

SUPPLEMENT ARTICLE

Linking agriculture and nutrition education to improve infant and young child feeding: Lessons for future programmes

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Abstract

Agriculture and food systems play a central role in nutrition by supplying nutritious, healthy and affordable foods. When integrated with nutrition education for behaviour change, agricultural interventions that supply diverse affordable foods from all food groups have great scope for improving young child and family diets. In 2014, process reviews were conducted in Cambodia and Malawi of food security projects that provided agricultural support and community-based nutrition education on improved infant and young child feeding (IYCF). In both countries, household visits were carried out with mothers/caregivers, and interviews and Focus Group Discussions (FGDs) were conducted with purposively selected project stakeholders (53 in Cambodia, 170 in Malawi), including government staff from the agriculture and health sectors. Results highlight that adoption of improved IYCF practices was facilitated by participation in nutrition education and practical cooking sessions, and supportive family and community structures. Barriers faced by families and caregivers were identified, such as women's workload and lack of access to high quality foods, namely fruits, vegetables, legumes, nuts and animal source foods. Implementation challenges regarding coordination of cross-sectoral targeting strategies and capacities of extension services to sustain community-based IYCF nutrition education need to be addressed to improve programme effectiveness and impact. The project lessons from Cambodia and Malawi are useful for integrated agriculture-IYCF nutrition education programmes to help ensure better young child nutrition outcomes.

KEYWORDS

agriculture, Cambodia, complementary food, infant and young child feeding, Malawi, nutrition education

1 | INTRODUCTION

Since the publication of the 2008 Lancet Maternal and Child Undernutrition Series (The Lancet, 2008), a highly active nutrition landscape has evolved. There is rapidly growing interest in agriculture's role in nutrition and food systems, such as the way food is produced, harvested, stored, marketed, processed and eaten, and the impact these processes have on nutrition (Webb, 2013; UNSCN, 2014). The central role of agriculture and the entire food system in supplying nutritious, healthy and affordable diets has gained traction, as has the recognition that there is great scope for agriculture to improve its contribution to reducing all forms of malnutrition (FAO, 2013). A nutritious, diverse diet is essential for infants and young children to ensure optimal physical growth, cognitive development, health and well-being (Arimond & Ruel, 2004; Dewey, 2013; WHO, 2010).

A series of reviews have analysed the evidence base for the impact of agricultural interventions on nutrition outcomes (Berti, Krasevec, & Fitz, 2004; Girard, Self, McAuliffe, & Olude, 2012; Masset, Haddad, Cornelius, & Isaza-Castro, 2012; Meeker & Haddad, 2013; The World Bank, 2007). Agricultural interventions reported in these studies aimed to promote availability and access to a variety of high quality foods; however, few used anthropometry to measure nutritional status. The studies generally found a positive effect on agricultural production and consumption of specific foods, for example, vitamin A-rich foods, but no overall changes in diets. Some evidence of effect was shown on vitamin A status, but none on iron status. The reviews concluded that lack of nutritional impact was the result of short intervention duration and weak evaluation design. Reviews specifically looking at nutrition-related outcomes of agricultural development projects have noted that positive impacts depend

on inclusion of nutrition education in the interventions (Girard et al., 2012 and references therein). This is because even when food resources are available in the home, lack of knowledge, cultural beliefs, attitudes, practices and inappropriate advice may prevent caregivers from making use of these foods (Issaka, Agho, Burns, Page, & Dibley, 2015; Waswa, Jordan, Herrmann, Krawinkel, & Keding, 2015). Correspondingly, nutrition education for behaviour change is now almost universally acknowledged as an essential component of Infant and Young Child Feeding (IYCF) interventions (Fabrizio, van Liere, & Pelto, 2014).

The 2013 Lancet Nutrition Series provides further evidence for the link between nutrition education and behaviour change interventions, and improved complementary feeding practices and linear growth (Bhutta et al., 2013). However, nutrition education on its own may not be sufficient, particularly in food insecure countries, and should be combined with access to nutritious complementary foods that are affordable (Lassi, Das, Zahid, Imdad, & Bhutta, 2013). Therefore, ideally, agriculture and nutrition education need to be linked, in order to address the underlying determinants of maternal and child undernutrition (Ruel et al., 2013). By doing so, it should be possible to ensure that improved agricultural production and/or purchasing power translate into access and consumption of nutritious foods, and result in improved diets. Concurrent improvements to the health and social environment, including reduction of disease, access to potable water and sanitation, health care, food safety and women's empowerment are also necessary (FAO, 2015a; Smith, Kahn, Frankenberger, & Wadud, 2011).

A two-year cluster randomised control trial conducted in Burkina Faso reported that an integrated agriculture, nutrition and health behaviour change intervention significantly improved child health outcomes, including wasting, diarrhoea, mean haemoglobin and anaemia prevalence levels, especially among the youngest children (Olney, Pedehombga, Ruel, & Dillon, 2015). It was also hypothesised that a greater impact on children's nutrition and health outcomes would have been achieved with earlier and longer intervention exposure.

In 2010, the Food and Agriculture Organization of the United Nations (FAO) embarked on a comprehensive five-year research and advocacy project entitled: "Improving the dietary intakes and nutritional status of infants and young children through improved food security and complementary feeding counselling" (IMCF), with partners in Cambodia, Germany, Malawi and Thailand (FAO, 2016). The research was carried out in the context of FAO food security and nutrition projects in Cambodia ["Improving Market Linkages for Smallholders in Oddar Meanchey and Preah Vihear" (MALIS) 2012–2015] and in Malawi ["Improving Food Security and Nutrition Policies and Programme Outreach" (IFSN) 2011–2015]. These two projects aimed to improve household food security and diets, and nutritional status of children aged 6–23 months through a combination of activities focusing on agricultural production, marketing and community-based nutrition education for behaviour change (FAO, 2016). A description of the IMCF research and advocacy initiative, the project processes, reports and tools produced can be accessed at: <http://www.fao.org/nutrition/education/infant-and-young-child-feeding/en/>

The FAO's integrated agriculture-IYCF nutrition education approach is illustrated in Figure 1. It combines diversification of food production (and strengthened market linkages where appropriate) with

Key messages

- Practical nutrition education empowers caregivers and communities to improve IYCF behaviours.
- Availability and access to nutritious, affordable foods remains a major barrier for IYCF, highlighting the urgent need for food systems diversification.
- Well-designed integrated programmes and explicitly co-targeted services can ensure that caregivers with young children benefit from multiple sectors' work.
- Involvement in agriculture can empower women, but adverse effects on mothers' time and childcare need to be addressed.
- Volunteers are a crucial resource for community-based interventions. Developing their IYCF knowledge and nutrition education skills, and the operational capacities of extension systems, is vital.

nutrition education to promote behaviour change aimed at improving dietary quality for the whole family. Formative research using the trials of improved practices (TIPs) method (Dicken, Griffiths, & Piwoz, 1997) informs the design of the food security intervention (ensuring that agriculture addresses food gaps) and the nutrition education intervention (so that complementary feeding recommendations are culturally acceptable, feasible and affordable). Emphasis is placed on gender and women's empowerment, capacity development of existing agriculture and health extension services, community engagement, and monitoring and evaluation to help facilitate and capture change.

The concept of "nutrition education" used here involves working with people to help them improve their practical food skills and dietary behaviours, and engaging influential community members, including volunteers, to support and advocate for behaviour change and improvements in the food environment. This is in line with Contento's (2016) definition of nutrition education.

In 2014, FAO staff conducted process reviews in both project sites to supplement the routine project monitoring and evaluation, and to identify implications for strengthening future project design and implementation, particularly with regard to the IYCF nutrition education interventions and linkages with agriculture (FAO, 2015b; FAO, 2015c). The current paper provides an overview of the main facilitating factors and barriers that influence adoption of desirable IYCF practices, and highlights some opportunities, as well as critical implementation challenges, that need to be addressed for greater programme effectiveness and impact.

2 | MATERIALS AND METHODS

2.1 | Context and background

Formative research using TIPs was carried out in Cambodia prior to the start of the MALIS project and in Malawi, during the first year of the IFSN project, during two agricultural seasons to capture seasonal

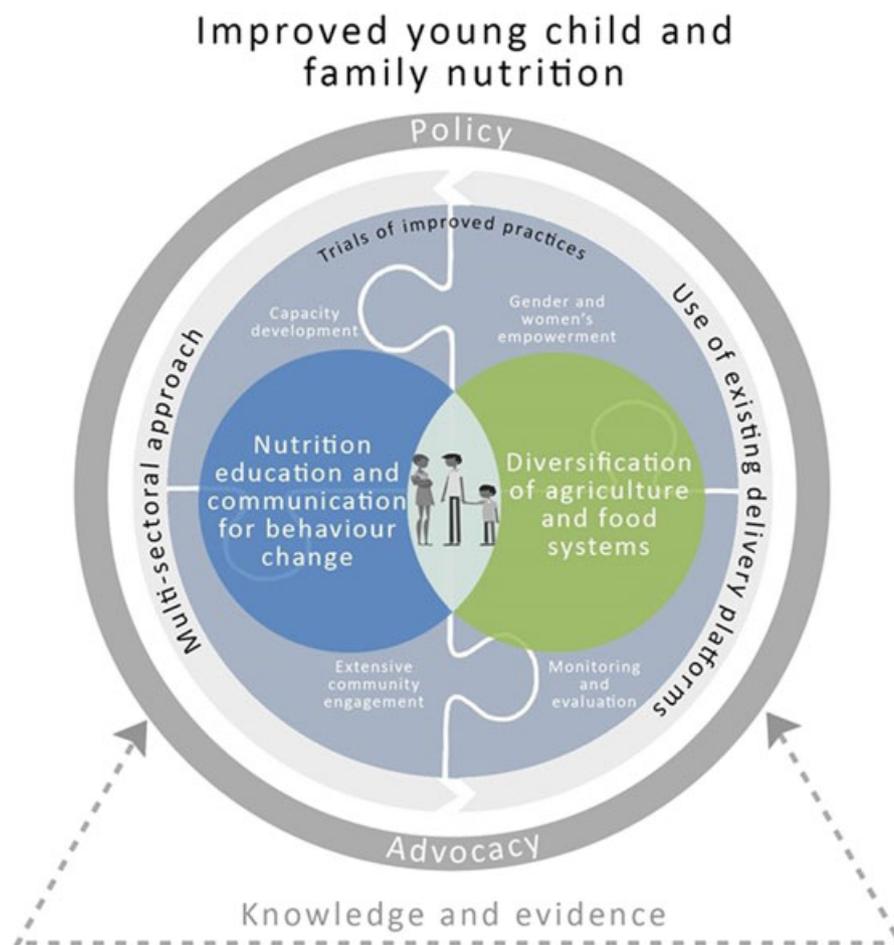


FIGURE 1 The FAO's integrated agriculture-IYCF nutrition education approach

variations in food availability. During TIPs, the training needs of extension staff were assessed, and the feasibility and acceptability of complementary feeding recommendations and recipes were tested with mothers and other caregivers using locally available foods (FAO, 2014). Based on the findings, a training programme and information, education and communication (IEC) materials were developed in both countries to improve the knowledge and skills of extension services on nutrition education for behaviour change, IYCF practices and group facilitation skills.

The MALIS food security and nutrition project in Cambodia targeted 7,500 beneficiary households in Oddar Meanchey and Preah Vihear Provinces. Goals included increased market linkages, strengthened farmer groups, diversified agricultural production and improved water access through sustainable irrigation technologies. Agricultural activities were implemented through farmer field schools (FFS), farmer business schools, farmer field days and agricultural input trade fairs. The FFS incorporated three nutrition modules covering dietary diversification and use of home gardens for the production of diverse fruits and vegetables.

The nutrition education intervention comprised training sessions on improved IYCF practices with a focus on age-appropriate complementary feeding using locally available foods following World Health Organization guidelines (PAHO/WHO, 2003), with four participatory cooking sessions, nutrition modules in FFS, and promotional activities at agricultural fairs and field days. Master trainers from the National Nutrition Programme and two FAO staff conducted cross-sectoral trainings with field workers from the Provincial Department of Health, the Provincial

Department of Women's Affairs, and Non-Governmental Organizations (NGOs). The government and NGO staff in turn trained volunteers who were assigned as Community Nutrition Promoters (CNPs) by the village leadership to conduct IYCF nutrition education activities with caregivers at village level. The CNPs were trained in basic IYCF nutrition, including preparation of complementary foods and facilitation skills.

Mothers/caregivers were enrolled according to their membership of FFS and agricultural cooperatives to enhance synergies between the agriculture and IYCF nutrition education activities. However, in practice, the number of female farmers participating in the FFS who had a child in the target age group of 5–18 months at enrolment was lower than anticipated. Therefore, other mothers/caregivers with children in this age group (not receiving any agricultural support) were invited and agreed to participate in the IYCF nutrition education sessions.

In Phase one of the IYCF nutrition education intervention (August 2013–March 2014), CNPs trained groups of 15 mothers/caregivers (including grandmothers) with children aged 5–18 months at enrolment, pregnant women and women of reproductive age, referred to as an "IYCF care group", aiming to involve women who were actively engaged in agriculture. In Phase two (April 2014–March 2015), the training approach was modified due to the CNPs limited capacity in performing their assigned tasks and NGO staff became the main facilitators with back-up from provincial government staff.

Training was carried out every week or bi-weekly for approximately 2–3 hr over a period of 3–4 months. The course consisted of seven

facilitated community-based IYCF nutrition education sessions focusing on continued breastfeeding, improved complementary feeding, hygiene, food safety and family nutrition using the Government Communication for Behavioural Impact (COMBI): Campaign to Promote Complementary Feeding in Cambodia materials (Government of Cambodia, 2011), and included four participatory cooking sessions, and two discussions with mothers/caregivers on motivating factors and barriers to improved complementary feeding practices. According to the MALIS project monitoring data, 153 CNPs and 1,400 mothers/caregivers (including grandmothers) were trained. The process in Cambodia was adapted from the Malawi training cascade (see below), which was implemented one year prior to the start of the MALIS project in Cambodia.

The IFSN project in Malawi focused on poor smallholder farmers in Kasungu and Mzimba Districts, who received agricultural support and/or nutrition education. Approximately 35,000 farmers were provided with agricultural inputs and training through FFS, junior farmer field and life schools (JFFLS) and farmer field days. Participatory IYCF nutrition education was provided to families with children aged 6–18 months in the same communities where households were considered eligible for agricultural support. Project activities were designed to benefit households with the following vulnerability selection criteria: extremely poor; child or female-headed; caring for orphans; caring for people living with HIV or other chronic diseases; widows; and elderly people living on their own.

During the first year of the project (2011–2012), the food security intervention did not include households with a pregnant woman or a caregiver who had a child below 2 years of age, as targeting used the narrower set of criteria mentioned above. Although this was rectified during the second round of IYCF nutrition education sessions, not all IYCF participating families could receive agricultural support, as priority was given to the most vulnerable people in the community.

IYCF nutrition education was initiated through a training cascade process that developed nutrition capacity at all levels (Figure 2), using a set of training tools and IEC materials that were developed from formative research (FAO, 2012a; FAO, 2012b). A pair of CNPs working as a team—a Lead Farmer and a Community Health Volunteer—jointly facilitated IYCF nutrition education sessions with an IYCF care group in their home villages, with periodic support from front line extension staff in agriculture and health. The IYCF care group was composed of approximately 15 mothers/caregivers (including grandmothers and fathers) with children aged 6–18 months at enrolment and traditional leaders that met weekly or bi-weekly for approximately 2–3 hr over a period of 3–5 months. The 10 IYCF nutrition education sessions included four participatory cooking sessions, which featured age-appropriate complementary feeding recipes composed of nutritious, in-season or preserved ingredients, such as dried vegetables and fish. Some IYCF nutrition education sessions specifically targeted grandmothers and fathers to obtain their support for dietary diversity, healthier practices and alleviating women's workload. The trickle-down training took place annually during 2012 to 2015, in different areas of the districts. Three rounds of training were held. According to the IFSN project monitoring data, 1,118 CNPs and 12,012 mothers/caregivers (including grandmothers, fathers) and traditional leaders were trained. The two FAO projects did not provide any monetary or in-kind incentives to mothers to encourage their participation. In the MALIS Cambodia

project, in line with government policy, the CNPs received an allowance while in the IFSN Malawi project the community volunteers were not given any monetary or in-kind compensation for their time.

2.2 | The process reviews

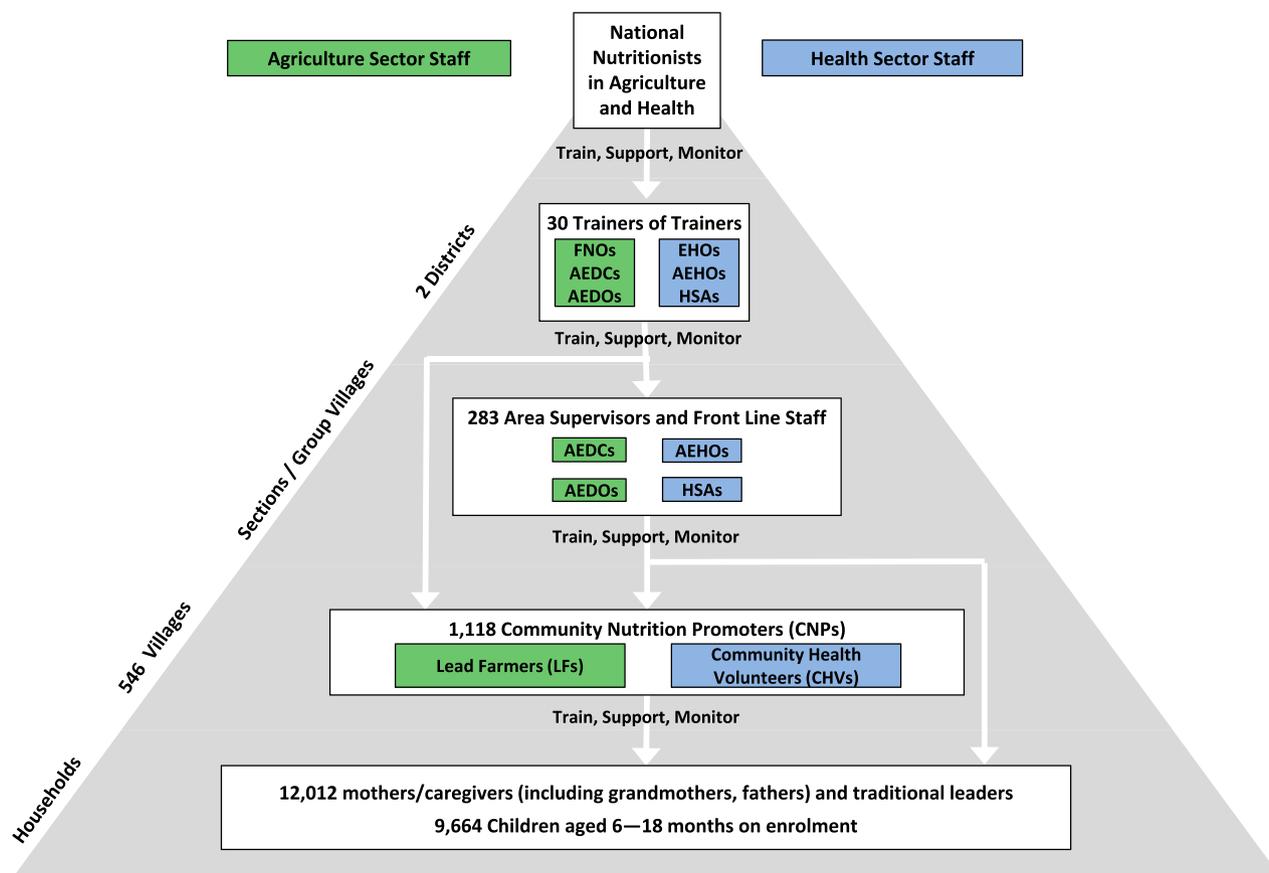
The process review evaluation framework was adapted from the Alive & Thrive programme (Rawat et al., 2013). The Cambodia project process review was conducted during June–July 2014 in Oddar Meanchey and Preah Vihear Provinces, involving a total of 53 stakeholders. Purposive sampling was used to select seven villages in different communes, reflecting strong and weak villages, defined in terms of whether or not the IYCF care groups had completed all seven nutrition education sessions. The process review in Malawi was conducted during September–October 2014 in selected villages of Kasungu and Mzimba Districts, involving a total of 170 stakeholders. Purposive sampling was used employing different methods to ensure representation of project stakeholders at multiple levels. Table 1 provides an overview of the process review data collection methods and type of participants in both countries.

2.3 | Questionnaire

An initial set of approximately 60 guiding questions was developed related to the themes of agriculture-nutrition linkages, community-based nutrition education activities, family environment, socio-cultural factors influencing IYCF behaviours and involvement of service providers. The guiding questions were used to tailor questionnaires for interviews, household visits and focus group discussions (FGDs) with different stakeholders (see Supplementary material). The questionnaires were developed by two of the authors and reviewed by the project teams in Rome, Cambodia and Malawi. Interviews and FGDs were audiotaped and written notes taken concurrently. Household visits with mothers/caregivers involved a questionnaire and observation schedule, and lasted approximately 60–90 min while FGDs lasted approximately 90 min. Data collection was in *Khmer* and English in Cambodia, and in *Chichewa*, *Chitumbuka* or English in Malawi. Audiotapes were transcribed and translated into English when necessary, and quality of transcription was checked against the audiotapes.

2.4 | Data analysis

Data analysis was undertaken using OpenCode 4 software. Interviews and FGDs from Cambodia and Malawi were initially coded independently and systematically after several readings per document by the same coder. Subsequently, other authors revisited the raw data at various points. (This is not unusual for process reviews, see for example Volpe et al., 2013.) Furthermore, by comparing the emerging themes and findings with available routine programme monitoring data, programme documents and reports, and knowledge of recent literature in the field, we could be confident that the most crucial aspects were identified. In a text driven manner, 180 and 130 codes were derived for Cambodia and Malawi, respectively, and subsequently used to organise text segments from different interviews/FGDs according to the main themes. Participant quotations were presented to illustrate the themes and findings, with each quotation identified by participant



AEDC Agricultural Extension Development Coordinator	EHO Environmental Health Officer
AEDO Agricultural Extension Development Officer	FNO Food and Nutrition Officer
AEHO Assistant Environmental Health Officer	HSA Health Surveillance Assistant
CHV Community Health Volunteer	IFSN Improving Food Security and Nutrition Policies and Programme Outreach
CNP Community Nutrition Promoter	IYCF Infant and Young Child Feeding
	LF Lead Farmer

Source: FAO (2015b).

FIGURE 2 Malawi IFSN project IYCF nutrition education intervention training cascade

characteristics, for example, mothers, grandmothers, fathers, project stage, data collection method, country, etc.

2.5 | Ethics

The MALIS and IFSN project agreements among FAO, the Government of the Kingdom of Cambodia, the Government of the Republic of Malawi and the respective donor agencies involved direct activities with the communities, including data collection. Participants were thus informed of the purpose of data collection and provided oral consent prior to the interview/FGD/household visit.

3 | RESULTS

This section is organised according to the main themes identified from the interviews, FGDs and household visits.

3.1 | Improved caregiver knowledge and skills

Mothers/caregivers and grandmothers participating in FGDs reported that their nutrition knowledge and child feeding skills

increased after the IYCF nutrition education sessions, especially with regard to using more food groups (pro-vitamin-A rich vegetables and animal source foods [Cambodia and Malawi], legumes and nuts [mainly Malawi]), preparation of enriched porridges, and sanitation and hygiene practices [Cambodia and Malawi]. Mothers and fathers independently acknowledged that locally available foods were used to make porridge and the nutritionally enriched recipes were feasible:

“The recipes are easy to follow and fit to our situation as we can find vegetables around the house during this season, but the difficulty is having meat.”
(Mothers, FGD, Phase two, Cambodia)

These self-reported improvements were supported by observations made by government, FAO project and NGO staff in both countries, such as seeing a child's porridge bowl in the kitchen and improved hygiene behaviours in the home.

In Malawi, some IYCF care group participants reported being able to substitute unavailable ingredients for those of a similar nutritional profile. For example, several community members said that they used mice (a traditionally valued animal source food) and home-made pumpkin or gourd seed oil as a source of fat. Caregivers were also able to

TABLE 1 Overview of the process review data collection methods and participants in both countries

Methods	Malawi	Cambodia
Interviews	<ul style="list-style-type: none"> ● 21 interviews ● 23 participants ● IFSN project staff ● Different cadres of agriculture, health and education government staff at national, agricultural development division, district and Extension Planning Area ● NGO staff (MALEZA and Feed the Children) ● JFFLS facilitator (primary school teacher) 	<ul style="list-style-type: none"> ● 13 interviews ● 16 participants ● MALIS project staff ● Provincial Ministry of Agriculture and National Nutrition Programme staff ● NGO staff (Malteser International, Medical Team International and World Vision)
Focus group discussions	<ul style="list-style-type: none"> ● 14 focus group discussions ● 141 participants ● Mothers, grandmothers, fathers ● CNPs ● Village Heads ● Agriculture and health front line extension staff ● JFFLS learners ● Nutrition focal persons in Ministries of Agriculture, Health and Department of Nutrition 	<ul style="list-style-type: none"> ● 7 focus group discussions ● 30 participants ● Mothers, grandmothers, fathers ● CNPs
Household visits	<ul style="list-style-type: none"> ● 6 household visits ● 6 participants ● Mothers 	<ul style="list-style-type: none"> ● 7 household visits ● 7 participants ● Mothers
Secondary data review	<ul style="list-style-type: none"> ● Six-monthly reports ● Baseline and mid-term survey reports ● Monitoring data 	<ul style="list-style-type: none"> ● Six-monthly reports ● Meeting reports ● Monitoring data ● Baseline survey report

CNP = Community Nutrition Promoter; IFSN = Improving Food Security and Nutrition Policies and Programme Outreach; JFFLS = Junior Farmer Field and Life School; MALEZA = Malawi Enterprise Zone Association; MALIS = Improving Food Security and Market Linkages for Smallholders in Oddar Meanchey and Preah Vihear; NGO = Non-Governmental Organization.

recount the different foods used to feed their children after the IYCF nutrition education sessions, including wild fruits, cassava, potatoes, cooking oil, beans, groundnut flour, bean leaves, mustard leaves, pumpkin leaves, pumpkins and other vegetables. They also knew about the Malawi Six Food Groups, and considered grasshoppers and *vilungulungu* (edible caterpillar), *wachenje* (edible locust) and *nkhululu* (edible cricket) as local animal source foods.

3.2 | Practical hands-on learning

The IYCF nutrition education sessions were considered a highly valued platform for reliable knowledge and skills by mothers and other caregivers in both Cambodia and Malawi. Mothers who participated in FGDs reported that the practical learning during the cooking sessions increased their skills and confidence to prepare enriched porridge (in Cambodia, the enriched porridge is locally called *bobor khap krop kroeng* and is hereafter referred to as *bobor*) at home:

“After the cooking demonstration, I have confidence in preparing bobor [...] and I remember the ingredients.”
(Mothers, Phase one, FGD, Cambodia)

Similarly, in Malawi, CNPs confirmed that caregivers, many of whom were semi-literate, were able to memorise the recipes more easily when they practiced them during hands-on sessions. A grandmother said:

“During the cooking session ... I really wanted to cook something because the things that I have cooked I cannot forget.”
(IYCF Grandmother, FGD, Malawi)

In addition to feeling more confident about feeding their children well, some caregivers expressed satisfaction that their children liked to eat

the porridge, had a better appetite, cried less and were healthier. They felt motivated by these improvements to continue cooking enriched porridge:

“The bobor is good for the health of my child; it is now growing well and eats more diverse foods.”
(Mothers, Phase two, FGD, Cambodia)

3.3 | Supportive families and communities

In Cambodia and Malawi, grandmothers have a key function in influencing, caring for and feeding young children, particularly when the mother is at work. According to one source:

“They are well respected, whatever they say mothers listen to them. Their involvement influences behaviour changes for the mothers. If they are not involved, they are able to say ‘this does not work in this way.’ If they understand, they are even able to explain further to the young mother. This is basically their role.”
(National Nutritionist, Interview, Malawi)

Hence, grandmothers were invited to participate in IYCF nutrition education sessions and did so enthusiastically. Grandmothers stated that their knowledge and skills had increased, and project staff noted that grandmothers became strong advocates for improved childcare and feeding practices, as is evident in the following quotes:

“Normally, during the cooking demonstration we cooked bobor in groups. After the demonstration, I was about 80% sure that I can prepare the bobor on my own at home.”
(Grandmothers, Phase one, FGD, Cambodia)

"When my daughter-in-law comes [to visit], I would teach her and demonstrate to her."

(IYCF Grandmothers, FGD, Malawi)

In both countries, fathers of young children were highly encouraged to participate in IYCF nutrition education sessions, however, their attendance was low which was explained by father's reported perceptions that childcare was women's business and their own personal high workloads in agriculture. In Malawi, husbands determined their wife's participation in the IYCF nutrition education sessions and household practices:

We encourage [fathers] to attend the sessions and participate because they are influential in the household. Being the head of the house, whatever he says [is done], even though the mother has learned something, he can say "No, don't do this."

(National Nutritionist, Interview, Malawi)

Husband FGD participants purportedly appreciated their wives' participation in the IYCF nutrition education sessions, because they perceived that their children's health had improved.

In Malawi, sensitisation of village leaders, their wives and key community members was conducted by holding a community engagement meeting where participants were informed about the purpose of the IYCF nutrition education intervention. They were consulted about the selection of suitable CNPs and drama was performed to mobilise community support. These meetings facilitated greater community buy-in with the programme compared with villages where community mobilisation had not been conducted earlier in the project. Village leaders expressed their appreciation:

"They gave us a leading role in the programme and they ensured that we understood that the programme was fully meant for us. This was an achievement because we felt in control over things that happened in the programme. A drama was used to disseminate the message to us. It was very nice and there was laughter and a lot of people came to watch. The meeting helped us in many ways, starting from the selection of the right people to take responsibility of the programme."

(Group Village Heads, FGD, Malawi)

3.4 | Women's workload and time constraints

In the Cambodia project, where women comprised over 70% of FFS membership (mainly due to male outmigration), a frequently mentioned barrier to preparing *bobor* was mothers/caregivers not having enough time due to farming activities. According to one husband:

"My wife prepares bobor once every three days because we have no time and we don't have food available and money, which we need to buy fish and meat. Sometimes we need to rush to work on the rice field. We only cook when we have free time."

(Fathers, Phase one, FGD, Cambodia)

Mothers/caregivers admitted to giving their young children complementary food from family meals only, or just pure rice, due to time

constraints. In Malawi, health centre staff reported observing that children can be left without any food from morning to afternoon while their mothers are working in the fields. During the rainy season, project staff recorded decreased attendance of caregivers, CNPs and front line extension staff at the IYCF nutrition education sessions due to a conflict with agricultural activities.

3.5 | Resource constraints and limited food diversification

In Cambodia, some households reported financial constraints in buying the ingredients needed for *bobor*, particularly the animal source foods:

"If we would have money, we would buy good and nutritious food. But sometimes, if we do not have money, we eat whatever is available."

(Grandmothers, Phase one, FGD, Cambodia)

A heavy focus on staple foods and limited food production diversification was a barrier in the IFSN project in Malawi, partially related to the government's Farm Input Subsidy Programme, which primarily provides support to vulnerable homes for maize and fertiliser. According to an Agricultural Development Officer:

"What I wish could be done is that we should encourage the production of crops and keeping of animals that can assist a farmer in coming up with good health in terms of nutrition."

(Agricultural Development Officer, Interview, Malawi)

Reasons given by mothers/caregivers for not preparing nutritious dishes were that animal source foods, legumes, fruits and vegetables were not always readily available because of poor agricultural diversification, poverty and lack of market access. Some caregivers commented that, had they been given the opportunity of participating in the food security intervention and provided with diverse agricultural inputs and training, in addition to the nutrition advice, they would have felt more empowered to practice what they had learned during the IYCF nutrition education sessions.

3.6 | Supporting extension systems and future sustainability

In the MALIS project in Cambodia, CNPs were responsible for facilitating IYCF nutrition education sessions in Phase one. During project monitoring visits, many CNPs were found to have limited facilitation skills, lacked confidence and struggled to conduct the participatory cooking sessions, particularly with regard to demonstrating recipes and providing age-appropriate quantities of *bobor* to the caregivers:

"[In Phase one] it was hard to conduct the trainings, because I was just new in providing trainings. Before the MALIS project, I had never been a trainer. Therefore, providing trainings within the MALIS project was a new experience for me. Fortunately, I always got support from the supervisors, such as NGO and health centre staff."

(CNPs, Phase one, FGD, Cambodia)

NGO staff, who carried out facilitation of caregiver groups in Phase two, felt that if the project duration had been longer, the CNPs would have gradually learned how to be good trainers.

In the Malawi project, CNPs reported that caregivers and other community members were encouraged to take the IYCF nutrition education intervention more seriously when they saw CNPs being regularly supervised by extension staff:

"For it to work it's when we and they [the supervisors] coordinate, because in some sessions there is need for supervisors. Also, the women ... to encourage them it's when they see our superiors ... our bosses. [So when the women see them, they would think:] This thing is strong indeed."

(CNPs, Round two, FGD, Malawi)

Village leaders acknowledged their reliance on CNPs to teach the caregivers and ensure that the IYCF nutrition education sessions took place. However, they expressed uncertainty as to whether the CNPs would continue to work without regular supervision and project support. Round two CNPs commented that they loved their job, even without being paid. But they were worried that the IYCF nutrition education sessions would not work if they were left in the hands of the health or agriculture extension staff.

One District Agricultural Development Officer recalled that integrated nutrition services were more easily delivered in former times by Farm Home Assistants (FHA). Farmers, nutritionists and other cadres of staff from NGOs and government in Malawi have called for this post to be reinstated:

"The FHA was there to help the community to make their home good. We are talking about sanitation, preparation of recipes, maybe small businesses by women as income generation activities, decoration at the household and backyard gardening."

(District Agricultural Development Officer, Interview, Malawi)

4 | DISCUSSION

Overall, IYCF nutrition education sessions were consistently reported by caregivers, as well as government and NGO staff, to have improved caregiver knowledge and skills in food preparation and feeding. Caregivers who were able to apply what they had learned were motivated to improve complementary feeding practices and increase the diversity of foods consumed by children; this observation has been confirmed by the results of the cluster randomised control trials conducted by the IMCF research and advocacy project (Kuchenbecker, Reinbott, Mtimuni, Krawinkel, & Jordan, 2017).

The process reviews highlight that in both Cambodia and Malawi, in addition to mothers' knowledge and capacities to feed their children well, family members—especially husbands and grandmothers—play an important role in providing social support and in determining that good IYCF practices are adopted and maintained, as has been observed elsewhere (Aubel, 2012; Avula et al., 2013; Mukuria, Martin, Egondi, Bingham, & Thuita, 2016). Experiences from other programmes concur with the current process review findings that community mobilisation and

engagement through involving important influencers, such as village leaders, are vital for paving the way for new behaviours to become the future social norm (Baker, Sanghvi, Hajeerhoy, & Abrha, 2013).

Empowering women by increasing women's agricultural productivity, processing and marketing skills, and incomes are emphasised as pathways towards improving both their own and their children's nutritional status (Arimond et al., 2010; The World Bank, 2007; van den Bold, Quisumbing, & Gillespie, 2014). However, the process reviews indicate that women's attendance at IYCF nutrition education sessions and their ability to put dietary advice into practice was limited by their workload in both countries; findings that are consistent with other studies (Jones, Cruz, Galway, Bentley, & Pinstrup-Andersen, 2012; Nordang, Shoo, Holmboe-Ottesen, Kinabo, & Wandel, 2015; Olney et al., 2015). In the project area in Cambodia, where women constituted the main agricultural labour force, owing to male outmigration, there is a need to explore diverse options, in addition to home-based food preparation. It is important that other potential child caregivers such as older siblings, grandmothers, and other key community members have appropriate IYCF knowledge and skills to ensure that children receive optimal care while their mothers are away.

At the same time, appropriate technology and infrastructure are urgently required to alleviate women's workloads and enable caregivers to devote adequate time and attention to childcare and feeding (FAO, 2015a; FAO, 2015d). High levels of poverty, lack of markets and poor access to agricultural knowledge, inputs and skills to improve family livelihoods and increase purchasing power, were considered by caregivers to be among the main barriers to obtaining high quality foods; these findings concur with several other studies (Hotz et al., 2015; Iannotti, Muehlhoff, & McMahon, 2013; Stewart, Iannotti, Dewey, Michaelsen, & Onyango, 2013).

Despite efforts to boost agricultural production and increase food access in the target communities, FAO monitoring data and findings from the process reviews indicate that many caregivers with young children, who participated in the IYCF nutrition education sessions, especially in Malawi, may not have shared in the agricultural benefits. Targeting, particularly in the FAO Malawi food security project focused on households that are traditionally eligible for agricultural support, that is, male farmers, established female farmers or male and female members of farmers' cooperatives, because these were the people assumed to have the resources (including access to land) and capacities to improve production and raise productivity. In contrast, health and nutrition programmes target vulnerable women and children, and focus on treating malnutrition, thus contributing to the much-cited disconnect between nutrition and agriculture (IFPRI, 2012). Hence, devising strategies whereby vulnerable caregivers and families with young children receive practical nutrition education, agricultural support, skills and technology is fundamental, so that agricultural investments can contribute to improved family diets and enhanced young child nutrition outcomes (Komatsu, Malapit, & Theis, 2015).

In both Cambodia and Malawi, more effective action is needed across sectors to diversify food availability and access, and to scale up the integration of IYCF nutrition education into agriculture. This requires a vitally needed shift in policies and approach, including access to diverse high quality seed and planting material for all the food groups, and knowledge and skills to process and prepare foods, to encourage food diversification and align agriculture with dietary

requirements. Providing caregivers in Malawi with inputs that match the Malawi Six Food Group guide would have enabled them to grow the diverse foods needed to follow the WHO complementary feeding guidelines. Additionally, the processing and safe use of underutilised nutrient-rich foods, such as wild plants, fruits or animals (including fish and insects), for complementary feeding could be further explored as these food items are already consumed and culturally valued in some countries (Kuyper, Vitta, & Dewey, 2013; Wijesinha-Bettoni, Kennedy, Dirorimwe, & Muehlhoff, 2013).

Nutrition and agriculture are high on the national agenda in Cambodia and Malawi, and cross-sectoral coordinating mechanisms exist at national levels in both countries, which are reinforced by the Scaling Up Nutrition (SUN) Movement (SUN, 2016). Despite well-conceived national nutrition policies and strategies, challenges can persist at implementation level. In the Malawi project, where front line extension staff in agriculture and health, and CNPs had not previously been exposed to IYCF nutrition knowledge and practices, repeated refresher training sessions proved necessary to ensure the quality of the IYCF nutrition education intervention. Initially, front line extension staff needed to spend considerable time with CNPs to build their confidence and skills to help facilitate IYCF care groups. Findings from Cambodia and Malawi indicate that CNPs need to be encouraged by communities and require regular supervision, technical support, and feedback to perform their role well, which has also been observed in other programmes (Kim et al., 2015).

In the IFSN project in Malawi, CNPs were considered by village leaders and mothers/caregivers to be the cornerstone for sustaining the IYCF nutrition education activities. While small stipends were essential incentives for CNPs in Cambodia, in Malawi they were frowned upon in development circles. In either context, regular supervision of CNPs and other front line staff was an important motivating factor not only for the CNPs, but also for the caregivers. Supervision (recommended ideally at monthly or at least quarterly intervals) is viewed as one of the most important elements to successful programmes that rely on community-based workers for village level implementation (Crigler, Gergen, & Perry, 2013).

Strengthening nutrition in agriculture extension systems could be an effective use of resources, as front line extension agents are already working in communities (Fanzo et al., 2015). The Cambodia and Malawi projects show that while there is ample scope for reinforcing existing extension structures if a continuous training system were in place and made use of for projects of this nature; IYCF nutrition education continues to be perceived as project-based and may not be continued once external funding ends. Frequently, there is a lack of government resources for critical ongoing activities, such as training, supportive supervision and monitoring, that are essential for strengthening the capacities and motivation of front line extension staff and volunteers alike. The Cambodia project illustrates that in line with government policy, NGOs can fill a gap where public extension systems may not have the capacities to deliver and/or support community-based IYCF services.

In order to effectively implement high quality, co-targeted integrated agriculture-IYCF nutrition education interventions to improve household and young children's diets, additional resources including staff, a permanent training infrastructure, supervision and monitoring of CNPs are indispensable, in addition to strong cross-sectoral collaboration.

5 | LIMITATIONS OF THE PROCESS REVIEWS

The process reviews were small qualitative enquiries, carried out as part of project monitoring and evaluation. Project staff in Cambodia and Malawi had limited experience in undertaking qualitative data collection and language barriers resulted in transcripts being analysed only once they had been translated into English. Transcription and translation inaccuracies may have biased the findings.

6 | CONCLUSIONS

This paper highlights ways in which agriculture and IYCF nutrition education can contribute to improving young children's diets, emphasising the importance of household and community level action, and support for successful behaviour change. Because agriculture is a direct source of food and income, it is often assumed that agriculture, nutrition and health are easily integrated. However, our paper demonstrates that this assumption does not necessarily hold true even in projects that aim to strengthen existing extension systems, and promote cross-sectoral implementation and coordinated delivery of project components. Despite some limitations, the FAO projects have resulted in important lessons that can be used to improve the effectiveness and impact of future integrated agriculture-IYCF nutrition education programmes.

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CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

CONTRIBUTIONS

Authors have been listed according to their level of contribution. EM, in her capacity as FAO lead Technical Officer and IMCF Project Manager initiated the process reviews in Cambodia and Malawi in 2014, which formed the basis of this paper. EM conceptualised this paper, selected and reviewed the literature, and drafted the manuscript with support of RWB, using data selectively from the FAO Cambodia and Malawi process review reports, which had previously been prepared for project purposes. EW led the field implementation of the process reviews with support from TJ in Cambodia and SN in Malawi. EW and TJ developed a set of guiding questions to explore different thematic issues. The questions were subsequently tailored into questionnaires targeted to key informants, households and for use in FGDs in Cambodia and Malawi. JG coded the process review data using OpenCode 4 software and carried out the initial analysis. EW, SN, TJ and JG contributed to the revision of the manuscript for this paper. All authors have read and approved the final paper and its submission.

REFERENCES

- Arimond, M., & Ruel, M. T. (2004). Dietary diversity is associated with child nutritional status: Evidence from 11 demographic and health surveys. *Journal of Nutrition*, 134(10), 2579–2585.
- Arimond M., Wiesmann D., Becquey E., Carriquiry A., Daniels M. C., Deitchler M., ... Torheim, L. E. (2010). Simple food group diversity indicators predict micronutrient adequacy of women's diets in 5 diverse, resource-poor settings. *Journal of Nutrition*, 140(11), 2059S–2069S.
- Aubel, J. (2012). The role and influence of grandmothers on child nutrition: Culturally designated advisors and caregivers. *Maternal & Child Nutrition*, 8(1), 19–35.
- Avula, R., Menon, P., Saha, K. K., Bhuiyan, M. I., Chowdhury, A. S., Siraj, S., ... Frongillo, E. A. (2013). A program impact pathway analysis identifies critical steps in the implementation and utilization of a behavior change communication intervention promoting infant and child feeding practices in Bangladesh. *Journal of Nutrition*, 143(12), 2029–2037.
- Baker, J., Sanghvi, T., Hajeerbhoy, N., & Abirha, T. H. (2013). Learning from the design and implementation of large-scale programs to improve infant and young child feeding. *Food and Nutrition Bulletin*, 34(Suppl. 3), S226–S230.
- Berti, P. R., Krusevec, J., & Fitz, G. S. (2004). A review of the effectiveness of agriculture interventions in improving nutrition outcomes. *Public Health Nutrition*, 7(5), 599–609.
- Bhutta, Z. A., Das, J. K., Rizvi, A., Gaffey, M. F., Walker, N., Horton, S., ... Black, R. E. (2013). Evidence-based interventions for improvement of maternal and child nutrition: What can be done and at what cost? *The Lancet*, 382(9890), 452–477.
- Contento, I. R. (2016). *Nutrition education: Linking research, theory & practice* (3rd ed.). (pp. 13). Burlington, Massachusetts: Jones & Bartlett Learning.
- Crigler, L., Gergen, J., & Perry, H. (2013). Supervision of community health workers. In (ed) *Developing and Strengthening Community Health Worker Programs at Scale. A Reference Guide for Program Managers and Policy Makers*. USAID/Maternal and Child Health Integrated Program. Baltimore, Maryland: Jhpiego Corporation. Retrieved from http://www.mchip.net/sites/default/files/mchipfiles/CHW_Reference_Guide_sm.pdf (Accessed December 3, 2016).
- Dewey, K. G. (2013). The challenge of meeting nutrient needs of infants and young children during the period of complementary feeding: An evolutionary perspective. *Journal of Nutrition*, 143(12), 2050–2054.
- Dicken, K., Griffiths, M., & Piwoz, E. (1997). *Design by dialogue: A program planner's guide to consultative research for improving young child feeding*. Washington, D. C.: Manoff Group and Academy for Educational Development.
- Fabrizio, C. S., van Liere, M., & Pelto, G. (2014). Identifying determinants of effective complementary feeding behaviour change interventions in developing countries. *Maternal & Child Nutrition*, 10(4), 575–592.
- Fanzo, J., Marshall, Q., Dobermann, D., Wong, J., Merchan, R. I., Jaber, M. I., ... Davis, K. (2015). Integration of nutrition into extension and advisory services: A synthesis of experiences, lessons, and recommendations. *Food and Nutrition Bulletin*, 36(2), 120–137. <https://doi.org/10.1177/0379572115586783>
- FAO. (2012a). *Kupititsa patsogolo kadyetsedwe koyenela ka ana. Promoting improved infant and young child feeding. Key Messages Book. Chichewa Version*. Rome, Italy: Food and Agriculture Organization of the United Nations. Retrieved from <http://www.fao.org/3/a-bc615b.pdf> (Accessed December 6, 2016).
- FAO. (2012b). *Kupititsa patsogolo kadyetsedwe koyenela ka ana. Promoting improved infant and young child feeding. Facilitator's Book. English Version*. Rome, Italy: Food and Agriculture Organization of the United Nations. Retrieved from <http://www.fao.org/ag/humannutrition/36039-0ea07ef6a136d3db8b5052d0fca811f7.pdf> (Accessed December 6, 2016).
- FAO. (2013). *The state of food and agriculture: Food systems for better nutrition*. Rome, Italy: Food and Agriculture Organization of the United Nations. Retrieved from <http://www.fao.org/docrep/018/i3301e/i3301e.pdf> (Accessed April 15, 2016).
- FAO. (2014). What works at home? Improving complementary feeding based on locally available foods-learning from caregivers through trials of improved practices in Kasungu and Mzimba districts of Malawi. Rome, Italy: Food and Agriculture Organization of the United Nations. Retrieved from <http://www.fao.org/ag/humannutrition/43005-0217b833f79d8cd50e5dee498df36bfd.pdf> (Accessed December 6, 2016).
- FAO. (2015a). *Designing nutrition-sensitive agriculture investments - Checklist and guidance for programme formulation*. Rome, Italy: Food and Agriculture Organization of the United Nations Retrieved from <http://www.fao.org/3/a-i5107e.pdf> (Accessed December 6, 2016).
- FAO. (2015b). *Improving complementary feeding in Malawi - Lessons learned from a process review of a food security and nutrition project* Rome, Italy: Food and Agriculture Organization of the United Nations Retrieved from <http://www.fao.org/3/a-bc791e.pdf> (Accessed April 15, 2016).
- FAO. (2015c). *Improving complementary feeding in North-Western Cambodia - Lessons learned from a process review of a food security and nutrition project* Rome, Italy: Food and Agriculture Organization of the United Nations Retrieved from <http://www.fao.org/3/a-bc792e.pdf> (Accessed April 15, 2016).
- FAO. (2015d). *Key recommendations for improving nutrition through agriculture and food systems*. Rome, Italy: Food and Agriculture Organization of the United Nations. Retrieved from <http://www.fao.org/3/a-i4922e.pdf> (Accessed April 15, 2016).
- FAO. (2016). *Integrating agriculture and nutrition education for improved young child nutrition: Programme lessons*. Rome, Italy: Food and Agriculture Organization of the United Nations. Retrieved from <http://www.fao.org/nutrition/education/iycf/en> (Accessed April 15, 2016).
- Girard, A. W., Self, J. L., McAuliffe, C., & Olude, O. (2012). The effects of household food production strategies on the health and nutrition outcomes of women and young children: A systematic review. *Paediatric and Perinatal Epidemiology*, 26(Suppl. 1), 205–222.

- Government of Cambodia. (2011). Communication for Behavioural Impact (COMBI). Campaign to promote complementary feeding in Cambodia: 2011-2013. Phnom Penh, Cambodia: National Centre for Health Promotion and National Maternal and Child Health Centre. Retrieved from <http://camnut.weebly.com/uploads/2/0/3/8/20389289/2011compfeedingcommstrategy.pdf> (Accessed July 18, 2016).
- Hotz, C., Pelto, G., Armar-Klemesu, M., Ferguson, E. F., Chege, P., & Musinguzi, E. (2015). Constraints and opportunities for implementing nutrition-specific, agricultural and market-based approaches to improve nutrient intake adequacy among infants and young children in two regions of rural Kenya. *Maternal & Child Nutrition*, 11(Suppl 3), 39–54.
- Iannotti, L., Muehlhoff, E., & McMahon, D. (2013). Review of milk and dairy programmes affecting nutrition. *Journal of Development Effectiveness*, 5(1), 82–115.
- IFPRI. (2012). *Reshaping agriculture for nutrition and health*. In S. Fan & R. Pandya-Lorch (Eds), Washington, D.C.: International Food Policy Research Institute. Retrieved from <http://www.ifpri.org/publication/reshaping-agriculture-nutrition-and-health> (Accessed December 3, 2016).
- Issaka, A. I., Agho, K. E., Burns, P., Page, A., & Dibley, M. J. (2015). Determinants of inadequate complementary feeding practices among children aged 6–23 months in Ghana. *Public Health Nutrition*, 18(4), 669–678.
- Jones, A. D., Cruz Agudo, Y., Galway, L., Bentley, J., & Pinstrup-Andersen, P. (2012). Heavy agricultural workloads and low crop diversity are strong barriers to improving child feeding practices in the Bolivian Andes. *Social Science & Medicine*, 75(9), 1673–1684.
- Kim, S. S., Ali, D., Kennedy, A., Tesfaye, R., Tadesse, A. W., Abrha, T. H., ... Menon, P. (2015). Assessing implementation fidelity of a community-based infant and young child feeding intervention in Ethiopia identifies delivery challenges that limit reach to communities: A mixed-method process evaluation study. *BMC Public Health*, 15, 316.
- Komatsu H., Malapit H.J.L. & Theis S. (2015). How does women's time in reproductive work and agriculture affect maternal and child nutrition? Evidence from Bangladesh, Cambodia, Ghana, Mozambique, and Nepal. Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2741272 (Accessed April 23, 2016).
- Kuchenbecker, J., Reinbott, A., Mtimuni, B., Krawinkel, M., Jordan, I. (2017). Nutrition education improves dietary diversity of children 6-23 months at community-level: Results from a cluster randomized controlled trial in Malawi *PLoS One*. 2017; 12(4): e0175216. doi:10.1371/journal.pone.0175216 (Accessed June 15, 2017).
- Kuyper, E., Vitta, B., & Dewey, K. (2013). Novel and underused food sources of key nutrients for complementary feeding. A & T Technical Brief Issue 6 February 2013. Retrieved from http://picn.ucdavis.edu/resources/a-and-t/issue_6_novel_and_underused.pdf (Accessed December 3, 2016).
- Lassi, Z. S., Das, J. K., Zahid, G., Imdad, A., & Bhutta, Z. A. (2013). Impact of education and provision of complementary feeding on growth and morbidity in children less than 2 years of age in developing countries: A systematic review. *BMC Public Health*, 13(Suppl. 3), S13.
- Masset, E., Haddad, L., Cornelius, A., & Isaza-Castro, J. (2012). Effectiveness of agricultural interventions that aim to improve nutritional status of children: Systematic review. *British Medical Journal (Clinical Research ed.)*, 344(7843), d8222.
- Meeker, J. & Haddad, L. (2013). A state of the art review of agriculture-nutrition linkages. An AgriDiet Position Paper. Cork, Ireland: Department of Food Business and Development, University College Cork. Retrieved from <https://opendocs.ids.ac.uk/opendocs/bitstream/handle/123456789/3035/AgriDiet%20Global%20Review%20FINAL.pdf;jsessionid=B4A6606AEB516C5DAF3DE46E9384D404?sequence=1> (Accessed December 6, 2016).
- Mukuria, A. G., Martin, S. L., Egondi, T., Bingham, A., & Thuita, F. M. (2016). Role of social support in improving infant feeding practices in Western Kenya: A quasi-experimental study. *Global Health: Science and Practice*, 4(1), 55–72.
- Nordang, S., Shoo, T., Holmboe-Ottesen, G., Kinabo, J., & Wandel, M. (2015). Women's work in farming, child feeding practices and nutritional status among under-five children in rural Rukwa, Tanzania. *The British Journal of Nutrition*, 114(10), 1594–1603.
- Olney, D. K., Pedehombga, A., Ruel, M. T., & Dillon, A. (2015). A 2-year integrated agriculture and nutrition and health behavior change communication program targeted to women in Burkina Faso reduces anemia, wasting, and diarrhea in children 3–12.9 months of age at baseline: A cluster-randomized controlled trial. *Journal of Nutrition*, 145(6), 1317–1324.
- PAHO/WHO. (2003). Guiding principles for complementary feeding of the breastfed child. Retrieved from http://www.who.int/child_adolescent_health/documents/a85622/en/index.html (Accessed April 13, 2011).
- Rawat, R., Nguyen, P. H., Ali, D., Saha, K., Alayon, S., Kim, S. S., ... Menon, P. (2013). Learning how programs achieve their impact: Embedding theory-driven process evaluation and other program learning mechanisms in alive & thrive. *Food and Nutrition Bulletin*, 34(Suppl. 3), S212–S225.
- Ruel, M. T., Alderman, H., & The Maternal and Child Nutrition Study Group (2013). Nutrition-sensitive interventions and programmes: How can they help to accelerate progress in improving maternal and child nutrition? *The Lancet*, 382(9891), 536–551.
- Stewart, C. P., Iannotti, L., Dewey, K. G., Michaelsen, K. F., & Onyango, A. W. (2013). Contextualising complementary feeding in a broader framework for stunting prevention. *Maternal & Child Nutrition*, 9(Suppl. 2), 27–45.
- SUN. (2016). The Scaling Up Nutrition (SUN) Movement. Retrieved from <http://scalingupnutrition.org/> (Accessed December 6, 2016).
- The Lancet. (2008). Maternal and child undernutrition. Retrieved from <http://www.thelancet.com/series/maternal-and-child-undernutrition> (Accessed April 23, 2016).
- The World Bank. (2007). From Agriculture to Nutrition: Pathways, Synergies and Outcomes. Report No. 40196-GLB. Washington, D.C.: The International Bank for Reconstruction and Development/The World Bank Retrieved from <http://siteresources.worldbank.org/INTARD/825826-1111134598204/21608903/January2008Final.pdf> (Accessed December 3, 2016).
- UNSCN. (2014). Findings from a review of country level programming in nutrition-sensitive agriculture. Geneva, Switzerland: United Nations System Standing Committee on Nutrition. Retrieved from https://www.unscn.org/files/Announcements/Other_announcements/Review_country_level_programming_nutrition-sensitive_agriculture_UNSCN_FINAL.pdf (Accessed December 4, 2016).
- van den Bold M., Quisumbing A.R., & Gillespie S. (2014). Women's empowerment and nutrition: An evidence review. IFPRI Discussion Paper, 1294. Washington, D.C.: International Food Policy Research Institute. Retrieved from <http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/127840> (Accessed April 15, 2016).
- Volpe, S. L., Hall, W. J., Steckler, A., Schneider, M., Thompson, D., Mobley, C., ... El Ghormli, L. (2013). Process evaluation results from the HEALTHY nutrition intervention to modify the total school food environment. *Health Education Research*, 28(6), 970–978.
- Waswa, L. M., Jordan, I., Herrmann, J., Krawinkel, M. B., & Keding, G. B. (2015). Community-based educational intervention improved the diversity of complementary diets in western Kenya: Results from a randomized controlled trial. *Public Health Nutrition*, 18(18), 3406–3419.
- Webb, P. (2013). Impact pathways from agricultural research to improved nutrition and health: Literature analysis and research priorities. Rome, Italy: Food and Agriculture Organization of the United Nations and Geneva, Switzerland: World Health Organization. Retrieved from <http://www.fao.org/documents/card/en/c/b8d5bf64-f96b-4178-8835-524b616d2803/> (Accessed December 4, 2016).
- WHO. (2010). Indicators for assessing infant and young child feeding practices part 3: Country profiles. Geneva, Switzerland: World Health Organization. Retrieved from <http://apps.who.int/iris/handle/10665/44368> (Accessed September 15, 2016).
- Wijesinha-Bettoni, R., Kennedy, G., Dirorimwe, C., & Muehlhoff, E. (2013). Considering seasonal variations in food availability and caring capacity

when planning complementary feeding interventions in developing countries. *International Journal of Child Health and Nutrition*, 2(4), 335–352.

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Additional Supporting Information may be found online in the supporting information tab for this article.

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