Maxwell B. Konlan, Helen H Habib, Sandra B Kushitor, Paulina Addy, Awurabena Q Dadzie, Menno Mulder-Sibanda, Richmond Aryeetey. 2024. "Evaluation of the Improved Feeding Practices for the First 1000 Days in Ghana." *World Nutrition*, June, 74–86. https://doi.org/10.26596/wn.202415274-86

Research

Evaluation of the Improved Feeding Practices for the First 1000 Days Project in Ghana

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Keywords: nutrition-sensitive agriculture, OFSP, micronutrient powder, Ghana, dietary diversity, first 1000 Days, orange-fleshed sweet potatoes

https://doi.org/10.26596/wn.202415274-86

World Nutrition 2024;15(2):74-86

Background

Sub-optimal nutrition during the first 1000 days of life can impair the physical and cognitive development of children, as well as limit their health and wellbeing. The improved feeding practices for the first 1,000 days (IFP) project aimed to improve the dietary practices of women of reproductive age (pregnant and lactating) and children below ages two years in three selected districts (Kassena-Nankana West [KNW], Sekyere East[SE], and Kintampo South[KS]) in Ghana. This integrated project combined interventions on micronutrient powder (MNP) distribution, social behaviour-change communication, and nutrition-sensitive agriculture to catalyse enhanced awareness and consumption of nutrient-rich foods in selected communities.

Objective

This paper evaluates the IFP project based on measures associated with relevance, effectiveness, impact, and sustainability.

Methods

Using a mixed-methods design, data from in-depth interviews of project beneficiaries, and key community-based actors involved in the project's implementation were triangulated with routine project monitoring data, and documentation to answer the evaluation questions. The evaluation questions and our analyses were guided by the Development Assistance Committee evaluation criteria. Interviews with key stakeholders were conducted in June 2023. Key project data were compared between baseline and endline assessments to ascertain the extent to which the project met its intended objectives and targets.

Results

The project demonstrated high relevance of the proposed project among the target groups; for example, nearly half the children were eating low quality, non-diverse diets (49% in KNW, 46% in KS and 35 in SE). The project enabled almost 14,000 children to be reached with MNP. While 96,000 eggs were produced, <10% was consumed at home. About 35,000 kilograms of orange-fleshed sweet potatoes (OFSP) were produced, resulting in improved access to the nutrient-rich foods produced. Nutrition messages were disseminated widely and were reported to have contributed to improved awareness of nutrition among caregivers. Data-based and reported evidence both indicated there was improved child dietary diversity between baseline and endline of the project; in KNW, 90% of children met minimum dietary diversity at endline compared to 75% at baseline. In KS and SE, the endline estimates of dietary diversity were 71% and 70%, up from 65% in both districts at baseline, respectively. Multiple strategies aiming to support project sustainability that were built into the project design were implemented. Additional sustainability strategies

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evolved during the project's lifetime, including crossbreeding of project chickens with hardier local breeds, continued multiplication of OFSP vines, and transfer of Village Savings and Loans Association funds accumulated from MNP sale to Village-Based Entrepreneurs to sustain MNP supply.

Conclusions

IFP project delivered interventions successfully, leading to improved awareness and practices related to diets of women in reproductive age and young children, in project communities. These strategies can be extended to women and children living in similar settings to improve the diet quality of women and children.

INTRODUCTION

Optimal dietary intake among young children, especially during the first 1000 days, that is from conception to their second birthday, can reduce the risk of stunting and wasting and associated adverse consequences on wellbeing (Keats et al, 2021; Bhutta et al, 2013). Improving the nutritional status of children is also crucial to ensure optimal cognitive development and long-term health.

Sub-optimal nutrition among women of reproductive age is associated with intergenerational adverse effects on their offspring (Das et al. 2018). Malnutrition in women and children limits productivity, increases susceptibility to infections, and slows recovery from illness (Siddiqui et al., 2020). Pregnant women and young children are at greater risk of micronutrient deficiencies (Bailey et al., 2015). Addressing micronutrient deficiencies in pregnant women does not only improve their health, it can also limit risk of malnutrition in their unborn children (Birhanie et al., 2020; Ducarme et al., 2021; Ahmed, 2022; Keats et al., 2021).

Ghana has made significant progress in reducing child undernutrition over the past two decades (Aryeetey et al, 2021). However, undernutrition rates remains unacceptably high (Aryeetey et al., 2022). One in every 40 children does not survive to his or her fifth birthday (GSS and ICF 2014). Moderate stunting prevalence at the national level is estimated at 17.5% and an estimated 6% of children in Ghana are moderately wasted. Further, among young children below 5 years, an extremely high anaemia prevalence (66%) may indicate severe micronutrient malnutrition affecting population health and wellbeing (Coomson and Aryeetey, 2022). Anaemia also affects 51% of pregnant women and almost 40% of non-pregnant women (GSS and ICF, 2023).

Integrated nutrition interventions that include nutrition-sensitive agriculture, water and sanitation and hygiene strategies are recognized as effective for addressing the immediate and underlying drivers of undernutrition (Margolies et al. 2022; Marquis et al., 2018; Sharma et al., 2021; Ruel et al., 2018). In Ghana, the Nutrition Links study tested an integrated intervention involving nutrition-sensitive agriculture, behaviour-change communication, and health system strengthening in the Upper Manya Krobo District, resulting in improved diet and reduced stunting among young children (Marquis et al. 2018).

Between 2020 and 2023, World Vision Ghana (WVG) implemented the "Improved Feeding Practices for the first 1000 days'' (IFP) project in three districts (Kassena-Nankana West [KNW], Sekyere East [SE], and Kintampo South [KS]). The IFP project was designed to improve the dietary practices of women of reproductive age (including pregnant and lactating women) and the feeding of children under two years (that is, focusing on the "first 1000 days of life"). The project aimed to achieve these outcomes by: (1) promoting interventions that would increase access to innovative nutritional supplements using social enterprise to scale-up nutritional supplements by Village Based Entrepreneurs (VBEs), (2) improving dietary diversity (through the promotion of fruits, vegetables, and a biofortified food [orange-flesh sweet potato, OFSP], and animal-source foods) delivered through small-scale agriculture-based livelihood interventions and, (3) increasing awareness of nutrition and health through nutrition messaging delivered via a social behaviour-change communication strategy.

The current study evaluated the IFP project by assessing indicators associated with relevance, effectiveness, impact, and sustainability across the three implementation districts. Earlier publications have reported on other aspects of the IFP project including (1) experience of the interventions (Kushitor et al, 2024); (2) availability, acceptability, and utilization of the MNP (Donkor et al, 2024), and (3) production and utilization of nutrient-rich foods (Habib et al, 2024). The current study was not designed to scientifically establish causality of the interventions (which would have required comparison areas). Rather, it documents the outcomes of the intervention from diverse perspectives and the lessons that were learned from its implementation.

The evaluation answered the following questions: To what extent was the IFP project relevant to the identified needs of the targeted communities? To what extent were the objectives/outcomes of IFP project achieved? What real difference did the IFP project make to the intended beneficiaries? What strategies have been implemented to ensure that the benefits of IFP project are likely to remain beyond completion of the project?

METHODS

STUDY DESIGN AND SETTING

A mixed-methods approach was used for gathering data for this study. This included a baseline and endline quantitative survey, endline qualitative interviews and project reports. According to the 2021 Population and Housing census, the population of KS was 90,735, KNW was 88,384 and SE was 74,789 populations. KS and KNW are predominantly rural areas with agriculture as the main occupation. World Vision Ghana has implemented several projects in these three districts, including the Savings for Transformation (S4T) project. Through the S4T project, Village-based Savings and Loans Associations were formed. The beneficiaries of the IFP project were selected from participants in the Village-based Savings and Loans Associations.

QUANTITATIVE DATA

Quantitative data were collected at baseline and endline of the project. In 2020, cluster sampling was conducted to select 17, 19, and 18 communities in KNW, KS and SE, respectively. In each community, 25 households with lactating mothers who had children between ages 6-23 months were selected through systematic sampling. A total of 1,354 households were interviewed at baseline. A household questionnaire was developed, adapting standard indicators used by WHO of child and maternal health including minimum dietary diversity, exclusive breastfeeding (EBF, based on a 24-hour recall among mothers of infants under 6 months of age), and early initiation of breastfeeding (EIBF, within one hour of birth). The demographic questions were adapted from the Ghana Demographic and Health Survey questionnaire. The questionnaire was uploaded in electronic format on a tablet or smartphone using the Open Data Kit software. Field workers were trained for three days in community entry, questionnaire administration and software use before commencement of interviews. The questionnaire was piloted in Tamale, a small city in northern Ghana. After piloting, local language keywords were selected to facilitate questionnaire administration.

QUALITATIVE DATA

Sixty-one in-depth interviews were conducted with purposively selected project implementers and beneficiaries (n=61). In each district, two project communities were selected. In each community, two project beneficiaries, one relative of a beneficiary, one community volunteer, one male "project champion" and one village-based entrepreneur were interviewed. Regarding program implementers, seven WVG staff (including the monitoring and evaluation officer) and the district project managers were interviewed. Government representatives were also interviewed. In each district, the director and agriculture extension officers of the Department of Agriculture were interviewed, as well as district nutrition officers and community health workers.

An interview guide was designed collaboratively by the research team members. The guide explored stakeholders' experience and perception of the IFP project interventions, focusing on the impact of the project on the diet of women and children as well as perceived health and nutrition outcomes. The in-depth interviews explored the beneficiaries' awareness and experiences of the project activities, and their perception of the impact of the interventions on their lives, livelihoods, and their families' health and wellbeing. Evidence was also obtained on the processes utilized for mobilizing the community, delivering interventions, overcoming barriers, and leveraging opportunities. Data were also gathered on respondent's perspectives about the lessons learned from implementing the project activities.

The interviews were conducted in the respondent's preferred language (English, *Twi* or *Kassena*). Most of the interviews were conducted face-to-face at their workplace or home except two, which were conducted virtually via Zoom. During community-level interviews, only the interviewer and participant were present for each interview to ensure confidentiality. Community-level interviews lasted between thirty and sixty minutes and were audio-recorded. Interviews with project implementers and partners were longer (between 1 and 1.5 hours) and were also audio-recorded.

PROJECT REPORTS AND GOVERNMENT POLICIES

Eight project documents were identified and reviewed, including the baseline study report, endline study report, project proposal, project implementation manual, two annual progress reports, Mid-year monitoring reports and project log frame. These documents were used to capture information on the number of participants reached, agriculture production, community meetings and project outputs. The government policies utilized in this study were the National Nutrition Policy, the National Health Policy (NHP), and the National Agriculture Investment Plan.

ANALYSIS

The quantitative data were analysed using SPSS version 21 and involved summary statistics related to the project's output, outcome, and impact data. Qualitative data were analysed thematically by coding and identifying pertinent themes, inductively, using *Atlas.ti* qualitative software version 23. Details of the qualitative data analysis and reliability have been described by Kushitor et al. (2024).

ANALYTICAL FRAMEWORK AND DATA INTEGRATION

This study used the OECD Development Assistance Committee (DAC) Network on Development Evaluation (EvalNet) framework. (OECD, 2019) The DAC evaluation criteria are described in Table 1. We determined relevance as to whether the project focused on addressing unmet needs of the beneficiaries, including key gaps related to the quality and adequacy of the diets of women in reproductive age and young children, and as expressed in national food and nutrition policies, guidelines, and commitments. We also determined how the project responded to changes in the local situation during the implementation of the project. Evidence for determining relevance included findings of the baseline survey as well as other relevant findings on food security and dietary practices in the selected districts or their respective regions. Project data on changes occurring during the project were also utilized to determine relevance.

Effectiveness was determined as the extent to which project objectives and outputs were achieved, as well as the extent to which intervention activities contributed to the achievement of the stated project outputs. Effectiveness was determined by comparing the findings of the baseline survey with the endline survey and with reference to the immediate outputs as indicated in the theory of change derived from the project's implementation (Kushitor et al., 2024). Impact was determined as the extent to which outputs were translated into nutrition and health outcomes. Impact was determined using evidence from the baseline and the endline surveys with a focus on longer term outcomes. Sustainability was determined as the measures put in place to ensure sustainability of the project, that is, the likelihood of continuation of the project outputs, outcomes, and benefits persisting in the communities beyond the lifetime of the IFP project. Evidence from the in-depth interviews, and project reports were synthesized to determine sustainability.

Table 1. Development Assistance Committee (DAC) evaluation criteria

Relevance	Is the project doing the right thing? Was the project relevant to the identified needs? To what extent are the objectives of the project still valid?
Effectiveness	To what extent were the objectives/outcomes achieved, or are likely to be achieved? How did the project contribute to the achievement of these objectives/outcomes? How effective were the strategies and tools used in the implementation of the project?
Impact	What has happened as a result of the IFP project – either as intended or unintended, positive, or negative? What real difference has the project made to the intended beneficiaries? What is the impact or effect of the intervention in proportion to the overall situation of the target group or those effected?
Sustainability	What measures are put in place to ensure sustainability? Are the measures put in place likely ensure project continuation and sustainability of project after completion of the project?

ETHICS

Ethics approval was obtained from the Noguchi Institute of Medical Research Board (073/22-23). All participants provided informed consent prior to the interview.

RESULTS

SOCIAL-DEMOGRAPHIC CHARACTERISTIC

The IFP project included a total of 1,318 direct beneficiaries with an average age of 30 years (range 15-49) across the three districts. Details of the participants included in the study have been previously reported (Kushitor et al, 2024). Seven staff members from WVG were interviewed. In each of the districts, three beneficiaries were interviewed, while a VBE was selected from each district

RELEVANCE

The IFP project demonstrated strong relevance and alignment with the nutrition situation in Ghana at both the national and sub-national levels, particularly, regarding the diet of young children and women of reproductive age. Evidence from the Demographic and Health Survey (DHS) showed that the prevalence of stunted growth among children were 21% in the Upper East region (KNW); 17% in the Ashanti region (SE), and 14% in Bono East (KS).

In the implementation districts, 49% of young children were consuming sub-optimal diets in KNW at baseline; in SE and KS, poor diet quality was estimated at 35% and 46%, respectively. High rates of suboptimal maternal diet diversity were also observed at baseline: KNW (71.9%), SE (67.4%), and KS (82.6%). Other national-level policies have identified and reported these dietary deficits and proposed actions to address maternal and child nutrition as expressed in the National Nutrition Policy, National Health Policy, and the National Agriculture Investment Plan. These policies recommended remedial actions that included capacity strengthening, extension services, enhanced service delivery, and social and behaviour- change communication, all of which are part of the strategies employed by the IFP project. Evidence from the in-depth interviews also demonstrated the relevance of the interventions as follows:

As the Department of Agriculture, we are fortunate to be partners [of the IFP] because most of the interventions fit into our departmental objectives. … So, they (WVG) are basically helping us to implement our mandate. (KS Director of Agriculture)

Kassena-Nankana West is one of the poorest districts in the region in terms of food production. One part is doing well, but the two other parts actually have some challenges when it comes to providing food sources for consumption. That has affected the nutritional status of the vulnerable: children under five, pregnant women and adolescents. (Nutrition Officer, KNW).

Before, we were unaware of the fact that overcooking 'Kontomire' leaves strips away valuable nutrients. We were given lessons on how to properly prepare our stews, and we were told that the 'Kontomire' can be added to the stew after washing it with salt. I believe that by heeding this advice, we will now receive all the necessary nutrients we need from the food we eat. (Beneficiary, SE)

OUTCOMES OF THE PROJECT

COMPONENT 1: AGRIVULTURAL INTERVENTION

Tables 2 and 3 provide a summary of the output indicators of the IFP project. The agriculture component of the IFP project was aimed at enhancing production of nutrient-rich crops at the household level. Trained agriculture extension agents (AEAs) provided training on best practices for feeding and caring for poultry. In 2022, 1081 farmers were trained in poultry management; the project also trained beneficiary farmers on planting fruit trees (including mango, pawpaw and moringa) and OFSP. The crop-related training focused on land preparation, setting up plants/fruits and vegetable nurseries, transplanting seedlings to farm plots, pest control and use of organic fertilizers. The AEAs participated in a training of trainers' program prior to the community-level training. A total of 2,172 beneficiaries were trained although the project target was 2,000. Details of this can be found in Table 2.

The IFP project supplied 45,395 live laying hens to the project beneficiaries. As a result, the beneficiaries produced 2.7 million eggs (95784 crates) (Table 3). About 1,600 households received seedlings for fruit trees. Altogether, households received 7,000 mango seedlings, 3,000 moringa seedlings and 6,000 pawpaw seedlings in 2022. The participants also received 645,050 OFSP vines. In 2022, beneficiaries harvested 35,413kg of OFSP. Details on production of nutrient-rich foods can be found in Tables 2 and 3. The in-depth interviews with beneficiaries supported these outcomes:

*They (*IFP Project partners*) taught us how to take care of the poultry and they made us understand there are some diseases that may be present in poultry, which can possibly affect us as humans, so we should be careful and mindful of how we handle things. They also said we should clean their coop all the time, feed them morning, afternoon, and evening. We were also told to separate the unhealthy birds when we notice any. (Beneficiary 06, KNW).*

COMPONENT 2: MICRONUTRIENT POWDER DISTRIBUTION

The IFP project created a value chain to facilitate the distribution of MNPs. Although 280 VBEs were planned to be trained and to be supported to distribute KOKO Plus, by the end of the project, 300 had been trained. Training of the

VBEs was provided by Point Hope, a local non-governmental organization, working together with district-level business advisory centres of the local government. Through the VBEs, the IFP project supplied nearly 200,000 sachets of KOKO Plus to beneficiaries in the project communities through Child Welfare Clinics (CWC) selling points, door-to-door sales, shops, and community markets. Almost 14,000 children were reported to have consumed 192,092 sachets of KOKO Plus. Beneficiaries confirmed the role of the IFP project for increased access to MNPs at the community level and at relatively affordable prices.

Initially, the KOKO Plus was available at Sekyere East and not at Ahwerewa [a rural community]. It will be difficult for someone to pick a car to Efijuase (District capital) to buy KoKo Plus, but now, when the World Vision came, they took some of the mothers through training and they are selling it, which helps. (Community Health Nurse, SE).

Among beneficiaries, the acceptability of KOKO Plus was reported as positive. Community Health Nurses working in the project communities reported increased acceptability due to targeting promotion and sale of KOKO Plus to clients visiting the CWC; beneficiaries generally perceived KOKO Plus as healthy and important to improve the wellbeing of their children.

It improves the health and nutrition of babies. When I for instance completed my six-[months] exclusive breastfeeding, my baby refused to take any foods I introduced him to and wanted just the breast milk but Koko Plus got him to start eating after I was introduced to it by the health professionals at the weighing (post-natal health checks) centre. It is very healthy for babies because it gives them increased cognitive abilities and improves their overall health and general wellbeing. (KS, VBE).

The IFP created a value chain to facilitate the distribution of MNPs. The VBEs also generated income for themselves. According to the beneficiaries, the IFP project effectively increased access to MNPs at the community level and at relatively affordable prices.

Four children diagnosed with moderate malnutrition were provided with KOKO Plus in SE and KN. After four weeks of continues use of KOKO Plus in addition to medical treatment, their conditions were reported to have improved significantly. This incident was reported to have increased acceptability of the product. The mothers also saw KOKO Plus as cheaper than powdered milk products which had been used to fortify their children's meals.

COMPONENT 3: NUTRITION MESSAGING

Nutrition messaging was provided to beneficiary communities by the Ghana Health Service (GHS) via mother-to-mother support groups (MTMSG), community health volunteers, and so-called male champions (male community health volunteers), using social and behaviour-change communication tools. Among the stakeholders trained on dietary messages and how to disseminate the messages were 70 GHS staff trained on infant and young child feeding, and maternal support. Subsequent step-down training for other health workers was conducted for community volunteers including 280 MTMSG facilitators, 140 community health volunteers, and 120 male champions. To further strengthen the capacity of the GHS staff, the IFP project provided job aids needed for anthropometric and biomarker analysis of nutrition outcomes including 1,800 weighing scales, weight pants, slings, infantometers and electronic weighing scales. The IFP also provided 30 microcuvette packets 12 Hemocue kits, and 300 bicycles. Health facilities across the 3 districts received 4,155 IEC materials such as posters, fliers, and flipcharts.

Personally, I have been helped, I have been able to gain knowledge which I transfer to my child to also take outside and share. So those of us working with World Vision in the community, if you compare us to the communities without World Vision, when it comes to capacity building where we are giving a message on exclusive breastfeeding and complementary feeding, you can realize there's a difference, due to the training we passed through (Community Health Nurse 001, SE).

The training we received under the project broadened our knowledge in the areas of maternal health and child nutrition. To some of us who are already in the system, it's been a refresher course for us but to the new entrants, they've gained valuable knowledge. Even the volunteers have been really impacted by these training sessions because they have broadened their knowledge base and now they don't only understand the nutrition indicators but use the jargon in their communication. They can competently educate the mothers on the indicators and use the counselling charts and flip cards in their education. (Nutrition Officer, KS).

The channels most used for message dissemination were churches, community centres, venues for food demonstrations, individual counselling, child welfare clinics, and radio. The IFP project collaborated with the Women in Agriculture Department of the Department of Agriculture and Mother-to-Mother Support Group to conduct food demonstration campaigns. In 2021, 407 beneficiaries (321 females and 86 males) were trained on preparation of various dishes incorporating OFSP roots and leaves.

Initially, the information was delivered through meetings [MTMSG], where they would meet with the bosses [MTMSG Facilitator]. However, the nurses were later put in charge, and we would meet every Saturday evening to learn. We have a community Information Centre where the information is broadcasted. (Beneficiary 004, SE).

The project has led to improved nutrition among the people in the twenty-one (21) communities and this is evident from our indicators. Practically, they now know how to combine the food products available in their communities such as moringa, OFSP, Koko Plus etc to prepare nutritious meals. Apart from this, they learnt from our food demonstrations how to enrich their foods not just with Koko Plus but with eggs as well. For instance, mixing eggs with corn dough to prepare koko (porridge) for the child, or adding margarine, soya beans, agushie, vegetable oil or palm oil to food to enrich it. (Nutrition Officer, KS).

IMPACT OF THE IFP PROJECT

In KNW, 97.4% of mothers practiced EBF at the endline of the study compared to 90.0% at baseline; in KS and SE, the EBF rates increased from 62.0% to 92.0% and 44.0% to 96.0%, respectively. The rate of EIBF increased, marginally, in KS (from 80.0% at baseline to 85.0% at endline) and in SE (83.0% at baseline to 88.0% at endline).

However, in the KNW district, the EIBF rate at baseline was 96.0%, and declined, marginally, to 89% at endline

(Table 4). There was an overall increase in proportion of young children who were fed with minimum meal frequency for their age. In KNW, meal frequency increased from 76.0% to 91.0%; from 65.0% to 71.0% in SE, and from 74.0% to 76.0% in KS. Another indicator of child feeding that is reported is minimal acceptable diet; there was an increase in the proportion between baseline and endline in one district and a decline in the other two districts.

Table 2. Output indicators of the of the IFP project components: nutrition messaging, agriculture production, and micronutrient powder distribution

Nutrition messaging	KNW	KS	SE	Total	Target
Number of VBE's trained on nutrition supplements and micro-franchising	-	-	-	280	300
Number of mother-to-mother support groups created	24	19	22	65	-
Number of men support group	5	9	12	26	-
Number of community-based health volunteers trained and conducting GMP	-	-	-	284	140
Mother's support group facilitator trained in year 1 & 3	-	-	-	280	280
Male champions trained	-	-	-	120	120
GHS trained in IYCF in 2022	-	-	-	70	-
VPE Member Training on usage of OFSP in 2021	-	-	-	407	-
Agricultural production					
Live birds supplied	12,624	15,338	17,433	45,395	-
Vines supplied	144,150	230650	270,250	645,050	-
Number of moringa supplied in 2022	-	-	-	3000	-
Number of mango seedlings supplied in 2022	-	-	-	7000	-
Number of papaya seedlings supplied in 2022	-	-	-	6000	-
Number of households that received starter crops	-	-	-	1609	1575
Number of farmers trained by AEAs on selling and saving crops for improved dietary diversity	-	-	-	2000	2172
Number of participants trained on OFSP production (2022)	-	-	-	1510	
Number of farmers trained on poultry management in 2022	-	-	-	1081	1050
Micronutrient powder					
Number of KOKO Plus sachets purchased for the project	80,400	82,800	86,800	250,000	-
Number of supplements sold by VBEs	54,875	72,600	64,617	192,092	-

GMP: Growth Monitoring and Promotion; IYCF: Infant and Young Child Feeding; OFSP: Orange-Fleshed Sweet Potato; VBEs: Village-Based Entrepreneurs; GHS: Ghana Health Service; KNW: Kassena-Nankana West; KS: Kintampo South; SE: Sekyere East; AEA: Agriculture Extension Agents

DISCUSSION

Interviews with stakeholders and beneficiaries indicated that the IFP project was perceived to have made a positive impact on the diets of beneficiaries. The sentiments of interview respondents capture the perceived benefits as below:

I cannot think of any negative outcomes from the project. On the contrary, there are several benefits that I can attribute to the project. First, it gave us access to some nutritional foods which were difficult to come by. Before the project, our household could go for a year and over before we could have access to eggs to cook for the children and sometimes for us the adults (Beneficiary, KNW)

When it comes to IYCF, in the past 2 years we were having malnourished children and many children were underweight even though we were educating them, but because they were not getting some nutritious diet they weren't taking it seriously, but through the implementation of the first 1,000 days project, it has enabled many mothers to know the benefits of varieties of foods which will give their children energy and weight. Project has provided an opportunity for them to practice (*Community health worker, Sekyere East).*

It has improved our diet and health. I use the leaves of the OFSP for soups and stews and I incorporate the eggs from the poultry in the koko (porridge) I prepare for my baby. It has really improved the health of the family, especially the children. For instance, my baby no longer has diarrhoea or anaemia. The only health issue we now worry about is fever or an increase in temperature. So anytime we visit the clinic, it's to treat these minor conditions but this wasn't the case prior to my becoming a beneficiary of the project (Beneficiary, KS).

ADDITIONAL OUTCOMES

Interview participants also indicated that there were additional outcomes of the IFP project, including perceived improved nutritional status outcomes among children. Parents felt that the interventions contributed to improved growth and cognitive development of their children.

Yes, so last two years when I did my analysis, I realize that there has been a lot of improvement in terms of our indicators in the project implementing communities, sub-districts or zones as compared to others. As we speak now Kayoro, Katiu, Nakong and Nakolo, these sub-districts are still leading in terms of anaemia in pregnancy recording over 75% but Kayoro is 80%.

Table 3. Annual project implementation outcomes across districts

Indicator	2021	2022	2023
Eggs produced (crates)			
KNW	-	18,720	1,770
KS	-	19,680	2,826
SE	-	40,128	12,660
OFSP harvested (kg)			
KNW	-	3,083	
KS	1,575	28, 266	
SE	2,400	3,980	-
People who have received essential health, nutrition, population (HNP) services (Number)			
KNW	-	15,691	-
KS	-	40,372	-
SE	-	15,373	-
People who have received essential health, nutrition, and population (HNP) services-Female (RMS) requirement) (Number)			
KNW	-	12,321	-
KS	-	11,299	-
SE	-	13,569	-
Number of women and children who have received basic nutrition services			
KNW	-	21,322	-
KS	-	42,887	-
SE	-	13,569	-
Total outcome of children reached with KOKO Plus in targeted households			
KNW		2778	
KS		6580	
SE		4584	
Total		3, 942	

HNP: Health, Nutrition and Population; OFSP: Orange-Fleshed Sweet Potato KNW= Kassena-Nankana West; KS: Kintampo South; SE: Sekyere East AEA: Agriculture Extension Agents

When you come to that of the project implementing zones, the highest of all is 39%. And so comparatively, you realize that the project enrollment is changing a lot of things in terms of malnutrition and other nutrition related issues across the board, and so this project has really added a lot of value. Again, nutritional status assessment talking about the measurement of length and height to identify stunted early to deal with it. You get to realize that the figures have improved massively in the project zones (Nutrition officer, KNW).

Table 4. Infant and young child feeding practices of children across districts

	Baseline (%), 2021	Endline (%), 2023
Exclusive breastfeeding below 6 months		
KNW (N=423)	90.1	97.4
KS (N=477)	62.1	91.8
SE (N=448)	44.0	95.8
Total (N-1348)	64.8	94.7
Early initiation of breastfeeding		
KNW (N=357)	95.6	89.3
KS (N=405)	79.9	85.2
SE (N=395)	82.5	87.6
Total (N=1, 157)	85.8	87.
Minium dietary diversity of children 6- 23 months of age		
KNW (N=423)	75.4	90.1
KS (N=477)	65.2	71.1
SE (N=448)	64.5	70.0
Total (N=1348)	68.2	75.8
Minimum meal frequency of children 6-23 months of age		
KNW (N=423)	61.1	85.5
KS (N=477)	73.6	75.5
SE (448)	73.9	84.4
Total (1348)	69.9	81.1
Minimum acceptable diet, children 6-23 months of age		
KNW (N=423)	51.5	72.5
KS (N=477)	56.3	51.9
SE (N=448)	54.4	50.7
Total (1348)	54.2	55

KNW: Kassena-Nankana West; KS: Kintampo South; SE: Sekyere East

So, since we started, we have been supporting parents of some malnourished children in the community with the leaves and crop from the OFSP. We advise them to use the leaves to prepare soups and stews for their malnourished children and to cook or boil the crop for them. And as expected, these children started becoming healthy, and gained the weight they ought to be. This was such a phenomenal feat for us because we saw evidence of the training we had received. So yes, this project has been most impactful, and we've seen all the project objectives come to pass (Male Champion, KS).

Many beneficiaries sold their produce, particularly eggs, and thereby generating additional revenue for their households. Increased revenue generation was also reported by the VBE's from the sale of KOKO Plus. There were others who had been able to expand their poultry enterprise and created a business out of it. Other respondents also mentioned how they cherished the opportunity to learn new skills such as how to prepare home-made feed for the poultry.

As previously reported by Habib and colleagues, there was increased production of eggs (95,784 crates) across districts (Habib et al, 2024).

Impact on maternal diet quality

There was a substantial increase in the diversity of women's diets, as shown in Table 5.

Table 5. Minimum dietary diversity score for women

	Kassena-Nankana West		Kintampo South		Sekyere East		Total	
MDDS_W	Baseline (N=423) (%)	Endline (N=423) (%)	Baseline (N=477) (%)	Endline (N=493) (%)	Baseline (N=448) (%)	Endline (N=428) (%)	Baseline (N=1344) (%)	Endline (N=1345) (%)
Low	71.9	16.3	82.6	15.8	67.4	39.2	74.2	23.4
Moderate	18.4	34.5	16.1	47.2	26.8	38.3	20.4	40.4
High	9.7	49.2	1.3	37.0	5.8	22.5	5.4	36.2

MDDS_W= minimum dietary diversity for women

Table 6: Production and mortality trends of poultry[a]

community	Chickens starting year	Mortality among chickens	Mortality, %	Chickens ending year	Total eggs harvested
	(A)	(B)		(C)	(D) In crates
2021					
KNW	3600	0	0	3600	-
KS	3150	63	2	3087	-
SE	3750	112	3.0	3638	-
Total 2021	10,500	175	4.9	10,325	
2022					
KNW	5200	1376	26.5	3824	18,720
KS	6750	1312	19.4	5438	19,680
SE	7500	1317	17.6	6183	40,128
Total 2022	19450	4005	20.6	15445	78528
2023					
KNW	3824	1973	51.6	1851	1770
KS	5438	1382	25.4	4056	2826
SE	6183	1058	17.1	5125	12660
Total 2023	15445	4413	28.6	11032	17256
Total	45395	8593	18.9	36802	95784

[a]*Some data are missing due to gaps in monitoring. KNW: Kassena-Nankana West; KS: Kintampo South; SE: Sekyere East*

The use and disposal of the eggs has also been reported in the same paper, including consumption and sale for income.

Yes, the beneficiaries now have at least an extra source of income for those who had a source of income and a source of income for those who didn't. For instance, from the twenty-five birds I was given, I could get at least seventy (70) eggs from the birds weekly. From this, I sell some to buy their feed, give some to my neighbours and consume the rest in the household. This does not only give me an additional source of income to support my household, but I get to save the money I would have otherwise used to purchase eggs for household consumption, and this is able to meet certain needs in the household such as payment of my children's school fees. So, it's a very good source of income for me (Male Champion, KS).

Yes the koko plus is profitable, because now we sell 1 cedi instead of the earlier 50 pesewas, and I make 20 pesewas per each sachet I sell. So, when I finish selling one box, I take out my profit and then put the rest of the money in the susu box [piggy bank] (KNW, VBE)

SUSTAINABILITY PLANS

The sustainability measures put in place by the project were documented across three main aspects: economic, social, and environmental.

ECONOMIC SUSTAINABILITY

Among VBE's, the demand created for KOKO Plus created a viable and secure income-generating opportunity. VBEs were also happy to have an established distribution network that will enable them to continue distributing KOKO Plus in their respective communities, even in the absence of the IFP project.

There's a vendor in Sirigu here, that's the main supplier now. So, should World Vision go [away], we will rely on that person and even recently there was a meeting held and they called the VBEs to introduce us to the main agent from Tamale, he came around then we exchanged contacts. So, the man also said if it comes to a time that we need, we should come together. So that he can bring it all the way from Tamale and supply to us, then go back. (VBE, KNW)

For Koko plus for example, we have informed community leaders, the chiefs, assembly members, opinion leaders about the capital we will be giving to the VBEs and the need for them to follow up and to ensure that Koko plus is available in the community all times. And then we have also linked the VBEs to the manufacturers so they could supply directly to them in case the project ends (KS, project Officer).

In addition to the economic sustainability of jobs, the scale up of household poultry and OFSP production to small-

to-medium scale agribusinesses is a relevant indication of the economic sustainability of the project in the medium-long term. Between 2021 and 2022, additional poultry inputs were provided by the project to the beneficiaries to enhance their capacity to be sustainable. There was, however, an epidemic leading to mortality and lower productivity of the birds. Productivity can only be sustained if the lost birds are replaced. Table 6 shows the production and mortality trends of poultry across the entire project.

One male champion who benefited from poultry rearing reported this about the poultry intervention.

If I have been able to multiply the twenty-five (25) birds I was given to over 150 birds, what can't I do? From the knowledge I now have, I will be a big-time poultry farmer in the next two (2) to three (3) years. -Male Champion, SE.

The project aimed to sustain its OFSP component by training beneficiaries on how to multiply the vines for replanting at every farming season. They were also encouraged to share the vines with other farmers in the community. The following is from an in-depth interview:

As part of our sustainability strategy for the OFSP, we trained them on the multiplication of the vines which can be used to plant all year season to ensure its sustainability (Project Manager, SE).

In the first year of egg production (2022), an average of 88.9% of the eggs produced were sold for income. At the time of evaluation during the early part of the second year, 87.6% of eggs produced were being sold for income. These data were corroborated by participants who revealed that they sold eggs to purchase feed and other inputs as a means of sustaining the birds. One participant stated:

It has also improved our finances because I sell some of the eggs to meet certain needs in the household. Our standard of living has improved considerably due to this project (KS, direct Beneficiary).

Among the VBEs who traded the nutritional supplement, the sale of the product was a sustainable source of income from which they made profit and reinvested the capital into the enterprise. As one VBE from KNW stated:

Yes, I am making money from KOKO Plus because now we sell at one cedi instead of the earlier 50 pesewas, and I make 20 pesewas per each sachet I sell. So, when I finish selling one box, I take out my profit and then put the rest of the money in the box (KNW, VBE).

Similarly, OFSP production as a source of household food security, which is an important indicator of household economic stability, continued to grow annually. As reported by some beneficiaries, the slips were shared with members of the community who were not beneficiaries and preserved for future cultivation seasons to sustain large-scale production in the future.

Also, apart from the beneficiaries, many of the other farmers are now cultivating the OFSP. So, in the future, even when World Vision is no longer part of the project, there will be OFSP and poultry in the communities.-Male Champion, KS

SOCIAL SUSTAINABILITY

Social sustainability of the project was conceptualized to include health system issues. The job aids received by the health facilities are reportedly still functioning and will continue to be used to strengthen community-level health service delivery.

This is the difference the project is bringing on board. Now checking of HB is no more stressful for the mothers again because we have Hemocue machines in the facility but before then we used to travel to Bolgatanga or Navrongo to go and do simple Hb checkup for pregnant women but now all these things are here so when we check and realize that you are below the recommended value for HB, we quickly put you into some form of treatment-Nutrition Officer, KNW

The communities continue to experience improved technical capacity of health and agricultural staff, which has positively enhanced health and agricultural service delivery in the community as described by the professionals including AEAs and nurses. Importantly, the dissemination of the skills learnt by some direct participants of the training sessions will help ensure long term sustainability of these technical skills in the community healthcare system, even in the event of staff turnovers.

There's been a lot of capacity building on, for instance, poultry production, etc. I initially used to undertake my sensitization duties with Farmer-Based Organisations and farmers in their respective homes, but now due to the intervention, I now undertake them in churches and mosques and so I have basically extended the reach of my services. Their training has led to increased knowledge, and this has made the work easier. Even without World Vision, undertaking extension service is my duty so their intervention has made me more efficient at my work because the more you train the farmers, the more you broaden the scope of your extension service delivery (AEA, KS).

The social sustainability of the project was widely confirmed by the direct and indirect beneficiaries of the project. Social norms, especially concerning dietary restrictions and harmful gender roles have been challenged and some have been overcome because of the project leveraging existing community leadership structures-including Queen Mothers/Chiefs, elders, Local Council of Churches (LCC), Male Champions, VSLAs, MTMSGs and Community Health Volunteers (CHV) as social catalysts for change.

One direct beneficiary expressed this as indicated below:

I agreed to and adopted the change because when we started practicing them, we didn't experience any negative impacts or have any side effects. We were told by our parents that when you eat sweet potato or give it to a child, for instance, you and the child would experience stomach upset, so we avoided it like a plague, but when we listened to the advice from the nurses and started incorporating it in our diet, we realized that it was not true. We didn't experience any stomach upsets and we realized it was nutritious, so we were encouraged to not only continue their practices but wholly adopt them. (beneficiary, KS).

In addition, the constitution of a steering committee with action plans for the short-term (one-year post-closure) encourages the project's activities to continue after its official close.

They are a lot of sustainability strategies, we are concentrating on capacity building, concentrating on institutional strengthening even though some of the activities were part of the project but we are re-echoing and reinforcing the fact that, take over we are going. So, we have brought a couple of stakeholders right from the community to the districts. We have brought the chiefs, we have brought the VBEs, we have brought MTMS, Ghana heath service staff, DOFA and all those who matter in the project, and we have

organized separate workshops to come out with measures they have put to take over (KNW, Project Officer).

ENVIRONMENTAL SUSTAINABILITY

One important outcome of the project was the availability of poultry droppings as manure for household gardens and some farms. This source of organic fertilizer was widely perceived as beneficial to the community members.

Hmmmm, when I came, I collected the droppings and applied them on my maize farm. The maize grew well. I even demarcated a small portion, sowed maize, and applied the droppings, which yielded very well. The place was too small, yet I harvested two basins. I believe the droppings have more benefits than anything. Direct Beneficiary, KNW

DISCUSSION

The IFP project was a community-based integrated nutrition intervention designed to improve the diets of young children within the first 1,000 days of life, and women of reproductive age in Ghana. This paper reports on the findings of an evaluation of the project's performance. The main findings from this evaluation were that the project objectives and strategies were relevant to the identified needs of the targeted beneficiaries, characterized by sub-optimal diet intake across project implementing communities. The evaluation also showed that the IFP project was effective in contributing to increased household and community-level access to nutrient-dense foods including OFSP and eggs; however, although fruit trees had been planted, there wasn't evidence of use of the fruits yet at the time of the study in 2023, partly because of farmer disinterest in this aspect of the intervention. The was also increased consumption of OFSP as well as KOKO Plus, the micronutrient powder product introduced into the participating communities. Increased awareness of nutrition and health actions could be attributed partly to nutrition messaging and capacity strengthening for staff of social service providers. The evaluation data showed improved child and maternal dietary practices. The evidence also pointed to the IFP project interventions having established some means of sustaining the project after World Vision withdraws.

Evidence from multiple sources demonstrated the relevance of the IFP project –that is, showed that it was dealing with substantial problems. This was observed both in the project baseline study findings and the recent (2022) nation-wide demographic and health survey, which reported that almost half of children were consuming minimum diverse diets (41%) and minimum acceptable diets (49%). Children and women exposed to suboptimal diets require interventions that limit adverse impacts on social, health, and economic outcomes. In the absence of appropriate interventions, vulnerable women and children at risk of undernutrition are exposed to a vicious cycle of malnutrition and loss of human capital (Shemsu et al., 2020).

The apparent effectiveness of the intervention could be partly attributed to the existing unmet need for such services. Although the Ghana Health Service and Department of Agriculture provide some of the services offered through the IFP project, additional value included provision of training for the staff as well as provision of free inputs by the project enhanced participation.

Nutrition and agriculture integrated interventions have been shown to be effective to reduce the malnutrition (Kerr et al., 2016). The finding that the intervention seemed to be effective is consistent with other integrated intervention studies using similar strategies (Margolies et al., 2022; Marquis et al., 2018; Reinbott et al., 2016). In this project, nutrition-sensitive agricultural interventions involving promoting the production and consumption of eggs, and OFSP and as well as the promotion of micronutrient powder, yielded findings similar to previous studies (Marquis et al., 2018; Tano-Debrah et al., 2019). In the Eastern region of Ghana, Marquis et al. (2018) reported reduced risk of stunting among children exposed to home gardening (including OFSP cultivation) and poultry rearing. In Burkina Faso, Olney et al. (2016) reported reduced undernutrition among women exposed to similar intervention strategies. Although there was planting of fruit trees in the IFP, there was not enough time to observe their use, since this strategy yields longer rather than short term benefit. The findings from this evaluation validate the need for a more comprehensive approaches to tackling the complex and often interrelated drivers of malnutrition.

The findings of apparent impact of the project on child and maternal dietary practices are also similar to outcomes demonstrated elsewhere (Olney et al., 2016; Marquis et al., 2018). The design of the project, however, does not allow us to determine which aspects of the intervention may have resulted in the improvement in behaviour. However, it is possible that enhanced behaviour-change communication explains the apparent improvements in the observed outcomes, particularly for breastfeeding and maternal dietary diversity. Elsewhere, use of community-based nutrition messaging has been reported as effective for improving infant and young child feeding and maternal diets (Kulwa et al., 2023; Muehlhoff et al., 2017). The coordinated mobilization of community health nurses, mother-to-mother support groups, male champions, and village health committees could be linked with improved exposure to nutrition information to mothers with young children.

The rate of exclusive breastfeeding rates in the IFP project communities was higher than those reported nationwide from the 2022 Demographic and health survey report (GSS et al., 2023). This outcome suggests that with more focused interventions, there can be more robust outcomes in nutrition. The community-based strategies employed in the IFP project can therefore be leveraged for improving child feeding outcomes across the country, if scaled up.

The findings indicate that there have been intentional efforts to make the project sustainable. For example, the use of VSLA's and VBE's created a community-cantered framework for sustaining delivery of the micronutrient powder in the targeted communities, beyond the life cycle of the IFP project. The unintended benefit of commercialization of poultry rearing through the sale of eggs created a sustainable business model to allow for continuity. The strategy of institutionalizing the interventions through creating ownership and involvement of government agencies (GHS, Department of Agriculture, and District Assembly) is also likely to enhance sustainability since the institutions have an ongoing mandate to work in the respective communities. The project leveraged the existing community leadership structures -- such as Queen Mothers/Chiefs, elders, LCC, Male Champions, VSLAs, MTMSGs and CHVs who were equipped to promote nutrition messages and this to a large extend can lead to the sustainability of the project.

The strategies utilised by the IFP project could be adapted for use in multiple settings as a community-based intervention strategy. For instance, the household poultry rearing, planting of fruit trees, and using key community groups such as male champions, MTMS groups, CHV can be easily extended to other settings to support household agriculture and improved availability of nutrient dense foods such as OFSP at the community level.

LIMITATIONS

The current study employed a mixed methods approach which enabled it to examine the IFP project from both qualitative and quantitative perspectives. The opportunity to triangulate diverse perspectives strengthens the evidence. However, it's important to emphasize that the study's design does not indicate a causal relationship. In particular, the intervention effects were not compared to a control or comparison group, and the measured effects were not adjusted for possible confounders. There were also weaknesses and gaps in the project monitoring data. This was partly because the focus of the intervention was not for research purposes. Future interventions should be intentional about carefully documenting the process of the intervention and the output and outcome data to enable better assessment of the outcomes and impact of similar projects.

CONCLUSION

Integrated nutrition and agriculture interventions have proven to be beneficial to improving child and maternal dietary diversity. This evaluation suggested that such an approach has the potential to improve access to targeted foods and to improve diet diversity of young children and mothers in similar settings. Also, suitability of certain breeds of poultry should be considered for the geographical context in which they are provided, as mortality was high in these northern Ghana communities.

AUTHOR CONTRIBUTIONS

MBK, SBK, HHH and RA contributed to the study design. Data collection tools were designed by MBK and RA. Initial analysis and coding were conducted by SBK and MBK. MBK wrote the first draft of the manuscript with routine critical reviews by RA. All authors then critically reviewed the following versions. All authors have read and approved the final version of the paper and its submission.

CONFLICT OF INTEREST

This research was funded by World Bank through World Vision Ghana Country Office. Professor Richmond Aryeetey was a member of the Steering Committee of the Improved Feeding Project. The authors declare that they have no conflicts of interest.

ACKNOWLEDGEMENTS

The authors would like to thank all respondents (participants and program implementers/officers) for their participation and contributions.

FUNDING

This research was funded by the World Vision Ghana Country Office through the Improved Feeding Practices for the first 1000 days (IFP) Project sponsored by Japan Social Development Fund through the World Bank

Submitted: March 12, 2024; Accepted: June 29, 2024; Published: June 30, 2024

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