventions for vulnerable population groups should be complemented by activities strengthening their rights and resources, for example through cash transfers, the provision of seeds, and counselling on land rights.

Third, for an ICSBC intervention to be effective in terms of food system resilience, the context and design of the intervention need to be considered. In particular, social capital and multicomponent interventions have shown to contribute to increased food system resilience.

Implication 3: To improve food system resilience, the context and design of the ICSBC interventions are key. According to the findings of this study, development cooperation actors should prioritise the following when planning and implementing interventions specifically intended to increase resilience:

- Plan multicomponent interventions or multisectoral approaches. For example, provide the required material and equipment for production like drought-resistant seeds, water and storage facilities.
- Enhance the social capital and agency of individuals and communities. For example, support their capability to decide on food production and consumption. In addition, target the inclusion of marginalised groups to strengthen their social network.

Finally, better knowledge management/research is needed to identify the key factors for overall food stability and the resilience of related systems. The study finds positive effects on food sustainability for two intervention types: farmer field schools and agricultural extension services. On the other hand, there are no significant results for the other key outcome area of food stability. This is mostly because of lack of evidence.

Implication 4: Development cooperation actors who commission or conduct rigorous impact evaluations, as well as researchers in the field should increase their focus on food stability. This means they should strive to generate additional knowledge on the effectiveness of ICSBC interventions regarding strengthening the capacity of actors to ensure food security and nutrition in the event of sudden shocks or cyclical/seasonal events.

6.

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7.

ANNEX

7.1 Intervention types

Table 16 Intervention types in the quantitative analysis

	Intervention	Definition
Food supply chains	Farmer field schools	Farmer field schools bring together a group of farmers to learn about agricultural techniques. They meet regularly during a production cycle, setting up experimentation and engaging in hands-on learning to improve skills and knowledge that will help them adapt practices to their specific context. Demonstration farms may be used in farmer field schools or separately to show the use of certain agricultural techniques.
	Agricultural extension services	Trained agents visit communities to teach current practices, organise cooperatives and engage in other secondary activities.
	Workshops and short trainings	Ad hoc or short training is provided to food producers on farming techniques, use of equipment or best practices.
	Farmer peer-to-peer learning	Meetings of food producers are facilitated to share their knowledge with peers and/or connect with professionals in the same sector.
	Information and guidance by phone	Information/reminders are provided over the phone, such as via voice message or SMS.
	Capacity strengthening in storage and distribution	Educational programmes are provided to support storage and distribution techniques. This reflects education itself, without necessarily providing additional services.
	Capacity strengthening in process and packaging	Educational programmes are provided to support processing and packaging
Consumer behaviours	Peer support and counselling	Peer support and counselling are provided to increase healthy eating.
	Healthy eating classes	A classroom structure is used to provide messages regarding healthy eating. This includes classrooms outside of school.
	Community meetings	Community meetings are held to provide messages regarding healthy eating. Education provided to a specific group would be a class, not a community meeting. A community meeting must involve public engagement for discussion and mobilisation, not simply education. Education within established groups (such as women's self-help groups or microfinance groups) does not count, as these groups are not open to the public.
	Healthy eating media campaigns	Healthy food social marketing campaigns are run. This includes campaigns on social media, radio and TV. It also includes provision of media, such as magazines and newsletters, to promote healthy eating. This includes e- and m-health, movies and multimedia, text messages, newsletters, posters and games.
	Nutrition advisory services	Professional services, such as dieticians or nurses, provide messages regarding healthy eating. This can be provided one-on-one or in a group. However, the service must be related to direct training, not simply provision of general information to a group (i.e. the provider must act as a dietician and not a teacher; this must be "group counselling", not "group education").
	Door-to-door campaigns	Health messages are delivered door-to-door.

Source: DEval, own visualisation

7.2 Moderators

Table 17 Moderators included in the moderator analyses

Moderator	Description	Analysis
Cash transfer	Intervention includes a component of conditional or unconditional cash transfer	Binomial variable with 0 if the study's intervention does not include a cash transfer component and 1 if it does
Environmental hazards	The type of environmental or environment-driven hazards or risks affecting the context of the intervention: drought, floods, human epidemic, infestation, plant diseases, soil degradation, socio-political unrest, other	Binomial variable for each of the hazards with 0 if the study does not report the hazard as ongoing and 1 if it does (e.g. ongoing flood is 1, no report of ongoing infestation is 0)
Exposure to intervention	Number of months of beneficiary population's exposure to the intervention	Continuous variable
Follow-up	Number of months between the end of the intervention and the start of the measurement of outcomes	Continuous variable
Ongoing hazards	Context of intervention is exposed to an ongoing environmental hazard	Binomial variable with 0 if the study's intervention is not exposed to an ongoing environmental hazard and 1 if it is
Subregion	Region of implementation of the intervention: Western, Eastern, Central, and Southern Africa	Categorical variable using "Western Africa" as the reference group or the most prevalent group in the absence of Western Africa studies
Vulnerability Indices	Vulnerability score for environmental vulnerability of the country of intervention according to the following intervention indices: ND-GAIN index, WRI vulnerability index, GVI, INFORM Climate Change Risk Index	Continuous variable for each index
Year of intervention	First year of the intervention under study	Continuous variable

Source: DEval. own visualisation based on Lwamba et al. (2026)

Notes: Only moderators relevant to this study are presented. The original study included other moderators (see Lwamba et al., 2026).

7.3 Overview of quantitative studies

Table 18 Overview of quantitative studies per intervention type

Intervention type	Number of studies	Countries researched (n of studies)	References
Food supply chain interventions			
Farmer field schools	15	Kenya (4), Liberia (1), Malawi (2), Mali (1), Nigeria (1), Tanzania (3), Uganda (1), Zambia (1), multiple countries (1) ⁴¹	Bonan and Pagani (2018), Garbero and Chichaibelu (2018), Kangmennaang et al. (2017), Kithi et al. (2023), Larsen and Lilleør (2014), Merchant et al. (2023), Osei et al. (2018), Rutherford et al. (2016), Santoso et al. (2021), Sibhatu et al. (2022), Siéwé et al. (2024), Steinke et al. (2023), Wanjala and Muradian (2013), Wanyama et al. (2010), Weinhardt et al. (2017)
Agricultural extension services	11	Democratic Republic of Congo (DRC) (1), Ethiopia (1), Ghana (2), Kenya (2), Mali (1), Uganda (3), Zambia (1)	Beyuo and Anyidoho (2022), Biggeri et al. (2022), Deschamps-Laporte (2013), Fuller (2012), MacPherson and Sterck (2021), Ntakyo and van den Berg (2019), Okyere and Kornher (2023), Osei et al. (2018), Pan et al. (2015), Sakketa et al. (2022), Sibhatu et al. (2022)
Workshops and short trainings	11	DRC (1), Ethiopia (3), Ghana (4), Mozambique (1), Niger (1), South Africa (1), Tanzania (1), multiple countries (1)	Abate et al. (2021), Biggeri et al. (2022), Boucher et al. (2022), Fuller (2012), Homiah et al. (2012), Iddrisu et al. (2020), Issahaku and Abdulai (2020), Pretari (2019), Rusike et al. (2014), Steinke et al. (2023), Tesfamariam et al. (2018)
Farmer peer-to-peer learning	6	DRC (1), Ethiopia (2), Liberia (1), Niger (1), Tanzania (1)	Biggeri et al. (2022), Francesconi and Ruben (2012), Fuller (2012), Rusike et al. (2014), Rutherford et al. (2016), Santoso et al. (2021)
Information and guidance by phone	2	Ghana (1), Mali (1)	Osei et al. (2018), Tambo et al. (2023)
Storage and distribution	9	Ethiopia (1), Ghana (1), Kenya (1), Liberia (1), Mali (1), Nigeria (1), Tanzania (1), Zambia (2)	Barnabas et al. (2023), Biggeri et al. (2022), Brander et al. (2021), Okyere and Kornher (2023), Osei et al. (2018), Rutherford et al. (2016), Sakketa et al. (2022), Sibhatu et al. (2022), Walton (2012)

⁴¹ There is one study in the dataset that analysed several countries: Benin, Burkina Faso, Cambodia, Malawi, Mali, Togo and Zambia.

Intervention type	Number of studies	Countries researched (n of studies)	References
Consumer behaviour interventions			
Peer support and counselling	16	Burundi (1), Ethiopia (1), Ghana (1), Kenya (3), Madagascar (2), Malawi (1), Niger (1), Nigeria (1), Somalia (1), Tanzania (2), Togo (1), multiple countries (1)	Ali et al. (2022), Banerjee et al. (2017), Briaux et al. (2020), Carneiro et al. (2021), Datta et al. (2021), Freeman et al. (2020), Galasso et al. (2019), Gilligan et al. (2020), Leroy et al. (2015), Luoto et al. (2021), Merchant et al. (2023), Premand and Barry (2020), Santoso et al. (2021), Steinke et al. (2023), Wang et al. (2008), Weinhardt et al. (2017)
Healthy eating classes	9	Ethiopia (1), Ghana (1), Kenya (2), Madagascar (1), Malawi (1), Niger (1), Tanzania (1), multiple countries (1)	Datta et al. (2021), Freeman et al. (2020), Gilligan et al. (2020), Homiah et al. (2012), Luoto et al. (2021), Premand and Barry (2020), Steinke et al. (2023), Wang et al. (2008), Weinhardt et al. (2017)
Community meetings	8	Ethiopia (1), Niger (1), South Africa (1), Tanzania (2), Togo (1), Uganda (1), multiple countries (1)	Abate et al. (2021), Briaux et al. (2020), Mpiira and Okello (2020), Premand and Barry (2020), Santoso et al. (2021), Steinke et al. (2023), Tesfamariam et al. (2018), Wang et al. (2008)
Healthy eating media campaigns	5	Ghana (1), Nigeria (1), Somalia (1), Uganda (2)	Carneiro et al. (2021), Fongar et al. (2023), Grijalva-Eternod et al. (2023), Homiah et al. (2012), Mpiira and Okello (2020)
Nutrition advisory services	5	Ghana (1), Somalia (1), South Africa (1), Uganda (1)	Ali et al. (2022), Banerjee et al. (2017), Leroy et al. (2016), Mpiira and Okello (2020), Tesfamariam et al. (2018)
Door-to-door campaigns	4	Kenya (1), Niger (1), Togo (1), multiple countries (1)	Briaux et al. (2020), Freeman et al. (2020), Premand and Barry (2020), Steinke et al. (2023)

Source: DEval, own visualisation

7.4 Further meta-analyses with insignificant results

Table 19 Information and guidance by phone: Meta-analyses results

Outcome area	Effect size	95% confidence interval	Significance of effect (p-value)	Number of estimates
Food availability	0.15	-0.02, 0.31	.08	2
Food access	Not enough evidence			
Food utilisation: food diversity	Not enough evidence			
Food utilisation: anthropometrics	Not enough evidence			
Food stability	Not enough evidence			
Food agency	Not enough evidence			
Food sustainability	0.14	-0.09, 0.37	.22	2

Source: DEval, own visualisation based on calculations by Lwamba et al. (2026)

Notes: At least two studies are necessary to run a meta-analysis. Any outliers or overly influential estimates, if they existed, were removed. Estimates with high risk of bias were not removed from the estimates. Effects can be categorised as very small (< 0.1), small (< 0.2), moderate (< 0.37) and large (> 0.37).

Table 20 Healthy eating classes: Meta-analyses results

Outcome area	Effect	95% confidence interval	Significance of effect (p-value)	Number of estimates
Food availability	0.09	-0.02, 0.31	.33	2
Food access	-0.31	-0.81, 0.19	.22	4
Food utilisation: food diversity	0.04	-0.11, 0.20	.58	6
Food utilisation: anthropometrics	-0.04	-0.14, 0.06	.48	4
Food stability	0.03	0.04, 0.10	.39	2
Food agency	Not enough evidence			
Food sustainability	Not enough evidence			

Source: DEval, based on calculations by Lwamba et al. (2026)

Notes: At least two studies are necessary to run a meta-analysis. Any outliers or overly influential estimates, if they existed, were removed. Estimates with high risk of bias were not removed from the estimates. Effects can be categorised as very small (< 0.1), small (< 0.2), moderate (< 0.37) and large (> 0.37).

Table 21 Nutrition advisory services: Meta-analyses results

Outcome area	Effect	95% confidence interval	Significance of effect (p-value)	Number of estimates
Food availability	Not enough evidence			
Food access	0.05	-0.003, 0.10	.07	2
Food utilisation: food diversity	Not enough evidence			
Food utilisation: anthropometrics	-0.05	-0.24, 0.14	.61	2
Food stability	Not enough evidence			
Food agency	Not enough evidence			
Food sustainability	Not enough evidence			

Source: DEval, own visualisation based on calculations by Lwamba et al. (2026)

Notes: At least two studies are necessary to run a meta-analysis. Any outliers or overly influential estimates, if they existed, were removed. Estimates with high risk of bias were not removed from the estimates. Effects can be categorised as very small (< 0.1), small (< 0.2), moderate (< 0.37) and large (> 0.37).

Table 22 Door-to-door campaigns: Meta-analyses results

Outcome area	Effect	95% confidence interval	Significance of effect (p-value)	Number of estimates
Food availability	Not enough evidence			
Food access	0.07	-0.03, 0.16	.20	3
Food utilisation: food diversity	0.001	-0.11, 0.11	.97	3
Food utilisation: anthropometrics	Not enough evidence			
Food stability	Not enough evidence			
Food agency	Not enough evidence			
Food sustainability	Not enough evidence			

Source: DEval, own visualisation based on calculations by Lwamba et al. (2026)

Notes: At least two studies are necessary to run a meta-analysis. Any outliers or overly influential estimates, if they existed, were removed. Estimates with high risk of bias were not removed from the estimates. Effects can be categorised as very small (< 0.1), small (< 0.2), moderate (< 0.37) and large (> 0.37).

Table 23 Meta-analyses results: Effect of ICSBC interventions on food stability

Domain	Intervention type	Effect	95% confidence interval	Significance of effect (p-value)	Number of estimates
Food supply chains	Farmer field schools	0.08	-0.04, 0.19	.19	2
	Workshops and short trainings	0.08	-0.01, 0.17	.09	3
Consumer behaviours	Peer support and counselling	0.03	-0.03, 0.08	.33	3
	Healthy eating classes	0.03	-0.04, 0.10	.39	2

Source: DEval, own visualisation based on calculations by Lwamba et al. (2026)

Notes: At least two studies are necessary to run a meta-analysis. Any outliers or overly influential estimates, if they existed, were removed. Estimates with high risk of bias were not removed from the estimates. Only those intervention types for which a meta-analysis was possible are shown. Effects can be categorised as very small (< 0.1), small (< 0.2), moderate (< 0.37) and large (> 0.37).

7.5 Moderator analyses: Environmental crises moderators

Table 24 Influence of environmental vulnerability on effectiveness

	Intervention type	Outcome area	Context of higher vulnerability measured by:			
			GVI	WRI vulnerability index	ND-GAIN index	INFORM Climate Change Risk Index
Food supply chains	Farmer field schools	Food agency		–	+	– (2050 and 2080)
		Food sustainability				– (2050)
	Agricultural extension services	Food availability	–			
		Food sustainability		–		
	Workshops and short trainings	Food diversity		–		
	Storage and distribution	Food availability	–			
		Food diversity	–		+	– (2050 and 2080)
		Food sustainability		–		
Consumer behaviours	Peer support and counselling	Food access		–		
		Food diversity	–			
		Anthropometrics		–		
	Healthy eating classes	Food access		–		
	Community meetings	Food access	–	–		
		Food diversity			–	
	Healthy eating media campaigns	Food access			–	– (2050)

Source: DEval, own visualisation

Notes: The table reports only the statistically significant findings of the moderator analyses. The “–” represents smaller effects of higher vulnerability on food security and nutrition compared to the average effect from the meta-analyses, while “+” indicates larger effects of higher vulnerability on food security and nutrition. For the INFORM Climate Change Risk Index, there are projections for 2050 and for 2080. Not in all cases both projections turn out different, as indicated in the table.

Table 25 Influence of ongoing crisis on effectiveness

Intervention types	Outcome area	Moderator analyses
Agricultural extension services	Food availability	<i>Larger</i> intervention effects implemented in the context of ongoing risk or crisis compared to non-affected contexts
Peer support and counselling	Food access	<i>Smaller</i> intervention effects implemented in the context of drought compared to non-affected contexts
Healthy eating classes	Food diversity	<i>Smaller</i> intervention effects implemented in the context of drought compared to non-affected contexts
Community meetings	Food access	<i>Smaller</i> intervention effects implemented in the context of drought compared to non-affected contexts

Source: DEval, own visualisation

Note: The table reports only the statistically significant findings of the moderator analyses.

7.6 Food security and nutrition in the 2030 Agenda

Box 4 Food security and nutrition in the 2030 Agenda

The Sustainable Food System Framework is reflected in multiple components of the 2030 Agenda and its Sustainable Development Goals (SDGs). Contributing to SDG 2 (Zero hunger) is the main goal for food security and nutrition interventions, while many other SDGs relate to drivers, preconditions or outcomes linked to food security and nutrition. The evidence reveals that many interventions in the field of international cooperation also address other SDGs. These are illustrated by the following examples.

Approaches to combating poverty (SDG 1) often include capacity strengthening in agriculture as an income opportunity, which is also connected to SDG 8 on decent work (Banerjee et al., 2017). According to the SDG 2025 report, about 75% of the population who live in extreme income poverty are smallholder farmers (Sachs et al., 2025). This is a major constraint for vulnerable population groups and must be addressed before information, capacity strengthening and behaviour change (ICSBC) interventions can succeed (see Section 4.5). Vulnerable population groups are also at the centre of SDG 5 (Gender equality) and SDG 10 (Reduced inequalities). Many food security and nutrition interventions target vulnerable population groups, especially women, but the effects remain understudied (see Section 4.5).

Furthermore, interventions related to health and child development (SDG 3) focus on better nutrition (Galasso et al., 2019; Weinhardt et al., 2017). In this study, health outcomes are reflected in the anthropometrics dimension of food utilisation, but the meta-analyses did not find significant effects across settings. Single studies show the positive effects of ICSBC interventions on anthropometrics.

Food security and nutrition depends on environmental sustainability. SDG 13 (Climate action) plays a major role in agricultural interventions too, as climate change increasingly threatens global food production. Therefore, many ICSBC interventions aim to build resilience against environmental crises – for example, by introducing climate-adapted seed varieties (see Section 4.6). Sustainable agricultural practices, in turn, can contribute to reducing agriculture's carbon footprint. For example, a food security and nutrition intervention studied by Abate et al. (2021) included two subcomponents on climate change mitigation and adaptation. Similarly, interventions that primarily target other SDGs might include activities on hunger, such as school meal programmes which offer benefits from both education and nutrition points of view (Barnabas et al., 2023; Wang et al., 2024).

This evaluative study also aims to contribute to the achievement of the 2030 Agenda. First, synthesising information on effective interventions for combating hunger is essential for progress in SDG 2. Second, if the identified implications are taken up by policy makers, improvements related to the food system and other SDGs, as stated above, could be achieved. Finally, the study shows that development cooperation has positive effects. In times of doubt, this message is a positive signal for the international community and supports SDG 17 (Partnerships for the goals).

7.7 Study schedule

Time frame	Tasks/phases
November–December 2024	Conception phase and reference group meeting (concept note)
December 2024–February 2025	Inception phase and reference group meeting (updated concept note)
February–July 2025	Data collection, analysis and synthesis, reference group meeting (preliminary findings)
July–October 2025	Reporting phase and reference group meeting (draft report)
November 2025–January 2026	Proofreading, layout
January 2026	Publication

7.8 Evaluation team and contributors

Core team	Role	CRedit statement ⁴²
Dr Cornelia Römling	Senior Evaluator and Team Leader	Conceptualisation, Data curation, Formal analysis, Investigation, Methodology, Project administration, Supervision, Validation, Visualisation, Writing – original draft, Writing – review & editing
Anna Sting	Evaluator and Team Leader	Conceptualisation, Data curation, Formal analysis, Investigation, Methodology, Project administration, Supervision, Validation, Visualisation, Writing – original draft, Writing – review & editing
Carolin Wicke	Evaluator	Conceptualisation, Data curation, Formal analysis, Investigation, Methodology, Validation, Visualisation, Writing – original draft, Writing – review & editing
Laura Kunert	Evaluator	Data curation, Formal analysis, Investigation, Methodology, Validation, Visualisation, Writing – original draft, Writing – review & editing
Hamide Bayramoglu-Fatoum	Project Administration	

Responsible	Role
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Contributors	Role
Sushma Jayaprakash	Student assistant
3ie (Etienne Lwamba, Ingunn Storhaug, Dr Suvarna Pande, Pierre Marion, Diana Cordova-Arauz, Dr Shannon Shisler, Dr Esteban J. Quinoñes)	Consultants: rapid evidence assessment
Dr Isabel Mank (formerly DEval)	Internal peer reviewer
Dr James Rao (International Livestock Research Institute)	External peer reviewer
Dr Charlotte Coogan	Consultant: - evidence scoping study - literature review on effects of ICSBC interventions on vulnerable population groups

⁴² The CRedit statement (Contributor Role Taxonomy, <https://credit.niso.org/>) indicates the roles of the authors of this evaluation report in the evaluation. The CRedit taxonomy distinguishes between 14 different roles to show the specific contribution of the individual authors.

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