DEVELOPMENT OF A CONTEXTUALISED FOOD-BASED STRATEGY TO IMPROVE THE DIETARY DIVERSITY AND NUTRITIONAL STATUS OF CHILDREN AGED 12 TO 36 MONTHS IN RURAL FARMING HOUSEHOLDS IN CENTRAL UGANDA

by
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Declaration

By submitting this dissertation electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third-party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

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Declaration by the candidate:

The principal researcher, Ms Deborah Nabuuma, developed the idea and the protocol. She planned the study, undertook data collection with field assistants, captured the data for analyses, analysed the data with the assistance of a statistician, interpreted the data, developed the strategy and drafted this dissertation.

The promoters, Prof Xikombiso Mbhenyane, Dr Beatrice Ekesa, and Prof Mieke Faber, provided input at all stages of the study and reviewed the protocol, implementation and dissertation.

Nature and extent of contribution (%)

With regard to the dissertation, the nature and scope of my contribution and that of the co-authors were as follows:

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The undersigned hereby confirm that:

1. the declaration above accurately reflects the nature and extent of the contributions of the candidate and the co-authors to the dissertation;
2. no other authors contributed to the dissertation besides those specified above; and
3. potential conflicts of interest have been revealed to all interested parties and that the necessary arrangements have been made to use the material in this dissertation.

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Abstract

Food insecurity, low dietary diversity, and malnutrition remain prevalent in sub-Saharan Africa. Food-based strategies have a high potential of improving diet quality in agriculture-dependent communities and their development and effectiveness can be enhanced by systematic approaches. This study aimed to develop a food-based strategy to improve the dietary diversity of children aged 12 to 36 months from rural smallholder farming households in Central Uganda. An embedded-sequential, mixed-methods research design was used: i) quantitative situation analysis using household and market surveys, ii) qualitative assessment of community perspectives using focus group discussions, iii) design of the food-based strategy using intervention mapping, and iv) qualitative validation using key informant interviews and focus group discussions.

The results showed household food production and food consumption were mainly based on cereals and grains, roots, tubers, cooking bananas and legumes. There was low dietary diversity; 78% of six- to 23-month-old children did not meet the minimum dietary diversity and 71% of children ≥ 24 months were consuming less than three food groups. The most accessed markets had limited diversity of food groups (six out of 11 (55%)) compared to other markets in the community. Food production and consumption focused on priority crops that alleviated hunger and contributed to income – mainly maize, cooking bananas, sweet potatoes, cassava and beans. Food production was influenced by access to land, production costs, income potential, climate and farmer knowledge. The cost of food and market availability influenced the type and quantity of food bought and consumed. Poor perception towards meetings/training and inadequate nutrition information and skills were noted.

These findings, relevant theory and literature were applied using intervention mapping to systematically identify determinants, outcomes, objectives, and pathways to improve dietary diversity. The resulting contextualised food-based strategy (CFBS) aims to improve dietary diversity of children in smallholder farming households through improved household production, income utilisation, and food consumption practices by: i) increasing diversity of foods produced, particularly fruits and vegetables, ii) increasing access to diverse foods through appropriate income and market, including an increase in diversity of foods in consumer markets and financial literacy, and iii) improving the quality of diets consumed, especially diversity, frequency, nutrient quality and safety through nutrition education. Actors included policy makers, development organisations, extension workers, community-level groups, community champions and smallholder farmers. Validation results rated the factors and actors in the CFBS as important for improving productivity, food availability, dietary diversity, livelihoods of smallholder farmers, thereby verifying the strategy and design process used.

To improve dietary diversity among rural smallholder farmers, their food security and production challenges need to be addressed. This increases the relevance and motivation to participate and

implement recommended practices. Markets have the potential to significantly contribute to dietary diversity. However, this requires adequate supply and demand of diverse foods in rural consumer food markets, as well as income and financial literacy to facilitate financial decisions that promote dietary diversity. The CFBS empowers smallholder farmers to decide on a course of action that achieves dietary diversity, having been equipped with information and skills on agriculture, nutrition and finances.

Opsomming

Voedselonsekerheid, min verskeidenheid ten opsigte van eetgewoontes en wanvoeding is steeds algemeen in Afrika suid van die Sahara. Voedselgebaseerde strategieë het groot potensiaal om die dieetkwaliteit in die landbouafhanklike gemeenskappe te verbeter en die ontwikkeling en doeltreffendheid daarvan kan deur middel van sistematiese benaderings verbeter word. Hierdie studie het ten doel gehad om 'n voedselgebaseerde strategie te ontwikkel om die dieetverskeidenheid van kinders tussen 12 en 36 maande van landelike huishoudings ten opsigte van kleinboere in Sentraal-Uganda te verbeter. 'n Navorsingsontwerp met ingebedde sekwensiële gemengde metodes is gebruik: i) kwantitatiewe situasie-analise met behulp van huishoudelike en markopnames, ii) kwalitatiewe assessering van gemeenskapsperspektiewe met behulp van fokusgroepbesprekings, iii) die ontwerp van die voedselgebaseerde strategie deur intervensie-kartering te gebruik en iv) kwalitatiewe bekragtiging deur van belangrike onderhoude met segspersone en fokusgroepbesprekings gebruik te maak.

Die resultate het aangedui dat huishoudelike voedselproduksie en voedselverbruik hoofsaaklik op graankos, wortels, knolle, piesangs, en peulgewasse gebaseer was. Daar was min dieetverskeidenheid met 78% van kinders van ses tot 23 maande oud wat nie aan die minimum dieetverskeidenheid voldoen nie en 71% van die kinders ≥ 24 maande wat minder as drie voedselgroepe verbruik het. Die mees toeganklike markte het 'n beperkte verskeidenheid voedselgroepe gehad (ses uit 11) en 'n beperkte verskeidenheid voedselitems per voedselgroep, in vergelyking met ander markte in die gemeenskap. Voedselproduksie en -verbruik het gefokus op prioriteit-oeste wat honger verlig en tot inkomste bydra – hoofsaaklik mielies, piesangs, patats, kassava en boontjies. Die koste van voedsel en die beskikbaarheid in die mark het die soort en hoeveelheid voedsel wat gekoop en verbruik is, beïnvloed. 'n Swak persepsie ten opsigte van vergaderings/opleiding en onvoldoende voedingsinligting en -vaardighede is opgemerk.

Hierdie bevindings, relevante teorie en literatuur is toegepas deur ingrypings-kartering te gebruik om uitkomste, doelstellings en wysigingswyses stelselmatig te identifiseer. Die gevolglike gekontekstualiseerde landelike voedselgebaseerde strategie (CFBS) is daarop gemik om die dieetverskeidenheid van kinders in kleinboerhuishoudings deur middel van verbeterde huishoudelike produksie, inkomsteverbruik en voedselverbruikspraktyke te verbeter deur: i) die verskeidenheid voedselprodukte te verhoog, veral vrugte en groente, deur gebruik te maak van volhoubare produksiepraktyke wat hulpbronne optimaliseer; ii) groter toegang tot diverse voedsel deur die toepaslike gebruik van inkomste en markte, insluitend 'n toename in diversiteit van voedsel in markte wat landelike gemeenskappe en finansiële geletterdheid bedien en iii) die verbetering van die kwaliteit van verbruikte diëte, veral diversiteit, frekwensie, kwaliteit van voedingstowwe en veiligheid deur voedingsopvoeding. Rolspelers wat geteiken is, het beleidmakers, ontwikkelingsorganisasies, voorligtingswerkers, groepe/netwerke op gemeenskapsvlak, gemeenskapskampvegters en kleinboere ingesluit. Valideringsresultate het die faktore en rolspelers in die CFBS as belangrik beskou vir die verbetering van produktiwiteit,

voedselbeskikbaarheid, dieetverskeidenheid, lewensbestaan en gesondheid van kleinboere, en sodoende word die doelstellings, strategie en die ontwerpproses wat gebruik is, bekragtig.

Om hul uitdagings op die gebied van voedselsekerheid en produksie aan te pak, moet die dieetverskeidenheid van kleinboere op die platteland verbeter word. Dit verhoog die relevansie en motivering om aan aanbevole praktyke deel te neem. Markte kan die grootste bydrae tot die dieetdiversiteit lewer. Dit verg egter voldoende vraag en aanbod van uiteenlopende voedselsoorte in landelike verbruikersvoedselmarkte, sowel as inkomste en finansiële geletterdheid om finansiële besluite te fasiliteer wat die diversiteit van diëte bevorder. Die CFBS bemagtig kleinboere om 'n plan van aksie te beraam wat dieetverskeidenheid bewerkstellig nadat hulle inligting en vaardighede oor landbou, voeding en finansies verkry het.

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Acronyms

CBO: Community Based Organisation

CCs: Community Champions

CFBS: Contextualised Food-Based Strategy

ELM: Elaboration Likelihood Model

FGD: Focus Group Discussion

GALs: Gender Action Learning System

GST: Goal-Setting Theory

HFCS: Household Food Consumption Score

HFIAS: Household Food Insecurity Access Scale

KI: Key Informant

NGO: Non-Governmental Organisation

OFSP: Orange-fleshed sweet potatoes

PCA: Principle Component Analysis

RAA: Reasoned Action Approach

SCT: Social Cognitive Theory

UGX: Uganda Shilling

USD: United States Dollar

Glossary

Community-level farmer group/organisation: Community formed groups or organisations such as farmer, saving and credit, trader, women, youth, faith, learning organisations or groups; can be formal or informal in structure (MAAIF, 2016b).

Coping models: Coping models or peer models are individuals that face and successfully address challenges and barriers to change that observer's or targeted actor's face (Glanz, Rimer & Viswanath, 2015a).

Determinant (behavioural, environmental, personal): Factors that influence the behaviour and/or health problem at behavioural, environmental, or personal levels (Eldredge et al., 2016).

Financial literacy: Having the knowledge, skills and confidence to manage one's finances well, taking into account one's economic and social circumstances (BOU, 2013).

Performance objective: Specific behaviours that the target group agents have to perform to achieve the desired change (Eldredge et al., 2016).

Production diversity: Number of crop or livestock species produced (Sibhatu, Krishna & Qaim, 2015).

Smallholder farmer: Farmers that depend on 0.4 to 1.0 hectares of land or less (NPA, 2013a).

Social support: A network of communication and mutual obligation through which emotional, esteem and network (social integration, material and tangible aids) support are given and received (Donev, 2005).

Operational definitions

Cooking bananas: Banana types that are consumed when unripe as the starchy staple of a meal. Includes cooking and plantain types of *Musa* spp.

Dessert bananas: Banana types that are consumed when ripe as a dessert or snack.

Positionality statement

Having been raised in a middle-class family in Kampala, Uganda, education and hard work were highly valued. It was important to put in your best effort and work towards your aspirations because your future would depend on how and what you did. In addition to a formal education, it was instilled that learning never stops and continues beyond a classroom. In fact, there was something to learn from everyone you interacted with, but only if you chose to.

As an undergraduate, I studied food science and technology, a course that offered several career opportunities. However, I had little desire for the food industry and was more drawn to nutrition. This was confirmed as I volunteered at the Malnutrition Clinic at the National Referral Hospital. Looking at the different socio-economic classes of children that were severely malnourished and the recurrence/re-admission rates got me interested in community nutrition, behavioural change, and prevention of malnutrition. I was able to explore and learn more about these issues as I pursued my M.Sc. in nutrition.

Following this, I have had the opportunity to apply this knowledge working in the agricultural research field to improve farming systems and the utilisation of agrobiodiversity to enhance food security and nutrition outcomes, especially among rural communities in Eastern Africa. During the implementation of various activities, it was interesting to see how communities grappled with several challenges as they attempted to meet their basic needs given the resources, knowledge and skills at their disposal. While dietary quality was at the centre of our nutrition focus as an organisation, based on interactions with farmers and other stakeholders, food security appeared to be the main motivation for farmers and households.

National and NGO efforts have made tremendous progress to improve food and nutrition security. However, malnutrition not only persists, but the environment in which it exists is fluid. Farming systems are changing and so are the socio-economic and cultural conditions in rural areas. In addition, where only undernutrition and micronutrient deficiencies existed, overnutrition will soon join because of the increased availability and consumption of processed high sugar, salt and oil foods, even in rural areas.

I was therefore, drawn to how dietary diversity and quality, which are lacking across all age groups in any given household, could be improved amidst the aforementioned environment. How we could lean on reported successes, existing frameworks and reconcile them with the realities on the ground to improve the food systems, especially for rural smallholder farmers. Children offered an important entry point to these farming households, to empower and improve their nutrition, health and livelihoods, and were therefore, the focus of this study.

Chapter 1 Introduction

1.1 Background

Children below five years of age and women of reproductive age are the most vulnerable to malnutrition (Burchi, Fanzo & Frison, 2011). Household access to food is a strong determinant of malnutrition (Development Initiatives, 2018). Two billion people are food insecure, without regular access to safe, nutritious and sufficient food (FAO et al., 2019). Among children under five years globally, 151 million are stunted, 51 million are wasted, 38 million are overweight, and 42% are anaemic (Development Initiatives, 2018). Majority of the food insecurity is observed in Africa and Asia. Uganda, an East African country, was one of the signatories of the Sustainable Development Goals that pledged to end poverty and hunger by 2030 (Government of Uganda, 2017). Despite the reduction in the prevalence of malnutrition among children under five years of age – from 39% stunted and 23% underweight children in 2000 to 29% stunted and 11% underweight in 2016 – action against malnutrition is still key because the prevalence rate remains a public health concern. Malnutrition, which includes undernutrition, overnutrition and micronutrient deficiencies, not only contributes to 60% of child mortalities in Uganda, it also hinders cognitive development and reduces long-term productivity and economic growth (UBOS, 2001; UBOS & ICF, 2018). Addressing factors like quality diets that contribute to malnutrition is therefore important. In Uganda, children in rural areas are more likely to be stunted (30%) compared to those in urban areas (24%) (UBOS & ICF, 2018). The rural areas rely on agriculture for their livelihood and have diets based mainly on starchy staples. This situation is not unique to Uganda, but can be found across low-income countries in Africa and beyond (FANTA-2, 2010; Thompson et al., 2014).

Dietary diversity refers to the number of food groups consumed over a given period by households or individuals. It reflects the nutrient adequacy of the diet and is used as a measure of the households' access to a variety of food (Daniels et al., 2007; Moursi et al., 2008; Kennedy et al., 2013). In addition to food access, other factors that affect dietary diversity include knowledge, culture and time available for food related tasks (Nankumbi and Muliira, 2015). Dietary diversity scores have not only been associated with the macro and micro nutrient adequacy of the diets for children, adolescents and adults, but they have also been associated with better nutrient outcomes (Hoddinott & Yohannes, 2002; Ruel, 2002; Kennedy et al., 2013). Consumption of diets with higher dietary diversity is associated with increased food intakes, micronutrient intakes and improved height-for-age Z-scores in some studies (Thompson et al., 2014). Likewise, dietary diversity scores are a potential indicator of household food access and food security, especially with regard to the per capita consumption of staple and non-staple foods within the household (Hoddinott & Yohannes, 2002). Therefore, dietary diversity is a suitable indicator for strategies aimed at improving the diets of children.

After six months of age, the dietary diversity of the infants' meals is greatly associated with their nutritional status (UBOS & ICF, 2018). The period of transition from breastfeeding to family meals from six to 24 months, is characterised by a substantial increase in the prevalence of malnutrition due to poor feeding practices and increases in infections. Among children aged six to 23 months in Uganda, 30% have diets meeting the minimum dietary diversity (≥ 4 food groups), and 15% have minimum acceptable diets (as recommended by WHO) (WHO et al., 2010; UBOS & ICF, 2018). A separate survey in the central region of Uganda showed that 63% of children aged one to five years had low diverse diets (≤ 3 food groups) (Kizza, 2014). These findings highlight the existing dietary gaps among children, which could be addressed through food-based strategies.

Food-based strategies have a high potential of reducing the prevalence of nutrient deficiencies in agriculture-dependent communities. They can be used to address multiple nutrient deficiencies and enhance individual, household and community empowerment, especially that of women (Gibson et al., 2000; Underwood, 2000; Ruel, 2001). Even though food-based approaches may not have the capacity to rectify the nutritional status of the severely malnourished, particularly micronutrient deficiencies, they are able to significantly contribute to maintaining the nutritional status after rehabilitation, as well as restore the status of those that are moderately malnourished (Underwood, 2000).

Regardless of the specific food-based intervention, it is important for it to be tailored for the local context and for it to make use of existing local opportunities (Underwood, 2000). Adaptation of an intervention to a particular context involves defining the vital characteristics of the target individual or community such that the methods and materials developed are at the level of the target audience (Strolla, 2005). Adaptation of interventions is reported to improve the effectiveness of the intervention through identification and use of measures that mitigate the influence of factors like availability of resources, seasonality and the environment (Underwood, 2000; Bokhoven, Kok & Weijden, 2003). Development and/or adaptation of food-based interventions can be based on the 'needs' – gaps of a community or based on the 'assets' – resources and behaviours present in the community that can be used to influence and improve the specific food and nutrition situation in that community. In addition to having community participation in the research process, successful food-based interventions also require effective behaviour change and communication approaches to address the needed changes in attitudes and food-related behaviours (Thompson et al., 2014). This study, therefore, seeks to design a strategy to improve the quality of diets consumed by children aged 12 to 36 months in rural farming households in Central Uganda.

1.2 Problem statement

Smallholder farmers in developing countries produce 60 to 80% of the food consumed (Rapsomanikis, 2015). They are also the most vulnerable to poverty, food insecurity and malnutrition, as they face several challenges related to production, access to services, and

inadequate infrastructure, knowledge and skills (FAO, 2014a; van Wijk et al., 2018). Working in a limited resource setting while facing climate change and urbanisation exacerbates these challenges and their ability to cope (FAO, 2014a; van Wijk et al., 2018; Williams et al., 2018). In spite of this, they continue to rely on agriculture for food, are also producing food for income and earning off-farm income to meet their various needs (Ritzema et al., 2017; van Wijk et al., 2018). It is important that smallholder production and income positively and continuously contribute to food security and diet quality. As a result, serval food-based strategies have been implemented, which include but are not limited to nutrition education behaviour change communication to promote recommended practices, promotion of nutrient-dense and/or bio-fortified foods training in agricultural production (Pudasaini et al., 2013; Neumann et al., 2014; Thompson et al., 2014; Osei et al., 2017). However, the impact of these strategies and interventions has been mixed and this has been attributed to gaps in design and development, implementation, evaluation, methods and indicators used (Berti, Krasevec & FitzGerald, 2004; Masset et al., 2011; Thompson et al., 2014; Ruel, Quisumbing & Balagamwala, 2017).

The development of health and nutrition strategies and interventions can take a needs-based approach that identifies and seeks to resolve what is lacking in the community (their needs) or an asset-based approach that focuses on identifying the resources and behaviours present in the community that can be used to influence a specific situation, or a hybrid of these two approaches (Berggren & Wray, 2002; Lapping et al., 2002). Use of a needs-based approach faces limitations such as limited sustainability of interventions and creation of communities that are dependant and are 'clients' on the receiving end of support. It was on this basis that asset-based approaches are currently being used and promoted to empower and improve communities (Berggren & Wray, 2002; Lapping et al., 2002; Mathie & Cunningham, 2003). These two approaches can still be used in tandem to identify, understand and define the specific problem, explore the available resources and opportunities that can be utilised to address the problem, and ensure that the strategy influences and addresses the specific problem, all with the community at the core of these activities. Incorporating these two approaches can result in an effective, acceptable, feasible and sustainable strategy that reaches those with the greatest need (Gibson et al., 2000; Black et al., 2013).

Designing food-based strategies can be complex, involving a number of trade-offs that may not be systematically presented in a manner that allows replication and efficient adaptation of a developed strategy to another context (Eldredge et al., 2016; Leroy, Olney and Ruel, 2016). This can be addressed by using strategy development frameworks that systematically identify pathways to impact, processes to be used, and output and outcome indicators (Bokhoven, Kok & Weijden, 2003; Ruel et al., 2013; Gibson, 2014). This study therefore, explored how concepts of the needs-based approach and the asset-based approach can be used in the systematic design of

a food-based strategy that aims to improve the dietary diversity of children aged 12 to 36 months in rural farming communities.

1.3 Motivation

Smallholder farmers that make up most agricultural producers, not only in Uganda but globally, are vulnerable as they face a number of challenges. In addition to food insecurity, poor dietary quality and malnutrition, they face other challenges that include, but are not limited to, inadequate resources such as land, income, inputs and labour, pests and diseases, and insufficient infrastructure (van Wijk et al., 2018; Williams et al., 2018). Although these challenges are being addressed from farm level to national and regional levels, transformation of the agricultural sector is further confounded by urbanisation, integration and globalisation of markets and climate change (HLPE, 2013). All these factors have both positive and negative impacts, not only on food security, but also on dietary diversity.

Food-based strategies have a high potential of improving the diet quality and reducing the prevalence of nutrient deficiencies in agriculture-dependent communities (Gibson et al., 2000; Underwood, 2000; Ruel, 2001). The effectiveness of food-based strategies can be improved by strengthening their design, implementation and evaluation (Masset et al., 2011; Ruel, Quisumbing & Balagamwala, 2017). This can be achieved through the use of strategy development frameworks that systematically identify pathways to impact, processes to be used, and output and outcome indicators (Bokhoven, Kok & Weijden, 2003; Ruel et al., 2013; Gibson, 2014). The intervention mapping protocol is one such framework that provides a systematic approach to developing theory-based and evidence-based intervention methods and strategies (Kok et al., 2004; Brug, Oenema & Ferreira, 2005). Addressing low dietary diversity among smallholder farmers can therefore benefit from a sustainable systematic approach that caters to their context, incorporates local knowledge and perspective, and includes lessons from other areas. This study, therefore, sought to systematically design a food-based strategy that aims to improve the dietary diversity of children aged 12 to 36 months in rural smallholder farming communities.

1.4 Objectives

Research question

The guiding question for the study was how the needs-based and asset-based approaches can be used to develop a food-based strategy that improves the dietary diversity of children aged 12 to 36 months from rural smallholder farming households in Central Uganda?

Aim

The aim was to develop a food-based strategy to improve the dietary diversity of children aged 12 to 36 months from rural smallholder farming households in Central Uganda.

Specific objectives

1. To determine the current social and food security status of rural farming households,
2. To determine the current dietary diversity and nutrition status of children aged 12 to 36 months in the farming households,
3. To ascertain the community's perspective on the current social norms, and the food and nutrition situation and identify possible solutions,
4. To design a food-based strategy using the intervention mapping protocol,
5. To validate the developed strategy through a participatory approach.

1.5 Significance

Though the fight against malnutrition and hunger is making strides, it is; however, still ongoing and vital. Evaluations of interventions that were designed to improve the nutrition of children report sound interventions even though there are discrepancies in the effectiveness of the interventions and their impact on the diet and nutritional status of the children involved. Most of the gaps identified were due to weaknesses in the methodology and impact assessment (De Pee, Bloem & Kiess, 2000; Ruel, 2001; Berti, Krasevec & FitzGerald, 2004; Masset et al., 2011, 2012; Ruel et al., 2013; Thompson et al., 2014).

One way to improve the effectiveness of interventions is systematic and scientific development of interventions to improve the diet and nutritional status of children (Bokhoven, Kok & Weijden, 2003; Ruel et al., 2013; Gibson, 2014). This research aimed to achieve this through the use of a systematic and scientific transparent methodology to develop the strategy using information obtained from a quantitative situation analysis and a qualitative community perspective. Following the systematic design process, the strategy was validated by key community members, thus increasing the feasibility of the final strategy. This strategy and its design will inform the way strategies that aim to improve dietary diversity of children in rural farming households are designed. In addition, the resulting strategy will also be submitted to The Alliance of Bioversity International and CIAT, where the researcher works, for implementation with the aim of improving the dietary diversity of children in farming households in Uganda. This will be within the organisation's strategic objective to expand the access of low-income consumers to diverse, affordable and nutritious diets (Bioversity International, 2014).

1.6 Summary

Low dietary diversity is prevalent in Uganda, with more than 50% of both breastfed and non-breastfed children consuming three or less food groups a day, especially those in rural areas. Food-based strategies have a high potential of improving the diet quality and reducing the prevalence of nutrient deficiencies in agriculture-dependent communities. This study therefore explored how concepts of the needs-based approach and the asset-based approach can be used

to systematically design a food-based strategy that aims to improve the dietary diversity of children aged 12 to 36 months in rural farming communities in Central Uganda.

1.7 Structure of the dissertation

This dissertation is structured in a thesis formant with a total of nine chapters, as listed below:

1. Introduction: Includes the background, problem statement, motivation and objectives of the study.
2. Literature review: Presents a review of literature such as current food and nutrition status, the situation among smallholder farmers, the nutrition and agriculture link, and strategy development approaches to improve nutrition and health.
3. Methodology: Showcases the study design and methodology used to achieve the objectives. The study was conducted in four phases and the methods and tools used are presented.
4. Situation analysis using a quantitative approach: Presents results from Phase 1 of the study that entailed a household and a market survey.
5. Community perspective of the food and nutrition situation through a qualitative approach: Presents results from Phase 2 of the study that included two rounds of focus group discussions.
6. Designing the food-based strategy: Presents Phase 3 of the study that synthesised findings from Phase 1 and Phase 2 of the study to design a contextualised food-based strategy using the intervention mapping protocol.
7. Participatory validation of the food-based strategy: Presents results from Phase 4 of the study that validated the CFBS using FGDs and KI interviews.
8. Conclusion and recommendations: The chapter includes a summary and synthesis of the study findings, the contribution to knowledge, limitations of the study, conclusion and emanating recommendations.

Chapter 2 Literature review

2.1 Introduction

This chapter presents a review of literature that informs the development a food-based strategy to improve the dietary diversity of children aged 12 to 36 months from rural smallholder farming households in Central Uganda. The topics captured in the review include the current food and nutrition status, the situation among smallholder farmers, the nutrition and agriculture link, strategy development approaches to improve nutrition and health, the theories applied in development of the food-based strategy, and the national policies on agriculture and nutrition within which the food-based strategy was developed.

2.2 The current food and nutrition status

A high-quality diet is one that provides sufficient amounts of nutrients relative to age, sex, disease status and physical activity, reduces all forms of malnutrition, promotes health, eliminates hunger, is safe, and produced sustainably (Global Panel, 2016). A high-quality diet is characterised by healthy eating habits from before birth and depends on food availability and culture (Global Panel, 2016). Unfortunately, many people do not achieve these diets. The number of people facing hunger globally is on the rise, with 820 million people not having enough to eat. Two billion people are food insecure, without regular access to safe, nutritious and sufficient food. Of these, 700 million face severe food insecurity and possibly experienced hunger (FAO et al., 2019). Food security is defined as “a condition when all people at all times have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life”(CFS, 2012). Household access to food is a strong determinant of malnutrition. All parts of the world are faced with malnutrition, with some regions grappling with multiple burdens. Among children under five years globally, 151 million are stunted, 51 million are wasted and 38 million are overweight, while 39% of adults are overweight or obese (Development Initiatives, 2018). In addition to under- and overnutrition, micronutrient deficiencies are also prevalent, with 42% of children and 33% of women of reproductive age being anaemic, and 33% of children and 15% of pregnant women with vitamin A deficiency worldwide (WHO, 2009; Development Initiatives, 2018; Ritchie & Roser, 2019). Improving access to and consumption of high-quality diets can therefore contribute to the mitigation of malnutrition.

Undernutrition and micronutrient deficiencies are more prevalent in low- and lower middle-income countries, which include countries in Sub-Saharan Africa. These countries are also facing an increase in the prevalence of overnutrition – a change that has been attributed to urbanisation, a shift in dietary patterns with increased consumption of energy-dense, highly refined foods high in fat and sugar, and low in micronutrients, and a reduction in physical activity due to more sedentary work (Fanzo, 2012; UNICEF, WHO & World bank, 2018). East and West

Africa are the two sub-regions in Africa with the highest stunting, and wasting and underweight prevalence, respectively (Akombi et al., 2017).

In Uganda, 29% of children under five are stunted, while 11% are underweight, 4% are wasted and 53% are anaemic. Among adults, 24% of women and 9% of men are overweight or obese, while 32% of women and 16% of men are anaemic (UBOS & ICF, 2018). According to the 2016 National Demographic Health Survey, among children aged six to 23 months, only 15% have minimum acceptable diets and 30% consume diets with minimum dietary diversity. In addition, consumption of iron-rich and vitamin A-rich foods by these children is at 40% and 67%, respectively (UBOS & ICF, 2018). This highlights the prevalent gaps in nutrition and the need to contribute to their mitigation.

In addition to nutrition gaps among children, food security is also a concern in the country. The national average caloric intake is at 1,883 Kcal per day per person whereby 39% are estimated not to meet their energy requirements. In addition, household diets are of medium quality, that is, 40 - 60% of the caloric intake is derived from starchy staples (NPA, 2017). At a national level, 26% of households face stressed food insecurity, that is, they have borderline food consumption scores (21.5 - 25), are employing coping strategies and are unable to afford some essential non-food expenditures without engaging in irreversible coping strategies. Five percent of households face a food security crisis, whereby they have poor food consumption scores (≤ 21), low meal frequencies of up to one meal a day, low dietary diversity of less than three food groups, and no food stocks (IPC, 2017). Consequently, efforts to address the nutrition gaps among children need to consider the prevailing food security situation.

A look into the causes of inadequate diets and prevalent food insecurity noted that the causes were diverse as reflected in the conceptual framework of malnutrition. These included inadequate infant and young child feeding practices; repeated infections such as malaria, diarrhoea, and respiratory infections; lack of safe water, hygiene and sanitation; food insecurity; gender inequality and poverty (UNICEF, 2013; Namugumya et al., 2014). In Uganda, the high fertility rate of 5.4 children per woman, early births, with 25% of adolescents having children, and short birth intervals are additional risk factors for child malnutrition (Namugumya et al., 2014; UBOS & ICF, 2018). Malnutrition and dietary risks are among the ten major risk factors of death and disability in the country (IHME, 2018). Child undernutrition in Uganda has been estimated to lead to a loss of 899 million United States Dollars (USD), as costs related to health, education and productivity (WFP, 2013). The economic productivity losses, if the stunting situation remains unchanged, is estimated at eight billion USD and losses for iron deficiency anaemia are at 445 million USD (Namugumya et al., 2014). Therefore, addressing the malnutrition, inadequate diets and food insecurity situation in Uganda and other developing countries can yield both health and productivity gains. In fact, the 2040 Uganda national vision strategy states that the current health strategy to improve the nutritional status of the

population, especially for young children and women of reproductive age, has the potential to reduce the number of maternal deaths by 6,000 and child deaths by 16,000 every year. The strategy estimates that for every 0.5 USD invested in improving the nutritional and health status of children, three USD of increased productivity will result from reduced child stunting, improved maternal health, enhanced micronutrient intake, and improved nutritional care (NPA, 2013b).

Diets in Uganda are mainly composed of cereals, roots, tubers, and cooking bananas, together with legumes, nuts, and green leafy vegetables foods (Shiverly & Hao, 2012). Kiboga district, located in the central part of the country, for example, largely consumes cooking bananas, cassava, maize, beans, and horticultural crops (Ekesa et al., 2015). Inadequate intakes of micronutrients have been noted, especially vitamin A, vitamin B-12, iron, zinc and calcium (Harvey, Zo Rambeloson & Dary, 2010). The consumption of fruit, vegetables, and animal-source foods is hampered by the high and rising costs and limited availability and access (Shiverly & Hao, 2012). Additional barriers to infant and young child feeding practices in rural Uganda include caregivers' level of knowledge, culture and customs, and the patterns and burden of other responsibilities of the caregivers (Nankumbi & Muliira, 2015). Maternal literacy and education, and delivering the child from a health facility have been associated with better feeding practices (Ickes, Hurst & Flax, 2015). Likewise, a father's education and household economic status have also been associated with the child's nutritional status (Kikafunda & Tumwine, 2007). The above reports provide insight into factors that need further assessment and action, like the knowledge, culture and customs related to food and nutrition to improve the dietary diversity and micronutrient intake.

2.3 The situation among smallholder farmers

Smallholder farmers make up two thirds of the world's population, producing 80% of the food in developing countries on two hectares of land or less (Rapsomanikis, 2015). More than 95% of farms are less than five hectares in size, occupying 75% of the farmland in low-income countries and 67% of farmland in lower-middle-income countries (FAO, 2014a). In developing countries, smallholder production accounts for 60 to 80% of food consumed and 40 to 60% of rural income (Rapsomanikis, 2015). Though smallholder farmers mainly rely on agriculture for food and income, they are increasingly taking part in off-farm income-generating activities (Ritzema et al., 2017; van Wijk et al., 2018). Smallholder households have varying household and farm characteristics, poverty levels and food security status. Labour is mainly provided by family, with women making significant contributions (SOFA team and Doss, 2011). The nature of their production varies across countries depending on the level of development, with those in Africa and Latin America being rain dependant, while those in Asia are able to irrigate (Rapsomanikis, 2015). Smallholder farms have more intensive use of resources, resulting in higher yields per hectare despite lower labour productivity compared to larger or commercialised farms (FAO,

2014a; Rapsomanikis, 2015). Smallholder farmers are thus vital role players in developing countries whose nutrition, health and productivity are paramount.

Smallholder farmers produce a variety of crops to achieve diverse diets and reduce risks such as poor harvests and low prices for their harvests (Rapsomanikis, 2015). Their production contributes towards food security by making food available for the households, increasing food available in the markets, which reduces food market prices, and generating income for farmers, input providers and other actors in the value chain (Wiggins & Keats, 2012). The production systems, whether crop, livestock, or mixed, influence the household food consumption patterns and dietary diversity; and dietary diversity is achieved from consumption of food produced from the farms and through purchase (van Wijk et al., 2018). Ensuring functioning and resilient farming systems can, therefore, contribute towards the food security of smallholder farmers.

Though smallholder farmers produce the most of the world's food, they remain vulnerable to poverty, food insecurity, hunger, malnutrition, especially under nutrition and micronutrient deficiencies, and climate change. They are also affected by poor infrastructure and have limited access to information and services (FAO, 2014a; van Wijk et al., 2018; Williams et al., 2018). Despite these challenges, smallholder farmers hold the potential to make greater contributions towards food security and poverty alleviation. It is therefore important that the context and vulnerability of smallholder farmers is understood and considered during the development of a food-based strategy.

The importance of smallholder farmers in developing countries is also reflected in Uganda, where agriculture is dominated by smallholder farmers that make up 80% of farmers and contribute to 70% of the national production. The definition of a smallholder farmer varies with context. Globally, it has been reported to include those that farm on two hectares or less; however, in Uganda the national cut-off for planning and reporting is currently 0.4 to 1.2 hectares or less (NPA, 2013a; Rapsomanikis, 2015). Agriculture in the country contributes to 21% of the country's gross domestic product (GDP) and the majority of all agricultural produce is consumed domestically (NPA, 2015; OPM, 2017; UBOS, 2017b). The country mainly has two growing seasons and therefore two harvest seasons a year. Agriculture is dominated by food crops (52%), forestry (18%), and livestock production (18%). Key food crops include cooking bananas, maize, millet, sorghum, rice, cassava, sweet potatoes, potatoes, beans, cow peas, field peas, pigeon peas, groundnuts, soya beans and sesame (UBOS, 2018). In the central region, where the study site is located, households mainly grow cooking bananas, maize, beans and sweet potatoes, with men engaging more in maize, coffee and livestock, women in maize, beans, livestock, and youth in livestock grazing, poultry and marketing of vegetables (Ekesa et al., 2015). This is the agricultural context, within which the food-based strategy was developed. Figure 2-1 shows the diversity that can be found on a smallholder farm in Kiboga district, Central Uganda.

Figure 2-1 Part of an intercropped smallholder farm in Kiboga district with production diversity that include beans, cassava, bananas and maize.

Bananas are a staple crop in the East African region that are grown and consumed not only as dessert bananas but also when raw when ripe. Cooking bananas, are a starchy staple of main meals, commonly called *Matooke* in Uganda. A wide range of banana varieties are grown and the fruit are consumed in several ways, such as cooked – steamed, boiled, roasted or fried when raw or ripe – or made into juice and alcoholic beverages, dried and made into flour for porridges and confectionaries (Karamura et al., 1998; Kiiza, Abele & Kalyebara, 2004; JAICAF, 2010).

Agricultural production in Uganda meets only 40% of its potential. The particular challenges faced in Uganda include poor management of pests and diseases, limited access to quality inputs, low technology adoption, limited value addition, a weak agricultural extension system, limited access to land, credit and financial services, as well as poor infrastructure such as storage, processing and market facilities, road networks, and energy/fuel availability. Rural households and women have lower access to land, inputs and markets. About 30% of smallholder produce is lost due to poor handling and storage practices. Quality and safety standards are affected by the market systems, as 80% of produce is sold in informal markets. There is also limited value addition and farmers receive low prices due to middlemen in the value chain. As a result, the food available for consumption and income generated from agriculture is reduced (Ekesa et al., 2015; NPA, 2015; Fiala & Apell, 2017; WFP, 2017).

In addition to inadequate nutrition, food insecurity and challenged agriculture, poverty is also a concern in Uganda, and was an important factor during the development of the food-based strategy. About 8 million people (21%) in Uganda live in poverty, that is, live on less than $1.90 a day. With 76% of the population living in rural areas, they contribute to 89% of the poor. The reduction in poverty over the years was greatest among households working in agriculture (UBOS, 2019). However, it has been noted that the poverty line of $1.90 was set 20 years ago and is now too low and not reflective of the current reality due to the increase in the standard of living. In addition, for every three Ugandans that move out of poverty, two fall into poverty (World Bank, 2016). With most adults in rural areas, access to financial and credit services and information is limited. More Ugandan adults make use of non-bank formal services (58%) like mobile money, savings and credit cooperative organisations, and informal financial services (56%) like savings groups, village savings and loan associations, rotating savings and credit associations and community-based money lenders, compared to commercial banks and micro finance institutions (11%) (FSD Uganda, 2018).

2.4 The nutrition and agriculture link

Given the importance of agriculture to the livelihoods and food security of smallholder farmers, it is vital that improvements in agriculture support be made and thereby bring about a reduction in the prevalence of poverty, food insecurity and malnutrition. The contribution of agriculture towards improved nutrition is; however, not guaranteed because the impact is affected by a range of factors such as methodologies used, household characteristics, decision making dynamics, and access to resources, inputs and markets (Masset et al., 2011; Gillespie, Harris & Kadiyala, 2012; Herforth & Harris, 2014). To improve impact, it has been recommended that agricultural strategies have nutrition as an objective and use sound methodologies, monitoring and evaluation (Masset et al., 2012). In addition, various aspects of food security need to be addressed, not only focusing on food availability and accessibility but also food utilisation, stability and safety. Food security among smallholder households can be improved by increasing food availability through production and market access, increasing household incomes both on and off the farm, improving income expenditure, and addressing gender equity and the workload of women (Wiggins & Keats, 2012; FAO, 2014).

Individuals and households need to consume diverse and quality diets to meet their nutrient needs. Because foods are mainly sourced on the farm and from markets, production diversity and market access can contribute to dietary diversity. The effect of production diversity on dietary diversity has been found to be stronger for vulnerable and poor households, those with low on-farm diversity, poor market access, and located in challenging agro-ecological areas (Rajendran et al., 2014; Sibhatu, Krishna & Qaim, 2015; Ayenew et al., 2018; Kissoly, Fabe & Grote, 2018; van Wijk et al., 2018). The effect of production diversity on dietary diversity also reduces in lean/hunger periods that occur after planting and increases after harvesting (Ayenew

et al., 2018). Indeed, the influence of production diversity on dietary diversity is dependent on the agro-ecological characteristics and market dynamics. In households where incomes and market access are present, their influence on dietary diversity increases and that of production diversity decreases (Sibhatu, Krishna & Qaim, 2015; Kissoly, Fabe & Grote, 2018). The impact of incomes and market access is; however, further affected by the type of markets accessed, how incomes are used, food prices, whether healthy food choices are made, and the changing food environment (Fanzo et al., 2013; Herforth & Harris, 2014; Sibhatu, Krishna & Qaim, 2015). For example, it was reported that an increase in household income in Sub-Saharan Africa was associated with an increase in demand for fruit compared to that for vegetables, as vegetables were more expensive than fruit (Ruel et al., 2005). Therefore, the development of the food-based strategy should explore the dynamics between production diversity, income, market access and dietary diversity.

The pathway of how production diversity impacts nutrition has been reported from providing food for own consumption, to contributing to income for food and non-food expenditure through the sale of produce. Agriculture also influences food prices where increased production can reduce food prices and facilitate increased access to food and essential nutrients. It also contributes to economic growth and national income, reducing poverty and improving nutrition. Lastly, agriculture has been linked to nutrition through women empowerment, where women empowerment has been linked to improved nutrition of children and household (World Bank, 2007; Herforth & Harris, 2014). However, the evidence of the links between agriculture and nutrition has not been consistent due to different and/or weak methodologies, and a lack of comprehensive data on the effectiveness of interventions (Bhutta et al., 2008; Masset et al., 2012). In spite of this, agricultural interventions that promote production diversity, particularly micronutrient-rich crops, bio-fortified crops, small livestock and dairy, have reported improved production and consumption of target foods (Ruel, Quisumbing & Balagamwala, 2017). Production diversity has additional advantages as it increases agrobiodiversity. Agrobiodiversity increases and preserves the availability of diversity, which has varying nutritional and therapeutic value. Agrobiodiversity also increases the resilience of farms, enabling them to withstand pests, disease, droughts and climate change, and replenishes soils (Fanzo et al., 2013; Kahane et al., 2013). In addition to these benefits, the existing production diversity can be enhanced to support improved access to diverse diets among smallholder farmers.

2.4.1 Food-based strategies to improve nutrition

Food-based strategies are dietary approaches to improve dietary practices and nutritional status through increased production, availability, access, consumption and bioavailability of nutrient-rich foods and/or a diverse food basket (Ruel, 2001). They have been largely used to address micronutrient deficiencies. They can cover the whole food chain from crop and animal breeds and varieties, production, market access, processing and preparation, to consumption

(Underwood, 2000; Thompson et al., 2011). Breeding strategies include those that increase the concentration of nutrients, for example biofortified foods, and/or reduce the concentration of inhibitors to increase nutrient bioavailability. Strategies that focus on production promote the production and consumption of nutrient-rich foods and livestock. At the processing and preparation stage, strategies include fortification of foods, diversification of diets, and promotion of processing and preparation methods and food combinations that increase bioavailability, food safety, shelf life and reduce nutrient losses (Underwood, 2000; Ruel, 2001; Thompson et al., 2011, 2014).

Diversification as a strategy aims at improving the availability, access to and utilisation of nutrient-rich foods throughout the year. This requires behaviour change communication approaches to promote positive changes in food-related attitudes, behaviours and practices (Gibson, 2014). Selection of the particular foods (crops and/or animals) for promotion considers the nutrient gaps in the diet, the nutrient content of the foods, the available local, indigenous or underutilised crops that can contribute to the nutrient gaps, food preferences of the people and production practices by the target population (Faber, Laurie & van Jaarsveld, 2014; Thompson et al., 2014).

Examples of studies or interventions that used food-based strategies include a homestead food production strategy in Nepal, which incorporated nutrition education and behaviour change communication, and training in agricultural production with distribution of farm inputs. With a focus on women using model farmers in the communities, a randomised control trial showed a positive impact on the prevalence of anaemia in children and maternal underweight, increased production, household food security and improved infant and young child-feeding practices were observed (Osei et al., 2017). In Burkina Faso, an integrated agriculture and nutrition strategy showed that enhancing production using a behaviour change communication strategy implemented by community members increased the intake of fruit, animal products, and dietary diversity, as well as a reduction in underweight prevalence in mothers (Olney et al., 2016). These two reports highlight the importance of behaviour change communication and capacity building as key components within their strategies.

Other examples of studies or interventions that used food-based strategies include orange-fleshed sweet potatoes (OFSP) that were introduced in Uganda in a cluster-randomised control trial with community-based farmer groups. Following training on production, distribution of vines, demand creation/behaviour change and marketing, an increase in production and consumption of OFSP, a reduction of vitamin A deficiency in children and women were found (Hotz et al., 2012). The promotion of home gardens using cost-effective practices and activities to enhance family nutrition and income of resource-poor and disadvantaged groups of farmers in Nepal was found to increase diversity produced and access by households (Pudasaini et al., 2013). In Bangladesh, food-based strategies for the landless incorporated technologies that were

cost-effective, maximised yields and utilised small areas of land. They also included skill building and income generation linked to agriculture, and nutrition education and counselling in the promotion of home gardening, poultry production, group marketing, and nutrition (Hillenbrand & Waid, 2014). Additional elements that were important in these food-based strategies were access to seed of nutrient rich crops and improving production capacity of vulnerable households.

Focusing on animal-source foods, a randomised controlled feeding intervention among school-going children in Kenya showed the importance of animal-source foods and their positive effects on the cognitive function, school performance, physical activity, growth, micronutrient status and morbidity (Neumann et al., 2014). Another livestock food-based strategy in Nepal used a longitudinal control trial where women groups were trained on community development, empowerment, and livestock management. Results varied by agro-ecological region and season, whereby an increase in the number of food groups consumed and an increase in the proportion achieving minimum dietary diversity was more likely among children in poorer remote areas, (Darrouzet-Nardi et al., 2016). This emphasises the need for tailoring interventions. Elements from successful interventions such as those mentioned above can be useful in the development of a contextualised food-based strategy.

Food-based strategies are sustainable approaches to improve nutrition as they can empower actors across the food chain and can address multiple nutrient deficiencies, and enhance individual, household and community empowerment, especially that of women (Gibson et al., 2000; Underwood, 2000; Ruel, 2001). They allow for flexibility and adaptation through menu and recipe modification and inclusion of locally available food. Even with the emphasis on particular nutrients, the risk of nutrient interactions and toxicity is reduced because the nutrients exist in a natural balance within the food (Gibson et al., 2000; Underwood, 2000; Ruel, 2001).

Local adaptation of food-based strategies is important. Adaptation should make use of existing crop and animal diversity and address production and market factors to ensure that they support the food-based strategy (Underwood, 2000). Local adaptation of a strategy also increases the cultural acceptability, economic feasibility and sustainability of the strategy (Gibson, 2014). Nutrition education and behaviour change communication strategies are also vital elements to ensure that production and marketing of the promoted foods, and increased incomes, translate into improved diets and nutrition outcomes (Ruel, 2001; Murty, Rao & Bamji, 2016; Osei et al., 2017). Capacity building, investing in different types of capital and efforts to empower communities increase the likelihood of positive impact and sustainability of food-based strategies (Berti, Krasevec & FitzGerald, 2004; Thompson et al., 2014). Empowering women enhances the impact of agricultural interventions on diets and other nutritional outcomes. However, the relationship between nutrition and empowerment in agriculture varies with context given the

different cultures, gender norms and differences in levels of empowerment and should be addressed as such (Ruel, Quisumbing & Balagamwala, 2017).

Studies using food-based strategies have documented an improvement in household and individual access to and consumption of nutrient-rich foods such as orange-fleshed sweet potato, dairy products, fruit and vegetables (Hotz et al., 2012; Rawlins et al., 2014; Olney et al., 2016; Osei et al., 2017). However, the impact on nutritional status has been mixed (Berti, Krasevec & FitzGerald, 2004; Masset et al., 2011; Ruel, Quisumbing & Balagamwala, 2017). Therefore, there is a need for the design of robust interventions that use consistent and appropriate indicators, for rigorous impact pathways and quality impact evaluations (Berti, Krasevec & FitzGerald, 2004; Masset et al., 2011; Thompson et al., 2014; Ruel, Quisumbing & Balagamwala, 2017).

2.5 Strategy development approaches to improve nutrition and health

The successes of food-based strategies or nutrition-sensitive agricultural interventions are overshadowed by gaps in design, implementation, and evaluation that have limited the scope of evidence (Berti, Krasevec & FitzGerald, 2004; Masset et al., 2011; Thompson et al., 2014; Ruel, Quisumbing & Balagamwala, 2017). Food-based strategies are complex in design, implementation and evaluation; require time to design and implement for long-impact pathways to fully take effect; and are influenced by programmatic, logistical, and political factors that lead to trade-offs between implementation constraints and evaluation rigor (Leroy, Olney & Ruel, 2016). The complexity can be addressed by using strategy development frameworks that systematically identify pathways to impact, the processes to be used, and the relevant output and outcome indicators (Bokhoven, Kok & Weijden, 2003; Ruel et al., 2013; Gibson, 2014). Use of such frameworks enhances and links the development, design and evaluation processes and explicitly documents the choice and measures of the pathways, processes, outputs and impacts (Craig et al., 2008; Eldredge et al., 2016).

Various strategy development frameworks for health and nutrition interventions have been developed and implemented by development, research, non-governmental organisations, and government institutions. The Medical Research Council of the United Kingdom has a structure for systematic development and implementation of complex strategies and interventions to improve health. Their structure highlights aspects to consider when identifying relevant evidence, appropriate theory, modelling process, outcomes, and evaluation methods that assess effectiveness and cost-effectiveness and understand the processes (Craig et al., 2008). A programme theory framework was developed to establish how the Helen Keller International homestead food production programme in Cambodia impacted maternal and child health and nutrition outcomes. An iterative process was used to identify programme components and pathways from inputs to impact. The framework was used to assess the delivery and utilisation of the programme along the impact pathways and found that components were delivered and used as planned, and identified gaps in the pathway from poultry production to increased intake

of products and in the delivery of health and nutrition training (Olney et al., 2013). A casual modelling approach was used to develop a theory-based intervention to increase physical activity among individuals at risk of Type-2 diabetes. In this approach, behavioural determinants were causally linked, that is, from behaviour to physiological and biochemical variables, and to health outcomes through the use of relevant literature, information from focus group discussions and key informants, and theory. The theory of planned behaviour was then used to inform the identification of behavioural determinants and expected changes (Hardeman et al., 2005). The intervention mapping framework has also been used to develop and aid the planning and development of theory- and evidence-based health promotion interventions using an iterative process from the identification of a problem to its solution (Kok et al., 2004).

2.5.1 The intervention mapping approach to developing theory-based and evidence-based strategies

Intervention mapping is a protocol that provides a systematic approach to developing theory-based and evidence-based strategies (Kok et al., 2004; Brug, Oenema & Ferreira, 2005). It was developed to aid the use of theory, link theory and practice, and respond to challenges in intervention and strategy development, such as those related to determinants of behaviour and/or health problems, for example, problems encountered when trying to change behaviour not related to the problem, or changing determinants for behaviours not related to the behaviour (Kok & Mesters, 2011).

Health and health-related behaviours are a function of an individual, their environment, and public policies. The environment includes their family, community, and organisation (Kok et al., 2004). The impact of strategies and interventions is increased if they are not only guided by social and behavioural theories, but that the theories are applied appropriately and correctly (Kok et al., 2004; Brug, Oenema & Ferreira, 2005). Theories can be used to explain or predict behaviour, identify effective change methods, and evaluate why and how the change occurred. Theories can therefore, guide the choices made during strategy development to yield a focused strategy focused at determinants central to a particular behaviour, and therefore more likely to lead to change (McEachan et al., 2008). A wide range of applicable theories at different levels – individual, interpersonal, organisational, community and society – is available. Intervention mapping therefore, provides a protocol for selecting and applying theories during strategy development in addition to evidence (Eldredge et al., 2016).

The strategy development process in intervention mapping is divided into five steps: (1) definition of objectives based on the problem and its determinants; 2) selection of the intervention methods and strategies to change the determinants of the health-related behaviours; 3) production of programme components, design and production; 4) planning for adoption and implementation; and 5) planning for process and effect evaluation (Eldredge et al., 2016).

Throughout the process, relevant literature, theory, and evidence pertaining to the target group and problem at hand are applied and used to build a logic model of the problem and later the solution/strategy. Intervention mapping uses the PRECEDE/PROCEED model to build the logic model of the problem (Fig 2-2). The PRECEDE/PROCEED model has been used to understand the social and physical environments during the development of health interventions (Cole & Horacek, 2009; Li et al., 2009; Buta et al., 2011). The model includes the behavioural factors – what individuals, households, or communities do to support or inhibit the problem; the environmental factors – the social and physical environments that influence the health problem directly or indirectly through the behavioural factors; and the personal determinants of behaviour at an individual level, such as knowledge, attitudes, beliefs, values, perceptions, and skills that influence behaviour (Eldredge et al., 2016).

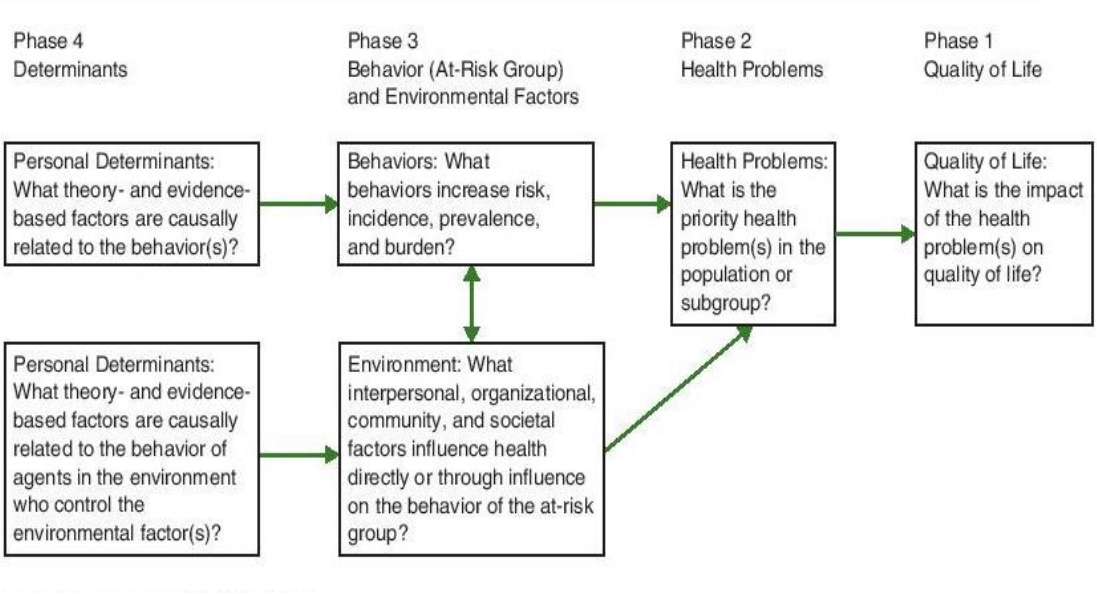


Figure 2-2 Logic model of a health problem.
(Eldredge et al., 2016)

The behavioural and environmental factors are then used to define the goals of the strategy and the proximal behavioural and environmental outcomes and performance objectives – which lay out the pathway to change (Figure 2-3). Behavioural outcomes refer to what the individual/household would or would not perform as a result of the strategy, while environmental outcomes are actions that will be done at different environmental levels to influence behavioural change in the target population (Eldredge et al., 2016). For example, at the interpersonal level, social support such as emotional support, information, material support, maintenance of social identity, and social outreach serve as protective factors to address a problem and/or improve health (Donev, 2005). The community also affects health directly or indirectly. This level of environment influences the social capital available and the community capacity for achieving and maintaining health, such as achieving adequate diets (Eldredge et al.,

2016). The environment also provides modelling and reinforcement of behaviours, which influences health outcomes (Bandura, 2006b). Environmental outcomes can therefore apply to a group of individuals – a household and/or community, to enable them to support the primary group – or an individual or household to achieve the strategy goal. When well defined, behaviour and environmental outcomes enable the formation of specified performance objectives (Eldredge et al., 2016).

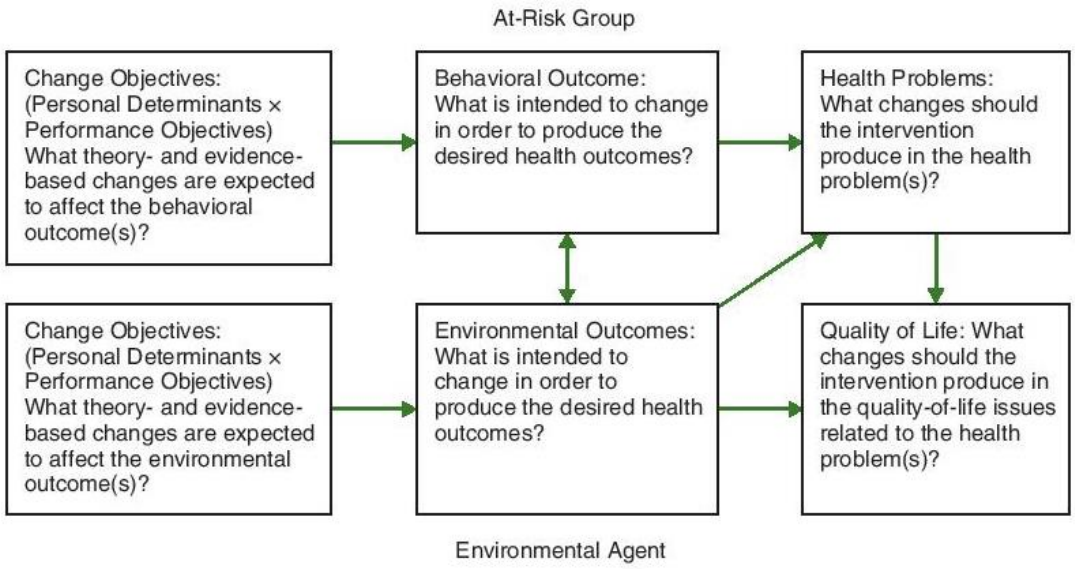


Figure 2-3 Logic model of change.
(Eldredge et al., 2016)

Performance objectives are actions or performances required to achieve the outcomes. Behavioural performance objectives clarify the actions required to achieve the behavioural outcomes and help sequence the behavioural learning process that will be required in the strategy. The main question to be answered is: "What do the beneficiaries in the programme or the environmental agents need to do to perform the behaviour or to make the environmental change stated in the behavioural and environmental outcome?" At an individual level, personal determinants are those within their direct control or influence, which can be changed or influenced, including skills and cognitive factors like knowledge, attitudes, beliefs, values, self-efficacy, and expectations (Eldredge et al., 2016).

Following identification of theoretical and behavioural change methods, and organising the change methods into a deliverable strategy, the implementation and evaluation process is also anticipated. The impact pathway shows the ways in which change is expected to be achieved and whether this change has been achieved (Eldredge et al., 2016). The evaluation involves conducting an effect and process evaluation (Figure 2-4).

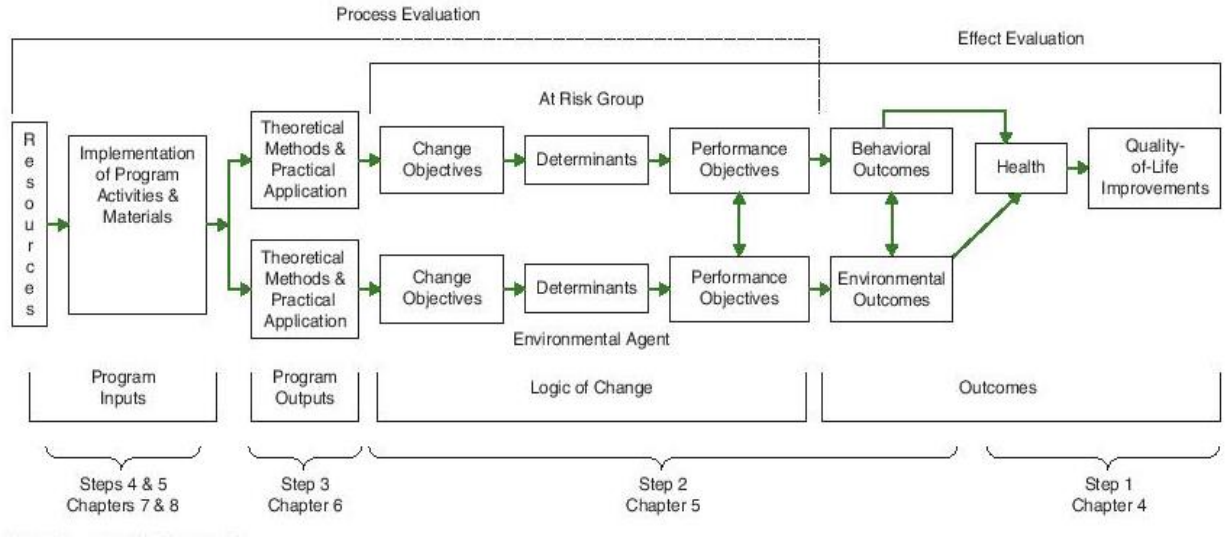


Figure 2-4 Intervention logic model showing the evaluation model.
(Eldredge et al., 2016).

Effect evaluation assesses the effectiveness and efficacy of the intervention, which includes the extent of change achieved and whether the change can be attributed to the intervention. This requires that the strategy be implemented using the appropriate design. With experimental designs, beneficiaries are assigned to an intervention group and compared to a control group or to itself. Random assignment of beneficiaries is the gold standard as it reduces bias. Examples of experimental designs include randomised control trials (individual or cluster), stepped wedge designs, preference trials, observational studies with propensity score matching, time-series designs, pragmatic designs, and comparative effectiveness designs. Nonexperimental designs can be used where an intervention applies to the whole population, and thus an experimental design is not appropriate. Choice of a design is informed by the purpose of the evaluation, size of effect expected and timing, feasibility, and cost (Shadish, Cook & Campbell, 2001; Eccles, 2003; Rossi, Lipsey & Freeman, 2004; Craig et al., 2008; Eldredge et al., 2016). Understanding the theoretical underpinnings of the strategy leads to suitable evaluation measures (Craig et al., 2008).

Process evaluation evaluates the implementation of the intervention, provides feedback/corrective measures during implementation and expounds on the results of the effect evaluation and provides insight on why and how the intervention succeeded or failed. This evaluation captures the extent of the strategy delivered and received, the fidelity of implementation – the degree to which the strategy was delivered as designed, the implementation context, and adherence by implementers and beneficiaries. The process evaluation can also identify the essential components of the strategy, and what is required to disseminate/scale out the strategy. Quantitative, qualitative, or mixed methods are used for process evaluations and require high methodological standards. Methods include

implementation records, surveys, key informant interviews, and focus group discussions (Rossi, Lipsey & Freeman, 2004; Carroll et al., 2007; Craig et al., 2008; Eldredge et al., 2016). The above steps in the intervention mapping protocol were applied in this study to incorporate the needs-based and asset-based approaches to develop a contextualised food-based strategy. Further details of the different steps and processes are presented in Chapter 6.

Intervention mapping has been used to design, adapt, implement and evaluate health and nutrition interventions. For example, a worksite intervention to increase physical activity that targeted awareness, motivation and the environment (McEachan et al., 2008); a workplace self-management programme for employees with a chronic somatic disease (Detaille et al., 2010); improving healthy nutrition and lifestyle behaviours in cancer survivors (Koutoukidis et al., 2018); and community and web-based HIV-prevention interventions (Kok et al., 2006; Wolfers et al., 2007). Other examples include web-based nutrition education for adults targeting fruit, vegetable, high-energy snacks and fat intake (Springvloet, Lechner & Oenema, 2014); community-based interventions to prevent childhood obesity in Europe (Verbestel et al., 2011); promotion of adequate weight gain among pregnant women (Merkx et al., 2017); family-based child weight management intervention (Pittson & Wallace, 2011); and school-based interventions to prevent obesity, promote healthy eating habits and increase physical activity (Draper et al., 2010; Lloyd et al., 2011).

A review of disease prevention studies that used intervention mapping found that the interventions successfully identified the determinants of uptake and showed an increase in the uptake of disease prevention programmes (Garba & Gadanya, 2017). Intervention mapping has also been adapted for health promotion in school settings with the aim of increasing healthy eating and physical activity using a community-based participatory approach (Belansky et al., 2011, 2013). Use of the intervention mapping approach can be limited by the composition and size of the group involved in the development process and the required iterative process. This requires time and resources. In addition, selection and application of the appropriate theories and methods is influenced by the developers' capacity to apply them and the available evidence based on the effectiveness of the theories and methods in different contexts (Peters, Ruiter and Kok, 2013; Fernandez et al., 2019).

2.6 Theories applied in the development of the food-based strategy

Theories present an integrated summary of hypothesised causal processes involved in behaviour change. Theory-based interventions/strategies utilise theory to understand the problem and related behaviours to create an explicit causal pathway to change (Michie et al., 2008). Theories can also be used to predict behaviour, identify effective change methods, and evaluate why and how change occurred (McEachan et al., 2008). There are a wide range of theories related to behaviour where no one theory can be applied in all cases and more than one theory is applicable in a given case. Theories tend to overlap and identification of theories and their use needs to

refer to the behaviour and context at hand (Glanz, Rimer & Viswanath, 2015a). Use of theory needs to be supplemented with the appropriate designs, measures and procedures (Glanz, Rimer & Viswanath, 2015a) otherwise their application may become redundant. Appropriate application of theory, together with evidence, can yield a focused strategy aimed at determinants that are central to the behaviours or practices in question and are thus more likely to lead to change. Frameworks like intervention mapping aid in the selection and application of theory during strategy development (Eldredge et al., 2016). The theories that were used in this study are discussed below (Sections 2.6.1 – 2.6.4); however, their application in the strategy development process is laid out in Chapter 6, Section 6.2.

2.6.1 Reasoned Action Theory

The Reasoned Action Approach (RAA) is an extension of the theory of planned behaviour by Icek Ajzen and Martin Fishbein (Ajzen & Fishbein, 1980; Fishbein et al., 2012). It is a theoretical model of behaviour change that seeks to identify the determinants of a particular behaviour of interest. The RAA suggests that "attitudes towards the behaviour, perceived norms, and perceived behavioural control determine people's intentions, while people's intentions predict their behaviours" (Ajzen & Fishbein, 1980). That is, intent to perform a behaviour is a precursor to the behaviour. This intent is influenced by three constructs: first, salient behavioural beliefs about the behaviour and its consequences, which lead to a favourable or unfavourable attitude about the behaviour; second, perceived normative beliefs towards the behaviour by relevant individuals or groups of people, which give rise to subjective norms (perceived social pressure) to perform or not perform the behaviour; and lastly, salient control beliefs, which are perceived factors that facilitate or impede performance of a behaviour (Gold, 2011; Fishbein et al., 2012; Eldredge et al., 2016). The control beliefs lead to perceived behavioural control, which is the perceived capability to perform the behaviour. When behavioural and normative beliefs are positive/favourable, the control beliefs become stronger, and as a result, the intent to perform the behaviour becomes stronger. Alongside the interaction of these three factors is actual control, which is determined by the environment and skills to deal with the factors and perform the behaviour such that when the opportunity arises, an individual carries out their intent and performs the behaviour. It is also noted that the three beliefs are influenced by a range of background factors such as disposition demographics and information (Gold, 2011; Fishbein et al., 2012; Eldredge et al., 2016). RAA has been applied to understand the intentions to buy and consume dark green leafy vegetables (Sheats et al., 2013); the fruit and vegetable eating behaviours (O'Neal et al., 2014); the intention and behaviour around milk purchase (Booth-Butterfield & Reger, 2004); the decisions to participate in work-site wellness programmes (Middlestadt et al., 2011); and to predict fruit consumption (Brug et al., 2006).

The RAA was applied in the design of the food-based strategy during identification of determinants of low dietary diversity and identification of possible changes in the personal

determinants that would support the strategy performance objectives. For example, changes in in knowledge, attitudes, beliefs, self-efficacy and expectations that would lead to behaviours and an environment that support dietary diversity (Section 6.2).

2.6.2 Social Cognitive Theory

In Social Cognitive Theory (SCT), a behaviour is dynamic, depending on the characteristics of the individual and the environment. The theory by Albert Bandura is an adaptation of the social learning theory and suggests that learning and behaviour are products of dynamic and reciprocal interactions between personal, behavioural, and environmental influences (Bandura, 1986, 1989). In SCT, behaviour is determined by outcome expectations, outcome expectancies, self-efficacy, behavioural capability, and environment. Outcome expectations are the perceived consequences likely to occur as a result of a behaviour in a given situation. The individual also expects these consequences to occur when the situation arises again. These expectations are learned from previous experiences, observing others in similar situations, hearing about similar situations, and emotional or physical responses to the behaviour. Outcome expectancies on the other hand refer to the value that an individual places on a particular outcome. This can be a positive or negative value. Activities that maximise positive outcomes and minimise negative outcomes are more likely to be chosen. Self-efficacy is the individual's confidence about performing a behaviour. This includes the confidence in overcoming barriers and is a primary indicator of intent to engage in a behaviour. It is a person's perception about the behaviour therefore, affecting the amount of effort invested and the level of performance attained. A behavioural capability concept is one where a person who is performing a behaviour must have knowledge of the behaviour and the skills to perform it. This enables a distinction between learning and performance. Lastly, environment refers to factors that are external to the individual, which affect their behaviour. This includes the social and physical environment. The environment provides cues about behaviour and can affect it even without a person's awareness (Baranowski, Cheryl & Guy, 2002; Eldredge et al., 2016).

Aside from understanding the underlying factors of behaviour, SCT is also instrumental in behaviour change – that is the development of behaviour change interventions. Aspects that strengthen the SCT concepts can be targeted during intervention development. For example, self-efficacy, a prerequisite for behaviour change, increases both motivation and action. Mastery, where beneficiaries learn, practice and master the behaviour and skills that lead up to the behaviour, increases self-efficacy. Utilisation of individuals that face and successfully address challenges, and barriers that beneficiaries face, referred to as coping models or peer models can help to increase the self-efficacy of beneficiaries (Bandura, 2004; Glanz, Rimer & Viswanath, 2015a). An additional concept in SCT that is important in behaviour change is self-regulation. Self-regulation is achieved through providing the skills and opportunities for self-monitoring, goal

setting, feedback, and problem solving – methods that can be incorporated in an intervention (Bandura, 2004; Glanz, Rimer & Viswanath, 2015a).

SCT has been applied to determine the determinants of: poor dietary habits (Doerksen & McAuley, 2014); dietary habits in pregnant women (Torkan et al., 2018); food-related behaviours of women (Byrd-Bredbenner, Abbot & Cussler, 2011); and health and nutrition behaviour in children and adolescents (Rinderknecht & Smith, 2004; Ball et al., 2009; Young Hong, 2016). It has also been applied in the design of nutrition education interventions (Chapman-Novakofski & Karduck, 2005; Kim & Lee, 2011); and interventions targeting nutrition behaviour change and physical activity (Anderson-Bill, Winett & Wojcik, 2011; Stacey et al., 2015).

The SCT was applied together with the RCT during identification of determinants of low dietary diversity and changes in personal determinants. The SCT was also applied during identification of behaviour change methods that would support the required changes in personal determinants and the design of a proposed implementation plan for developed strategy (Section 6.2).

2.6.3 Goal setting Theory

Goal Setting Theory (GST) is a behaviour change theory focused on motivation, where performance is a function of ability and motivation. The theory by Edwin A. Locke suggests that the mechanisms by which a specific, high goal leads to high performance are four-fold, where the three most direct goal mechanisms are primarily motivational, and one mechanism is choice or direction related (Locke, 1991; Locke & Latham, 2002). It bridges the intention-behaviour gap where individuals can have positive intentions but fail to perform the behaviour. Goal setting is an underlying concept in several theories, such as motivation theory, operant-based behaviourism and SCT. Goals can vary by degree of difficulty, specificity, precision, and complexity, where complex goals are those that include many intended outcomes. In GST, goal setting influences effort, persistence and concentration, which in turn influences achievement. Setting specific goals in combination with performance feedback leads to higher performance than when no goal or a vague goal is set. Higher goals are more likely to lead to more effort, persistence and concentration (Strecher et al., 1995; Locke & Latham, 2002; Seijts et al., 2004; Lunenburg, 2011; Eldredge et al., 2016).

GST is moderated by ability and task complexity. If the tasks are complex for an individual, the individual is not able to perform the related behaviours, and if the individual is not committed to the goals, goal setting will not lead to performance. In the instance of complex goals, for example, the goals will instead interfere with performance of the behaviours/tasks. To counter this, goals, sub-goals and implementation intentions or learning goals can be set. Learning goals lead to higher performance than performance goals and group goal setting is as important as individual goal setting. Self-efficacy leads to more effort and persistence as individuals with high self-efficacy are able to develop effective strategies and learn more from feedback. Goals must

therefore, be behaviourally specific, measurable or observable, difficult but attainable, accepted, not conflict with other goals, and followed by feedback on performance. GST can be used to explain and predict the tasks people choose and how they behave once they have knowledge and ability (Strecher et al., 1995; Locke & Latham, 2002; Seijts et al., 2004; Lunenburg, 2011; Eldredge et al., 2016). Goal setting has been used in the development of interventions targeting health behaviour change (Colineau & Paris, 2011); dietary behaviour change (Orji, Vassileva & Mandryk, 2013); dietary and physical activity (Shilts, Horowitz & Townsend, 2009); and diabetes care (Miller & Bauman, 2014). The GST was used alongside SCT during identification of behaviour change methods that would support the required changes in personal determinants and design of a proposed implementation plan for developed strategy (Section 6.2).

2.6.4 Elaboration Likelihood Model

The Elaboration Likelihood Model (ELM) is a theory of persuasive communication that has been applied in health promotion interventions or campaigns. It has also been used to understand the aspects of an intervention that require attitude and behaviour change. The theory by Richard E. Petty and John Cacioppo suggests that when people receive information, a level of 'elaboration' results. Where elaboration is the amount of effort used to process, evaluate and use the information (Petty & Cacioppo, 1986). According to the ELM, people differ in their ability and motivation to thoughtfully process information. Information can be processed through central/effortful processing, where an individual carefully reflects on a message and compares it against other messages and beliefs. In this instance, when thoughts are positive, but there is reason to doubt them, attitude change becomes unlikely. For central processing to occur, motivation and ability to think are important and this is in turn influenced by presence or absence of distractions, relevance of the information, and how often the message is repeated. Second, information can be processed through peripheral processing, where a message is processed without thorough consideration or comparison. This is because simple association processes and mental shortcuts like common sense/lateral thinking can be used. This processing method can be used to change attitudes in the short term (Petty, Barden & Wheeler, 2009; Eldredge et al., 2016).

The ELM emphasises enabling careful consideration of information by beneficiaries. This involves having information that is relevant, related to already known knowledge or preconceived ideas, that corresponds to their concerns, characteristics and learning styles, and is reinforced. Messages that are more personally relevant/important lead to more attitude-behaviour consistency. Thoughtful and strong attitudes are likely to be more accessible to memory, are durable, persist over time, are resistant to counter-persuasive attempts, and are predictive of behaviour. For beneficiaries to elaborately process information, they must be motivated and have the ability to think (Petty, Barden & Wheeler, 2009; Eldredge et al., 2016). The ELM has been applied in the development and delivery of messages to facilitate central processing by

targeting the audience at their different stages of awareness, attitude change, and/or behaviour change. It has also been applied in intervention tailoring/targeting (Petty, Barden & Wheeler, 2009; Eldredge et al., 2016). Examples include the development of an understanding of intention, attitude and perceptions regarding nutrition information (Nørgaard & Brunsø, 2009; Walters & Long, 2012; Boyce & Kuijer, 2014); and development of nutrition and physical activity interventions (Thompson et al., 2007). The ELM was used alongside the SCT and GST to identify behaviour change methods and design of a proposed implementation plan for developed strategy (Section 6.2).

2.7 National policies on agriculture and nutrition within which the food-based strategy was developed

Uganda has several agriculture- and nutrition-related policies, action plans and strategies. These policies are related to or informed by regional and international agreements such as Sustainable Development Goals, Comprehensive Africa Agriculture Development Programme (CAADP), the African Union and New Partnership for African Development (NEPAD).

In the agricultural sector, the National Agriculture Policy of 2013, Vision 2040, and Second National Development Plan 2015/16–2019/20 aim to transform the agriculture sector from subsistence farming to commercial agriculture, to make it profitable, competitive, and sustainable to provide food security and employment (NPA, 2013b, 2013b, 2015). This commercialisation could have negative impacts on smallholder farmer access to diverse diets especially, if market access is limited and the gender- decision making dynamics within households are not supportive. The Agriculture Sector Strategic Plan for the period 2015/16-2019/2020, that has come to an end, set out to increase production and productivity, increase access to critical farm inputs, improve agricultural markets and value addition for the prioritised commodities, and strengthen institutional capacity of MAAIF and public agricultural agencies. Priority commodities included bananas, beans, maize, rice, cassava, tea, coffee, fruit and vegetables, dairy, fish, livestock (meat), and four strategic commodities: cocoa, cotton, oil seeds, and oil palm (MAAIF, 2016a). The focus on production, productivity and markets has been skewed to having avenues where farmers can sell their produce and increase incomes. There is limited focus on markets that serve the farmers, where they can effectively utilise their incomes for food security. In addition, with the limited value addition applied by smallholder farmers, their produce is sold at a cost that is lower than that which they use to buy food (NPA, 2015; Fiala & Apell, 2017). This has potential negative implications on the impact of income whether from on- or off-farm on nutrition. As a result, the study explored the production and food access environment in the study site and incorporated the findings in design of the food-based strategy.

In the health sector, the Nutrition Action Plan 2011-2016 was designed to ensure that all Ugandans were well nourished and able to live long, healthy, active and creative lives. It promoted access to and utilisation of nutrition and health services by all women of reproductive

age, infants and young children; consumption of diverse diets; protecting households from the impact of shocks and other vulnerabilities; and strengthening the policy, legal, and institutional frameworks (Government of Uganda, 2011). The 2003 Uganda Food and Nutrition Policy and the 2004 Food and Nutrition Strategy and Investment Plan meant to operationalise the policy have had limited progress. The overall objective of the policy was to promote the nutritional status of all people through multisectoral and co-coordinated interventions that focus on food security, improved nutrition and increased incomes. Plans for an updated and more multisectoral policy, strategy and second action plan are already underway (Government of Uganda, 2003, 2011). Despite the overall positive government support towards nutrition and food security, the lack of functioning nutrition policies limits the implementation and monitoring of nutrition related interventions, especially those involving multi-sectoral engagements. The food-based study was developed to fit within and contribute to this agriculture-nutrition policy context and offer insights on the application of related policies for smallholder farmers.

Government initiatives and services are provided from the central government through the respective line ministries and then through the local government that is decentralised down to the community level, as shown in Figure 2-5 (Steffensen, Tidemand & Ssewankambo, 2004). These structures were explored and incorporated during identification of the target actors in the designed food-based strategy to enhance its applicability.

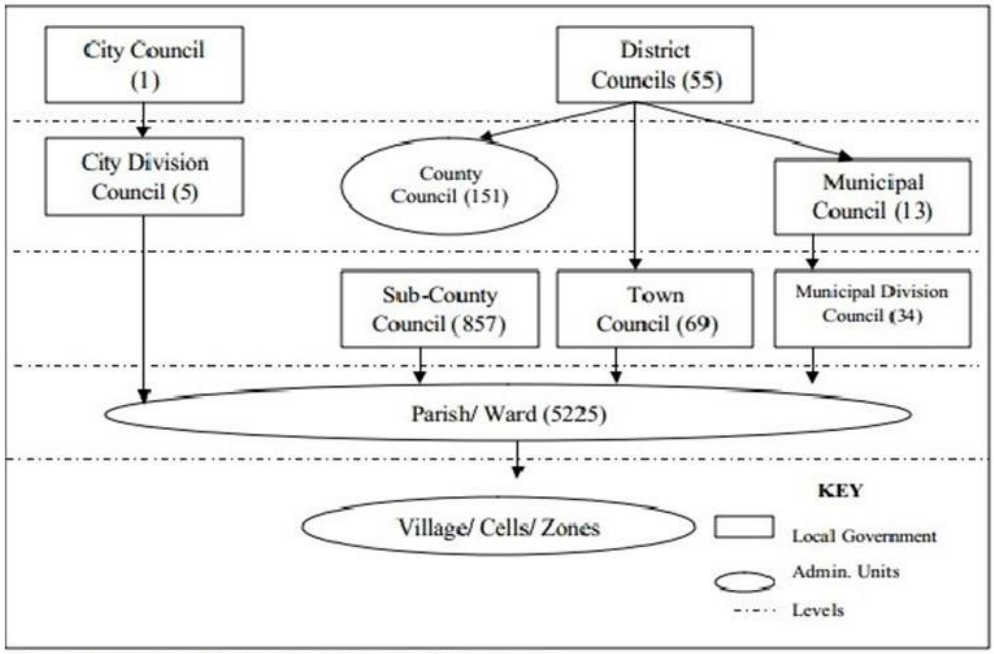


Figure 2-5 Local government structure in Uganda.
(Steffensen, Tidemand & Ssewankambo, 2004).

2.8 Summary of literature reviewed

Malnutrition and inadequate diets are prevalent around the globe, especially among smallholder farmers that also face poverty, food insecurity, and challenges in agricultural production. Given that smallholder farmers produce the majority of the world's food, their food and nutrition challenges have grave impacts on the health and productivity of their households, communities and nations. The food security and dietary diversity of smallholder farmers is influenced by what they are able to produce, their incomes and market access. Where incomes and market access are present, the influence of production diversity on dietary diversity decreases.

Food-based strategies are a sustainable approach to improving dietary practices and nutrition status. They can cover the whole food chain and can include focus on more than one type of food. Diversification, for example, aims at improving the availability, access to and utilisation of nutrient-rich foods throughout the year and requires behaviour change communication and capacity building. The impact of food-based strategies has; however, been limited by gaps in the indicators used, impact pathways, and quality impact evaluations. It is to this end that the developed food-based strategy made use of a systematic development approach, intervention mapping, to incorporate the needs-based and asset-based approaches.

Intervention mapping is a protocol that provides a systematic approach to developing theory-based and evidence-based intervention methods and strategies. It aids the use of theory, links theory and practice, and responds to challenges in intervention and strategy development such as those related to determinants of behaviour and/or health problems. Theories can be used to explain or predict behaviour, identify effective change methods, and evaluate why and how change occurred. Theories can therefore yield a focused strategy aimed at determinants central to the behaviour and are more likely to lead to change. Intervention mapping has been used to design, adapt, implement and evaluate health and nutrition interventions, especially in developed countries. This protocol was used to synthesise study findings to design the food-based strategy. The food-based study was developed to fit within and contribute to the existing agriculture-nutrition policy context and offer insights into the application of related policies for smallholder farmers.

Chapter 3 Methodology

3.1 Introduction

This study consisted of four phases, as shown in Figure 3-1. This chapter presents the study design, study population, methods and tools used and data analysis for each phase.

3.2 Study design

An embedded-sequential mixed methods research design that mainly comprised of a quantitative description, cross-sectional study, followed by an interpretive qualitative study, was used (Creswell, 2012). The descriptive cross-sectional study with an analytical component established the current social, nutrition and food security status of the households, as depicted by Phase 1 of the study (Leedy & Ormrod, 2012). This was followed by the interpretive qualitative study that sought to understand the patterns of behaviour in relation to food consumption and nutritional status; and identify the mediators of dietary diversity that are relevant to the community (Merriam, 2009). The results from these two phases informed the development of the strategy in Phase 3. The resulting strategy was then validated in Phase 4 (Figure 3-1).

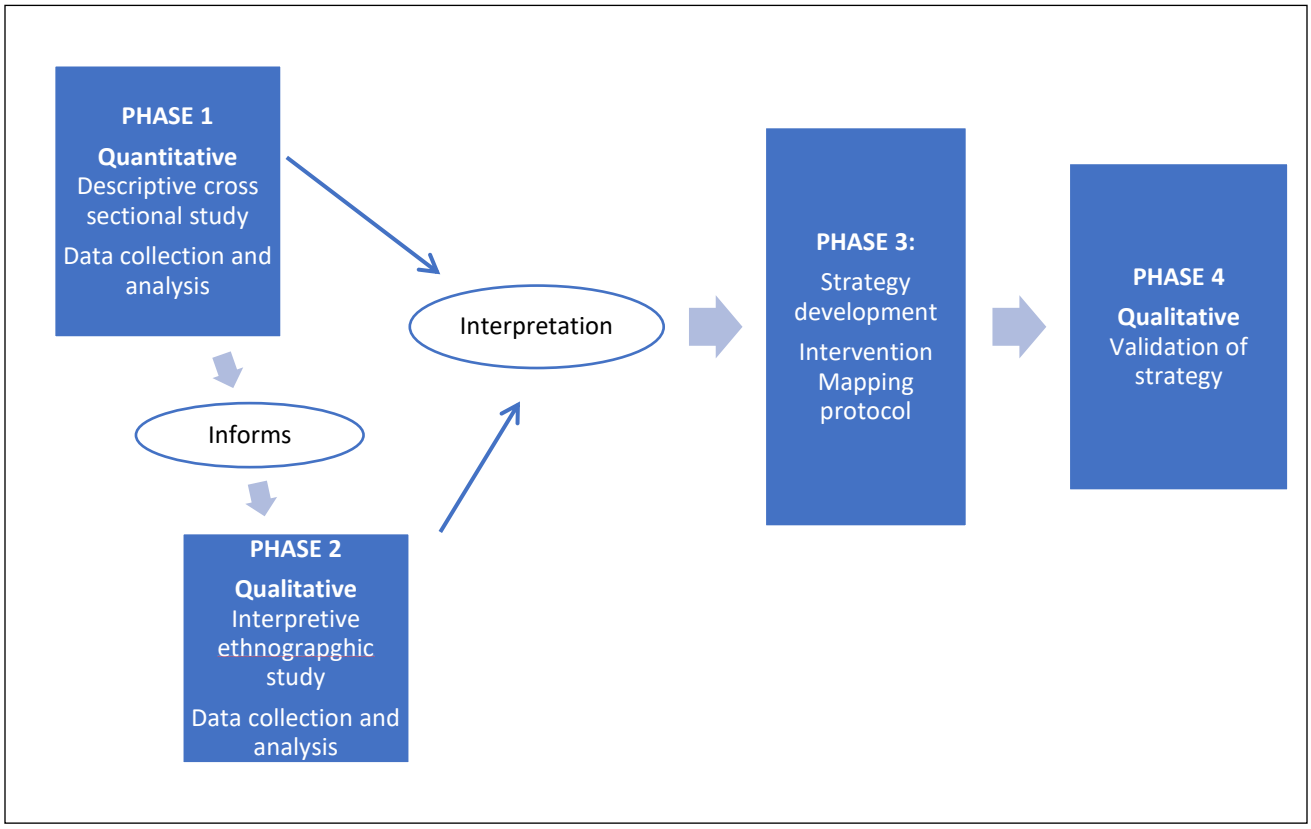


Figure 3-1 The four-phased design of the research study.

3.3 Study site

The study site was located in Kiboga district, Uganda (Figure 3-2). Uganda is a land locked country in East Africa that lies between latitude 10 29’ South and 40 12’ North of the Equator and longitude 290 34’ East and 350 0’ East of Greenwich. It has a total area of 241,551 square kilometres, with a land area that covers 200,523 square kilometres. The country is divided into districts, that are subdivided into counties, sub-counties and parishes as the administrative units for implementation of government programmes. At the end of 2014, there were 116 districts (UBOS, 2016). Kiboga district is located in Central Uganda, about 120 kilometres from Kampala, the capital city. It had six sub-counties and two town councils, which together had 41 parishes that consist of 257 villages in total (UBOS, 2017a). The study was conducted in Kisweeka and Ssinde parishes.

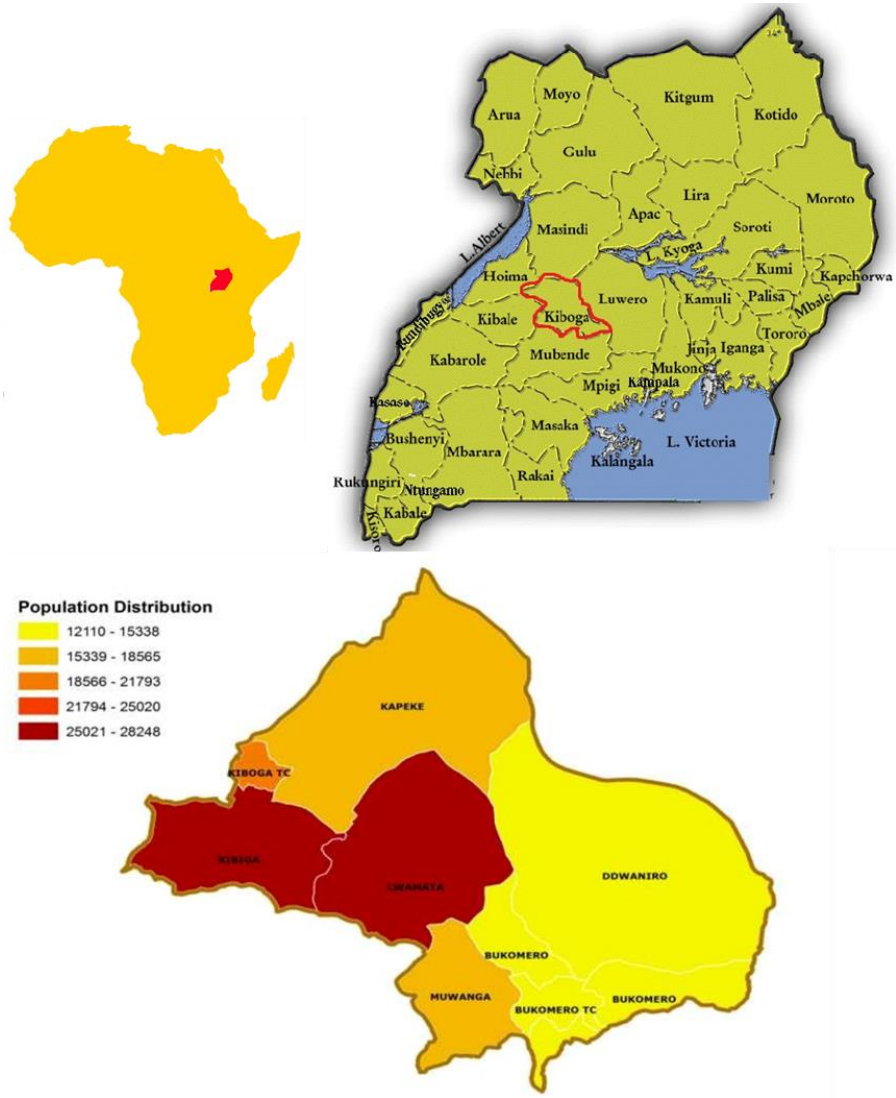


Figure 3-2 Maps showing the location of Uganda (top) and Kiboga district (bottom) (UBOS, 2017a).

Kiboga district has two main rainy seasons a year – March to May and September to December, with both perennial and annual production systems. Dominant production systems include agroforestry (fruit trees and/or indigenous trees), the banana-coffee farming system, and the maize farming system. Livestock keeping, especially cattle, pigs, goats and poultry is also present (Ekesa et al., 2015). In Uganda, a wide range of bananas varieties are grown for food and income. They are consumed when raw and/or ripe, as a staple when cooked (boiled, steamed, roasted or fried), or processed into juices and a range of alcoholic beverages (Karamura et al., 1998). The cooking banana is a staple food in the central and western parts of the country. As a banana-growing region, the production of this staple food in Kiboga was severely affected by the banana bacterial wilt from 2004. This disease, which led to total yield losses within a year of infection for some farmers, greatly affected the food security status and income of the affected households. Various efforts to contain the disease have been employed and productivity recovery is ongoing (Kalyebara et al., 2006; Tushemereirwe et al., 2006).

3.4 Study population

From the 2014 census, the population of Uganda was 34.6 million people with 51% women and a population density of 173 people per square kilometre (UBOS, 2016). Kiboga district, in particular, had a population of 148,606 people of which 51% were women, 54% were aged 0 - 17 years and 29% were youth, aged 18 - 30 years. The literacy rate of adults was at 72% and 85% had some form of employment. Majority of the population (90%) lived in the rural areas and more than 85% of the population were engaged in agricultural activities. The district had 34,010 households with 73% headed by males and 29% headed by youth aged 18 - 30 years (UBOS, 2017a).

The study population consisted of smallholder farming households from Kiboga district. The demographic characteristics of Kiboga are similar to the six surrounding districts, which are usually surveyed together in the same region during national surveys. This implies that a strategy developed for Kiboga district can be applied throughout the region and other similar regions/locales. Within Kiboga district, the study was conducted in Kisweeka and Ssinde parishes, which had an overall number of 595 and 414 households, respectively (UBOS, 2017a).

3.5 Phase 1: Situation analysis using a quantitative approach

Phase 1 of the study was the situation analysis using a quantitative approach. This included a household survey and market survey.

3.5.1 Household survey

A household survey was carried out in August 2016 to determine the household demographics and food security status, as well as the dietary intake and nutritional status of children aged 12 to 36 months in Kiboga district.

A multi-stage sampling procedure was used, with purposive selection of two parishes, and 10 villages. First, two parishes were purposively selected based on access and their locality, ensuring that they were not neighbours, and having predominantly farming households. Within the parishes selected, 10 villages were randomly selected using a list of random numbers, which was generated using Microsoft Excel. Within the selected villages, systematic random sampling of households was used to obtain the study sample size of 182 households (Figure 3-2).With the assistance of the village leaders, a list of households in each village was prepared that met the criteria of farming households who had at least one child aged between six and 59 months physically present, this was used for sampling. The households were numbered, and a list of random numbers was generated using Microsoft Excel. A sample size of 182 households was needed, based on guidelines by Magnani (1999), considering the population of households with children below 59 months in the selected villages and the prevalence of malnutrition among children in the Northern Central region, where Kiboga district is located, i.e. 28% stunted and 7% underweight and the assumption that the precision of the estimate will have a confidence interval of 0.076 (Magnani, 1999; UBOS & ICF, 2018). Discounting the population of Kisweeka and Ssinde parishes to the proportion of households that had children aged six to 59 months and for the household population of interest, the study sample size was estimated to be adequate to obtain estimates at a confidence interval of 95%. Due to the limited number of present and willing households with children aged 12 to 36 months, the study also included children six to 12 months (25%) and 36 to 51 months (9%).

Verbal informed consent was obtained from the household head, spouse or caregiver prior to the interview. The household head was recorded as perceived by the respondent to be the person responsible for making decisions and earning money. Preference was given to adult females as the main respondent due to the large number of questions pertaining to child health and feeding. Where more than one eligible child was present in the household, the data was obtained on the youngest child (referred to as the index child). Other ethical considerations are presented in section 3.10.

Eight enumerators were recruited based on previous data collection experience, language skills, and a balance of men/women. They received further training on the data collection tools for three days and a pre-test of the questionnaire was conducted prior to actual data collection. Household interviews were conducted in Luganda, the local language of the region at the respective households. A structured questionnaire (Appendix 1.1) was used to collect the data. This was a questionnaire adapted from the household survey tools used by The Alliance of Bioversity International and CIAT in Eastern Africa and was previously found to obtain the relevant data. The tools were used with permission (Appendix 2). The adapted tools were pre-tested to ensure collection of uniform data from all enumerators.

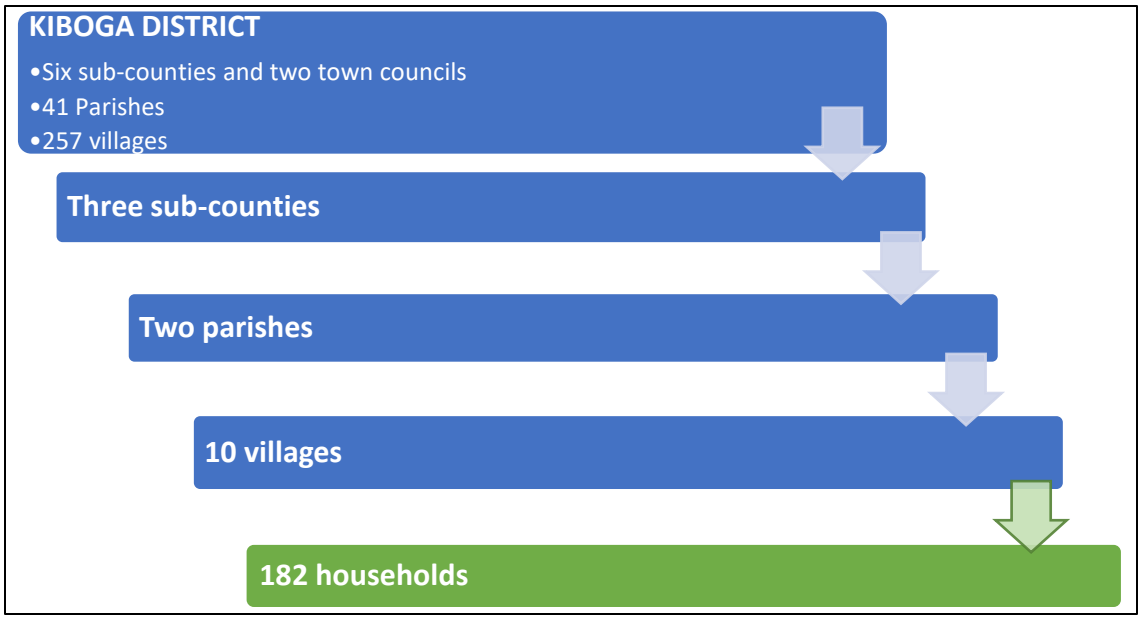


Figure 3-3 Household survey sampling strategy.

3.5.1.1 *Data collection methods*

A structured questionnaire (Appendix 1.1) was administered at the respective homesteads of the sampled households. The questionnaire collected data on household demographics, crop and livestock production; household food consumption frequency over the seven days prior to the survey; infant and young child feeding practices and morbidity in the two weeks preceding the survey; food consumption of the child over the 24 hours preceding the survey; and anthropometric measurements of weight and length/height of the child.

Household food security

The Household Food Insecurity Access Scale (HFIAS) (Appendix 1.1) was used to determine whether the household experienced any of the nine food insecurity-related conditions during the four weeks prior to the survey and the frequency of occurrence for each condition. The nine conditions are also categorised into three sub-domains of the HFIAS related to anxiety and uncertainty, insufficient food quality and insufficient food intake. The occurrence of the nine conditions was used to establish the occurrence of the sub-domains. The frequency of occurrence for the nine conditions were scored: never = 0, rarely = 1, sometimes = 2, and often = 3. The scores were summed to obtain the HFIAS score, which could range from 0 to 27. The higher the HFIAS score, the more food insecure the household. Households were further defined as food secure, mildly, moderately, or severely food insecure, using the recommended categorisation procedure (Coates, Swindale & Bilinsky, 2007).

To identify the number of months during which the household had adequate access to food, regardless of source, the respondent was asked whether in each of the past 12 months they had very little, little, just enough, enough for food and storage or more than enough to food and storage. Months where households had very little or little food were considered as food-shortage months. This information was also used to calculate the Months of Adequate Household Food Provision (MAHFP) score by summing up within the households the number of months during which the household did not have a shortage of food (Bilinsky & Swindale, 2010).

Household food consumption

Foods consumed by the household over the past seven days were recorded using a food frequency questionnaire (Appendix 1.1). The consumption, frequency of consumption, and source of these food groups were assessed, as well as the food items within each of the food groups. The food groups assessed were: (i) cereals and grains; (ii) white roots, tubers, cooking bananas; (iii) legumes; (iv) meat; (v) fish; (vi) milk and milk products and eggs; (vii) orange and dark yellow foods; (viii) dark green leafy vegetables; (ix) other fruits; (x) other vegetables; and (xi) condiments including sugar and oil (Kennedy et al., 2013).

The Household Food Consumption Score (HFCS) considers both quality and quantity of food group access and was therefore, calculated in addition to the house dietary diversity score. The HFCS was generated by summing the household food group consumption frequency over seven days, applying set weightings to each food group based on nutrient density versus caloric density (starchy staples 2, legumes 3, vegetables and fruits 1, meat and milk 4, sugars and oils 0.5, and condiments 0) (WFP, 2008). The HFCS was categorised as poor (0 - 21), borderline (21.5 - 35), and acceptable (> 35), where scores could range from 0 to 100 (WFP, 2008).

Child health and nutrition

An infant and young child feeding and morbidity questionnaire (Appendix 1.1), based on WHO guidelines (WHO et al., 2010), was used to obtain information on breastfeeding practices, introduction of solid/semi-solid foods, immunisation status and morbidity of the index child. The mother/caregiver was asked to recall any illness or illness-related symptoms such as fever/high temperature, cough, flu, diarrhoea/loose stool, vomiting, or difficulty in breathing that the child experienced in the two weeks preceding the survey; health-seeking behaviour when these symptoms occurred was also noted. Information on immunisation and vitamin A supplementation status was obtained from the child's immunisation card or respondent recall.

An unquantified 24-hour dietary recall (Appendix 1.1) was used to determine dietary diversity as proxy indicator of the micronutrient adequacy of the diet for the index child (Kennedy et al., 2013). The mother/caregiver was asked to recall all foods and beverages consumed by the index child over the last 24 hours, as well as the sources of these foods. The dietary diversity for children

older than 24 months was based on nine food groups: (i) cereals, white roots, tubers, cooking bananas; (ii) legumes; (iii) milk and milk products; (iv) eggs; (v) organ meats; (vi) meat and fish; (vii) dark green leafy vegetables; (viii) other vitamin A-rich plant foods; and (ix) other fruits and vegetables. A score of one was given for each of the nine food groups respectively if consumed at least once during the previous day, and zero otherwise. The scores were summed to obtain the dietary diversity score (DDS) (Kennedy et al., 2013). For children aged six to 23 months, minimum dietary diversity as recommended by WHO was assessed following the same procedures as above, except that is was based on seven food groups: (i) cereals, white roots, tubers, cooking bananas; (ii) legumes; (iii) milk and milk products; (iv) eggs; (v) meat and fish; (vi) vitamin A-rich fruits and vegetables; and (vii) other fruits and vegetables (WHO et al., 2010). Both the household and child food consumption questionnaires sought to distinguish consumption of orange-fleshed sweet potatoes from white-fleshed sweet potatoes but did not distinguish consumption of iron-rich beans.

Weight, length/height and mid-upper arm circumference (MUAC) measurements of the index child were taken following recommended procedures (Cogill, 2003; WHO & UNICEF, 2009). Weight was measured using Seca 874 U digital weighing scales, which can measure the child's weight while being held by an adult. The scales were calibrated using a known weight. Wooden child measuring boards were used to measure both the recumbent length for children younger than 24 months and the height for children 24 months and older. Children were undressed for assessment of weight and for length/height, and hair clips were removed before length/height was measured. The age and date of birth of the child was obtained by recall and where possible, verified using the health and/or immunisation cards.

3.5.1.2 *Data analysis*

All data were analysed using SPSS version 17.0 (SPSS Inc, 2008). Data was summarised using descriptive statistics. Cross tabulations, chi square tests, and bivariate correlations were used to establish any relationships between categorical and ordinal variables such as household characteristics; food security status; and nutritional status and diet diversity. T-tests were also used to establish any differences between the two parishes.

The ENA for SMART 2011 software using the WHO 2005 growth standards was used to generate Z-scores and the corresponding malnutrition classifications for weight-for-age, weight-for-height and height-for-age to identify the prevalence of underweight, wasting and stunting, respectively. Z-scores more than two SDs below the reference median were used to indicate underweight, wasted, or stunted (Cogill, 2003; WHO & UNICEF, 2009).

Principal component analysis (PCA) and cluster analysis were carried out using STATA 14 software to develop household food access typologies (StataCorp, 2015). The purpose of these typologies was to understand the variability of food security of households and inform development of best-

fit strategies to improve dietary diversity (Alvarez et al., 2014). The key variables included in the PCA were household size, total land size, MAHFP, HFIAS, HFCS, child dietary diversity score, and nutritional status indicators for the children (WAZ, WHZ, and HAZ) to further understand the variance between households. These indicators were all included in the PCA to control for multi-collinearity to determine the appropriateness of all the indicators included. All variables used in the analysis were first normalised to Z-scores before carrying out principle component analysis (PCA). Only indicators that loaded well were retained for the final PCA. The resulting three principal components were then used in cluster analysis using wards linkages to develop four group/typologies at an L2 dissimilarity measure of 40. For each of the four household typologies, the average household characteristics were also determined for HFCS, MAHFP, HFIAS category, child dietary diversity score, weight-for-age Z-score, household size, total land and total livestock units.

3.5.2 Market survey

A market survey was carried out in October 2016 to establish the foods available in the markets, their prices, where they were sourced and where the buyers came from. Six markets were sampled from the two parishes that were sampled in the household survey. The six markets were purposively selected from the household survey data that established the nearest daily, weekly and open-air markets to the respondents. Vendors in these markets were purposively selected to ensure that at least one available and willing vendor selling items from each of the 11 food groups was interviewed. The 11 food groups were: (i) cereals and grains; (ii) white roots, tubers, cooking bananas; (iii) orange and dark yellow foods; (iv) dark green leafy vegetables; (v) legumes; (vi) other fruits; (vii) other vegetables; (viii) meat; (ix) fish; (x) milk and milk products and eggs; and (xi) other foods. A total of 39 vendors, five to nine vendors from each market, were interviewed (6.5 ± 1.8).

A structured market survey questionnaire (Appendix 1.2) was used to establish the foods from each of the 11 food groups that were available in the markets. The tool was developed for this study and was pre-tested in one market in Kiboga district that had not been sampled. Market interviews were conducted in Luganda, the local language of the region by six trained enumerators at the respective vendor stalls. Written informed consent was obtained from each vendor prior to the interview. Other ethical considerations are presented in section 3.10. The data was analysed using SPSS software version 17.0 to obtain the descriptive statistics on the markets and food groups sold (SPSS Inc, 2008).

3.6 Phase 2: Determining the community perspective on food and nutrition through a qualitative approach

Focus group discussions (FGDs) were conducted in July and August 2018 to determine the social norms and community perspectives on nutrition and food security, and the interventions to improve them. The FGD participants were purposively recruited from the household survey

participants based on having had prior involvement with an agricultural and/or nutrition intervention or not (Figure 3-3). This distinction was made so that experiences, perspectives and awareness of the two groups could be ascertained and incorporated in the strategy. In addition, FGDs for men and women were conducted separately to provide a conducive environment for open expression of ideas and contribution towards the discussion. For each FGD, a maximum of ten men and ten women were identified and invited, respectively.

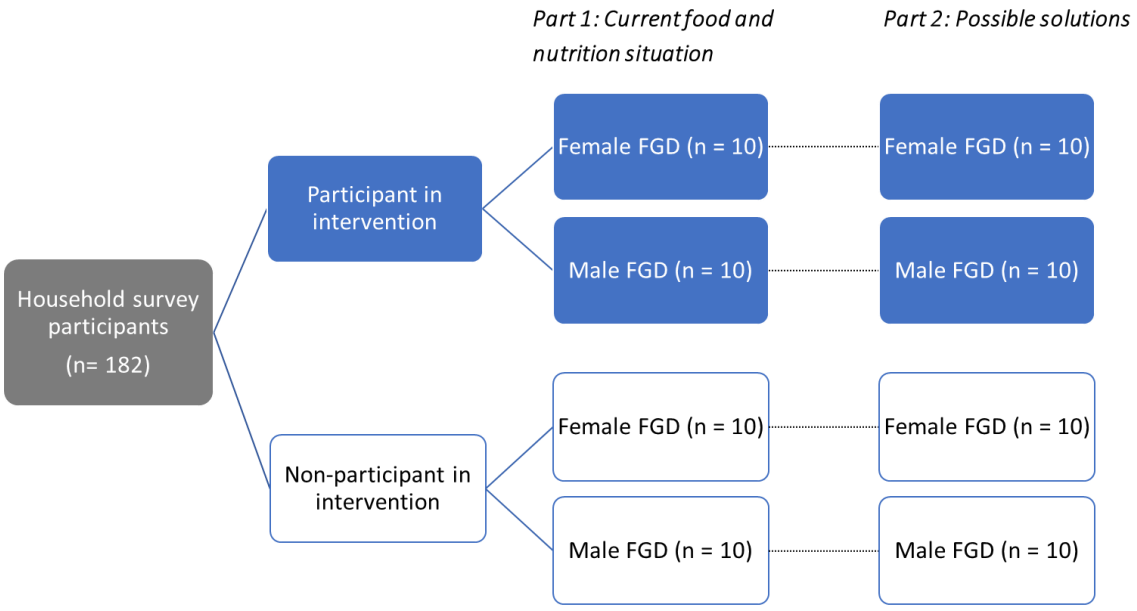


Figure 3-4 Design of Focus Group Discussions (FGDs).
*Agricultural and/or nutrition intervention

3.6.1.1 *Data collection methods*

The FGDs were carried out in two rounds with a total of eight FGDs (Figure 3-3) using semi-structured discussion guides (appendices 1.3, 1.4). The first round focused on the perspectives of the participants on the current community food and nutrition situation (Appendix 1.3). It explored the food consumption patterns of infants and young children and food availability in the household. The factors affecting household food and nutrition situation, particularly dietary diversity, were discussed. Significance was placed on the food consumption and dietary diversity of children aged 12 to 36 months.

The second round of FGDs, conducted with the same participants as the first round of FGDs, discussed the possible solutions to the food and nutrition problems identified and how all affected community members can access these solutions to improve the nutrition of children aged 12 to 36 months (Appendix 1.4). The discussion focused on the main factors affecting food

availability and dietary diversity that were identified in the first round of FGDs. Emphasis was placed on factors that directly affect food availability and dietary diversity, and those within the household's control. FGD participants discussed what they have been able to do to address these factors.

Both rounds of FGDs had an assets-based approach, with a discussion on the existing knowledge, skills, resources, values and relations existing in the community and their potential use in solving the problems identified (Kretzmann, 1995; Mathie & Cunningham, 2003).

The FGDs were carried out by trained facilitators and assisted by trained note-takers. Audio recordings were also made. Written informed consent to participate and record the discussion was sought from each participant prior to the start of each FGD and other ethical considerations are presented in section 3.10. The discussions were held in school halls that were accessible to selected participants and provided a conducive environment. The venues were also commonly used for community meetings making them acceptable to the participants. Permission to use the venues for data collection was obtained from the school administration.

3.6.1.2 *Data analysis*

The audio recordings for the FGDs and field notes were transcribed, translated from Luganda to English and cross-checked by the facilitators to ensure quality. The researcher also cross-checked the transcriptions versus the audio recordings for quality.

The transcriptions were analysed using Atlas.ti software v.8 (ATLAS.ti Scientific Software Development GmbH, 2016). The framework method of analysis was used to identify patterns and themes in the responses as a way of understanding the research themes and questions (Onwuegbuzie et al., 2009). The presence or absence of themes were compared across the FGDs.

Following coding and grouping of codes for the first round of FGDs, the codes were organised into a matrix based on how they could be used to answer the research themes and how they interacted with one another (Appendix 5) (Onwuegbuzie et al., 2009).

3.7 Phase 3: Designing the food-based strategy

The food-based strategy was designed using the intervention mapping protocol (Eldredge et al., 2016). This protocol provides a systematic approach to developing theory-based and evidence-based intervention methods and strategies. The five main steps in intervention mapping that were used are: 1) definition of objectives; 2) selection of the intervention methods and strategies; 3) designing the strategy; 4) planning for adoption and implementation; and 5) planning for evaluation (Figure 3-4) (Kok et al., 2004; Campbell et al., 2007; Craig et al., 2008; Eldredge et al., 2016).

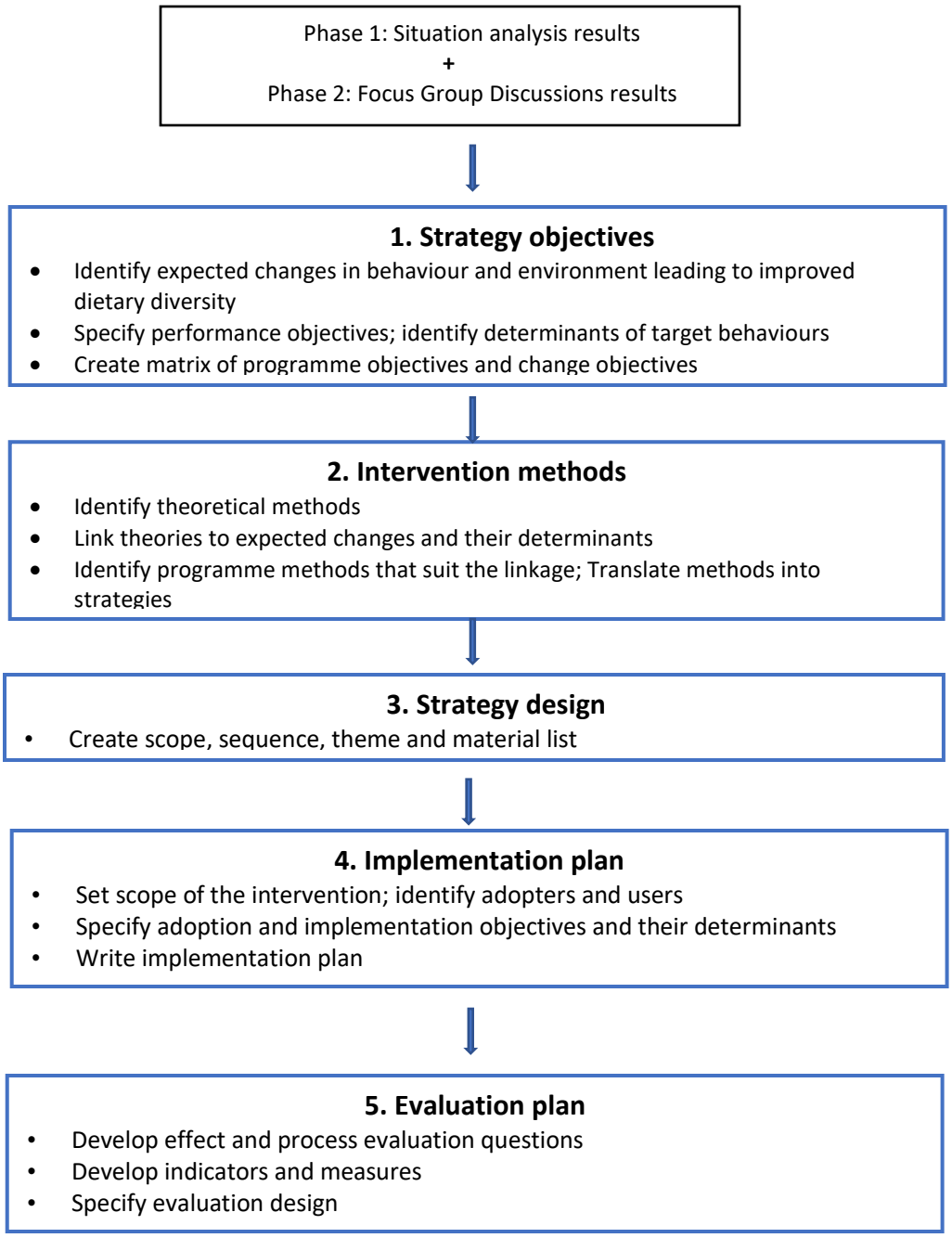


Figure 3-5 Conceptual framework of intervention mapping.
(Eldredge et al., 2016)

How this approach was applied to this study, including the application of theories and the process of incorporating results from phase 1 and 2 of the study, are laid out in Chapter 6.

3.8 Phase 4: Participatory validation of the food-based strategy

Phase 4 of the study was participatory validation of the food-based strategy using key informant interviews and focus group discussion.

3.8.1 Validation of the developed strategy

The developed strategy was validated to assess its suitability and feasibility and identify any gaps and/or possible barriers using FGDs and key informant (KI) interviews.

3.8.1.1 Validation FGDs

Two FGDs were conducted in October 2019, each with 12 participants (six men and six women). Half of the participants were randomly recruited from those that had earlier participated in Phase 2 of the study, while the other half had no prior involvement in the study. The two categories of participants were selected to validate the development process and the resulting strategy.

The FGD facilitator, using a semi-structured discussion guide (Appendix 1.5), led participants through (i) the main factors, and (ii) the target actors and beneficiaries incorporated in the developed strategy. Participants discussed the importance and relevance as well as any additional factors or actors that should be included, and any possible barriers.

The FGDs were carried out by the researcher, assisted by a trained note-taker. Audio recordings were also made. Written informed consent to participate and record the discussion was sought from each participant prior to the start of each FGD. The FGDs were held in the same settings as described in Phase 2 of the study (Section 3.5.1.2).

Audio recordings, notes and data from the FGDs were handled and analysed using the same methods used in Phase 2 of the study (Section 3.5.1.2).

3.8.1.2 Validation KI interviews

Fifteen KIs were purposively selected in November 2019 based on their professional knowledge and experience in nutrition and agriculture and were invited to validate the CFBS. Using a self-administered semi-structured questionnaire (Appendix 1.6) that was sent via email, the KIs evaluated:

1. The development approach used;
2. The strategy outcomes, outputs and performance objectives and critical success factors of change;
3. Target actors and beneficiaries of the developed strategy; and
4. The proposed implementation plan.

The KIs rated the importance of the different aspects using a scale of 1 to 5 where: 1 - Not important; 2 - Of little importance; 3 - Moderately important; 4 – Important; and 5 - Very Important. They also provided additional comments to expound on the rating given.

Data analysis

Average rating scores were calculated using Microsoft Excel. The comments were compiled in a Microsoft Excel spreadsheet and analysed using the same methods used in Phase 2 of the study (Section 3.5.1.2).

3.8.2 Revision of the developed strategy

Following analysis of the results from the validation FGDs and KI interviews, the developed strategy was revised to incorporate or strengthen key aspects identified during the validation process.

3.9 Rigour and validity

Utilisation of both quantitative and qualitative methods increased the data credibility, provided a complementarity that assisted the researcher to understand the complexity of the dietary diversity and nutrition of the community, while allowing for adaptability and flexibility in the study (Baxter & Jack, 2008; Harris et al., 2009).

The tools used in the household and market surveys were previously used by The Alliance of Bioversity International and CIAT, and/or were recommended and validated tools for assessing infant and young child feeding, household hunger, dietary intake and dietary diversity. In addition, the tools were piloted in a village similar to those selected for the household survey prior to data collection. It is acknowledged that the cross-sectional survey of the households and markets did not capture the changes that occur as the seasons change throughout the year.

All FGD facilitators and note-takers had prior experience in carrying out qualitative research. They also received refresher training on the procedures and refined their interviewing, moderation, and note-taking skills. Audio recordings of the discussion were taken and transcribed for analysis. The FGDs not only provide the general picture of the community, but also captured consensus and reasons for non-consensus about issues. For each phase, more than one FGD was carried out, which increased the trustworthiness of the data collected.

The FGDs with women were facilitated by the researcher (a woman), while the FGDs with men were facilitated by a man. The two facilitators conferred over the emerging themes and existing patterns. This increased the reliability of the data and thus the rigor of the research (Harris et al., 2009). In addition, the qualitative data were analysed using the Atlas.ti computer software, which ensured a systematic process and increased transparency of the process.

Collection of data on the nutrition, dietary diversity and food security situation using both quantitative and qualitative techniques allowed for triangulation of the data providing confirmation, completeness of the data, and increasing the trustworthiness of the results (Tracy, 2010; Leedy & Ormrod, 2012). The interpretation and discussion of the qualitative data was not limited to the understanding that reality is subjective and socially constructed (constructivist paradigm) alone, but also given context and understanding using the quantitative data (Draper,

2004; Swift & Tischler, 2010). This fusion increased the rigor of the research and expanded the researcher's understanding of the community and informed the use of the data during the development of the strategy.

It is noted that the study was restricted by the influence of the researcher's background, subjective understanding and interpretation of the situation. The reflexivity of the researcher is thus recognised and reported, as well as clear descriptions of the context and methodology used. This exposition increases the validity and transferability of the data (Swift & Tischler, 2010; Leedy & Ormrod, 2012).

3.10 Ethical considerations

Ethical approval was obtained from the Health Research and Ethics Committee of the Faculty of Medicine and Health Sciences, Stellenbosch University, ethics reference: S16/06/099 (Appendix 2). Ethics clearance progress reports were made, and approval was renewed annually until 2019 (2016-2017; 2017-2018; 2018-2019).

Respect for the community was of utmost importance and the researcher conferred with district level and community level leaders (local council) prior to the study, sharing the study objective and methods and obtaining their approval and involving them throughout the study. Informed consent was obtained from the household (Appendix 3.1) and market survey (Appendix 3.2) respondents, and FGD participants prior to data collection (appendixes 3.3, 3.4). Consent was also obtained for the validation of CBRS by FDGs (Appendix 3.5) and by key informants (Appendix 3.6). Consent followed explanation and understanding of the purpose and procedures of the survey, their freedom to participate in the study or not, the right to withdraw without penalty, the time required to administer the tools, anthropometric measurement procedures of the index child, no direct benefits to the respondent or household, guarantee of anonymity of the identity and all information shared, and that the participants' full names would only appear on the consent form as the questionnaires would be coded.

Confidentiality of information obtained from the different FGDs was ensured as information from one group was not transferred to another. The participants were also asked to respect each other's privacy and anonymity.

The consent forms, completed questionnaires, field notes and electronic copies of all data are accessible only to the researcher and the promoters and will be kept securely for a minimum of five years.

Households where any vulnerability such as severe malnutrition and/or hunger were observed and/or determined during the household survey (anthropometric measurements and HFIAS) were referred to the relevant stakeholders operating in the district with the assistance of community leaders.

The FGD participants received a refreshment and were compensated for their time and travel expenses. The household survey and market survey respondents and key informants were given a food parcel equivalent to R75 in compensation for their time.

An authorisation to use The Alliance of Bioversity International and CIAT data collection tools was also obtained (Appendix 4).

3.11 Summary

An embedded-sequential, mixed-methods research design was used. The study population was rural smallholder farming households from Kiboga district in Central Uganda. This study consisted of four phases: (1) A situation analysis was conducted using a qualitative approach that consisted of a household survey that determined household demographics and food security status, and the dietary intake and nutritional status of children aged 12 to 36 months. A market survey that established the foods available in the markets, prices, sources and buyers was also conducted. (2) A qualitative approach was used to determine the community perspective where a total of eight FGDs were conducted in two rounds. The first round focused on the perspectives of the participants on the community food and nutrition situation, while the second round discussed the possible solutions to the food and nutrition problems identified and how the solutions can be accessed to improve the nutrition of children aged 12 to 36 months. (3) The design of the Contextualised Food-based Strategy used the intervention mapping approach. (4) Qualitative validation of the developed strategy using key informant interviews and FGDs was done. Following data collection, the results of phase 1-4 are presented.

Chapter 4 Situation analysis using a quantitative approach

4.1 Introduction

This chapter presents results from Phase 1 of the study. This phase entailed a household survey that sought to determine the current social and food security status of rural farming households through a cross-sectional household survey, and the current dietary intake and nutritional status of children aged 12 to 36 months in the farming households. In addition, a market survey was carried out to establish the foods available in the markets, their prices, where they are sourced and where the buyers come from.

4.2 Household characteristics

4.2.1 Household demographics

Of the 182 households surveyed, 10 were excluded from the analysis due to incomplete or inconsistent data, especially regarding dietary intake and index child information. As a result, data for 174 households (96%) were analysed, with 67% from Kisweeka and 33% from Ssinde parishes.

Information on household demographics is summarised in Table 4-1. The average household size was 5.8 ± 0.2, with households in Kisweeka significantly larger than in Ssinde (6.1 ± 0.2 vs. 5.1 ± 0.3, $p < 0.01$). Men headed 83% of households, while 17% were headed by women. More than 55% of the respondents were married, with some primary school education. In terms of household composition, 57% of all household members were ≤ 14 years and 26% were aged 15 to 34 years.

Sixty-six percent of the respondents reported their occupation as farmers. In line with this, the main source of income for most of the households (63%) was farming, followed by income from a business (25%). Mixed farming (31%), that is production of both crops and livestock and arable farming (24%), were the main types of farming considered a major source of income. These percentages did not differ significantly between the two parishes. The markets most attended by the households were the bi-weekly markets (98 to 100%), which are located on average 6.5 ± 0.3 km from the homesteads. Concerning livestock ownership, 42% of the households owned at least one animal. Of those that had livestock, 59% had poultry (6.3 ± 6.7 birds), 41% had pigs (2.0 ± 1.3), and 19% had goats (3.1 ± 3.0).

The average distance of the households to the nearest safe water source was 1.4 ± 01 km, with a significantly longer average distance in Kisweeka compared to Ssinde (1.7 ± 0.1 km vs 0.9 ± 0.1 km, $p < 0.01$). The most used safe water sources in Kisweeka were boreholes (35%) and springs (32%) while in Ssinde piped water (42%) and shallow wells (25%) were more common. Households in Ssinde commuted significantly longer distances to the daily and occasional markets, and health facilities compared to households in Kisweeka (Table 4-2).

Table 4-1 Percentage proportions of households with different characteristics

Variable		All % (N = 174)	Kisweeka % (N = 117)	Ssinde % (N = 57)
Households		100.0	67.2	32.8
Respondents	Men	10.9	6.9	4.0
	Women	89.1	60.3	28.7
Household head	Men	83.3	55.7	27.6
	Women	16.7	11.5	5.2
Household size (number)	1 - 3	14.9	9.2	5.7
	4 - 5	40.2	23.6	16.7
	6 - 10	41.4	32.2	9.2
	> 10	3.4	2.3	1.1
Age of household members (years)	0 - 14	56.6	57.4	54.7
	15 - 34	26.5	27.1	24.9
	35 - 64	15.2	14.0	18.0
	65 +	1.8	1.6	2.4
Highest education level of household members	No formal education	18.5	17.0	21.2
	Primary	56.1	58.5	51.5
	Secondary	23.7	23.4	24.2
	Tertiary/vocational	1.7	1.1	3.0
Main source of income	Mixed farming[a]	31.4	31.8	30.5
	Trade	24.7	25.0	24.2
	Arable farming[b]	23.7	24.5	22.1
	Livestock farming	8.0	8.9	6.3
	Casual labour	7.7	6.8	9.5
	Employment	3.8	2.6	6.3
	Brick making	0.7	0.5	1.1
Main source of safe water	Spring	25.3	31.9	12.3
	Shallow well	12.9	7.1	24.6
	Borehole	30.6	35.4	21.1
	Tank	0.6	0.9	0.0
	Piped water	30.0	23.9	42.1
	Other	0.6	0.9	0.0
Access to nearest occasional market	Weekly	1.2	1.8	0.0
	Bi-weekly	98.8	98.2	100.0
Location of nearest market	Bukomero	6.8	40.4	17.8
	Buswabulongo	89.7	56.1	78.7
	Lwamatta	3.4	3.5	3.4
Interaction or participation in agricultural and nutrition intervention/activity		39.1	25.9	13.2

Figures are a percentage of households; [a]Mixed farming: production of both crops and livestock; [b]arable farming: engaging in crop production alone

Table 4-2 Average household size and distance to key facilities across study sites

Variable	All (N = 174)	Kisweeka (N = 117)	Ssinde (N = 57)	*p*-value
Household size	5.8 (0.2)	6.1 (0.2)	5.1 (0.3)	0.049
Distance to nearest safe water source	1.4 (0.1)	1.7 (0.1)	0.9 (0.1)	0.000
Distance to occasional market	6.5 (0.3)	5.3 (0.3)	8.9 (0.6)	0.000
Distance to daily market	3.6 (0.2)	3.3 (0.2)	4.0 (0.4)	0.029
Distance to health facility	5.3 (0.5)	4.7 (0.5)	6.5 (0.9)	0.006

Values are presented as mean (SD); *p*-value derived using Fisher's Least Significant Difference test.

4.2.2 Household land access

On average, the households had access to 1.5 ± 0.06 number of plots of land for agriculture that they owned, rented, borrowed or where they had any other form of access to land. Households in Kisweeka had a significantly higher number of plots than Ssinde (1.6 ± 0.1 vs. 1.4 ± 0.1; $p < 0.01$). The mean area of each plot was 0.04 ± 0.01 hectares. The mean total area of land that the households had access to was 0.96 ± 0.88 hectares. In terms of rights over the plots, 73% of the plots available were owned by the households, while 18% were rented, and 7% borrowed. For plots where the household had rights, actual ownership of the plot was by the household head that was a man (81%) and spouse (10%) (Figure 4-1). The household head was reported as the one who worked most on the plots of land (34%) and made most decisions on the land (54%). At the same time, 29% of households reported joint efforts between the household head and spouse when working on the land and 27% made joint decisions. Spouses mainly working on land were reported in 29% of households and made most decisions on land in 16% of households. Ssinde had more households, with spouses owning land (15% vs. 8% in Kisweeka), and a higher percentage of both the household heads and their spouses jointly making decisions on the land (43% vs. 19% in Kisweeka). Kisweeka on the other hand had more household heads making decisions on the land (68% vs. 40% in Ssinde).

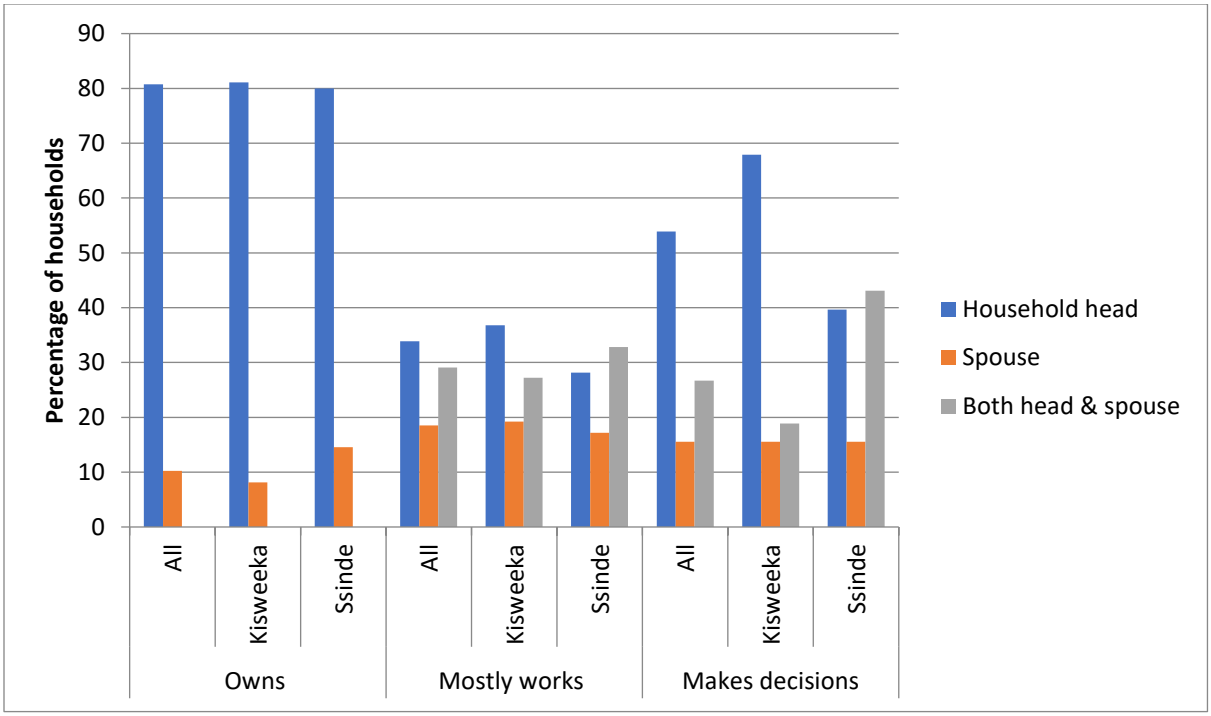


Figure 4-1 Proportion of land ownership, land use and decision making by household head and spouse.

4.2.3 Household crop production

Twenty-three different crops were grown by the households at the time of the survey. Of the crops grown, three were cereals and grains (maize, sorghum and rice); six were roots, tubers or cooking bananas (cooking banana, cassava, sweet potatoes, potatoes, arrow root, and coco yam); three were legumes (beans, groundnuts and soybean); ten were fruits and vegetables (amaranth, pumpkin, mangoes, jack fruit, tomatoes, watermelon, passion and citrus fruits, avocado and onions); and one was a cash crop (coffee).

Bananas (cooking and dessert) were the most frequently grown crop (71% of households), followed by other staples like cassava (65%), maize (64%) and sweet potatoes (38%) (Figure 4-2). Beans were the main legume grown by 63%, while groundnuts were grown by 10% of households. Mangoes were the only fruit grown by > 10% of households. The three vegetables reported (amaranth, pumpkin, onions) were each grown by < 10% of households. Overall, of the 23 crops recorded, 15 of the crops were grown by < 10% of the households.

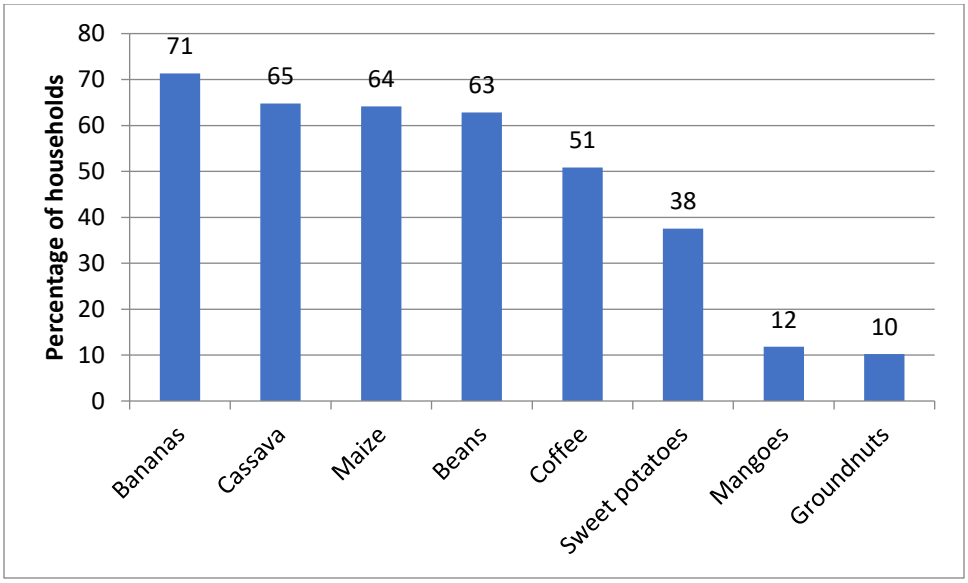


Figure 4-2 Proportion of crops grown by 10% or more households.

4.2.4 Household livestock ownership

Concerning livestock ownership, 42% of the households owned at least one animal, 60% had poultry (3.8 ± 0.5 birds), 40% had pigs (0.8 ± 0.1), and 20% had goats (0.6 ± 0.1) (Table 4-3). Poultry were owned by a similar number of household heads vs. spouses, 39% vs. 35%, respectively. Pigs and goats on the other hand were owned more by the household heads that were men compared to the spouses, where wife livestock ownership was at 27% for pigs and 34% for goats. The decision making on use of these animals was mainly made by the household heads that were men (37 - 42%). Noteworthy is that about 20% of the poultry, pigs and goats were reported to be jointly owned and that joint decision making was made on their use (Figure 4-3).

Table 4-3 Household livestock ownership

Livestock	Number of households	% with livestock (N = 174)	Mean number owned[#]
Poultry	104	59.8	3.8 (0.5)
Pigs	70	40.8	0.8 (0.1)
Goats	34	19.0	0.6 (0.1)
Cattle	18	10.3	0.3 (0.1)
Sheep	8	4.6	0.1 (0.1)
Rabbits	4	2.3	0.1 (0.0)
Other livestock	2	1.1	0.0 (0.5)

[#] Mean (SD) number owned by those rearing livestock.

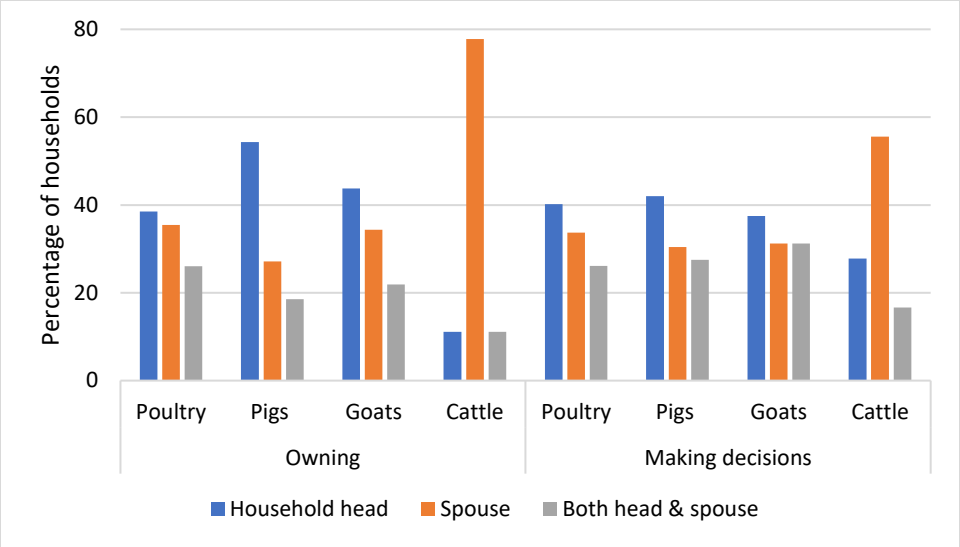


Figure 4-3 Proportion of livestock ownership and decision making between household head and spouse.

4.3 Household food security

Households surveyed had 7.6 ± 0.2 months a year in which they had adequate food access (MAHFP). The monthly food availability showed two peak seasons from November to February and June to July (six months) where more than 60% of households reported either just enough food, enough food to feed and store, or more than enough food to feed and store (Figure4-4). In addition, two lean seasons were noted from March to May and August to September (five months) during which more than 40% of the households reported having little or very little food available. Over the 12-month period prior to the study, 39% reported having little or very little food available, 34% of households had enough food and more than enough food to feed and store, while 27% had just enough food.

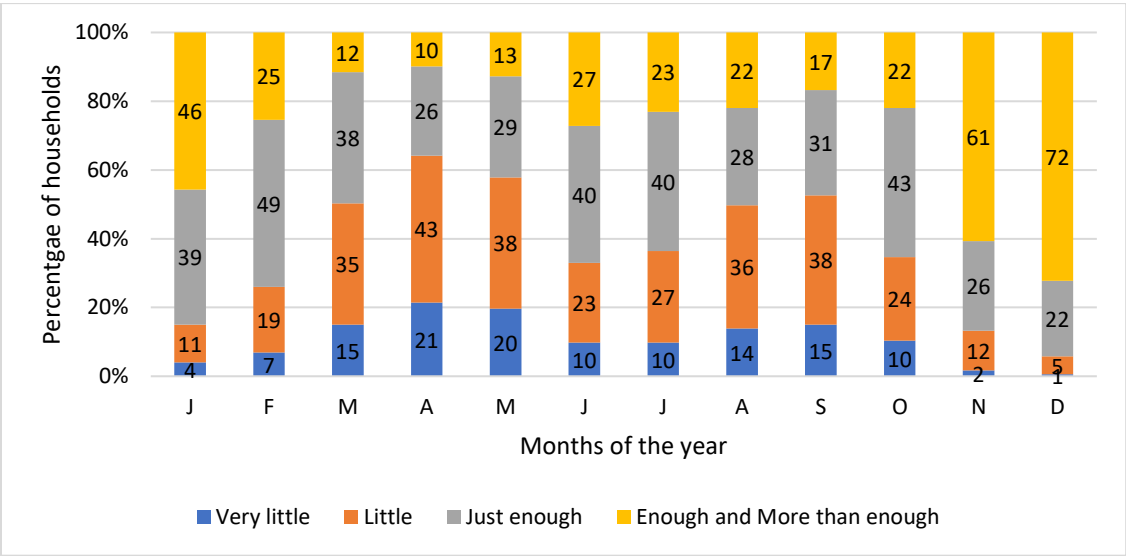


Figure 4-4 Household monthly food availability during the previous year.

According to the HFIAS, 71% of the households faced anxiety and uncertainty over food in the preceding four weeks, while 59% had insufficient quality of food, having consumed less preferred foods and/or a limited variety of foods and/or foods they did not want (Table 4-4). Sleeping hungry and going for a day and night hungry were the least-faced conditions by only 8% and 6% of the households, respectively. The mean HFIAS score was 10.7 ± 5.9, out of a maximum of 27, which occurs when a household has faced each of the conditions often. Standard categorisation of HFIAS scores showed that only 34% of households were food secure; 6% had mild food insecurity; 31% had moderate food insecurity; and 29% faced severe food insecurity. In response to food insecurity, households coped in the following ways: reduced number of meals (37%), reduced quantity of foods (21%), worked for food/money (19%), and borrowed from friends/relatives (19%).

Table 4-4 Household food security characteristics over a four-week period

Food security characteristic	**%**
HFIAS domains	
Anxiety and uncertainty over food	71.3
Insufficient food quality	58.6
Insufficient food intake	48.3
HFIAS conditions	
Worry about food intake	41.4
Not able to eat preferred foods	48.6
Limited variety of foods	48.9
Eat unwanted foods	53.5
Eat small meals	34.1
Eat fewer meals	44.1
No food in house	16.4
Sleep hungry	8.3
Whole day without food	6.6
HFIAS category	
Food secure	34.5
Mild household food insecurity	5.8
Moderate household food insecurity	31.0
Severe household food insecurity	28.7

HFIAS: Household Food Insecurity Access Scale

4.4 Household food consumption

On average, households consumed 2.6 ± 0.7 meals a day. Over a seven-day period, the mean number of food groups consumed was 8.8 ± 2.2 out of 11 food groups. The majority of households (82%) consumed > six food groups over the seven days. Food groups consumed by most households were legumes (100%), and roots, tubers, cooking bananas (97%), where all households consumed legumes at least once in the seven-day period. They were followed by cereals and grains (88%) and other fruits (such as jack fruit, dessert bananas, avocado and passion fruits), which were consumed at least once in seven days by 83% of households (Table 4-5). Intake of animal-source foods (meats, fish, dairy and eggs) ranged from 53 to 60% of households over a seven-day period.

Cereals and grains and the other vegetables group, which included cabbage, tomatoes, onions, eggplant, African eggplant and mushrooms, were consumed by the households on 4.5 ± 2.3 and 4.3 ± 1.3 days respectively over the seven-day period. This was followed by roots, tubers, cooking bananas, and other fruits, which were consumed on average 2.7 ± 1.0, and 2.3 ± 1.2 days, respectively. All households consumed legumes at least once over the seven-day period and the mean number of days of consumption was 1.7 ± 0.5, which is very similar to the mean number of days for meat consumption (1.7 ± 0.9 days). No consumption of orange-fleshed sweet potato was reported.

Diversity within the food groups was noted with average consumption of about two foods within a food group. Food groups with the highest mean number of food items consumed by the households in seven days were other vegetables (3.4 ± 2.1); roots, tubers, cooking bananas (2.6 ± 1.1); other fruits (1.9 ± 1.4); cereals and grains (1.8 ± 1.1); and legumes (1.7 ± 0.5). Other average values for food items per group consumed were meat (0.9 ± 1.1), dairy and eggs (0.8 ± 0.8), fish (0.7 ± 0.7), dark green leafy vegetables (0.6 ± 0.9) and vitamin A rich foods (1.2 ± 1.0). The major foods consumed within each food group are shown in Table 4-5. For 74 to 89% of households that consumed foods from a specific food group, their farmland was the source of the following food groups: roots, tubers, cooking bananas; vitamin A-rich fruits and vegetables; legumes and other fruits. On the other hand, meat; fish and other vegetables; and food items were sourced from the markets by 79 to 95% of households who consumed foods from the specific food group. Cereals and grains, and dairy were the only food groups where the sourcing from their harvest corresponded with that from the market with 40 to 44% sourcing from their harvest and 55 to 59% from the market. The mean HFCS was 68.0 ± 23.6. When categorised, 96% of households have acceptable HFCS (> 35) and 4% have borderline HFCS (21.5 to 35).

Table 4-5 Household food group consumption over a seven-day period

Food group	% of HHs (N = 174)	Mean number of days[#]	Source (%) [a]			Major food items [d]
			Own production	Bought [b]	Other	
Legumes	100	1.7 (0.5)	75.4	23.5	1.0	Beans (98%, 5.1 ± 2.4) Groundnuts (67%, 2.3 ± 1.4)
Root, tubers, cooking bananas	97	2.7 (1.0)	74.5	24.6	0.9	Cooking bananas (86%, 3.3 ± 2.4) Cassava (81%, 2.8 ± 1.8) White sweet potato (49%, 2.2 ± 1.4)
Other food items	90	2.6 (0.6)	5.0	94.8	0.2	Salt (83%, 6.7 ± 0.1) Sugar (79%, 6.0 ± 2.0) Cooking oil (67%, 5.3 ± 2.2)
Cereals and grains	88	2.0 (1.0)	44.2	54.8	1.0	Maize (86%, 4.5 ± 2.3) Rice (26%, 1.8 ± 1.2)
Other fruits	83	2.3 (1.2)	81.0	13.2	5.8	Jack fruit (69%, 4.1 ± 2.3) Dessert bananas (43%, 2.9 ± 2.2) Avocado (35%, 3.6 ± 2.2)
Other vegetables	79	4.3 (1.3)	20.7	79.0	0.3	Tomato (71%, 6.1 ± 2.0) Onions (63%, 6.3 ± 1.4) Eggplant (33%, 3.1 ± 2.1)
Orange, dark yellow foods	72	1.6 (0.8)	88.2	6.7	5.1	Mango (62%, 5.1 ± 2.5) Pawpaw (35%, 3.3 ± 2.3)
Fish	60	1.2 (0.4)	5.7	94.3	0.0	Silver fish (57%, 3.3 ± 2.1)
Dairy, eggs	55	1.4 (0.5)	39.7	58.8	1.5	Milk (49%, 4.7 ± 2.5) Eggs (26%, 2.8 ± 2.1)
Meat Items	53	1.7 (0.9)	12.9	85.8	1.3	Beef (36%, 1.7 ± 0.9) Pork (26%, 2.2 ± 1.7)
Dark green leafy vegetables	43	1.5 (0.7)	88.7	7.5	3.8	Amaranth (33%, 2.5 ± 2.0) African nightshade (19%, 2.6 ± 2.0)

[#] Standard deviations are given in brackets; [a]% of households that obtained the food group from that source, expressed as a percentage of those households that consumed foods from the specific food group at least once over the seven-day period; [b]Bought from market or shop; [c]Other refers to gifts, or food items borrowed or bartered; [d]In parenthesis (% of households that consumed that food item, mean number of times ± standard deviation).

4.5 Child health and nutrition

Of the 174 children that were included in the study, 53% were girls and 47% boys. Twenty-five percent were aged 6 to 11 months; 36% aged 12 to 23 months; 30% aged 24 to 36 months; and 9% aged 36 to 51 months. The majority of the children (94%) were immunised, with 68% having received the full 24 months immunisation regimen as per the Ministry of Health country guidelines (MOH, 2012). Ninety-one percent of the children had received vitamin A supplementation in the last 12 months.

Only 10% of the children experienced no morbidity symptoms in the preceding four weeks. Of the 90% that did experience morbidity, the main symptoms experienced were flu by 75% of the children, cough (71%), and fever (49%). Though breathing difficulty was reported for only 7% of children, this symptom had the highest mean number of times experienced at 1.9 ± 0.2. This symptom was followed by flu and cough in frequency at a mean of 1.9 ± 0.1 times. Vomiting was the least experienced symptom, both for number of children and number of times.

In response to these symptoms, about 80% of the children that experienced any of them were taken to a health centre for treatment. The decision on where and when to seek treatment was mainly made by the mother (39 to 83%) and the father (11 to 54%), depending on the condition. The mothers were noted to be major decision makers on treatment of diarrhoea (83%) and vomiting (57%), while the fathers mainly made decisions when children experienced breathing difficulty (54%) and vomiting (49%).

Almost all the children (99%) in the study sample were initially breastfed with 68% of those aged six to 23 months still breastfeeding. For those no longer breastfeeding (n = 38), the average duration of breastfeeding was 14.3 ± 0.6 months. The average age at which other liquid or solid foods were introduced in the diets was 6.1 ± 0.1 months. There was no significant difference between the breastfeeding patterns of boys and girls.

Among children aged six to 23 months, only 22% met the minimum dietary diversity of ≥ four food groups. Only 23% met the minimum acceptable diets, that is consumed four food groups and had two (six to eight months old) or three meals (nine to 23 months old). Food groups consumed were mostly starchy staples (97%) and legumes (87%), followed by dairy (34%), as shown in Figure 4-5. For children 24 months and above, 71% consumed foods from three food groups or less, while 29% consumed food from four to five food groups. Food groups consumed mostly were starchy staples (cereals, grains, roots, tubers, cooking bananas) by 99% of the children, followed by legumes (91% of children) (Figure 4-6). Less than half of the children consumed an animal source food (dairy, meat, fish or eggs), a vitamin A-rich fruit or vegetable (23%) or any kind of fruit or vegetable (42%). No consumption of organ meats was reported.

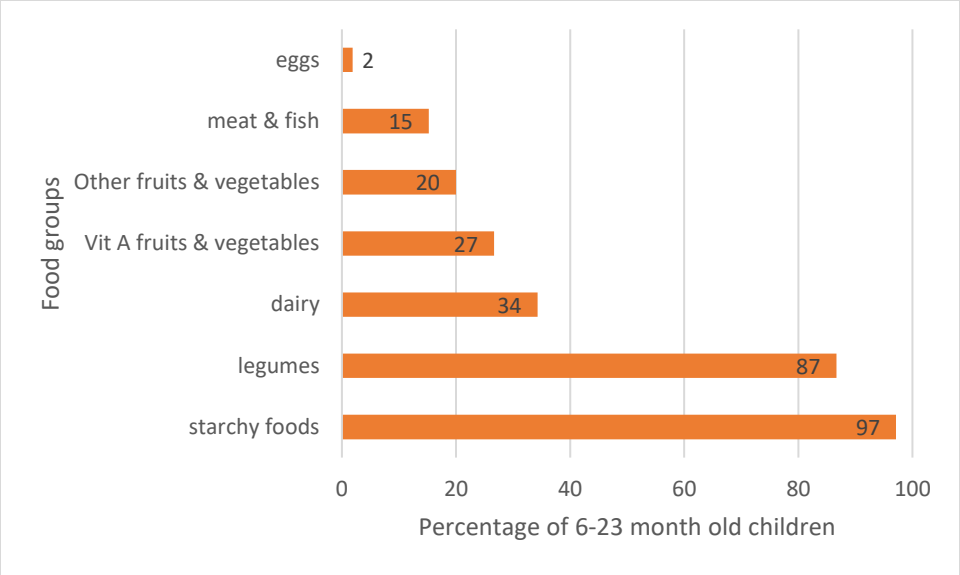


Figure 4-5 Food group consumption by the six to 23 months old children over a 24-hour period.

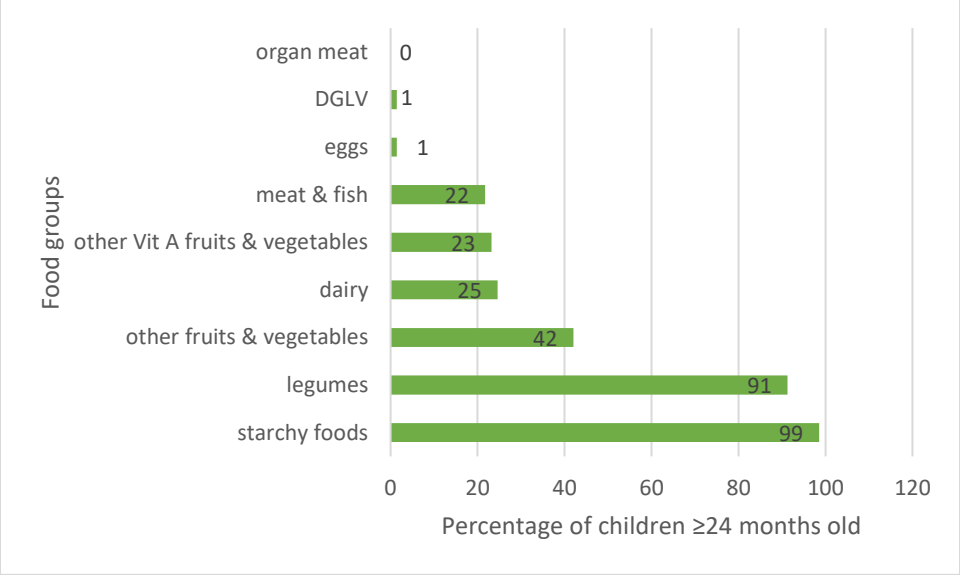


Figure 4-6 Food group consumption by children ≥ 24 months old over a 24-hour period.

The average number of food groups consumed during the 24-hour recall period by children aged six to 23 months was 2.8 ± 1.2, for the 24 to 36 months old children it was 3.0 ± 0.8 food groups, and that for children above 36 months was 3.2 ± 0.9 food groups. The average number of meals reported for the children was 3.3 ± 0.1 (girls 3.4 ± 0.1 and boys 3.3 ± 0.1). No significant relationship was noted between the gender of the child and the number of meals and total number of food groups consumed. There was however, a positive significant correlation between the number of meals and number of food groups consumed (Pearson's correlation analysis; r = 0.4; $p < 0.01$). Pearson correlations between food groups consumed showed a significant positive relationship between consumption of starches and legumes (r = 0.3; $p < 0.01$), and dark green

leafy vegetables and other vitamin A-rich vegetables ($r = 0.2$; $p < 0.01$). The total number of food groups was also significantly related with all food groups, except eggs and organ meats. The food groups with the strongest relationship ($r \geq 0.4$; $p < 0.01$) included dairy, meat and fish, other vitamin A-rich fruits and vegetables, and other fruits and vegetables. On the other hand, significant negative relationships were found between consumption of legumes and dairy ($r = –0.2$; $p < 0.05$); and legumes and meat ($r = –0.2$; $p < 0.01$).

In terms of nutritional status, 4.6% of the children were wasted, 9.2% were underweight and 33.3% were stunted. There was a significant monotonic relationship between age and prevalence of stunting, with a higher prevalence of stunting among children aged 12 to 23 months (42%) ($r = –0.3$, $p < 0.01$). Of the children aged six to 11 months, 14% were stunted while 26% of 24 to 36 months old, 26% were stunted. No relationship between gender and nutritional status was found.

4.6 Household typologies

Following Principle Component Analysis (PCA), three principal components that together explained 74.8% of the variation in household food security and child nutritional status were retained (Table 4-6). MAHFP and HFIAS had a strong correlation with component 1, HFCS and child dietary diversity score had a strong correlation with component 2. It is important to note that while MAHFP showed food insecurity for over 50% over five out of 12 months, and HFIAS showed food insecurity for 60% of households in the previous month, HFCS was in contrast with 96% having an acceptable score. Only prevalence of underweight had a strong correlation with component 3. An inference was made that component 1 explained the household food group consumption, component 2 the household food availability and access, while component 3 explained the nutritional status of the children in these households.

Table 4-6 Selected principle components loadings from the PCA

Component	**1**	**2**	**3**
Eigenvalue	2.2	1.4	1.0
Proportion	0.4	0.2	0.2
Component loadings			
HFCS	-0.3	0.5*	0.5
MAHFP	-0.6*	0.4	0.1
HFIAS category	0.6	0.0	0.3
Weight-for-Age Z-score	0.3	0.4	-0.6*
Child Dietary Diversity Score	0.2	0.6*	-0.2

HFIAS: Household food insecurity access score; HFCS: Household Food Consumption Score; MAHFP: Months of Adequate Household Food Provision; *Significant factor loadings

As a result, four household typologies with a fair distribution of households, 19 to 29%, were generated (Table 4-7). The first and second typologies had the more food-secure households of the four typologies based on the HFCS, MAHFP and HFIAS. The third typology had households

facing mild food insecurity with HFIAS of 2.8 and MAHFP of seven months, while the fourth typology had the most food-insecure households with an average HFIAS category of 3.9, implying severe food insecurity access and an MAHFP of five months. The average child dietary diversity score was lowest in the third typology.

Table 4-7 Average household characteristics for each of the four household typologies

Typologies	**Group 1**	**Group 2**	**Group 3**	**Group 4**
% of households	29.3	23.0	28.2	19.5
Food security variables				
Food Consumption Score	70.0	86.8	52.3	66.9
MAHFP	9.0	9.5	6.6	4.6
HFIAS category	1.9	1.9	2.8	3.9
Nutrition variables				
Child Dietary Diversity Score	3.0	2.9	2.7	3.2
Weight-for-Age Z-score classification	4.0	2.8	3.4	3.9
Household characteristics				
Household size (number)	5.9	5.7	5.6	6.0
Total land (hectares)	1.1	1.0	0.9	0.9
Total livestock units	0.5	0.5	0.6	0.5

Food Consumption Score: >35 is acceptable (WFP, 2008)
MAHFP: Months of Adequate Household Food Provisioning, out of 12 months (Leroy et al., 2015)
HFIAS category: Household food insecurity access score category, 1 is secure and 4 is severe food insecurity (access) (Coates, Swindale & Bilinsky, 2007)
Weight-for-Age Z-score classification: 1= severe underweight, 2= moderately underweight, 3= mild underweight, 4= normal (Cogill, 2003)
Total livestock units: numbers converted to a common unit, the larger, the more livestock (HarvestChoice, 2005).

Consumption of food groups by the different typologies showed the second household typology had the highest (Table 4-8). The third typology had the lowest consumption of dark green leafy vegetables, other fruits and vegetables, and milk, while the fourth typology had the lowest consumption of orange and dark yellow foods, meat, and fish. The fourth typology had the highest percentage of households consuming food from their own production and did not purchase any vitamin A-rich vegetables and other fruits. They also had the lowest percentage of households purchasing legumes, other vegetables, milk and fish (Table 4-8). The third and fourth typologies therefore, had vulnerable households facing more food insecurity and low dietary diversity.

Table 4-8 Household food group consumption and sourcing stratified by household typologies

Typology		Cereals, grains	Roots, tubers, cooking bananas	Legumes	Orange, dark yellow	Dark green leafy vegetables	Other fruits	Other vegetables	Meat	Milk and eggs	Fish
Group 1	Consumed	68.6	84.3	86.3	70.6	35.3	78.4	60.8	41.2	56.9	52.9
	Farm	44.0	64.4	64.8	91.9	77.8	75.0	25.6	20.8	28.6	7.4
	Market	52.0	33.9	33.3	2.7	5.6	16.7	74.4	79.2	68.6	92.6
Group 2	Consumed	82.5	90.0	90.0	75.0	42.5	80.0	75.0	70.0	77.5	75.0
	Farm	40.0	59.2	65.2	80.0	84.2	61.9	25.0	17.2	31.4	3.3
	Market	56.0	38.8	34.8	16.7	15.8	28.6	75.0	82.8	65.7	96.7
Group 3	Consumed	77.6	93.9	89.8	61.2	22.5	67.4	44.9	30.6	32.7	49.0
	Farm	35.4	71.2	70.4	80.7	81.8	65.8	24.1	13.3	25.0	4.2
	Market	64.6	27.1	29.6	6.5	18.2	21.1	75.9	86.7	75.0	95.8
Group 4	Consumed	85.3	76.5	91.2	32.4	29.4	73.5	50.0	26.5	52.9	32.4
	Farm	46.0	67.7	79.0	100.0	100.0	96.0	39.1	11.1	52.6	18.2
	Market	51.4	32.4	18.4	0.0	0.0	0.0	60.9	88.9	47.4	81.8

Figures are percentages of households within each typology/group. Food groups could be sourced from more than one source.
Consumed: percentage of households that consumed the food group in the preceding seven days
Farm: percentage of households that sourced the food group from their own production
Market: percentage of households that sourced the food group from market, shop, or stall.

4.7 Market survey

A total of 39 vendors were interviewed, with between five to nine vendors from each market. The average age of vendors was 35.9 ± 9.8 years and they had worked in their respective markets for 5.1 ± 3.8 years (Table 4-9). The markets were in three parishes of Kiboga district: Bukomero, Kisweeka, and Lwamata. Of the six markets surveyed, four were daily/permanent markets, meaning that each day of the week, there were vendors selling their merchandise. The other two markets were occasional markets that set up every fortnight in the same location (Table 4-10).

Table 4-9 Proportion of market vendor characteristics

Variable		**% Respondents (n = 39)**
Gender of respondent	Female	74
	Male	26
Age of respondent (years)	< 30	23
	30 - 39	41
	40 - 50	26
	> 50	10
Work experience in market (years)	< 2	26
	3 - 5	39
	6 - 10	28
	> 10	8
Work in other markets	No	95
	Yes	5

All 11 food groups were sold in the markets visited. Two of the six markets, Agali awamu and Kikuubo, had on sale at least one food item from each of the 11 food groups (Table 4-10). Buswabulongo market had the least number of food groups (six) with no food items on sale from the following food groups: cereals and grains, meat products, dairy and eggs, orange and dark yellow foods, or dark green leafy vegetables. Kisweeka market also had no dark green leafy vegetables or fish on sale. Buswabulongo market with the least diversity was the nearest/most visited occasional market by the surveyed households.

Table 4-10 Market characteristics and food groups available in each market

Name of market		Agali awamu	Buswabu-longo	Kikuubo	Kisweeka	Luunya	Noahs' ark	All markets (N)	Main food items
Parish location		Bukomero	Kisweeka	Bukomero	Kisweeka	Lwamata	Lwamata		
Type of market		Occasional	Occasional	Daily	Daily	Daily	Daily		
Number of respondents		9	5	7	5	5	8	39	
Number of food groups sold		11	5	11	9	10	10	11	
Number of food items sold per food group	Cereals and grains	5	0	3	4	3	3	6	Maize (grains and flour); Rice; Millet; Wheat; Sorghum
	Roots, tubers, cooking bananas	6	5	7	5	5	6	7	Potatoes; Cooking bananas; Sweet potato; Cocoyam; Cassava (tubers and flour); Arrow root
	Orange, dark yellow foods	4	0	5	3	4	3	5	Pumpkin; Mangoes; Carrots; OFSP; Pawpaw
	Dark green leafy vegetables	4	0	4	0	1	2	5	African nightshade; Spider leaf; Amaranth; Red amaranth; Spinach
	Legumes	3	1	3	3	2	2	4	Beans; Groundnuts; Soybean; Field peas
	Other fruits	6	2	7	2	7	5	7	Avocado; Dessert bananas; Passion fruit; Oranges; Pineapples; Jackfruit; Guava
	Other vegetables	6	4	7	4	6	7	7	Tomatoes; Onions; Cabbage; Eggplant; Bitter tomatoes; Bitter berries; Mushrooms
	Meats	4	0	6	5	0	6	7	Beef; Pork; Tripe; Liver; Chicken; Goat; Kidney
	Dairy and eggs	1	0	1	1	1	2	2	Eggs; Milk
	Fish	1	3	4	0	1	0	4	Silver Fish; Haplochromine; Tilapia; Nile perch
	Other foods	4	0	4	4	3	4	4	Salt; Sugar; Margarine; Cooking oil

4.7.1 Staple foods available in the markets

Cereals and grains were sold by 3 - 31% of the vendors, with 31% and 3% selling maize flour and rice, and maize grains and sorghum, respectively (Table 4-11). Sale of maize grain was only noted in one market, Luunya. The Buswabulongo market did not report sale of any cereal or grain. All cereals and grains were available all year round.

Vendors sourced maize grain and sorghum from neighbouring villages (100% of vendors). Maize flour and rice were sourced from Kiboga town (58% and 42% of vendors, respectively), millet from neighbouring districts (50% of vendors), and wheat flour was from either Kiboga town (50% of vendors) or far-off districts (50% of vendors). Vendors mostly sold the cereals and grains to neighbouring villages (92 - 100%). Prices ranged from USD 0.14 per kg for maize grain and maize flour to USD 1.12 per kg for rice.

Seven food items in the roots, tubers and cooking bananas food group were on sale: cooking bananas, white sweet potato, cassava, cassava flour, potatoes, cocoyam and arrow root. Of the 39 vendors surveyed, 10 to 44% sold at least one root, tuber or cooking banana food or product. Cassava flour was the least sold by 10.3% of vendors and markets, while potatoes were the most sold food item by 43.6% of the vendors and 51.3% of markets (Table 4-11). Agali awamu and Luunya markets had more food items in this food group on sale.

Vendors sourced all roots, tubers and cooking bananas from neighbouring villages (78 to 100% of vendors), except potatoes, which were sourced from Kiboga town (6% of vendors), near (11% of vendors) and far-off (6% of vendors) districts in addition to sourcing from the neighbouring villages (78% of vendors). Vendors mainly sold to neighbouring villages (40 to 100% of vendors), neighbouring districts (11 to 28% of vendors) or Kampala (6 to 24% of vendors). Prices ranged from USD 0.08 per kg for cooking bananas to USD 0.38 per kg for cassava flour.

The legumes sold in the markets were beans, groundnuts, soybean, and field peas in order of magnitude (Table 4-11). Field peas were sold in only Kikuubo market, while beans were sold in all six markets. Buswabulongo market only sold beans. All-year and seasonal availability were reported for all legumes except field peas. Vendors sourced the legumes from either the neighbouring villages (50 to 100% of vendors) or Kiboga town (40 to 50% of vendors). Vendors mainly sold to neighbouring villages (74 to 100% of vendors). A few buyers of beans (for 21% of vendors) and groundnuts (for 10% of vendors) were from Kampala. The most common legume, beans, was also the cheapest at USD 0.7 per kg. Field peas and groundnuts were the most expensive legumes at USD 1.2 per kg. All prices reported were for dry legumes and the prices of dry versus fresh legumes were not captured in this survey.

Table 4-11 Availability and cost of starchy staples and legumes in the markets

Food group	Food item	Market % (n = 6)	Vendor % (n = 39)	Seasonal availability [a]	All year availability[a]	Average price/kg[b] (USD)
Cereals and grains	Maize grains	2.6	2.6	0.0	100	0.1
	Maize flour	30.8	30.8	0.0	100	0.7
	Rice	30.8	30.8	0.0	100	1.1
	Millet	12.8	12.8	0.0	100	0.9
	Sorghum	2.6	2.6	0.0	100	0.5
	Wheat	7.7	7.7	0.0	100	0.6
Roots, tubers, cooking bananas	Cooking bananas	46.2	38.5	30.8	12.8	0.1
	White sweet potato	41	35.9	35.9	2.9	0.2
	Cassava	23.1	17.9	15.4	5.1	0.2
	Cassava flour	10.3	10.3	0.0	7.7	0.4
	Potatoes	51.3	43.6	46.2	0.0	0.3
	Cocoyam	25.6	20.5	12.8	5.1	0.3
	Arrow root	15.4	15.4	10.3	0.0	0.4
Legumes	Beans	53.8	46.2	25.6	20.5	0.7
	Groundnuts	25.6	23.1	7.7	17.9	1.2
	Field peas	5.1	5.1	2.6	0.0	1.2
	Soybean	7.7	7.7	2.6	5.1	0.9

[a]Percentage of vendors that had seasonal or all-year availability of the food item; [b]Price is per kg of roots, tubers, cooking bananas: Except for cassava flour, the price per kg includes both the edible and nonedible portions like peels. USD: United States Dollar.

4.7.2 Animal foods and products available in the markets

A range of animal foods and products were available in the markets. Four meat types were available – chicken, cow, goat, and pig – as well as bovine organ meats such as liver, kidney, and tripe (Table 4-12). No single market sold all the meat types. Kikuubo and Noah's ark markets sold the most meat types, while Buswabulongo and Luunya sold none. All meat types were sold fresh. Other meat items reported were bovine tongue, heart and hooves. All meat types were reported to be available all year round. Vendors sourced animal foods and products from neighbouring villages (50 to 100% of vendors), neighbouring districts (25% of vendors) and Kiboga town (25 to 50% of vendors) and all were sold to neighbouring villages. Apart from chicken that was sold whole, prices of meat food items ranged from USD 1.3 per kg for tripe and USD 3.4 per kg for liver.

Milk was the only dairy product sold. It was sold fresh, only in two markets Agali awamu and Noah's ark, throughout the year, at USD 0.3 per litre. Vendors sourced milk from and sold to neighbouring villages (100% of vendors). Eggs were sold in four markets by 18% of the vendors and were available all year. The eggs were sourced from neighbouring villages (43% of vendors), Kiboga town (29% of vendors) and neighbouring districts (29% of vendors), and all eggs were sold to neighbouring villages. A tray of 30 eggs was sold at US$2.7 with each egg at US$0.1.

Four kinds of fish were available in the market: silver cyprinid/silver fish (locally called *Mukene*), tilapia (*Oreochromis Niloticus*), haplochromis (locally called *Nkejje*), and Nile perch (*Lates Niloticus*), in order of abundance (Table 4-12). Tilapia and Nile perch were sold fresh, while the silver fish and haplochromis, both small fish, were sold sun-dried. Silver fish were sold in four of the six markets, while tilapia and haplochromis were sold in only two markets. Nile perch, the most expensive fish, was sold per kilogram only in Kikuubo market. Kisweeka and Noah's ark markets did not have any fish on sale. Vendors sourced all fish from far-off districts and sold to neighbouring villages. All fish, except the silver fish, were seasonally available.

Table 4-12 Availability and cost of animal source foods and products in the markets

Food group	Food item	Market % (n = 6)	Vendor % (n = 39)	Seasonal availability [a]	All year availability [a]	Average price/kg[b] (USD)
Meats	Liver	10.3	10.3	0.0	10.3	3.4
	Kidney	2.6	2.6	0.0	2.6	1.8
	Tripe	10.3	10.3	0.0	10.3	1.3
	Beef	10.3	10.3	0.0	10.3	2.7
	Goat	7.7	7.7	0.0	7.7	3.5
	Pork	10.3	10.3	0.0	10.3	2.1
	Chicken	7.7	7.7	0.0	10.3	3.2
Dairy and eggs	Milk	5.1	2.6	0.0	2.6	0.3
	Eggs	17.9	17.9	0.0	15.4	0.1
Fish	Silver fish	15.4	12.8	15.4	0.0	1.6
	Nile perch	2.6	2.6	0.0	2.6	3.3
	Tilapia	5.1	5.1	0.0	5.1	1.2
	Haplochromine	5.1	5.1	0.0	5.1	1.9

[a]Percentage of vendors that had seasonal or all year availability of the food item; [b]Price is per kg except eggs –price of each; milk – price per litre. USD: United States Dollar.

4.7.3 Vitamin A-rich foods available in the markets

Pumpkin and mangoes were the most sold orange and dark yellow foods in the markets (44%) (Table 4-13). Agali awamu and Kikuubo markets sold the most food items in this group, while Buswabulongo market sold none. Orange-fleshed sweet potato was the least sold within this food group, being sold in only two of the six markets. The availability of all orange and dark yellow foods was largely seasonal (3 to 41%). Only mangoes and pawpaw had a report of all-year availability (2.6%).

Vendors sourced pumpkin and mangoes from neighbouring villages (81%, and 93% of vendors, respectively), pawpaw fruits from Kiboga town (100% of vendors), and carrots were from far-off districts (50% of vendors), nearby villages, Kiboga town and neighbouring districts (17% of vendors each). Vendors mainly sold vitamin A-rich foods to the neighbouring villages (33 to 53% of vendors), neighbouring districts (19 to 27% of vendors), and Kampala (17 to 50% of vendors).

The sourcing and sale of orange-fleshed sweet potatoes were unique; all were obtained from Kiboga town and all sold to neighbouring districts. Prices of orange and dark yellow foods ranged from USD 0.2 per kg for orange-fleshed sweet potatoes and pawpaw to USD 1.2 per kg for carrots.

Five dark green leafy vegetables were sold in the markets: green and red amaranth, scarlet eggplant leaves (also known as *African nightshade*), African spider plant leaves (locally called *Jjobyo*), and spinach. Scarlet eggplant leaves were the most sold leafy vegetable, available in five markets by 18% of the vendors (Table 4-13). Spinach was sold only in Kikuubo market by 3%. Buswabulongo and Kisweeka markets did not have any dark green leafy vegetables on sale. All the dark green leafy vegetables were seasonally available and sourced from neighbouring villages. Vendors sold red and green amaranth, and scarlet eggplant leaves, to neighbouring villages (50 to 100% of vendors) and Kampala (17 to 50% of vendors), while African spider plant leaves were sold mainly to neighbouring villages. All spinach was sold to Kampala (100% of vendors). These vegetables were sold in bundles that weigh approximately 200 to 300 grams each.

Table 4-13 Availability and cost of fruits, vegetables and other food items in the markets

Food group	Food item	Market % (n = 6)	Vendor % (n = 39)	Seasonal availability [a]	All year availability [a]	Average price/kg[b] (USD)
Orange and dark yellow foods	Pumpkin	43.6	42.1	41	0	0.2
	Carrots	20.5	15.4	15.4	0	1.2
	OFSP	5.1	2.6	2.6	0	0.2
	Mangoes	43.6	38.5	38.5	2.6	0.2
	Pawpaw	0.8	20.5	15.4	2.6	0.2
Dark green leafy vegetables	Amaranth	5.1	5.1	5.1	0	0.6
	Scarlet eggplant	17.9	17.9	17.9	0	0.7
	Red amaranth	5.1	5.1	5.1	0	0.6
	African spider leaf	5.1	5.1	5.1	0	0.9
	Spinach	2.6	2.6	2.6	0	0.6
Other fruits	Dessert bananas	33.3	30.8	23.1	10.3	0.1
	Pineapples	23.1	17.9	20.5	0	0.4
	Jackfruit	12.8	7.7	5.1	5.1	0.1
	Oranges	23.1	17.9	20.5	0	0.4
	Passion fruit	28.2	28.2	23.1	2.6	1.2
	Avocado	35.9	30.8	30.8	0	0.4
	Guavas	7.7	5.1	5.1	0	0.5
Other vegetables	Cabbage	33.3	30.8	28.2	0	0.3
	Eggplant	20.5	20.5	17.9	0	0.7
	Bitter berries	12.8	7.7	7.7	2.6	0.6
	Bitter tomato	12.8	7.7	5.1	0	0.4
	Tomatoes	38.5	41	38.5	0	0.6
	Onions	38.5	38.5	35.9	2.6	0.6
	Mushrooms	5.1	5.1	5.1	0	3.6
Other foods	Cooking oil	28.2	28.2	0	25.6	1.3

Food group	Food item	Market % (n = 6)	Vendor % (n = 39)	Seasonal availability [a]	All year availability [a]	Average price/kg[b] (USD)
	Sugar	28.2	28.2	0	25.6	1.4
	Salt	28.2	28.2	0	28.2	0.4

[a]Percentage of vendors that had seasonal or all-year availability of the food item; [b]Price is per kg, includes both the edible and nonedible portions like peels and seeds. Price of cooking oil is per litre; OFSP – Orange-fleshed Sweet Potatoes. USD: United States Dollar.

4.7.4 Other fruits, vegetables and foods available in the markets

The other fruits sold in the market (that are not vitamin A-rich) were avocado, dessert bananas, passion fruit, pineapples, oranges, jackfruit, and guavas (Table 4-13). Kikuubo and Luunya markets sold all seven fruits, while Buswabulongo and Kisweeka markets sold only two of the seven fruits. Avocado was the only fruit sold in all six markets. All these fruits were largely seasonally available, and only dessert bananas, jackfruit and passion fruit were reported as available all year. Vendors sourced the fruits from neighbouring villages (88 to 100% of vendors) and they were sold to neighbouring villages (46 to 80% of vendors), neighbouring districts (8 to 25% of vendors) and to Kampala (10 to 39% of vendors). The size and unit of sale of the fruits varied. Pineapples and jackfruit are large fruits that contain more than one serving of fruit. Bananas were sold as a hand/cluster with approximately 12 to 15 fingers that also have more than one serving of fruit. The dessert bananas on sale were the smaller dessert bananas (apple bananas/*Kamaramasenge*/*Sukali Ndizi*) and not the larger Cavendish/Gros Michel bananas that are more available in peri-urban and urban markets.

Other vegetables on sale in the market included tomatoes, onions, cabbage, eggplant, bitter berries (locally known as *Katunkuma*), bitter tomatoes (garden eggs, locally known as *Ntula*), and mushrooms (Table 4-13). Kikuubo and Noah's ark were the only markets selling all eight vegetables and were the only markets that sold mushrooms. On the other hand, Buswabulongo and Kisweeka markets sold only four of the eight vegetables. All the other vegetables were seasonally available. Vendors sourced all these vegetables from neighbouring villages (57 to 100% of vendors) and neighbouring districts (7 to 17% of vendors) and sold them mainly to neighbouring villages (43 to 100% of vendors) and Kampala (33 to 43% of vendors). Onions had the largest range of sources (neighbouring villages, Kiboga town, neighbouring districts, far-off districts), while bitter tomatoes were sourced and sold mainly to neighbouring villages.

Other foods of interest were cooking oil, sugar, and salt. These were sold in all markets except Buswabulongo and were available all year round (Table 4-13). These items were sourced from Kiboga town and other districts and sold mainly to the neighbouring villages. Figure 4-7 shows a typical market common in peri-urban and rural areas of Uganda. This setup is similar to the markets surveyed, especially Kikuubo, Kisweeka, Luunya, and Noahs' ark markets.

Figure 4-7 A market common in peri-urban and rural areas of Uganda.

4.7 Discussion of the situation analysis results

4.7.1 Discussion of household survey results

Limited diversity of crops grown, low consumption of micronutrient rich foods, stunting, and household food insecurity were noted. Starchy staples (cereals, grains, roots, tubers, cooking bananas) and legumes were the most consumed food groups by both children and households. Roots, tubers, cooking bananas; legumes, vitamin A-rich fruits and vegetables; and other fruits consumed by households were mainly from on-farm production. Animal-source foods and other vegetables were sourced mainly from the market, while cereals and grains, and dairy were sourced equally from the farm (50% of the households) and the market (50% of the households).

The prevalence of malnutrition and low dietary diversity noted in the study require attention. These results, together with the low consumption of vitamin A-rich and iron-rich foods noted in the study were similar to the national and regional values reported in the 2016 national demographic health survey, reflecting an outstanding dietary gap among rural households (UBOS & ICF, 2018). Aside from cereals and grains, other vegetables were the second most frequently consumed food group consumed during a period of four out of seven days. The frequent consumption of other vegetables, mainly tomatoes, onions and egg plants, reported is probably skewed because they are usually added to food as a condiment and the quantities consumed may not provide sufficient nutrient benefits. The low quantities of vegetables consumed reflect the need for nutrition education such that vegetables such as dark green leafy vegetables are not only included in diets, but are consumed in considerable quantities (Afari-Sefa et al., 2016;

Kansiime et al., 2018). Though legumes were consumed at least once by each household in a seven-day period, they were consumed an average of only two out of seven days. This could imply consumption of other protein-source foods on other days, such as animal-source foods, particularly the silver fish because silver fish were consumed by 57% of households on three days a week. Seasonal effects on dietary diversity are acknowledged as the cross-sectional nature of the study did not allow for seasonal comparisons.

The low dietary diversity among the children in the study corresponds with previous reports (Aemro et al., 2013; Gewa & Leslie, 2015; Bandoh & Kenu, 2017; Nabuuma, Ekesa & Kennedy, 2018). Further studies have elaborated that children aged nine to 17 months are twice as likely to meet the minimum dietary diversity of four food groups compared to children aged six to eight and 18 to 23 months (Mokori, Schonfeldt & Hendriks, 2017). On the other hand, it is also reported that as children age, dietary diversity decreases, but meal frequency increases (Mekonnen et al., 2017). These changes have been attributed to the introduction of complementary foods, and the shift from complementary foods to family diets (Mokori, Schonfeldt & Hendriks, 2017). The increased mobility and communication skills of the children as they grow up could also be an additional factor as children may rely less on other household members to access food. For example, having the ability to ask, reach for, and/or harvest fruits. The change in diet quality across these age groups can be further explored through further qualitative study. Absence of organ meat consumption by children can be attributed to the limited access to the market and storage/preservation facilities, and high cost as reflected in Chapter 5.

Based on the results, the consumption patterns were in tandem with the crops grown, with more dependence on starchy staples and legumes. Indeed beans and starchy staples such as cooking bananas, maize, and sweet potatoes are the key crops produced in the study site (Ekesa et al., 2015; UBOS, 2017a). Vegetable production is limited by the availability of water and larger and more consistent production is mainly among farmers growing them for commercial purposes (the urban market) (Kansiime et al., 2018). A reduction in the available African indigenous vegetable species has also been reported from at least 160 species in 1989 to 23 species in 2017 (Sseremba et al., 2017). This has implications on available agrobiodiversity and the need for conservation, improvement of the seed system and promotion, particularly among smallholder farmers that produce 70% of the national agricultural produce (NPA, 2015).

Even though 42% of households had at least one type of livestock and < 30% of children consumed animal-source foods, no significant relationship was found between livestock ownership and consumption of animal-source foods. Some studies have reported positive significant relationships between livestock production and consumption (Brenner et al., 2011; Bioversity International, 2017), while others note that this is not always the case (FAO, 2002). Given that livestock in developing countries are often reared as a source of income and not for

consumption, nutrition education on how income can be used to achieve dietary diversity is important (Randolph et al., 2007).

While own production appeared to be the most important factor influencing dietary diversity, markets also played a role. Occasional markets were the most accessible markets. These markets are common in rural areas of Uganda, where traders set up at the same location for one day and community members travel to the market to make purchases or sell merchandise not limited to foodstuffs. The study had households travelling an average of seven kilometres to the occasional markets – a distance that can influence the purchase and consumption of perishable items such as animal-source foods. The large percentage of households buying vegetables (79% of those that consumed them) can be attributed to neighbourhood/roadside stalls and not the market. Access to markets influences dietary diversity even for farming households and improving this access can positively affect dietary diversity (Sibhatu, Krishna & Qaim, 2015; Kissoly, Fabe & Grote, 2018).

Household food security was a challenge for more than half of the surveyed households. Food availability and access are reported as the main limiting factors affecting the household food security pillars in the region where the study site is located, mainly due to drought and crop and livestock diseases that reduce crop harvests and food stocks, high food prices and low household incomes (IPC, 2017). MAHFP showed food insecurity for over 50% of households for five out of 12 months and HFIAS showed food insecurity for 60% of households in the previous month. However, HFCS was in contrast, with 96% having an acceptable score and thus being food secure. This difference between HFCS and HFIAS has been previously reported, that food security measures such as HFCS, HFIAS, Coping Strategies Index and reduced Coping Strategies Index were well-correlated with particular elements of food security. HFCS was more strongly correlated, with household dietary diversity capturing more of the food quality and diversity than HFIAS, which captures food quantity and stability (Maxwell, Coates & Vaitla, 2013). Though the food at hand in the study over the last seven days may be acceptable (HFCS), the households were experiencing food insecurity with anxiety over food and months of inadequate food (HFIAS and MAHFP). As such, dietary diversity and food security in this population need to be addressed.

Food availability is also influenced by the agricultural seasons where the contribution of different food groups and food species to the diet and nutrition of the household members changes with the seasons (Hillbruner & Egan, 2008; Stevens et al., 2017). This was reflected by the months of adequate food availability and lean seasons, and months of adequate food noted in the study. Periods of adequate food availability and access are negatively influenced by limited diversity produced, poor postharvest handling and limited infrastructure, typical in rural areas in sub-Saharan Africa, reduce food stocks (Ayenew et al., 2018). In the lean seasons, when production diversity has less effect on dietary diversity, incomes and markets can be harnessed (Zanello, Shankar & Poole, 2019). Improving production diversity; however, is an important avenue to

improving food and nutrition security in the country based on an analysis of panel household data (Sekabira, Nalunga & Sibhatu, 2018). The seasonal variation of different foods and species offered by agrobiodiversity can also be harnessed to ensure that availability and access to diverse nutrient-dense foods is improved across seasons (Herforth, Jones & Pinstrup-Andersen, 2012; Bioversity International, 2017).

Household agricultural production, income and market access are associated with dietary diversity (Sibhatu, Krishna & Qaim, 2015; Ayenew et al., 2018; Kissoly, Fabe & Grote, 2018). These three factors therefore, need to be addressed in relation to the smallholder farmers. For farmers with some on-farm diversity, income and market access particularly the first and second typologies, access to diverse foods through the market and capacity to efficiently utilise their incomes to contribute to dietary diversity may be of benefit (Sibhatu, Krishna & Qaim, 2015; Jones, 2017). For farmers with low on-farm diversity, income and market access, increasing on-farm diversity, income and income use will be beneficial (Jones, 2017; Qaim & Sibhatu, 2018), particularly the third and fourth typologies.

The land access noted in the study was similar to other reports. Availability of and the size of land for agriculture has also been associated with improved dietary diversity with larger land size, increasing the likelihood that the household has enough food to meet their needs (Taruvinga, Muchenje & Mushunje, 2013; Mbwana et al., 2016).

4.7.2 Discussion of market survey results

Markets are important in the production system and livelihoods of smallholder farmers and they affect dietary diversity. The commonly accessed markets were; however, found to have a limited diversity of food groups available (six out of 11 groups) and a limited variety of food items per food group. Where market access is good, there is a stronger relationship between market access and dietary diversity, and a weaker relationship between production diversity and dietary diversity (Taruvinga, Muchenje & Mushunje, 2013; Sibhatu, Krishna & Qaim, 2015; Kissoly, Fabe & Grote, 2018). Therefore, for the poor rural smallholder farmers, there is a stronger association between production diversity and dietary diversity (Rajendran et al., 2014; Ayenew et al., 2018).

Within market access, the proximity, purchasing power, and choices made by households also have an impact on dietary diversity (Kissoly, Fabe & Grote, 2018). To support this, markets should provide diverse, affordable and safe foods. The markets sourced and sold the food produce from the neighbouring villages (which include the study sites) and other locations like Kiboga town, near and far-off districts and Kampala, the capital. Reflecting a vibrant market system which can be harnessed to increase smallholder farmer access to diverse foods.

The surveyed markets also sold non-food items like clothes, household items and personal care and hygiene products. For markets with limited food group diversity like Buswabulongo, the non-food items outweighed the food items. Markets not only provided points of trade but were also

places of social interaction, especially the occasional markets like Agali Awamu and Buswabulongo. Markets in rural areas have been reported as places through which social participation is built and where gender equity is important, especially among traders (Nyanzi et al., 2005; Katungi, Edmeades and Smale, 2008; Mair, Martí & Ventresca, 2012). Since the study focused on formal/recognised markets, further exploration of the farm gate and informal shops (food stalls/kiosks) closer to the households is recommended, to assess their potential contribution to dietary diversity.

In addition to the food availability established from the market survey and the food group sourcing from the household survey, it is important to determine the perceptions of smallholder farmers on market and food access and this is reflected in Chapter 5. Similar to the results of the household survey, availability of food groups such as fruits and vegetables was influenced by seasonality. This seasonality in turn influences dietary diversity where the contribution of different food groups and food species to the nutrition of individuals changes with the seasons, especially in farming communities (Hillbruner & Egan, 2008; Herforth, Jones & Pinstrup-Andersen, 2012; Bioversity International, 2017; Stevens et al., 2017).

Increasing income and market access is not sufficient to lead to improved dietary quality. Affordable healthy food options need to be available in the markets, a situation that was not adequate in the assessed markets given that the commonly accessed markets had limited variety. This limitation needs to be considered during the development of the food-based strategy. In addition, individuals and households need to be equipped to make appropriate food choices that support nutrition to reduce the likelihood of increasing consumption of processed foods, and foods rich in sugar, oil, and salt (Townsend et al., 2016).

4.8 Summary

Although a wide range of crops can be grown, low diversity in production was noted in households, with majority growing starchy staples and beans. Low consumption of micronutrient rich foods, stunting, and household food insecurity were also observed in this study. In the midst of the food access, availability, production, and consumption limitations observed, emphasis on dietary diversity remains paramount. The rural households mainly sourced their food from own production and purchase from markets. Markets played a role in the households' access to micronutrient-rich foods. However, the most accessed markets had a limited variety of foods, particularly fruits and vegetables. Therefore, in addition to improving production of fruits, vegetables and small livestock, the effective use and enhancement of available incomes and markets to improve access and consumption of these food groups will benefit rural smallholder farmers. In addition, a look into access and food diversity within the markets commonly accessed by households will provide useful information for policy makers and intervention developers. This quantitative glimpse into the study population was followed by a qualitative evaluation of the food and nutrition situation.

Chapter 5 Community perspective on the food and nutrition situation through a qualitative approach

5.1 Introduction

This chapter presents results from Phase 2 of the study. This phase comprised two rounds of FGDs. The first round focused on determining the social norms and community perspectives on the food and nutrition situation. The second round explored possible solutions that can improve the food and nutrition situation in the community. This information was obtained from men and women that had or had no prior involvement with an agricultural and/or nutrition intervention.

A total of 28 participants, 12 men and 16 women, were involved in the FGDs (Table 5-1). All participants had primary-level education and their main occupation was farming. The average age for the four FGDs was 39.1±11.1. The average ages for the men's FGDs was 44.7±13.2 and that for women was 35.0±7.2. Fewer men than planned participated in the FGDs, mainly due to limited availability or unwillingness to participate.

Table 5-1. FGD participants' characteristics

FGD type	Gender	N	Age	Education level	Number of household members	Number of children	Occupation
Prior intervention	Men	6	44.8±9.4	Primary	7.7±2.3	8.2±4.9	Farmer
	Women	10	44.5±17.1	Primary	7.0±3.5	7.2±4.8	Farmer
No prior intervention	Men	6	35.6±7.5	Primary	9.3±3.0	6.6±3.2	Farmer
	Women	6	34.0±7.2	Primary	6.0±2.3	4.2±1.5	Farmer
All		28	39.1±11.1	Primary	7.7±3.0	6.5±3.8	Farmer

Values (except N) are means

5.2 Community perspectives on nutrition and food security

In this section, the results from the first round of FGDs are presented under the major themes generated: food consumption by infants and young children, food consumption and availability in the household, and factors affecting dietary diversity and food availability.

5.2.1 Food consumption of infants and young children

The types of meals and food groups consumed by children and the perception of whether the diets were adequate were discussed and are presented below.

5.2.1.1 Meal dynamics and food groups consumed

Meals served to children were said to be similar to those consumed by the rest of the household, with some considerations made to cater for children.

> "The food I eat at my home is the same my children feed on ..." [Men, prior involvement]

Three main meals were reported – breakfast, lunch, and supper – with some respondents consuming only two meals, either breakfast and lunch or breakfast and supper. Breakfast

consisted of mainly maize porridge and/or leftover food from the night before such as sweet potatoes, cooking bananas, cassava, or potatoes that may be warmed and served with tea. Lunch or supper were mainly composed of a starchy staple and a sauce from legumes or animal-source foods. Children were noted to consume some food between these mealtimes which was considered a fourth meal by the FGDs of the women. The number and quantity of these in-between meals, usually fruit, could only be estimated as some were not consumed in the home and children were accessing the fruit by themselves.

> "I don't count eating fruits like sugarcanes, mangoes, *Amatugunda (Vangueria apiculate)*, pawpaw, guavas, passion fruits, gooseberries and jackfruits as a meal, it's a supplement. I think they eat three times a day." [Women, prior involvement]

> "Honestly, it's hard to know the number of times they eat because they eat other things like fruits one cannot know the number of fruits eaten and the time period in which they are consumed" [Women, prior involvement]

Availability of food withstanding, there were differences in the children's diet compared to the rest of the household. These ranged from children accessing fruits in between meal times; preparation of enriched porridges like soy flour mixed with maize or millet flour; addition of silver fish or green leafy vegetables to the bean or groundnuts sauce; purchase of eggs or milk, which are prepared and served to the child; or mashing of the food for the infants. Commonly consumed foods by children are presented in Table 5-2.

> "Some foods are specifically prepared for children. These include fish, eggs, milk, soybean." [Men, no prior involvement]

> "… I give a child priority when it comes to good food. For instance, if I have four eggs and we are a family of seven, I would prepare the eggs for the baby first." [Women, no prior involvement]

Table 5-2 Foods commonly consumed by children, according to FGD participants

Food group	**Food items**
Staple foods	Cooking bananas; Sweet potatoes; Cassava maize; Rice; Potatoes, Sweet potatoes
Plant protein foods	Beans; Groundnuts; Soybean
Animal-source foods	Milk; Eggs; Silver fish
Fruits	Pawpaw; Mangoes; Jackfruit Guavas; Avocado; Dessert bananas *Vangueria apiculata*; Passion fruit; Gooseberries

Vegetables	Amaranth; Scarlet eggplant leaves (*African nightshade*); African spider plant (*Jjobyo*) Pumpkin; Pumpkin leaves

Mention of meat, milk, eggs, and fish was followed by emphasis on how the prices limit their consumption. This was reflected in all focus groups. Other foods, where consumption was said to be affected by the price and household income, include rice, potatoes, cooking bananas, and soybean.

> "… we fail to buy them when the prices are become high … foods like milk, soybean and sometimes cooking bananas." [Men, no prior involvement]

In all FGDs it was mentioned that use of sugar was occasional or not consumed at all due to its high cost.

> "Do not even talk about it (sugar) because we rarely take it, it's very expensive." [Women, no prior involvement]

Cooking oil was mentioned only by the FGDs of the women, with more participants frying sauces three to seven days a week. Quantity and frequency of use also depended on available income in the household, while the lack or occasional use of sugar due to its high cost was mentioned in all FGDs.

> "I don't exceed three days per week without adding cooking oil to the food when cooking." [Women, prior involvement]
>
> "I use cooking oil every time I cook." [Women, no prior involvement]
>
> "… if money allows, sometimes you boil the food if you do not have 200 UGX (0.05 USD)." [Women, prior involvement]
>
> "It depends on my income because sometimes I spend a week without frying food." [Women, no prior involvement]

5.2.1.2 Are diets of infants and young children adequate?

Each FGD had some participants that considered the diets they fed to their children to be adequate, and others that considered the diets inadequate. There were more responses reflecting inadequacy compared to adequacy, as shown in Figure 5-1. Inadequacy of diets was explained by limited availability and/or access to adequate food and a lack of money to buy the preferred foods.

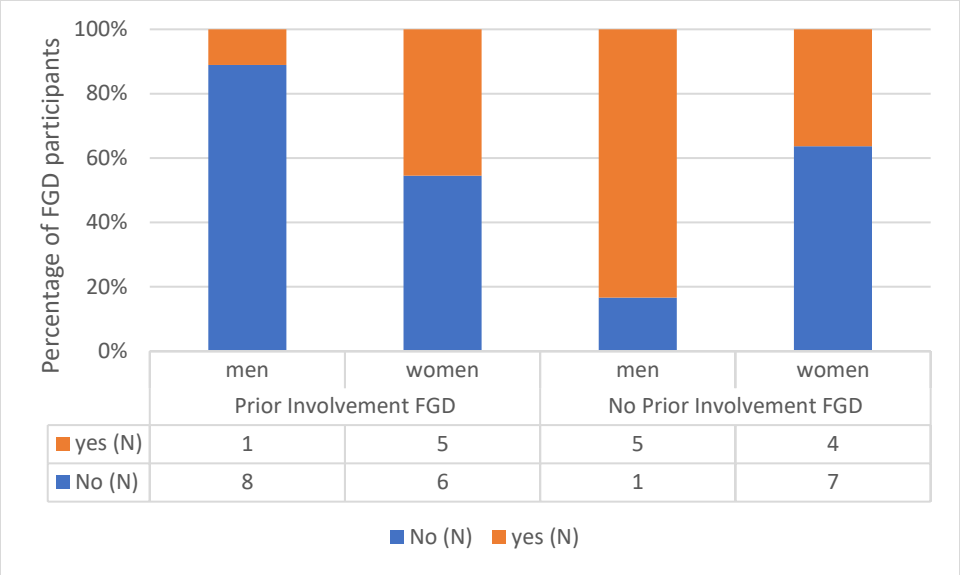


Figure 5-1 Tally of responses of the perception of participants on whether diets of children were adequate

> "it would be adequate, but the problem is that we sell most of the food to get money and meet expenses like school fees." [Men, prior involvement]
>
> "It's not enough. We only have enough for the three months after harvest. The rest of the months are characterised by scarcity." [Men, prior involvement]
>
> "Sometimes it's inadequate; I don't like giving my children tea without milk, but I do because I lack the money to buy milk." [Women, prior involvement]]

The participants had different understandings of what adequate diets were and this provided insight on their perception of the level of adequacy of the diets they provided their children. Their understanding of adequate diets was grouped into three:

i) Diets that provide sufficient quantity of food for the children, leaving them satisfied and even not able to finish all the food prepared.

> "It's inadequate because the portions are small, so they do not get satisfied." [Women, no prior involvement]
>
> "…. I can have only 1 kg of maize flour for both lunch and supper, which is not enough." [Women, no prior involvement]
>
> "… if I put food on the table, each of my children should be able to eat to their fullest, till they are able to leave some on the plate and not scamper for more." [Men, prior involvement]

ii) Diets are adequate if different types of food can be provided, such as milk, potatoes, and silver fish, and there is no monotony in the diet.

iii) When foods are well suited for children, that is warm and of a texture fitting their age, they are adequate.

"… for children at six months, I give them mashed sweet potatoes with groundnuts compared to the ones aged one to three years that I give *posho* (stiff maize porridge)." [Men, no prior involvement]

Adequacy was also said to be relative based on what one knows and has:

> "I might be thinking that what I am feeding my children is the right food, but someone else might look at it differently … we give according to how much we can afford." [Men, no prior involvement]

The extent to which the diets are adequate were linked to several perceptions around child feeding. The most common perception (11 quotations from three FGDs) was that children need to eat different and/or tasty foods and cannot be healthy or satisfied if they ate monotonous diets. Some of the foods mentioned included groundnuts, fish, eggs, milk, rice, potatoes, cooking bananas and amaranth. The importance of the animal-source foods was indeed highlighted (seven quotations, three FGDs). Second, serving food left over from the previous dinner for breakfast was a common practice. However, it was thought by respondents in two FGDs not to be good for children. Foods that could be warmed in the morning were preferred but were not always available or warming was not possible (three quotations, three FGDs). Food choice and preparation also needs to cater to the child's digestive system. Three FGDs noted a preference for soft foods like cooking bananas over foods like cassava. Soft foods were said to be suitable complementary foods for children six months to one year old (three quotations, three FGDs). Maize flour prepared as porridge or stiff porridge was also perceived to be good for children (two quotations, two FGDs). There was no trend noted between the FGDs of men and women concerning these perceptions about food and child feeding. It was also highlighted that children should be breastfed and start consuming other foods at six months and that feeding frequency reduces and type of food change as they grow older. Participants noted that not all women introduced foods at six months.

5.2.2 Food consumption and availability in the household

The results from the discussion on the extent of diversity among household diets and food availability are presented below:

5.2.2.1 Household consumption of diverse diets

The concept of children consuming diverse diets was linked to the diets consumed by the rest of the household. This was then related to which crops were grown by the households and if animals

were reared. That is, what can grow well given the land available, its fertility and other environmental factors like rainfall, pests and diseases. Certain crops were said not to grow well in the area and thus few individuals were successfully growing them, such as millet, potatoes, groundnuts, yams, cabbages, and tomatoes.

Consumption of fruits and vegetables was strongly linked to their seasonal availability, with preparation and consumption high during the harvest periods for fruits and the rainy season for vegetables. In the off- and dry seasons, minimal efforts were made to ensure that these food groups were consumed. Exceptions were those who have farmland near swamps, those with kitchen gardens, as vegetables require plenty of water and are scarce during the dry season.

> ".. amaranth and other vegetables are eaten during the rainy season when they are abundantly available … during the rainy season, we have a lot of vegetables which we mix with beans or groundnuts." [Women, prior involvement]

> "No one buys fruits. We eat fruits when they are in season and are available in plenty." [Men, no prior involvement]

Fruit availability was linked to two main issues – first, the number of trees and types of fruit trees one has. The more trees, the more stable the access throughout the year. This is because the trees flower and fruits mature at different times. Flowering was noted to not only differ across species, but also within species. Second, fruits are an income-generating crop in the community. This reduces the fruit available for home consumption and limits communal access (children eating fruits from neighbours' fields).

The choice of which crops are grown was said to be influenced by the farmers' effort. This refers to the importance one places towards growing a particular crop, which determines whether they grow a given crop and in what quantities. This in turn influences the household dietary diversity. Participants reflected that some farmers are lazy, while others do not value crops like green leafy vegetables, fruits and pumpkins.

> "cassava is always available; it just depends on one's effort and energy. If one fails to plant enough and on time, they will not have enough to eat. The same with sweet potatoes." [Women, prior involvement]

> "There are some foods that most people don't see the importance of planting, like pumpkins. It's not that they don't eat these foods, but they don't see the importance of planting them in their homes." [Women, no prior involvement]

The access and quality of information also influenced crop selection, appropriate planting and care for crops, and food choice and preparation. Participants were more likely to grow crops they were familiar with and those that produced a good yield. Knowledge from elders (mothers and

grandmothers) was also cited as having an influence on which foods were served to children. Though there has been agricultural and nutrition-related training in the community, some farmers have not been keen to participate. Examples of the repercussions of a lack of information included farmers that leave vegetables to grow unattended, which led to inconsistent availability; while others were not able to optimally utilise their land.

> "it depends on how well you plan for your farmland; for instance, if you have 0.8 hectares of land, you have to plan on where and how much to plant … There are some people who are poor at planning for their land even if it a lot they can end up misusing it for example someone might have like 1.2 hectares of land and plant there only maize. You can't feed on maize alone. So, they start moving around begging for other food stuffs." [Women, no prior involvement]

Consumption of animal-source foods was limited because households adhere more to crop production and not animal production given the high production costs, diseases, as well as losses incurred following theft. For example, continuous access to eggs was said to be possible only if one kept poultry, while milk was considered a luxury for others. To access animal-source foods, they used household income or sold other food items in stock to obtain money to purchase these foods.

Production, preparation and serving of diverse diets was also said to be hindered by time. Given the different chores and responsibilities, there was limited time to adequately care for children, farm and prepare the different foods that would constitute a balanced meal in time; in addition, as parents also considered the food preferences of the children when selecting foods. Children were said not to like monotonous diets, which are common following the harvest of a particular crop.

> "it also depends on the time you have at hand to prepare a meal for the family. For instance, if I have come back home at 1 pm and I need to prepare a quick lunch, I will opt for the food that takes a short time to prepare like *posho* (maize meal)*, katogo* (cooking bananas)*,* silver fish and then you can save the foods that take a bit longer for dinner." [Women, no prior involvement]

> "They have tried teaching us, but even then, we fail because we don't have time. We come from farms very late and tired. You cannot have the time and energy to mix foods when the children are hungry. So, the issue is time and some foods not being available – this prevents us from having balanced diets," [Women, no prior involvement]

> "Children who are three years and above are able to ask for what they want, and if it's available, it is given to them … Also, when the child loves and enjoys a kind of food, you continue to prepare it for them." [Men, no prior involvement]

The perceptions about food and child feeding described earlier also underpinned the food choices during preparation and serving.

Changes that have occurred over the last 20 years that have influenced household dietary diversity included reduced availability of wild fruits and vegetables, which mainly grew in bushes, forests and wetlands, but can hardly be found now. Fruits have become a cash crop and children can only eat fruits grown by the household. More people, especially youth, are becoming less interested in agriculture and are resorting to other professions. Lastly, there is an increase in the population, which leads to households having smaller parcels of land, and there are also more mouths to feed in a household due to extended family members.

“Fruits back then used to be communally accessible, however nowadays with everything having a price tag, the last you would want is your child being found ‘stealing’ mangoes or jackfruit at neighbours,” [Women, prior involvement]

More factors affecting dietary diversity were mentioned by the FGDs with prior involvement (105 prior involvement vs 79 no prior involvement), and by FGDs of women (110 FGDs of women vs 74 FGDs of men). The factors of effort put into agriculture and time for agriculture, childcare and feeding were only mentioned by FGDs of women.

5.2.2.2 Household food availability

Food was mainly sourced through four avenues: own farm production, bought from the market, gathered from the wild, and/or obtained in exchange for labour. There was consensus between all FGDs that the majority of the food was grown and should be grown on their farms. A few exceptions were noted. What they lacked because the crop was not grown by the household, or food stocks had run out, they bought from the market. However, as earlier mentioned, a lack of fruits and vegetables did not necessarily lead to their purchase. The cost of the food and its availability in the market was a major influence on the type and quantity of food bought. Markets with a larger variety of food stuffs were noted to be far.

> “… if we do not have any at home, we do not cook greens.” [Women, no prior involvement]
>
> “I also only buy cooking bananas, the rest of the food and vegetables I get from my garden” [Women, prior involvement]
>
> “It depends on what foods, for example Irish potatoes, groundnuts, maize flour, milk, watermelon, pineapples are bought from distant markets. Posho and rice are sold nearer so the distance to the market is not an issue.” [Women, prior involvement]
>
> “... there are periods when both the farmer and the buyer buy food. The main problem is change in weather; during the dry spell we all don’t have food. For us we are people in

> the village, we are not supposed to buy food like people who live in towns, but it is because of bad weather …" [Men, no prior involvement]

Food availability from own household production was affected by three factors. Land was a major issue, with the size of land that a household has access to limiting the variety and quantity of crops grown. Access to additional land through hiring was hindered by the availability of suitable land and the costs involved. The soils were also noted to have low fertility. Second, pests and diseases were prevalent, requiring the use of pesticides for most crops. Lastly, changing weather patterns that include prolonged dry seasons and unpredictable rainfall have affected crop yields. Extra income is therefore needed to access more land, hire labour to farm and purchase the necessary inputs, for example fertilisers, manure, pesticides and herbicides. This increases the cost of production for which returns may not be achieved, for example when the area faces a prolonged dry spell.

> "The land has been fragmented and is no longer enough to produce enough food … most families had plots of land to grow their own food, but most has been divided and some sold so others do not own any … In addition to this, our land is exhausted for you to get a good yield, you have to spend more on fertilisers, and watering to have meaningful harvest." [Men, prior involvement]

> "… soils used to have earth worms, which help in increasing soil fertility; now because of overusing spraying they are no longer present in soils …. We overuse chemicals, sometimes unnecessarily …. to wipe out weeds, pests and diseases – this has led to loss of soil fertility." [Women, prior involvement]

> "Producing food these days has become difficult because of soil exhaustion. It is hard to produce without using pesticides and fertilisers." [Men, no prior involvement]

It was not only the increased agricultural needs that had to be met, there were other household needs like school fees, medical bills, and sundries, which all required money. To raise income, participants noted that they were selling more of their agricultural produce and reducing the portion of the harvest left for home consumption. The sale of complete crop harvests and of fruits had increasingly become common. The FGDs of women particularly noted that men were more likely to sell complete crop harvests, while as women they had to consider what food will be available for the household.

> "The food we grow would be adequate, but the problem is that we sell most of the food to get money and meet some expenses such as school fees." [Men, prior involvement]

> "… most people sell off their crops to get money to sustain their homes, but it's the men who do it mostly. For us we are always thinking of our children, but men prefer to sell all …" [Women, no prior involvement]

Changes in food production over the last 20 years included lower crop yields, changes in the types and quantities of food grown, and cost of production. Reduction in crop yields were attributed to changes in the weather, reduction in soil fertility, and increased incidences of pests and diseases. Production of foods like maize has become more common, while others like cooking bananas, pumpkins, groundnuts have reduced. The diversity of green leafy vegetables has also reduced such that only two species are common: amaranth and scarlet eggplant leaves.

Less food was allocated for household consumption given the various income needs. In addition to an increase in cost of production, there has been a reduction in prices after harvest. While on the other hand, prices of food in the market have increased.

5.2.3 Factors affecting dietary diversity and food availability

Following the discussion of food availability and consumption, a summary of factors influencing dietary diversity and food availability in the households and inferred in the community was made together with the participants. The list included: weather patterns, drought, pests and diseases, limited variety and quantity of crops grown, increased sell of harvest, increased household size, limited land availability, lack of water for farming, limited labour, high cost of foods, poverty, lack of income, soil fertility, limited access to inputs, limited time, low prices for harvest, information, skills, motivation and level of effort applied, thieves, and distance to markets.

The four-cell results generally showed that the factors affected many households, frequently (Figure 5-2). The factors and their placement were informative during the food-strategy development process (Chapter 6). The FGDs of women placed all factors in the same cell while the FGDs of the men had eight factors affecting few households.

> "When you look at the factors that we said affect many households, these are the issues that are faced by almost every family in this area. For example, diseases, almost each family is experiencing … those that happen once in a while are not prevalent in most months of the year. For example, drought comes three to six months in a year." [Men, no prior involvement]

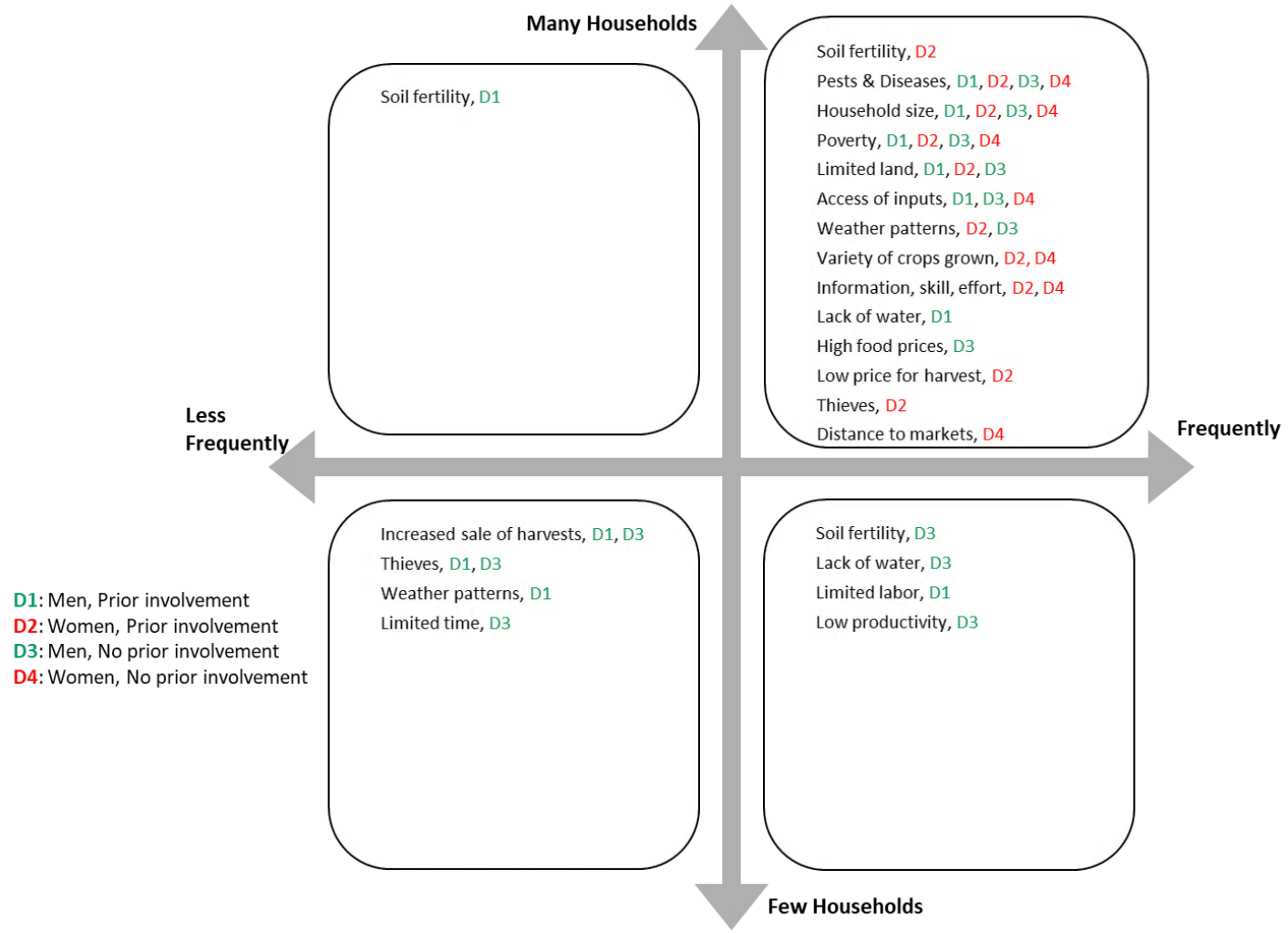


Figure 5-2 Magnitude of factors influencing dietary diversity and food availability as perceived by FGD participants using the four-cell[1]

[1]Few households referred to less than four households for every 10 households; frequently referred to a scenario occurring often or regularly throughout the year

5.3 Improving the food and nutrition situation

Following an analysis of the above results from the first round of FGDs, the main factors that affect food availability and dietary diversity were identified (Table 5-3).

Table 5-3 Summary of factors that affect food availability and dietary diversity

Category	Factors
General farming factors	Size of land available Knowledge and skills on land use Interest and effort put into farming
During farming	Agricultural inputs: seeds, fertiliser, pesticides Seasons/drought Soil fertility Pests and diseases
After harvest	Food for the home vs food sold for income Thieves Income received from sale of harvests Types of food in the market Price of food in the market Distance to the market
Food preparation and serving	Time for food preparation Knowledge on what to feed the children and how to prepare it Types of food that were grown Food preferred or desired by father or mother Food preferred by child Child getting other food in-between time for meals Seasonal availability of certain foods
Other factors	Number of people in the household Knowledge and understanding about food and its importance Putting into practice what is learned Household income

The above factors were grouped into six focus areas for the second round of FGDs. This round consisted of the same participants (in their respective categories) as in the first round of FGDs. The factors were grouped by the researcher based on how they affect food availability and dietary diversity, and those within the household's control:

1. Knowledge and skills on land use
2. Farming techniques to improve production (address fertiliser, pesticides and soil fertility)
3. Knowledge and understanding about food and its importance
4. Putting into practice what is learned: cost and time for preparation of meals
5. Access and use of inputs like seeds, fertiliser, pesticides
6. Interest and effort put into farming diverse foods that yield a balanced diet

5.3.1 Knowledge and skills on land use among smallholder farmers

Issues around land use included limited land size, poor soil fertility and a limited range of crops that could be grown. Participants addressed these issues by prioritising on crop

production area allocations, increasing their access to land and using a range of techniques to increase soil fertility and manage water.

Given the available land, emphasis was placed on knowing how to partition land and plant the required crops to ensure enough food for the household is grown – that is, to ensure that one can grow crops for food and sale as per respective household needs and preferences. This was noted to require knowledge on which crops can be intercropped and those that cannot, as well as when to grow annual (seasonal) and perennial crops. The selection of which crops were grown was also dependent on soil fertility, and one's capacity to manage that crop on that piece of land.

> "… for me on one side I plant crops that can grow any season and on the other side I put crops that are seasonal." [Men, no prior involvement]

> "…it depends on the amount of land one has and the food needs in the household … you have to decide according to the food you need whether to grow only beans, or maize or cassava … or you can end up growing many food stuffs on the same piece of land." [Women, prior involvement]

To improve soil fertility, the use of manure and fertilisers, mulching and crop rotation were employed where possible. However, the latter was not perceived as favourable because it limited the variety of crops that could be grown. The use of fertilisers and manure like cow dung was limited by the cost and the size of land that required their use. While all FGDs mentioned use of manure, most participants did not practise this. It was noted as an old technique, which some participants were not vigilant to continue. Mulching was mainly mentioned in relation to banana plantations, where it improves soil fertility and water retention. In addition to mulching, watering of vegetables and fruit seedlings was also noted. Irrigation was not extended to other crops because of the expenses and labour involved.

> "… for me when I plant food like maize on a piece of land in a season and it doesn't mature well, the next time I don't plant maize there. It means that the land is not good for maize, so I try another crop in the next season … But because of this, I also end up losing on the opportunity to plant other types of food, because if a food doesn't mature well in the area it means I can't have it." [Men, no prior involvement]

> "We also use fertilisers or manure and other methods of farming like mulching to keep the soil healthy and fertile so that we can maximize harvest … we dig holes where to collect rubbish and once it rots its very good for the soil. For me I have it at home." [Men, prior involvement]

Hiring of additional land for growing annual crops was also done to increase the total land under cultivation by the household. This was dependent on the availability of money and land to hire.

While the above practices were mentioned by both FGDs with prior intervention and those without, more practices were currently being implemented by participants with prior intervention involvement.

> "We have not done much to change how we farm. Although I am also using crop rotation, it has not helped much. I think we need to use manure and fertilisers, but we are not doing it because we do not have money." [Men, no prior involvement]

5.3.2 Farming techniques used by smallholder farmers to improve production

The practices employed by farmers to adequately utilise land in the previous section were also applied to improve production. That is, in addition to crop rotation, mulching, use of manure and/or fertilisers and irrigation, use of pesticides to combat pests and diseases, use of herbicides against weeds were mentioned. However, while some of the participants disliked the use of chemicals and thus did not employ them, others found them beneficial, but could not afford their regular use. On the other hand, some of the participants found their use inevitable given the available seed. As noted in the first round of FGDs, most of the seed available was said to have been treated. This in turn implied that if the resulting crops were not treated with pesticides, yields would be low.

> "Me I plant maize, there are pests that used to affect my maize, but I put together some money and bought medicine and sprayed. Ever since I started spraying there is an improvement and the harvests are good." [Men, no prior involvement]

Timely land preparation, planting, weeding and pruning was also mentioned. The management practices differed with the crop in question. Participants were more likely to cultivate crops they had experience of growing and for which high yields were previously obtained. The selection of crops grown, the skills and knowledge used in their production were largely a result of practices passed on from elders, parents, friends and neighbours.

> "You learn with the experience in farming, you keep trying different things, interacting with friends until you find a technique(s) that work well for you. I also apply my own knowledge because I have been farming from childhood." [Men, no prior involvement]

Availability and the use of inputs such as seed (particularly improved or treated seed), manure, fertilisers, pesticides, and herbicides was a product of the knowledge one had about their use and application; their costs; and their impact on yield. It was noted that though one needs additional income to purchase fertiliser, a small amount can be used for a large area and less time and labour is required compared to organic manure. However, trade-offs were made when choosing between fertiliser and organic manure. This is because fertiliser leads to good yields, requires less time and labour, and a small amount could be used for a large area. However, it must be applied each season. For organic manure, it can be made on the farm, thus reducing costs, and the effects on yield can continue until the next season. The

yields are not as high as for fertiliser – a large amount is required for a small area, and application is laborious.

> "Buying fertilisers depends on the level of income in that particular season … also, we have preferred the fertilisers over organic manure. The fertilisers we buy tend to work well for one season and in the next the land is weak and does not yield well. Also, for example I might have 10,000 UGX (3USD) and I buy 3 kg of NPK or DAP (types of fertiliser) which I can use on a large area, but it only works in that season. I could buy 1 kg of cow dung or waste from goats or poultry for 10,000 UGX (3 USD), but will not cover large space, but it lasts longer therefore when there are not enough resources, I settle for cow dung." [Women, prior involvement]

Access to genuine inputs such as seed, fertiliser, and pesticides was also a concern as well as being able to obtain additional income to buy seed and fertiliser, such as borrowing from saving groups.

5.3.3 Knowledge and understanding about food and its importance

Participants made choices over which foods to plant, which foods (and quantities) to keep as food or sell, and which ones to cook for a given day or meal. The reasons behind these decisions were interconnected and centred around the food needs of the household.

First, priority for production and consumption was given to foods that alleviate hunger, traditional and/or local foods, and foods that provide income. Key foods such as maize, cooking bananas, sweet potatoes, cassava, and beans were planted/tended to or purchased first.

> "You need to have money for various things, so you have to ensure that you have diversity of food crops at home to avoid expenditures on food because money is an issue … It is better for one to plant food crops that are enough to cater for the diet of our children and family members at large." [Women, prior involvement]

> "When the rains come, what comes to mind for everyone to first plant beans, maize, cassava." [Women, prior involvement]

> "In my home there are some foods that we know are important and have to be there at all times like beans. So, we make sure we plant it and store beans" [Men, prior involvement]

Second, having seasonal/annual crops vs perennial crops, crops that mature quickly, or available all year round especially in the lean season, or 'easy' to produce were preferred. This was because a crop that required less labour allowed more time for production of other crops or household responsibilities. Fast-maturing crops were also favoured as they shortened the lean seasons. Third, the taste preferences and nutrition benefits, particularly for children, were also considered.

> "For us (women), our main objective is to have food to eat and provide for the family." [Women, no prior involvement]

Consumption of a balanced diet was noted as important, particularly for FGDs with prior involvement. However, achieving it was affected by the ability/inability to grow and purchase the different crops, which would result in a balanced diet. The former was the preferred scenario because the cost of foods did not allow for their adequate purchase. Informed and careful planning was therefore needed to ensure that a balanced diet is consumed.

> "I plant different foods and make sure my family has a variety to eat. Also, I educate my family (wife and kids) to prepare different foods and most importantly healthy foods." [Men, prior involvement]

> "Most of these foods you cannot rely on spending money on them, because what you can buy is not even enough to feed the family, for children to eat and be satisfied …. So, this motivates us to grow more." [Women, prior involvement]

> "Other crops like cassava, sweet potatoes, *African nightshade* (scarlet eggplant leaves) and other greens, also are not seasonal, they can endure any season of the year as long as they are well taken care of." [Women, prior involvement]

Even with the right information and intention to produce and consume a balanced diet, time was a limiting factor. Crops must be planted and managed in a timely manner. Therefore, in order to grow different crops, participants noted that one had to plan, be systematic, be strong/ determined, and have support. Income to obtain additional labour was an added advantage.

> "Because of limited labour you find yourself not planting certain crops and missing out in certain season. For example, by the time you finish preparing the land and planting beans, maize and sweet potatoes, it is time to weed them and you have not been able to plant other foods" [Women, prior involvement]

In addition, the time required to prepare balanced meals strongly influenced what was cooked. The women FGDs noted that the different chores especially gardening determined the timing of meals and what foods could be cooked. Lunch meals usually consisted of foods that had short cooking times and were less diverse. Evening meals had more preparation time available that allowed preparation of more diverse meals.

> "For me I cannot leave the garden before midday, and when we are back home, I prepare a quick *katogo* meal on the charcoal stove for the child, for the older ones, I always have left overs of cassava or potatoes aside which I leave warm on the stove. Immediately we finish lunch at about 3pm, I begin dinner preparations which we eat at 8pm. It's hard to balance the diet on that tight schedule, yet it's important that we tend to the gardens ….and all things are on you (the mother) singlehandedly" [Women, prior involvement]

> "You return from the garden very tired which makes it very hard to put detail into cooking. But there are days when you are free, staying at home then you can plan and add detail to whatever it is you are going to cook. Therefore, those who don't spend many hours in the garden can afford to but not for many who spend most of the day in the garden. You come back home and there is even no water the you have to first fetch some before you start cooking; there is just no time" [women, no prior involvement]

For the FGDs with no prior involvement, emphasis was placed on providing food for the household and not the nutritional value of the food. Even though the different foods that make up a diverse diet were mentioned as important for good nutrition, taste, and meal composition, a diverse diet was mainly viewed as consuming different types of starchy staple foods. Consumption of a diverse diet was therefore viewed as costly, a waste, or impractical due to the incorrect understanding of a balanced diet by some of the participants.

> "It is a bit tricky (having a diverse diet) because the foods you have are cooking bananas, potatoes, pumpkins but if perhaps you want to add rice and potatoes it becomes really expensive and yet you have to save money for the children. It becomes wasteful and you will even have leftovers because the family can't eat all that. Children love rice, therefore when we are preparing, you have rice for children and add cooking bananas for the adults because rice is costly. Therefore, it is impossible to cook all those foods at a low cost, either way you lose money and even time." [women, no prior involvement]

5.3.4 Implementation of practices learned by smallholder farmers

The skills, information and knowledge behind the practices and decisions made by the participants presented above were said to have been obtained mainly from parents, elders, family, friends and neighbours; from experience; and through training, media and fellow community members who had attended these training.

Learning from one another and replication of practices was a result of observations of the effects of a technique. This was followed by interactions and sharing of information. Observations included good-looking fields, high yields, and good-looking children. The downside of this process was a lack of detail by the person sharing the technique and failure to accurately follow directions by the one trying it out. This negatively affected the results, for example, incorrect administering of fertiliser or pesticides, which would inaccurately imply that the fertiliser or pesticide did not work.

> "For some we learn from the different agricultural seminars, but mostly we copy and learn from one another. You copy from someone who got good yields. From friends or neighbours … But also, this knowledge is natural, within us, which we grew with from experiences and discernment." [Women prior involvement].

> "The truth is that we plant to have quantity and enough food; even if we get the knowledge from the studies, we just somehow don't follow them. But we try especially with young children who need milk, porridge Irish and special foods. Also, we learn from neighbours, friends when you see how they feed their children, or you can just ask a friend who has children what foods to give your child at specific age as they grow … For me there are some things I learn from other farmers, if I see something that has worked well for them, I also put it in action. For example, spraying I asked a friend of mine and he told me to try. When I tried, it worked well." [Men, no prior involvement]

Armed with skills and information, several participants adopted practices such as the production and consumption of vegetables, and enriching children's meals. However, implementation was not continuous, with many reverting to old practices. This was attributed to a lack of resources, such as money, seeds, land, labour; and limited time. Laziness and/or a lack of a push factor also led to abandonment of the technique. Push factors included monitoring by projects, community extension workers or leaders.

> "I have tried to put in practice, but sometimes I fail. For example, the poultry failed, the nutritious beans failed, and paw paws dried. But I managed to keep growing *dodo* (amaranth)." [Men, prior involvement]

> "it is true all these things require time, whatever we learn will need that you allocate time for its implementation, sometimes omitting some routine things at home which is very hard, because these routines and responsibilities are still important." [Women, prior involvement]

Access to information and training was considered inadequate as most of the community members were said to be untrained by the FGD participants. More misinformation, especially nutrition information, was noted among FGDs with no prior involvement versus those with prior involvement with an agricultural and/or nutrition intervention. There was limited information on nutrition and 'new' agricultural techniques such as the use of fertiliser and pesticide. Even when avenues to acquire information via meetings and training were presented, it was noted that attendance was lacking. The FGDs of women were of the view that women were more inclined to attend meetings and/or training compared to men, yet implementation of important or new knowledge requires both the man and woman of the household to be present.

> "The others issue is that people don't show up for meetings because they feel meetings are a waste of time and they don't benefit much from them … It is mostly the women who attend these meeting because by nature it is the women who care for the well-being of their families. Men are not that concerned with such things." [Women, no prior involvement]

> "When you mention such a topic for the meeting (nutrition or food security) most people will not show up … 25% is the percentage of people who attend meetings in the community. However, if you tell them that they will receive money in that meeting, then the whole village will attend." [Women, no prior involvement]

5.4 Discussion of the community perspective results

Though a variety of foods were available in the community from own production and markets, meals were largely composed of starchy staples and legumes. The diets discussed corresponded with earlier reports of diets mainly composed of cereals like maize, roots and tubers like cassava, cooking bananas and beans (Shiverly & Hao, 2012; Ekesa *et al.*, 2015), and corresponded to the findings in Phase 1 of the study (Chapter 4). While some participants considered the diets of their children to be adequate, others considered them inadequate, with varying perceptions of what an adequate diet is. Despite the perception of adequacy by some, diets of children in the study region have been reported to be lacking with only 26% meeting the minimum dietary diversity (≥4 food groups), and 13% consuming the minimum acceptable diets, values lower than national figures of 30% and 15% respectively (UBOS & ICF, 2018). In addition, inadequate intakes of micronutrients, especially vitamin A, vitamin B-12, iron, zinc and calcium have been reported(Harvey, Zo Rambeloson & Dary, 2010).

Food was mainly obtained from own farm production and markets, with own production regarded as pivotal. Purchase of different food groups were limited by their cost and availability in the market with markets having a variety of food stuffs located farther from the participants' households/ villages. Household food consumption patterns and dietary diversity are influenced by the production systems of smallholder farmers, whether crop, livestock, or mixed, and their market access (FAO, 2014b). In addition to providing diverse diets, production of a variety of crops has additional advantages for the smallholder farmer such as reducing risks to shocks such as poor harvests and low prices for harvests (Rapsomanikis, 2015).

For households that are poor, have low on-farm diversity and have poor market access such as the long distances faced by participants, production diversity has been found to have a stronger influence on dietary diversity. While for households with more income and market access, the influence of production diversity on dietary diversity reduces (Sibhatu, Krishna & Qaim, 2015; Kissoly, Fabe & Grote, 2018). Therefore, both the productivity and production diversity and markets access of similar smallholder farmers should be addressed in order to improve their dietary diversity and food security. (Wiggins & Keats, 2012; FAO, 2014b).

Consumption of fruits and vegetables was limited by seasonal availability where a lack did not necessarily lead to purchase even when income was available. Participants noted that fruit availability and household consumption was also linked to fruit diversity produced and the income potential of fruits because majority were sold. The diversity of fruits and vegetables can be leveraged to address the seasonal access challenges through agrobiodiversity assessments, targeted diversification and promotion of fruit and vegetable consumption

(Kahane *et al.*, 2013; Borelli *et al.*, 2020). In fact, improving year-round availability of micronutrient-rich fruits and vegetables by increasing the number of varieties available has been reported to increase consumption (Bioversity International, 2017). Also, an increase in household income was associated with increased in demand for fruits compared to that for vegetables in Sub-Saharan Africa, as vegetables were more expensive than fruits (Ruel *et al.*, 2005). Therefore, for the study site, such an increase in income whether on-or off-farm may reduce the quantities of fruits sold, thus increasing their availability for home consumption.

Household food production a major determinant, was related to the diversity of foods consumed and production was in turn influenced by land availability, soil fertility, pest and diseases and weather patterns. The production challenges noted were similar to those previously reported for smallholder farmers in Uganda and elsewhere (Ekesa *et al.*, 2015; NPA, 2015; Rapsomanikis, 2015; Fiala & Apell, 2017; WFP, 2017; van Wijk *et al.*, 2018). Participants in an ethnographic study in Tanzania also closely related the determinants of dietary diversity and those that affected having enough food and agricultural production (Powell *et al.*, 2017). This goes to show that addressing production challenges to improve the livelihoods of smallholder farmers will go a long way in improving food security and dietary diversity.

Agricultural and nutrition knowledge and awareness informed the priority crops in terms of food production, consumption and diversity. Inadequate nutrition information was also noted. Agricultural knowledge and income have been reported to influence input and technology use and adoption (Rapsomanikis, 2015; World Bank, 2018), and improving nutrition knowledge and skills has been shown to improve dietary practices (Kulwa *et al.*, 2014; Agize, Jara & Dejenu, 2017; Hirvonen *et al.*, 2017; Murendo *et al.*, 2018). Community members have specialised knowledge and experience that can be harnessed to solve challenges, which strengthens the case for participatory approaches and context driven interventions (Bogart & Uyeda, 2009; UNDP, 2012).

Information access and use was varied and a poor attitude towards meetings and trainings was noted particularly among men. To efficiently improve the knowledge, attitude and skills in agriculture and nutrition revealed in the study, the available information access channels need to be maximised. Community meetings and trainings provide an opportunity to share and receive information that can improve food security diet quality (Nankumbi & Muliira, 2015). And to improve their effectiveness, appropriate behaviour change methods should be used. Behaviour is influenced by several factors, the perceptions and attitudes of an individual and their community, the local culture, economic environment and availability of resources (Schmied, 2019). Therefore, development of a social behaviour change strategy can inform communication strategies, build social support, increase intervention impact and enhance empowerment in the target community (Michie *et al.*, 2009).

Time was a major limiting factor noted by the women, affecting production of diversity, preparation of balanced diets. Time has been previously reported as a determinant of child

feeding practices and dietary diversity (Nankumbi & Muliira, 2015; Powell *et al.*, 2017). While agricultural interventions tend to increase time commitments of the impacted household member, women are especially affected given their key role in both agriculture and nutrition. In addition, different household members (men, women, youth, children) respond to the increased time burdens and workload in different ways, which has implications on the nutrition impacts of interventions (Johnston *et al.*, 2018). Intervention designs therefore need to assess and address such gender issues and include labour and time sensitive practices.

5.5 Summary

Children's diets were similar to those of the rest of the households. The diversity of diets was mainly influenced by the crops grown by the household, the seasonality of the crops, especially fruits and vegetables, the price of food stuffs, particularly animal-source foods, and household income. Priority was placed on key crops that alleviate hunger and contribute to household income; these are maize, cooking bananas, sweet potatoes, cassava, and beans. It was perceived that food within a household should be produced by the household. Poor perception towards meetings, insufficient nutrition information, skills and training in the community were also noted by the FGD participants. Food production was influenced by access to land and capital, costs of production, income potential, climate, and farmer knowledge and experience. Cost of food and market availability influenced the type and quantity of food bought and consumed. Gaps in knowledge about nutrition and dietary diversity were noted. Improving knowledge and skills in food production, optimisation of available resources to enhance dietary diversity and improving access to diverse foods could lead to improved dietary diversity among households in the study area. Efforts to improve dietary diversity should therefore address the food security and production challenges faced as well as support income generation whether on- or off-farm, and market access to diverse foods. Intervention design needs to address gender issues and include labour and time sensitive practices. Capacity building in nutrition and practices that support access to and utilisation of diverse food baskets is also required. This can be enhanced by development of social behaviour change strategies and further studies into knowledge sharing and access, and attitudes towards learning in households and communities will inform communication strategies, build social support and enhance empowerment. These results (chapter 5) together with those in chapter 4 were brought together in the design of the food-based strategy in chapter 6.

Chapter 6 Designing the food-based strategy

6.1 Introduction

This chapter presents Phase 3 of the study that brought together the findings from Phase 1 (household and market survey) and Phase 2 (FGDs) to design a Contextualised Food-based Strategy (CFBS) using a systematic planning framework. The strategy was contextualised to the needs and assets of the study population. The intervention planning framework was used to systematically bring together the needs-based and asset-based approaches in strategy design. This chapter therefore lays out information on the design approach used, the strategy design process and the developed CFBS.

6.1.1 The design approach used to develop the food-based strategy

An intervention planning framework was used to systematically design the CFBS. This section presents this approach and how it was applied to the study. An assessment of the needs identified in Phase 1 and 2 of the study was conducted and a description of low dietary diversity was made. This was followed by an assessment of the abilities and resources of the community, a description of the intervention context and setting of strategy goals. All the above were informed by results from Phase 1 and 2 of the study, relevant literature and relevant theories.

The PRECEDE/PROCEED model was used to define low dietary diversity through an analysis of the causes and determinants of the related behaviours and environment in the study population (Green, Kreuter & Green, 2005; Eldredge et al., 2016). The main components of the logic model were:

a) Health problem

The logic model began with a definition of the health problem under study; that is, low dietary diversity, its prevalence, characteristics, and the population facing the problem.

b) Quality of life

The quality of life issues that occur as a result of low dietary diversity were then ascertained using relevant literature.

c) Behaviour and environmental factors

Behavioural factors, that is behaviours within the households and community that support or inhibit dietary diversity, were identified. The environmental factors that refer to conditions in the social and physical environments that influence low dietary diversity and influence the behavioural factors were also identified. The environmental factors were analysed at three levels: (i) the interpersonal level, looking at the individuals or groups that influence the behaviour and norms of the households; (ii) the organisational level, looking at how formal structures like schools, religious institutions, health services, and extension services in the community influenced dietary diversity; and (iii) the community level, evaluating the social space shared by different units in the community, such as families, villages, and groups such as farmer groups and saving groups (Eldredge et al., 2016).

d) Personal determinants

An analysis of the personal determinants of behaviour within the households and of those who can influence their environmental conditions was conducted at an individual level; that is the parents or caregivers of the children.

Identified theoretical frameworks were used throughout the development of the logic model. The theories of behaviour, Reasoned Action Approach (RAA) (Ajzen & Fishbein, 1980; Gold, 2011; Fishbein *et al.*, 2012) and Social Cognitive Theory (SCT) (Bandura, 1986; Baranowski, Cheryl & Guy, 2002; Glanz, Rimer & Viswanath, 2015a; Eldredge *et al.*, 2016) were used to understand and tease out the behavioural, environmental and personal factors and determinants.

Using the existing data, the assets and capacities of individuals, communities and their environments were evaluated to identify assets that could be leveraged and incorporated into the strategy to improve dietary diversity. The assets were assessed in the following categories:

i. Physical environment that includes the natural or built environment
ii. Human capital
iii. Social environment that includes community values, power, groups or organisations, and communication channels
iv. Institutional or policy environment

The context in which the CFBS will be implemented was determined and described. This included a description of the implementers, actors and beneficiaries of the strategy. The strategy goals were set based on the factors identified in the logic model of low dietary diversity. The factors were ranked based on their relevance and changeability. Relevance was related to the dietary diversity of children in the target households and the quality of life as supported by evidence. Changeability related to a factor being more or less changeable within the strategy implementation time frame, community assets identified, and a given set of resources in the strategy. Behavioural and environmental conditions that are more relevant and more changeable were a priority, while those that were less relevant and less changeable were not a focus. Less relevant but more changeable factors were of lower priority, but were incorporated because they can be used to demonstrate initial change and ensure good will in the community and among stakeholders (Green, Kreuter & Green, 2005; Eldredge et al., 2016).

The proposed change in dietary diversity in the CFBS goal was based on the dietary diversity of the children and households surveyed. The average dietary diversity of the 33% of households with the highest score was then used as the target (Swindale & Bilinsky, 2006). These goals were set at the end of the needs assessment step and refined throughout the development phase.

A logic model of change that shows the pathways of effects of the CFBS was developed. This involved identification of the behavioural and environmental outcomes that the strategy will

accomplish, the performance objectives for obtaining the behavioural and environmental outcomes, and the personal determinants of the behavioural and environmental performance objectives.

The assumption of the logic model was that a change in the behaviour and environment factors identified during the needs-assessment would lead to more diverse diets and improve the quality of life of the target population.

Behavioural outcomes referred to what the individual/household would or would not perform as a result of the strategy. The environmental outcomes focused on the factors that influence low dietary diversity among the target population at interpersonal and community levels.

Performance objectives are actions or performances required to achieve the outcomes and ensure appropriateness of the strategy outcomes and expectations. Performance objectives were therefore set for each behavioural and environmental outcome, with different objectives for different categories of individuals or different levels.

Using the results obtained in Phase 2 of this study, and the RAA and SCT theories, an assessment of the changes in the personal determinants: knowledge, attitudes, beliefs, self-efficacy and expectations that would support the performance objectives, and lead to changes in the behaviour and environment that support dietary diversity, was conducted.

6.1.2 The strategy development approach

The change objectives were re-organised by their personal determinants, and subject matter. This was followed by a search for theories and behaviour change methods that have previously been used to influence the personal determinants (knowledge, skills, self-efficacy, and attitude), particularly in areas of nutrition and health.

This was followed by a selection of the target audience, that is, who the proposed target actors of the CFBS are. These included adopters, individuals or organisations that decide to put the strategy into action, implementers that deliver the strategy, and primary beneficiaries. This was followed by setting the outcomes and performance objectives, and determinants for the actors. Behaviour change methods that could be applied to address their determinants and thus contribute to the performance objectives were also identified.

An implementation plan that fits in the CFBS was proposed by considering practical ways in which the change methods could be applied in the given context while ensuring that the parameters that make the selected theories and behaviour change methods effective were maintained. This process also involved selecting who in the target population would be involved, how they would be engaged, the scope of the strategy implemented, sequence of activities, and materials required. The resulting plan was cross-referenced against the set strategy objectives, change methods, and theories to ensure that all were incorporated and addressed. The strategy was conceptualised at three levels: at the individual level of the target population (beneficiaries/target beneficiaries); at the individual level of community

champions/change agents (primary implementers); and at a community level involving leaders and extension workers.

The CFBS evaluation plan was developed to determine whether the strategy achieved the desired outcomes and if the observed changes could be attributed to the strategy. This involved identification of an evaluation design that fit the community context, the developed CFBS, and ensured validity and reliability. Effect and process evaluation plans that outlined the outcomes, evaluation questions, indicators and measures required were set.

Effect evaluation included assessment of the efficacy and effectiveness of the CFBS, the extent to which the outcomes were achieved and resulting changes in the set performance. The effect evaluation questions and indicators were derived from the quality of life factors, behaviour and environmental determinants, performance objectives, and change objectives in the logic model. The questions and indicators were identified considering what would be achievable in the strategy timeframe of two years, the level of effects expected within this timeframe, and the recommended indictors and measures from literature.

Process evaluation questions and indicators on the other hand focused on how the strategy was implemented. They captured the extent of the strategy that was delivered and received versus what was intended, the context in which it was implemented, the beneficiaries reached, and the responsiveness of the beneficiaries.

6.2 The CFBS design process

This section presents the strategy design process, that is, the results obtained at each stage of the design approach described above.

6.2.1 Needs assessment

This involved the identification and description of the problem that the strategy will address. A logic model that defined low dietary diversity in the study site (Figure 6-1) was developed by looking at the scope of low dietary diversity, its effect on the quality of life, and the behavioural, environmental and personal determinants. RAA and SCT theories were applied to Phase 1 and Phase 2 results to identify the determinants of low dietary diversity (Table 6-1).

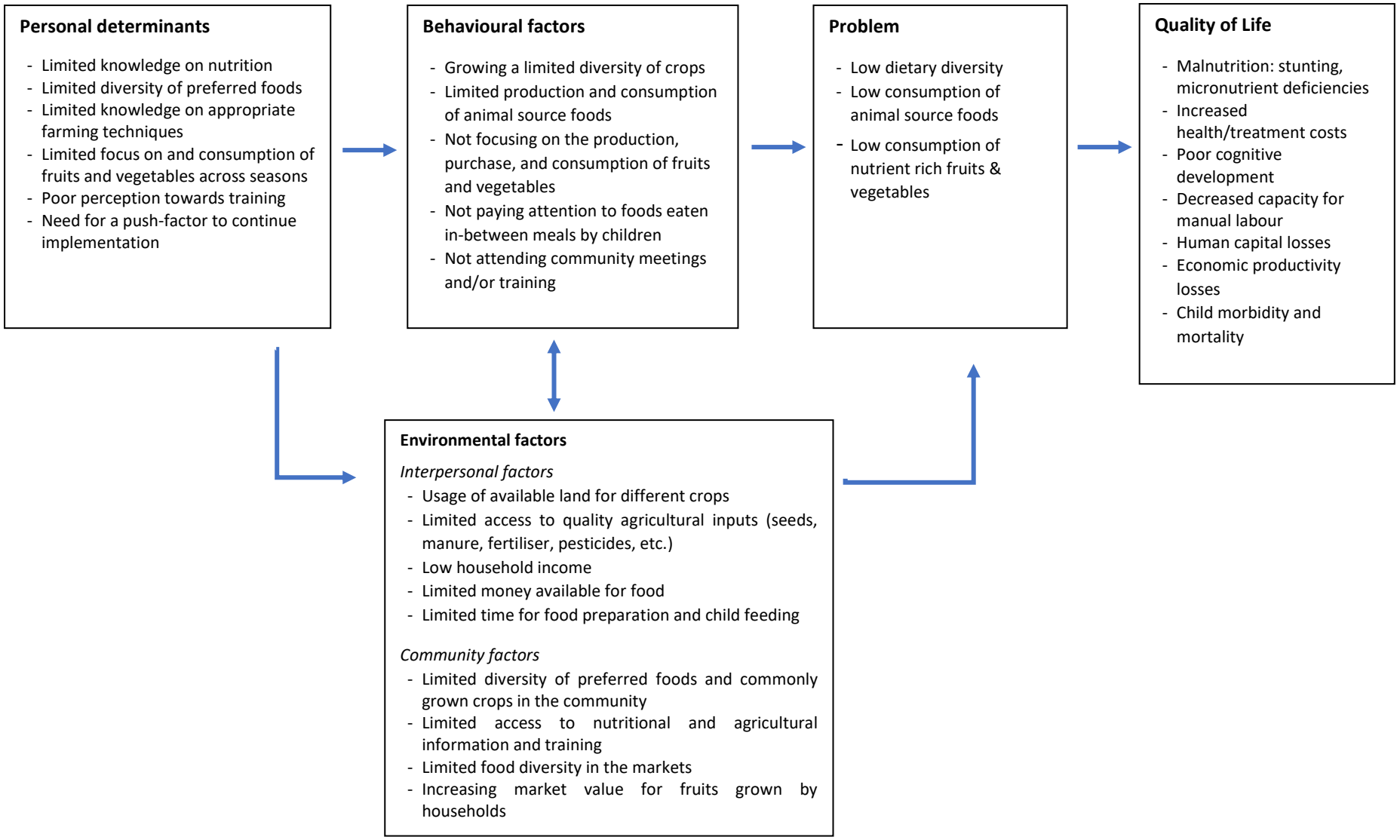


Figure 6-1 Logic model of low dietary diversity

Table 6-1 Application of the Reasoned Action Approach and Social Cognitive Theory to identify behavioural and environmental factors influencing dietary diversity

Theory	Aspects*	Aspect definition*	Determinants of dietary diversity from study results
Reasoned Action Approach	Intent to perform a behaviour is influenced by: 1) Salient behavioural beliefs	Beliefs about dietary diversity and its consequences which lead to a favourable or unfavourable attitude about dietary diversity	- Mixed information and inadequate knowledge about nutrition and whether dietary diversity is important or not - Incorrect understanding of dietary diversity as diversity of starchy foods and not diversity of the whole diet that led to the perception that dietary diversity was wasteful and expensive - Perception that if hunger is done away with, then the diet is adequate - Food preference was limited to a few crops, which limits diversity accessed (produced and consumed) - Perception that preparation of diverse meals required time, which was limited by various household chores and responsibilities
	2) Perceived normative beliefs	Beliefs towards dietary diversity by relevant individuals or groups of people give rise to subjective norms	- Limited diversity of commonly grown crops (priority crops) within the community, which influences the diversity available - Perception that food consumed must be produced within/by the household - Fruit consumption was limited to household production due to the increasing market value of fruits in the community - Poor perception and attendance of meetings and/or training, which are considered a waste of time or a luxury - Perception that consumption of a diverse diet was for households of a higher status or with higher income
	3) Salient control beliefs	Perceived factors that facilitate or impede dietary diversity	- Lack of time to adequately plant and tend to all the desired crops - Lack of time to adequately care for children, and prepare adequate meals, given the various household responsibilities - Lack of income to grow a variety of crops and buy additional foods that could increase dietary diversity, especially animal-source foods - Perception that current diets are adequate - Household reliance on seasonal availability of fruits and vegetables and making minimal effort to access them during the dry/off-season - The need for knowledge and skills on how to grow a variety of crops on the limited land available was mentioned by participants

Theory	Aspects*	Aspect definition*	Determinants of dietary diversity from study results
			- Fruit and vegetable consumption centred around their seasonal availability - Mixed information on the appropriate meals for children (food combinations and preparations) from social and cultural beliefs
Social cognitive theory	Behaviour is determined by: 1) Outcome expectations	Perceived consequences likely to occur as a result of having a diverse diet	- Perception that dietary diversity was wasteful and expensive (that is, diversity of starchy foods and not diversity of the whole diet) - Perception that diverse diets requires income, to produce and buy various foods, therefore is for households of a higher status or who have higher income - Perception that current diets are adequate and thus dietary diversity is not essential - Participants desired to have freedom of choice over what is consumed and ability to avoid monotonous diets
	2) Outcome expectancies	The value that an individual, places on a particular outcome as a result of dietary diversity	- Mixed information and inadequate knowledge about nutrition and the benefits of dietary diversity - Participants desired to feed their children well and have them healthy - Poor perception towards meetings and/or training
	3) Self-efficacy	Person's perception about dietary diversity, which affects the amount of effort invested and the level of performance attained	- Perception that diverse diets requires income, to produce and buy various foods, therefore is for households of a higher status or who have higher income - A lot of time is required to plant and tend to all the desired crops adequately - A lot of time is required to adequately care for children, and prepare adequate meals, given the various household responsibilities - Perception that if hunger is abated, then a diet is adequate - The perception that fruits and vegetables can only be consumed when they are in season
	4)Behavioural capability	Knowledge of dietary diversity and have the skills necessary to achieve it	- Mixed information on the appropriate meals for children (food combinations and preparations) - Mixed information and inadequate knowledge about nutrition and the benefits of dietary diversity - The need for knowledge and skills on how to grow a variety of crops on the limited land available was mentioned by participants

Theory	Aspects*	Aspect definition*	Determinants of dietary diversity from study results
			- Lack of knowledge on the adequate food choices amidst available resources
	5) Environment	External environment to the individual which affect dietary diversity including social and physical environment	- Presence of arable land. The quantity and quality of land influenced the type of crops grown and their yields - Climate that enables the planting of crops twice a year. However, changes in rainfall patterns negatively affected production - Perception that farming is an important livelihood for income and food security - Sharing of information with community members. Those that learned, taught others. Those that did not learn, asked others.

*References: (Ajzen & Fishbein, 1980; Bandura, 1986, 2004; Baranowski, Cheryl & Guy, 2002; Gold, 2011; Fishbein *et al.*, 2012; Eldredge *et al.*, 2016)

6.2.1.1 Identification of the health problem

Poor quality diets with low diversity among children and their households is the problem in this study. Children under five years are a priority because they are at a higher risk of malnutrition, morbidity and mortality due to malnutrition. In addition, improving their nutrition contributes towards breaking the intergenerational cycle of malnutrition (FAO, 2018; UBOS & ICF, 2018). Low dietary diversity among the target population – rural smallholder farming households in Kiboga district – was noted during the household survey and the FGDs conducted in this study. Low consumption of vitamin A-rich foods and animal-source foods (<30%) was found among children. The FGDs also noted limited consumption of animal-source foods and seasonal consumption of fruits and vegetables. The diversity of children's' diets was related to the household diets and food produced by the household. These findings are supported by other studies that report that 42 to 63% of children aged six to 59 months in Kiboga district have diets with low dietary diversity (Kizza, 2014; Nabuuma, Ekesa & Kennedy, 2018).

Health problem identified (Figure 6-1):

- Low dietary diversity
- Low consumption of animal-source foods
- Low consumption of vitamin A-rich fruits and vegetables

6.2.1.2 Quality of life of children

Dietary diversity is a proxy of micronutrient adequacy (dietary quality) and provides a measure of household access to a variety of food (Daniels et al., 2007; Moursi et al., 2008; Kennedy et al., 2013). Poor diets are among the leading risk factors for global health and disease (Stanaway et al., 2018). Inadequate diets are among the causes of malnutrition and mortality in Uganda. Malnutrition, particularly stunting, iron deficiency anaemia and iodine deficiency disorder lead to human capital and economic productivity losses attributed to poor cognitive development, lower school performance, reduced earning potential, and decreased capacity for manual labour (Namugumya et al., 2014).

Quality of life pathways identified (Figure 6-1):

- Malnutrition: stunting, micronutrient deficiencies
- Increased health/treatment costs
- Poor cognitive development
- Decreased capacity for manual labour
- Human capital losses
- Economic productivity losses
- Child mortality

6.2.1.3 Behavioural and environmental factors

The behavioural and environmental factors are discussed under two sub-headings.

Behavioural factors

The households surveyed were found to mainly grow eight crops out of a total of 23 crops reported. Only <10% grew fruits and vegetables. Results from the FGDs showed that both production and consumption were focused on priority crops that alleviated hunger and ensured there was 'food' in the household. Priority crops included maize, cooking bananas, sweet potatoes, cassava, and beans. In addition, less than half of the households surveyed owned at least one type of livestock (42%). From the FGDs, limited importance of fruits and vegetables was noted, where minimal efforts were made to ensure their production, purchase and consumption in the off- and dry seasons.

Households and children mainly consumed two to three meals. The fewer number of meals a household had, the fewer food groups they consumed. In addition, the fewer the number of months that households had adequate food, the more likely they were to experience food insecurity. In between the family meals, the FGDs noted that some households ensured that children had access to food, while others did not.

Low attendance during community meetings and/or training was also revealed in the FGDs. Community training led by community leaders, extension workers or organisations was said to cover a range of topics not limited to health, agriculture, food security, nutrition, finances, and governance. A poor perception towards meetings and/or training, particularly among men, limited dissemination and acquisition of knowledge and skills in the community.

Behavioural factors identified (Figure 6-1):

- Growing a limited diversity of crops
- Limited production and consumption of animal-source foods
- Not focusing on the production, purchase, and consumption of fruits and vegetables
- Not paying attention to foods eaten in-between meals by children
- Not attending community meetings and/or training

Environmental factors

a) Interpersonal-level factors

From the FGDs, it was found that the children's diets were related to the household's diets and the food available and/or accessed by the household. Household agricultural production was said to be influenced by the land available, soil fertility, labour available, household access to inputs like seed, fertiliser, herbicides and pesticides, and knowledge and skills to grow different crops. With access to 1.5±0.06 number of plots of land for agriculture where each plot was 0.04±0.01 hectares, knowledge on how best to use available land to produce enough food for the household influenced the diversity of crops grown.

Household income was said to influence the use of inputs, selection of crops grown, and purchase of food items. The FGDs reported limited household income amidst a wide range of

household needs, which include food. Reports also indicate that the proportion of income spent on food influences dietary diversity, especially when used to purchase diverse, nutritious foods, and obtain necessities for a healthy, productive life like health care, shelter, and education (Herforth & Harris, 2014).

Limited time to appropriately plant and manage all crops and prepare a balanced meal amid other household and personal responsibilities was noted in the FGDs. This affected the care given to children and the number, timing, and composition of meals served. The FGDs of women noted that a variety of food would be available, but the time to prepare them inadequate. Household lifestyles and work patterns have been reported to influence meal patterns and composition (Oniang'o, Mutuku & Malaba, 2003; Nankumbi & Muliira, 2015).

Interpersonal-level factors identified (Figure 6-1):

- Usage of available land for different crops
- Limited access to quality agricultural inputs (seeds, manure, fertiliser, pesticides, etc.)
- Low household income
- Limited money available for food
- Limited time for food preparation and child feeding

b) Community-level factors

According to the FGDs, households were more likely to grow crops they were familiar with, those commonly grown by the household and community, and those that produced a good yield. There was therefore a set of commonly accepted or expected crops or animals produced. This set basket of foods influences the diversity of food available and dietary diversity within the community. It has been reported that access to a variety of foods influences dietary quality even when there is adequate knowledge on appropriate food practices (Craveiro et al., 2016).

In addition to the poor perception towards meetings and/or training, insufficient nutrition information, skills and training in the community were noted by the FGDs.

The households surveyed attended bi-weekly markets 6.5±0.3 km away from their homesteads. However, from the market survey, the commonly accessed markets had a limited diversity of food groups available (six out of 11 groups) and a limited variety of food items per food group. The FGDs also noted that the cost of food and its availability in the market was a major influence on the type and quantity of food bought. The markets in the study site that had a larger variety of food stuffs required a longer commute. These market dynamics limited household access to a variety of foods, especially fruits, vegetables, legumes and fish.

A growing demand in the community for several food items, such as fruits by traders, was noted. Most households sold their fruits, which limited the amount available for consumption within the community as the traders took the fruits to the cities. This change also limited community access of fruits by children.

Community-level factors identified (Figure 6-1):

- Limited diversity of preferred foods and commonly grown crops in the community
- Limited access to nutritional and agricultural information and training
- Limited food diversity in the markets
- Increasing market value for fruits grown by households

6.2.1.4 Personal determinants

From the FGDs, it was found that both prior experience and personal preference played a role in the selection of which crops were grown and consumed. Knowledge on the production of different crops influenced the type and variety of crops grown by households. Choice of farming techniques used was based on several factors not limited to previous yields, information available, costs and labour required, and personal preference.

It was also perceived by the FGDs that the majority of food for the household should be grown on their own farms. However, consumption of fruits and vegetables was strongly linked to their seasonal availability, with limited consumption during the off-season.

Incorrect information on adequate diets, dietary diversity and food groups was noted among the FGDs, especially among FGDs with no prior involvement with an intervention. Nutrition was considered a crucial factor when selecting crops for production and consumption, particularly for participants with prior involvement with an intervention.

From the FGDs, a poor perception towards community meetings and/or training was noted whereby they were perceived to have limited value/applicability. After an intervention lifespan, FGD participants noted that implementation of technologies or practices was not continuous. Aside from the lack of resources such as money, seeds, land, labour; and limited time, the neglect of practices were due to a lack of a push-factor in the form of monitoring by project personnel, fellow community members part of the intervention, community extension workers or leaders.

Personal determinants identified (Figure 6-1):

- Limited diversity of preferred foods
- Inadequate knowledge on appropriate farming techniques
- Limited focus on and consumption of fruits and vegetables across seasons
- Limited knowledge on nutrition
- Poor perception towards meetings and/or training
- Need for a push-factor to continue implementation

6.2.2 Asset assessment

Assets that could be leveraged and incorporated into the strategy to improve dietary diversity included physical, human, social and institutional assets, as shown in Table 6-2.

Table 6-2 Assets identified in the study community

Type of asset	Assets identified
Physical	- Presence of arable land - Agro-ecological zone supports the production of a wide range of crops - The region has two rainy seasons, in which crops can be planted - Presence of markets: physical markets from which to buy food; and traders to whom harvested produce can be sold
Human	- Men and women involved in agriculture and ensuring household livelihoods - Family labour for food production and preparation (including youth) - Community labour for hire for agriculture-related tasks
Social	- Farming is considered a vital livelihood - Childcare is valued - In addition to subsistence farming, there is an economic mindset around agriculture - Able to work in groups. There are various groups in the community, such as farming and saving groups - Willing to share information - Inherent knowledge about agriculture and food
Institutional	- Presence of agricultural and health support in the form of agricultural extension workers and community health extension workers - Community leaders that support initiatives

6.2.3 Identification of CFBS goals

The behavioural and environmental factors that influence dietary diversity and need to be addressed by the CFBS were identified using a relevance-changeability ranking. Table 6-3 lays out the relevance-changeability ranking of the behavioural and environmental factors, while Table 6-4 summarises the factors based on their magnitude of relevance and changeability. The more relevant and more changeable factors were identified as priority factors for the strategy, followed by those that were ranked as more relevant and less changeable, and less relevant and less changeable.

Table 6-3 Relevance and changeability of behavioural and environmental factors influencing dietary diversity

Behavioural factors	**Ranking***	**Comment**
- Growing a limited diversity of crops - Limited production and consumption of animal-source foods	More relevant; More changeable	Emphasised by FGD participants as a determinant of dietary diversity. Production diversity improves availability and accessibility of food. Production diversity has been noted as a determinant of dietary diversity for rural smallholder and/or subsistence farmers, particularly when on-farm diversity is low and/or when market access is poor (Sibhatu, Krishna & Qaim, 2015; Kissoly, Fabe & Grote, 2018).
- Not focusing on the production, purchase, and consumption of fruits and vegetables	More relevant; More changeable	Study population relied mainly on the seasonal availability. Seasonality of fruits and vegetables influences their accessibility and the dietary diversity (Ayenew et al., 2018; Murendo et al., 2018).
- Not paying attention to in-between meals consumed by children	More relevant; More changeable	Fruit consumption (by children and rest of the household) was mainly in-between the main household meals, according to the FGDs. However, what and how much were eaten by the children was not planned/monitored, as noted in the FGDs. Household lifestyles and work patterns influence meal patterns and composition, which in turn affect diet quality (Oniang'o, Mutuku & Malaba, 2003; Beyene, Worku & Wassie, 2015; Nankumbi & Muliira, 2015).
- Not attending community meetings and/or training	More relevant; More changeable	Community meetings and training were one source of information on nutrition and agriculture in the study community. They provide an opportunity to share and receive information on nutrition promoting practices that can improve diet quality (Nankumbi & Muliira, 2015).
Environmental factors	**Ranking***	**Comment**
- Usage of available land for different crops	More relevant; More changeable	Availability of arable land influences the farming systems and technologies employed, as well as the production diversity and food security (Ritzema et al., 2017; van Wijk et al., 2018)
- Limited access to quality agricultural inputs (seeds, manure, fertiliser, pesticides, etc.)	Less relevant; Less changeable	Agricultural inputs were necessary for production and directly influenced yields, according to the FGDs. The income and knowledge available not only influences the type, quantity, and quality of inputs accessed and their usage, but also the adoption of productive technologies (Rapsomanikis, 2015; World Bank, 2018)
- Limited diversity of preferred foods and commonly grown crops in the community (priority crops)	More relevant; Less changeable	According to the FGDs, farmers were more likely to grow crops they were familiar with and those with market value and can therefore contribute to household

Behavioural factors	**Ranking***	**Comment**
		livelihoods. It has been noted that food production, supply and diets are increasingly limited to a few species (Lartey et al., 2016).
- Low household income - Limited money available for food	More relevant; Less changeable	In the study, income was noted to particularly limit consumption of animal-source foods and consumption of a diverse diet, especially in the off-seasons. Income, especially food consumption expenditure, is related to dietary diversity (Kissoly, Fabe & Grote, 2018). In fact, household dietary diversity is used as a proxy indicator of a household's economic access to food (Kennedy et al., 2013). Access to income and markets reduces the association between food production and dietary diversity. So, for the poor, there is a stronger association between production diversity and dietary diversity (Rajendran et al., 2014; Ayenew et al., 2018). Decision making over household income and its allocation also affects nutrition, with joint decision making and participation of women leading to better dietary patterns (Dioula et al., 2013; Jones, Shrinivas & Bezner-Kerr, 2014).
- Limited food diversity in the markets	More relevant; Less changeable	The influence of market access on dietary diversity, that is, proximity, purchasing power, and choices made have been reported (Kissoly, Fabe & Grote, 2018). However, the diversity available in the market is an additional aspect that can affect dietary diversity, as reflected in the market survey.
- Increasing market value for fruits grown by households	Less relevant; Less changeable	Increasing market value for fruits grown by households reported in the study implies an increased likelihood of the sale of household fruit harvests for income. The resulting income, if adequately allocated and appropriate food choices are made, can contribute to dietary diversity (Sibhatu, Krishna and Qaim, 2015; Qaim, Sibhatu and Krishna, 2016)
- Limited access to nutritional and agricultural information and training	More relevant; More changeable	Nutrition knowledge and education positively influence dietary diversity and nutrition outcomes (Hirvonen et al., 2017; Ochieng et al., 2017; Murendo et al., 2018). This makes access to appropriate information important.
- Limited time for food preparation and child feeding	More relevant; Less changeable	Meal planning, preparation and feeding are part of the caregiver roles and responsibilities. This is in addition to various household, agricultural, and even off-farm responsibilities, which compete for time (Nankumbi & Muliira, 2015; Powell et al., 2017)

*Ranking: Relevant - factors' relevance towards improving dietary diversity of children in the priority population based on evidence (data and literature); Changeable – assumption that the CFBS can lead to a change of this factor, as based on evidence (data and literature)

Table 6-4 Rank of factors influencing dietary diversity for identification of strategy goals

More relevant; less changeable Food access - Limited production of animals - Low household income - Limited money available for food - Limited food diversity in the markets - Limited diversity of preferred foods and commonly grown crops - Limited time for child food preparation and child feeding - Need for a push-factor to continue implementation	**More relevant; more changeable** Food production - Growing a limited diversity of crops - Usage of available land for different crops - Not focusing on the production, purchase, and consumption of fruits and vegetables Food consumption - Low consumption of fruits and vegetables - Low consumption of animal-source foods. Limited focus on and consumption of fruits and vegetables across seasons - Not paying attention to foods eaten in-between meals by children Efficacy - Limited access to nutritional and agricultural information and training - Poor perception towards training and not attending community meetings and/or training
Less relevant; less changeable - Limited access to quality agricultural inputs - Increasing market value for fruits grown by households	**Less relevant; more changeable** Not applicable

The goal of the strategy is to improve dietary diversity of children in smallholder farming households through improved household production, income utilisation, and food consumption practices. The dietary diversity of children surveyed was 2.9±1, with 78% of children six to 23 months old consuming less than four food groups (did not met the minimum recommended dietary diversity) while 71% of the children 24 to 59 months old consumed three food groups or less (had low dietary diversity). The average dietary diversity of the third tertile (children with the highest dietary diversity score) was two food groups for the children six to 23 months old and three food groups for the children 24 to 59 months old. Regarding meal frequency, the average number of meals consumed by the children was 3.3±0.1. The average meal frequency of the third tertile for children six to 23 months old and 24 to 59 months old was four meals. Therefore, the dietary diversity goal of the CFBS was set as consumption of at least three food groups and at least three meals and a snack each day.

6.2.4 Application of behaviour change methods and theories

A review of behaviour change methods in literature revealed several methods in use, a wide array of terminology, and missing details like either absence of the theoretical underpinnings that the method used, or how the methods were applied. The most frequently used methods provided information, created awareness, formed intentions, set goals, included action planning, identified barriers/had problem solving, included demonstration and practice, provided social support, and had self-monitoring. These were mainly delivered through community/group models, individual counselling, and media, and targeted the individual, household/family and community (leaders or members). Nutrition education was part and parcel of the delivery of the recommended practices (Michie et al., 2009; Shi & Zhang, 2011;

Fabrizio, van Liere & Pelto, 2014; Kulwa et al., 2014; USAID, 2015; Samdal et al., 2017). The group approach was selected for use in the CFBSCFBS proposed implementation plan.

Though the use of several methods and channels was found to be more effective than a single one, the use of a small set of methods and channels was more effective than several different techniques due to the inconsistent quality of delivery that can arise with several techniques (Michie et al., 2009).

The theories referred to in behaviour change interventions included control theory, information-motivation-behavioural skills model, theory of planned behaviour, operant theory, and social cognitive theory (Michie et al., 2009; Michie, van Stralen & West, 2011; Stacey et al., 2015; Cradock et al., 2017; Macready et al., 2018). In the CFBS, three theories were selected to inform its design, that is, used to identify the behaviour change methods, how the methods will be applied and the strategy aspects such as scope and sequence. The theories were: 1) Social Cognitive Theory (SCT) (Bandura, 2004; Glanz, Rimer & Viswanath, 2015a); 2) Goal-setting Theory (GST) (Locke, 1991; Strecher *et al.*, 1995; Locke & Latham, 2002; Lunenburg, 2011); and 3) Elaboration likelihood model (Petty & Cacioppo, 1986; Petty, Barden & Wheeler, 2009).

Skills and self-efficacy are key personal determinants in the CFBS; for this reason, SCT was well suited. Self-regulation is a key concept in this theory and is achieved through providing the skills and opportunities for self-monitoring, goal-setting, feedback, and problem solving (Bandura, 2004; Glanz, Rimer & Viswanath, 2015a). Self-regulation, mastering of skills, and use of coping models to improve self-efficacy particularly related to the personal determinants of dietary diversity, and observational learning were also incorporated in the CFBS.

To elaborate self-regulation in SCT, GST was also applied to further bridge the intention-behaviour gap. SCT also complements GST given that enhanced self-efficacy leads to setting of higher goals and more effort and persistence, resulting in higher performance of goals and behaviour change (Locke & Latham, 2002; Lunenburg, 2011). Therefore, the behaviour change methods and applications were selected and designed to ensure that ability and self-efficacy were enhanced, strategic goal setting could be done, and feedback was provided.

The elaboration likelihood model was used to inform how the identified behaviour change methods would be applied in the CFBS. This model emphasises enabling careful consideration of information by beneficiaries, implying that for the priority population, realistic and practical information, informal settings with deliberations, and demonstrations would be beneficial (Petty, Barden & Wheeler, 2009).

The personal determinants of the behavioural and environmental performance objectives were identified as knowledge, skills, self-efficacy, attitude, perception, and outcome expectations (Table 6-5) and their importance with regard to the CFBS was ranked (Table 6-6). However, for the development of performance objectives, focus was placed on

knowledge, skills, self-efficacy, attitude, and outcome expectations. Attitude is how individuals see and behave towards a situation and is formed as a result of learning, modelling, and experiences. Attitudes influence decisions and behaviour and are a socio-economic characteristic of an individual (Pickens, 2005; Bahamonde-Birke et al., 2015). Perceptions on the other hand are how an individual interprets a situation into something meaningful to them based on beliefs, experiences or attitudes. They are an intrinsic value and portray how an individual experiences their environment prior to taking action towards or concerning the factor at hand (Pickens, 2005; Bahamonde-Birke et al., 2015). Attitude was therefore selected over perception for inclusion in the matrices because it encompasses how individuals experience their environment, as well as the stand/position they take as a result of their experience or assessment of said experience.

Table 6-5 Identification of personal determinants of the behavioural and environmental performance objectives

Theory	**Factors**	**Factor definition**	**Personal determinants*** *(why would people perform the performance objectives?)*
Reasoned Action Approach	Intent to perform a behaviour is influenced by: 1) Salient behavioural beliefs	Beliefs about dietary diversity and its consequences, which lead to a favourable or unfavourable attitude about dietary diversity	- Have knowledge of the importance of dietary diversity - Have first-hand experience of the importance and benefits - Know how to achieve dietary diversity with the available resources - Want to achieve dietary diversity in addition to providing food (addressing hunger) and other household needs (have it as a goal) - Have a positive attitude, perception and confidence in their ability to achieve dietary diversity
	2) Perceived normative beliefs	Beliefs towards dietary diversity by relevant individuals or groups of people give rise to subjective norms	- Information and experience that dietary diversity for the children and household can be achieved using the available resources - Know how to achieve dietary diversity with the available resources - Community and its actors have the necessary information on nutrition and dietary diversity to support households - Community and its actors know and are implementing some of the approaches that support dietary diversity - Community and its actors have positive attitude, perception and confidence, and share information and skills on dietary diversity
	3) Salient control beliefs	Perceived factors that facilitate or impede dietary diversity	- Know how to achieve dietary diversity with the available resources - Able to increase and utilise resources to ensure diets are diverse - Have information and skills on how to produce diverse foods - Have support within the household to implement the chosen approaches (attend training, grow crops, prepare, serve, enable time to do so, permission, avail resources) - Have positive attitude, perception and confidence in their ability to achieve dietary diversity
Social cognitive theory	Behaviour is determined by 1) Outcome expectations	Perceived consequences likely to occur as a result of having a dietary diversity	- Have knowledge of the importance of dietary diversity - Have first-hand experience of the importance and benefits - Have positive attitude, perception and confidence in their ability to achieve dietary diversity - Have the ability (knowledge and skills) on how dietary diversity can be achieved

Theory	Factors	Factor definition	Personal determinants* *(why would people perform the performance objectives?)*
	2) Outcome expectancies	Value that an individual, places on a particular outcome as a result of dietary diversity	- Know the importance of dietary diversity to quality of life - Know the additional benefits to the household livelihood - Have first-hand experience of the importance and benefits
	3) Self-efficacy	Person's perception about dietary diversity, which affects the amount of effort invested and the level of performance attained	- Know the importance of dietary diversity to quality of life - Know how to achieve dietary diversity with the available resources - Have information and skills on how to produce diverse foods - Have support within the household and community to implement the chosen approaches (attend training, grow crops, prepare, serve, enable time to do so, permission, avail resources) - Have positive attitude, perception and confidence in their ability to achieve dietary diversity - Able to increase and utilise resources to ensure diets are diverse
	3)Behavioural capability	Knowledge of dietary diversity and have the skills necessary to achieve it	- Know how to achieve dietary diversity with the available resources - Able to increase and utilise resources to ensure diets are diverse - Have information and skills on how to produce diverse foods - Have access to resources required to achieve dietary diversity - Have first-hand experience of the importance and benefits
	4) Environment	External environment to the individual, which affects dietary diversity including social and physical environment	- Community and its actors have the necessary information on nutrition and dietary diversity to support households - Community and its actors know and are implementing some of the approaches that support dietary diversity - Community and its actors have positive attitude, perception and confidence, and share information and skills on dietary diversity

*Personal determinants were based on study results that showed an influence on the behavioural and environmental performance objectives. That is, answering the question 'Why would people perform the performance objectives?'

References: (Baranowski, Cheryl & Guy, 2002; Bandura, 2004; Fishbein et al., 2012; Eldredge et al., 2016)

Table 6-6 Ranking of personal determinants of the behavioural and environmental performance objectives

Personal determinant	Ranking*	Justification
1. Knowledge	More relevant; More changeable	Nutrition knowledge is an important determinant of the diet quality of children, women, and households. Caregivers' understanding of appropriate infant and child feeding practices when addressed has been shown to improve dietary practices (Kulwa et al., 2014; Agize, Jara & Dejenu, 2017; Hirvonen et al., 2017; Murendo et al., 2018). Knowledge on the importance of different food groups and appropriate child feeding were gaps identified by study participants.
2. Skills	More relevant; More changeable	Food availability and access are central to diet quality. Adequate skills are required in food production, generation and use of income, food purchase, preparation and consumption. Presence of these skills improves food security, dietary quality and nutritional status (Sibhatu, Krishna & Qaim, 2015; Ochieng et al., 2017; Powell et al., 2017; Kissoly, Fabe & Grote, 2018).
3. Self-efficacy	More relevant; More changeable	Self-efficacy is one of the determinants of behaviour and a predictor of behaviour change. It has been shown to influence food choices, preparation methods and improve feeding practices when addressed (Bastani, 2012; Gase, Glenn & Kuo, 2016; Stephens et al., 2017; Zongrone et al., 2018). Study results showed a perception that diverse diets could only be achieved by households of higher socio-economic status. A lack of confidence to overcome barriers to providing balanced meals and barriers encountered during implementation of recommended practices after an intervention ends were also noted.
4. Attitude	More relevant; More changeable	Results of the study showed that the type and quantity of crops grown and consumed were also influenced by the household decision makers' attitude. This was associated with dietary diversity, food security, and access to information. Attitude together with knowledge have an impact on practices. To achieve recommended diets (through behaviour and environmental change), the three elements need to be appropriate (Vardanjani et al., 2015; Christian et al., 2016; Nassanga, Okello-Uma & Ongeng, 2018; Zerfu & Biadgilign, 2018)
5. Perception	More relevant; More changeable	An individual's perception of the importance of a behaviour and its consequences, the determinants/barriers of a behaviour and their capacity to overcome and achieve it are important aspects of behaviour change (Baranowski, Cheryl & Guy, 2002; Fishbein et al., 2012). Perceptions of adequacy of diets, importance of foods, determinants of dietary diversity and the ability to achieve dietary diversity that supports and hinders diet quality were noted in this study and also reported elsewhere (Frohberg, 2017; Powell et al., 2017; Ng'endo, Bhagwat & Keding, 2018). Negative perceptions need to be addressed while positive perceptions can be capitalised on in the development of the strategy.
6. Outcome expectations	More relevant; More changeable	Outcome expectations are the perceptions around the consequences likely to result from a behaviour or action. They are learned from previous experiences, observing and hearing from others in similar situations, and emotional and physical responses to the behaviour (Baranowski, Cheryl & Guy, 2002; Eldredge et al., 2016). They in turn influence the attitude, adoption, effort invested, and maintenance of the behaviour. The study noted various perceptions around achieving dietary diversity, food security, and applying agricultural practices that were said to be beneficial but not in use that will need to be addressed.

*Ranking: Relevant – relevance of factors towards improving dietary diversity of children in the priority population based on evidence (data and literature); Changeable – assumption that the CFBS can lead to a change of this factor as based on evidence (data and literature)

6.3 The developed CFBS

This section presents the developed Contextualised Food-based Strategy (CFBS), that is: (i) the goal, outcomes, outputs, performance objectives; (ii) target actors; and (iii) the proposed implementation and evaluation plan.

6.3.1 Goal and objectives of the CFBS

The CFBS is designed for rural smallholder farming communities with children under five years old, who will be the primary beneficiaries. The CFBS is designed for use by development and/or community-based organisations, policy makers, and government institutions with a mandate to improve the nutrition and livelihoods of farming communities, particularly in rural areas.

The goal of the CFBS is to improve dietary diversity of children in smallholder farming households through improved household production, income utilisation, and food consumption practices. The dietary diversity goal is consumption of at least three food groups and at least three meals and a snack each day. The basis of the goal and baseline are outlined in section 6.2.3. The baseline was determinised by the dietary diversity noted in chapter 4.

The CFBS has three objectives that will need to be achieved in tandem:

(1) To increase diversity of foods produced by the households, particularly fruits and vegetables, using sustainable production practices that enable smallholder farmers maximise their available resources. This will increase household availability and access to diverse foods and contribute to income. To achieve this objective, production methods will be tailored to smallholder farmers, and be gender, labour, time and cost sensitive. Access to the required information and skills will be increased through equipping and involvement of extension service providers and community leaders, community champions that demonstrate practices, and local media, as well as the use of formal and informal learning environments. Additional social support to promote adoption of the practices will be provided through farmer and community groups and networks across different household typologies to ensure that the vulnerable households also have support and access to the information and skills. This will require formation/ strengthening of formal and informal farmer groups and organisations.

(2) To increase household access to diverse foods through appropriate use of household income and markets. This objective focuses on improving dietary diversity through markets and requires an increase in the diversity of foods in markets that serve the rural communities, household financial literacy to support allocation of income to diverse foods, appropriate food choices, and increase of household income through on-farm and/or off-farm activities. Linkages of traders to farmer groups and support of informal trading of diverse foods such as fruits, vegetables, legumes and animal-source foods by households and farmer groups will be important. Households will be equipped to plan and maximise their resources whether on-farm and/or off-farm so that income and livelihoods are improved. This capacity building needs to address household gender

dynamics around decision making. It is important that household incomes can be effectively and consistently used to access diverse diets and not only starchy staples. Improving the diversity produced in objective one will also increase the household access to diverse foods.

(3) Improve the quality of diets consumed by children and households in terms of diversity, frequency, nutrient quality and safety. This will be achieved through nutrition education that includes promotion of and capacity building in incorporation of fruits, vegetables, and animal-source foods in child and household diets, increase of meal frequency by children, essential nutrition actions, utilisation of appropriate post-harvest-handling, food preparation, and food safety methods, and appropriate food choices in the market. Similar to objective one, extension service providers and community leaders, community champions, local media, and social support will be vital in creating awareness and increasing adoption of practices. These awareness creation efforts will also serve to create a demand for diverse foods within the rural communities and therefore buyers for the diversity being sold as a result of objective 2. Demand creation can target community institutions such as schools, faith institutions, and farmer organisations and groups.

The CFBS outcomes, outputs and performance objectives are outlined in Box 1 Section A (Chapter 7).

As a result, the behavioural and environmental outcomes, performance objectives and personal determinants created a logic model of change, an illustration of the effects of the implementation of the CFBS (Box 1 Section B, chapter 7).

6.3.2 Target actors of the CFBS

To achieve the set CFBS objectives and outcomes, involvement of different actors at different levels will be required. The selected actors include policy makers, government institutions and development organisations, extension workers, community-level groups/ networks, community champions, smallholder farming households, and other influencing actors/stakeholders. These actors, whose details are outlined in Box 1 Section C (Chapter 7), all have individual mandates that currently contribute towards improved livelihoods, production, and nutrition. The actors were identified based on the strategy objectives and existing organisational frameworks (section 2.7). However, the CFBS, strengthens and/or complements their respective mandates, and ensures that dietary diversity among rural smallholder farmers is improved.

At their respective levels, the personal determinants of the actors need to be addressed if the performance objectives are to be met and barriers addressed, that is, changes in their knowledge, skills, self-efficacy, attitude, and outcome expectations. They require knowledge about the CFBS, correct and current information about strategy information and practices, and the importance of the CFBS with reference to their mandates and the livelihoods of the communities they serve. Therefore, creating awareness among these actors and building their capacity is part of the CFBS.

They also require skills, self-efficacy, positive attitude, and positive outcome expectations regarding programme planning, awareness creation, enhancing social support, mobilisation, creation of linkages, application of required agricultural production, market, financial and nutrition skills and practices, to mention but a few, with respect to their role in the CFBS.

It is also important that as custodians of information and skills, both formal and informal learning environments are harnessed. Learning needs to be active, goal driven, and activity based, enabling problem solving, decision making, and review of behavioural and learning goals. Examples of channels that incorporate the above include workshops and meetings for formal settings; village and homestead group interactions for learning in informal environments; practical and relevant messages that address a problem and present the required decision; local media and mobile phones; demonstrations and practice that allow internalisation and processing of information; sequencing of information to allow for internalisation and processing of information; and reinforcement of information.

Social support during enhancement of skills, self-efficacy and attitude of the actors and beneficiaries is also needed. Therefore, learning in group settings, building of social networks, and use of models and coping models was incorporated. This enables sharing of experiences, comparison, and encouragement.

Due to the varying actor characteristics, the channels of engagement and communication materials and channels should be tailored to ensure that learning and communication objectives are met.

6.3.3 Proposed implementation and evaluation plans

Within the CFBS, several programmes can be developed, making use of the identified determinants, change methods, and actors to achieve any of the performance objectives and outcomes. Below is a presentation of a proposed implementation plan that focuses on the capacity building of extension workers, community champions, and beneficiary vulnerable smallholder farming households using household groups.

6.3.3.1 Proposed implementation plan

The implementation plan focuses on household groups. These are defined as informal farmer groups, through which small groups of vulnerable smallholder farming households learn, apply information, practice and adopt the skills in agriculture and nutrition that are within the CFBS. The groups are moderated by community champions, as the primary implementers, with support from extension workers, community-level groups/networks, community leaders, and other stakeholders. It is within these groups that the knowledge, skills, self-efficacy and attitude of beneficiary households will be enhanced. Box 1 Section D (Chapter 7) summarises the proposed implementation plan.

Thorough group learning sessions, participation, active learning, demonstration, practice, and feedback are facilitated. Strategic goal setting is also conducted which includes goal setting, setting of sub-goals, feedback, review of progress, barrier identification and problem solving,

and re-evaluation of goals. Home visits will be used to reinforce information, assess progress and provide individual feedback on progress.

Engagement of the beneficiary households will begin with learning and demonstration of information and skills covering three modules: 1) improving agricultural production, 2) improving income and food access through markets, and 3) improving food consumption patterns. These modules and corresponding sessions need to be scheduled to allow for internalisation of information and practice by households, while also reducing activity burden on community champions, extension workers, community-level groups/networks and community leaders. They should also be scheduled in sync with the agricultural seasons so that when skills are taught, action plans can be set and implemented in a reasonable timeframe. For example, if the learning period covers one rainy season, one dry season and one harvest period, the module on agriculture can be conducted during the dry season to enable planning, foresight, and implementation when the rainy season begins. This will also allow for active and timely feedback where barriers are identified and addressed.

Following the period of learning, beneficiary households will be monitored and given support throughout the adoption/follow-up period. This period will allow the review of progress, barrier identification, problem solving, and re-evaluation of goals as strategy beneficiaries implement the skills and adopt the behaviours under promotion. It is also best if this adoption/follow-up period covers more than once agricultural season to allow for feedback and support across the different seasons.

As outlined in the CFBS, social support is a key component. This proposed implementation plan provides social support through building of relationships within members of the household groups and building of networks between the household groups and community champions, extension workers, community-level groups/networks and community leaders. These networks will be particularly beneficial to the vulnerable households that would usually be side-lined or marginalised.

The above activities are preceded by capacity building and linkage of community champions, extension workers, community-level groups/networks and community leaders. These actors are equipped with information and skills corresponding to the three modules, how to share and promote the behaviours and practices that support dietary diversity and how to build social support. They will also be equipped with reference materials to guide the training and follow-up of the household groups.

Another important aspect is the adoption and implementation of practices by the community champions. This reinforces the messages through direct experience and prepares them for beneficiaries' training. It also turns them into coping models for the strategy beneficiaries as they face and overcome similar challenges during adoption and implementation. The activities of the community champions during the training and follow-up of the household groups will also be supported through feedback sessions that provide an avenue for the

community champions to share their experiences, receive feedback on progress, reinforce information and build social support.

For the extension workers, community-level groups/networks and community leaders, in addition to strengthening their capacity regarding the CFBS, dietary diversity and programme modules, they will support the community champions and create awareness about dietary diversity, its importance and how it can be achieved by incorporating components from the modules into their community activities.

Key core components of the proposed implementation plan that enhance the knowledge, skills, positive self-efficacy and attitude of beneficiary households while ensuring that the theoretical framework is adhered to are:

- having appropriate information;
- conducting demonstrations and practising the methods/practices;
- having coping models that are adopting the methods/practices;
- group and individual household interactions that allow active learning and provide social support;
- setting and reviewing of goals;
- adequate communication and sharing of information in an informal setting and using materials that allow internalisation;
- message reinforcement;
- ensuring adequate knowledge, skills, positive self-efficacy and attitude; and
- providing support across the different agricultural seasons.

The three key core components for the proposed learning modules are: 1) improving agricultural production – 'Food from my home'; 2) improving income and food access through markets – 'Food for my home'; and 3) improving food consumption patterns – 'Food for health'. For each component, key messages conveyed need to be positioned in relation to known information or current situation to make the information relevant. Messages need to be sequenced in a logical flow to build upon previous information/knowledge and reinforce new information. Sharing of information is to be followed by a demonstration of relevant skills, practise by beneficiaries, discussions, and setting of goals and sub-goals in relation to the key messages of the session. Home visits and subsequent group sessions reinforce the messages covered while addressing the specific household dynamics around the adoption of the recommended behaviours and practices.

Within the modules, key messages or concepts covered can include but are not limited to the following: 1) For the module focused on improving agricultural production – 'Food from my home': making use of underutilised spaces around the homestead and farm; low-cost, sustainable, climate-smart soil, water and pest management technologies; matching crop characteristics and requirements with land characteristics; production of fruits and vegetables; and post-harvest handling practices. 2) For the second module focused on improving income and food access through markets – 'Food for the home': financial literacy;

income allocation to increase dietary diversity; making appropriate food choices that promote dietary diversity; utilising formal and informal markets to access diverse foods – buying and selling; and improving off-farm income. 3) For the third module on food consumption patterns – 'Food for health': balanced diets, incorporating fruits, vegetables, and animal-source foods in the child and family diets, meeting the nutritional needs of children, essential nutrition actions, appropriate food preparation and preservation methods, food safety and sanitation and hygiene. Some of the key messages and other nutrition, health, and agricultural-related information can be shared directly by other stakeholders.

6.3.3.2 Proposed evaluation plan

Evaluation of the CFBS will determine whether implementation of the CFBS achieved the desired outcomes, lead to changes in the performance and change objectives, and whether the observed changes can be attributed to the strategy. This can be assessed using impact (effect) and process evaluation plans, which are outlined in Box 1 Section E and F (Chapter 7).

The impact (effect) evaluation plan sets out indicators and methods that establish whether the CFBS achieved the desired outcomes and determines the efficacy and effectiveness of CFBS. The process evaluation plan on the other hand focuses on how the CFBS was implemented, which includes determining the fidelity of implementation – the degree to which the strategy was delivered as designed, understanding the underlying factors that affected implementation and outcomes, and identifying the essential components of the strategy and what is required to disseminate the strategy. The two evaluation plans will require assessment of indicators before, during and after CFBS has been implemented.

The evaluation will need to involve the various CFBS actors and results from the evaluation need to be packaged and shared in appropriate formats suited to the various stakeholders, such as the communities in target areas, leaders and organisations at the different district and national levels, the research, development and implementation teams, and the scientific community.

Though evaluation will mainly be conducted before and after implementation, it is important to note that some outcomes, variables, and evaluation indicators cannot be fully achieved within implementation timeframes. This particularly applies to the quality of life outcomes that include reduced prevalence of malnutrition and micronutrient deficiencies such as stunting, iron deficiency anaemia, and vitamin A deficiency, and reduced child morbidity. As a result, the impact evaluation plan does not include the identified quality of life critical success factors of change.

Other indicators for which proxies will be used include increased consumption of fruit, which is a result of the planted fruit trees and increased production from use of underutilised land and use of compost. Proxies can include capturing households that planted fruit trees, started composting, and applied compost. Given the seasonal nature of production, food availability and consumption, evaluation of the dietary diversity, consumption, production and market variables of the community champions and households will also be conducted on a seasonal

basis. The impact evaluation plan including references for the indicators are presented in Appendix 6.

For the proposed implementation plan, use of a quasi-experimental design will enable comparative effectiveness. This design requires implementation, as described above in one locale, while in another separate locale with a matching population, only extension workers, community-level groups/networks and community leaders are equipped. These actors then proceed with their usual course of agricultural and nutrition-related activities that involve promotion, awareness creation and sharing of information and skills. These two locales will provide comparison data and allow for evaluation of the implementation plan.

6.4 Discussion of CFBS design process

The CFBS was designed to improve dietary diversity of children in smallholder farming households through improved household production, income utilisation, and food consumption practices. Use of the intervention mapping framework to systematically understand low dietary diversity in the target population, identify pathways and incorporate theory strengthens the strategy and resulting evidence, as well as enhances behaviour change (Kok & Mesters, 2011; Eldredge et al., 2016; Garba & Gadanya, 2017).

Given the context and study findings, the aim of the CFBS is to improve the production diversity, production practices, market access and market diversity. Reports indicate that the production diversity influence on dietary diversity is higher where on-farm diversity is low and market access is poor (Sibhatu, Krishna & Qaim, 2015; Kissoly, Fabe & Grote, 2018). Though markets are reported to be more important for dietary diversity than household production, it is also noted that the interaction between production diversity, market access and dietary diversity varies with regard to context (Jones, 2017; Qaim & Sibhatu, 2018). The CFBS therefore incorporates these synergistic components so that vulnerable smallholder households can achieve dietary diversity. For such households, production diversification is reported to lead to more opportunities for market engagement – as a source of income through agricultural output markets where they can sell their food produce and consumer food markets where they can purchase diverse foods (Jones, 2017). Income from off-farm activities also increases access to diverse foods through markets (Sibhatu, Krishna & Qaim, 2015). In addition to household access to these two categories of markets, the availability and seasonality of diverse foods, especially nutrient-dense foods, their cost, and consumer preferences all influence the extent to which markets contribute to dietary diversity (Herforth & Harris, 2014; Jones, 2017).

The strategy is designed to equip smallholder farmers with information, skills and support in agriculture, nutrition, and finances, which empowers them to decide on and implement a course of action to achieve dietary diversity. With reference to the household typologies created from the household survey (Chapter 4), the first and second typologies were more food secure and purchased more foods for consumption. Focus for households in the first and second typologies can therefore be placed on ensuring adequate use of income for food and

appropriate food choices that promote dietary diversity, followed by improving household production to increase productivity and income. On the other hand, for the third and fourth typologies, which were more food insecure with lower dietary diversity and lower purchase of foods, focus can first be placed on improving household production and production diversity to improve food security and access to diverse foods.

A poor perception towards training and community meetings was noted in the study. This is crucial because for knowledge, skills, self-efficacy and attitude – the personal determinants of the strategy to be improved – individuals and households need to access and be receptive to information that can improve their livelihoods. Nutrition knowledge and education is an important aspect of food-based interventions and positively influences dietary diversity and nutrition outcomes (Hirvonen et al., 2017; Ochieng et al., 2017; Murendo et al., 2018). Interpersonal communication through individual and group sessions is an effective social behaviour change approach where information and skills are disseminated and social support is provided or enhanced (Lamstein et al., 2014). The CFBS therefore aims to increase access to information and skills through various actors, building social support within and between actors and thus increasing information-seeking behaviours and uptake and sharing of information.

The CFBS and proposed implementation plan fit within the national strategies, focusing on the vulnerability of smallholder farmers and therefore contribute to national priorities and systems. It lends to aspects included in food and nutrition policies such as developing and providing information and skills to promote proper food and nutrition practices in rural and urban communities and mobilising communities to identify and solve their food and nutrition problems (Government of Uganda, 2003, 2009; MAAIF & MOH, 2005). In the agricultural sector, the CFBS strengthens the goal to transform from subsistence farming to commercial agriculture ensuring that vulnerable smallholder farmers are not left behind and that sustainable access to food and diet quality is achieved (NPA, 2013b). The strategy also looks beyond the 12 commodities of interest in the Agriculture Sector Strategic Plan to see that smallholder farmers improve their productivity, food security and dietary diversity (MAAIF, 2016a). The extension system is a big part of the national agricultural strategies (NPA, 2013b; MAAIF, 2016a) and has been incorporated within the strategy.

The need for robust designs, methods and evaluations of food-based strategies are some of the documented gaps limiting scale out (Masset et al., 2011; Thompson et al., 2014; Ruel, Quisumbing & Balagamwala, 2017). Planning for both effect and process evaluations in the CFBS ensures that the change achieved following implementation of the strategy is assessed and whether the change can be attributed to the strategy. The process evaluations evaluate the implementation and expound on the effect evaluation results. This compressive information can then be used to refine the strategy for continued implementation and guide scale out (Rossi, Lipsey & Freeman, 2004; Carroll et al., 2007; Craig et al., 2008; Eldredge et al., 2016) and results from the strategy can contribute to the body of knowledge.

6.5 Summary

The Contextualised Food-based Strategy (CFBS) was developed using the intervention mapping framework using data from Phase 1 of the study – the household and market survey, Phase 2 of the study – focus group discussions, and relevant literature and theories. The reasoned action approach and social cognitive theory, in addition to data and literature, were used to understand the determinants of low dietary diversity in the target population. Behavioural and environmental outcomes and performance objectives were identified and used to conceptualise the strategy together with social cognitive theory, goal-setting theory and the elaboration likelihood model.

The goal of CFBS is to improve dietary diversity of children in smallholder farming households through improved household production, income utilisation, and food consumption practices. This goal is achieved through three overall objectives. The first is to increase diversity of foods produced by the households, particularly fruits and vegetables, using sustainable production practices that enable smallholder farmers to maximise their available resources. This will increase household availability and access to diverse foods and contribute to income. The second is to increase household access to diverse foods through appropriate use of household income and markets. This objective focuses on improving dietary diversity through markets and requires an increase in the diversity of foods in markets that serve the rural communities, household financial literacy to support allocation of income to diverse foods, and increase of household income through on-farm and/or off-farm activities. The third is to improve the quality of diets consumed by children and households in terms of diversity, frequency, nutrient quality and safety through nutrition education.

Actors targeted in the CFBS included: policy makers, development organisations, extension workers, community-level groups/networks, community champions, smallholder farming households, and other influencing actors. At their different levels, the CFBS strengthens and/or complements their current actions and objectives, ensures that dietary diversity is improved by enhancing their knowledge, skills, self-efficacy, attitude and self-efficacy, and builds social support.

Within the CFBS, several programmes can be developed to achieve the set performance objectives and outcomes. A proposed implementation plan that fits the study population and context (based on findings from Chapters 4, 5 and 6) focuses on capacity building of extension workers, community champions, and beneficiary-vulnerable smallholder farming households using household groups primarily moderated by community champions was presented. Core components within this plan include: availing appropriate information; conducting demonstrations and practising methods; having coping models that are adopting the methods and practices; having both group and individual interactions to allow active learning and provide social support; setting and reviewing of goals; message reinforcement; building knowledge, skills, positive self-efficacy and positive attitude; and both effect and process evaluations. The developed CFBS was further validated and revised. The findings of the validation process and final CFBS are presented in the next chapter – chapter 7.

Chapter 7 Participatory validation of the food-based strategy

7.1 Introduction

This chapter presents results from Phase 4 of the study that validated the CFBS using FGDs and KI interviews. This was followed by a revision of the CFBS based on the validation results.

7.2 Validation results from the FGDs

The two FGDs had a total of 23 farmers with an average age of 36.8±9.3 years (Table 7-1). The first FGD had six men and six women, while the second FGD had five men and six women. Each FGD included six participants that were involved in Phase 2 of the study and six participants that were not involved prior to the validation exercise. Including participants that were not involved in Phase 2 of the study served two purposes, to further validate the information obtained in Phase 2 and evaluate the applicability of the strategy. Fewer men than planned participated in the FGDs, due to limited availability. The participants were guided through the CFBS using a semi-structured discussion guide (Appendix 1.5).

Table 7-1 Validation FGD characteristics

FGD	Gender	N	Age	Education level	Number of household members	Number of children	Occupation
Group one	Men	6	39.5±13.3	Primary	6.0±3.1	4.0±3.1	Farmer
	Women	6	29.5±5.5	Primary	6.0±2.4	4.0±2.4	Farmer
Group two	Men	5	39.4±7.3	Primary	7.2±3.0	5.2±3.0	Farmer
	Women	6	39.3±6.3	Primary	7.0±1.5	5.0±1.5	Farmer
All		23	36.8±9.3	Primary	6.5±2.5	4.5±2.5	Farmer

Values are means

7.2.1 Discussion of the main factors incorporated in the CFBS from the validation FGDs

Increasing household production of diverse foods, agricultural production practices, and access to information and skills were considered important by the FGD participants. It was thought that this objective would increase the productivity of their farms, the quantity of food available in the household, and the diversity of foods available for consumption. This in turn would reduce hunger and poverty, increase the number of traders in the community buying agricultural produce and improve the health of the households.

> "… If you grow different types of food, you cannot lack food at home because by the time one type gets finished, another food type will be available. There are foods which cannot be stored, but if you have grown different types of food, you can have one type which you can store and use later." [FGD 2]

> "If you have such a plan (have increased production diversity), you have enough food at home, and you cannot end up poor." [FDG 1]

> "… as a result (of using sustainable production practices) what we harvest will be of high quality and more nutritious compared to what we have been harvesting since the productivity of crops would have improved." [FGD 2]

> "When we have many of the different foods produced in the community, even the traders will come looking to buy them." [FGD 2]

According to the FGD participants, a result of the CFBS would be households that are equipped to address agricultural production challenges and are linked or have access to extension workers and other farmers to share experiences and knowledge.

> "Even that person who does not know will see how I would have farmed in my garden and will come to inquire from me about the knowledge and skills I am using." [FGD 2]

> "There are times when you want to learn something … It can help to connect us with our fellow farmers and extension workers. This would be helpful, and it will unite us as farmers." [FGD 1]

Increasing the diversity in the markets that serve the rural community, household financial literacy, income allocation to food, and income from both on- and off-farm activities were also considered important by the FGD participants. It was discussed that these aspects would enable more households have access to different foods that they do not produce and reduce expenses incurred travelling to the markets that have a variety of foods. There would also be more opportunities for households to sell their surplus produce and therefore earn additional income.

> "It (increasing diversity in markets and avenues where diverse foods can be bought) reduces on amount of money we spend because if markets are near, you don't spend on traveling far to buy different foods." [FGD 1]

> "There might be a person who wants a type of food, but they can't manage going to a far market to look for it, so when you create markets closer it becomes easy to get that type of food and be able to consume it." [FGD 1]

> "…. it is difficult for some of our farmers to transport their produce most of the time. If you have a market nearby or a person in the community selling certain foods … it can easily be accessed by others." [FGD 1]

The FGD participants also noted the importance of households budgeting their income and using the money for food to buy nutritious foods so that they do not focus only on starchy staple foods. It was noted that increasing household income would improve the livelihoods of the households and enable them to purchase more diverse foods. It would also reduce the sale of some of the nutritious foods produced and increase their consumption because the additional income would be available for the different household needs.

> "…. before, we were budgeting for one type of food for eating at home because it would make everyone satisfied. We were ignoring other foods which was leading to

> many cases of sickness in our homes. So, you end up spending on treatment, yet that money could have been used to buy different types of foods that could help to prevent certain diseases." [FGD 2]

> "… people have to be trained that if you have cooked beans you need to add some n*akati* (African nightshade) or *dodo* (amaranth) which a person can buy from the stall or market in case they don't grow them at home." [FGD 1]

> "Because every time our incomes increase, our standards of living also changes. Therefore, one can be able to acquire some foods that they don't produce, because you can't produce all you need. For example, buying fish. The increased income will also help us to move from one level to another like buying a motorcycle, a car or even taking our children to better schools." [FGD 2]

> "With increased income, the foods like *dodo* (amaranth), avocado, jackfruits which you would have sold to get money to buy basic needs won't be sold but eaten at home." [FGD 2]

> "If someone has money, instead of selling the egg, there is a chance that it can be given to child to eat instead of selling it. Even the *Sukali Ndizi* (apple bananas, a type of dessert bananas) the person would have sold, so as to earn money to buy salt will be eaten," [FGD 1]

It was also noted that having more households in the community working together to increase their respective agricultural productivity and income would in turn improve community living.

> "… if you are united and are working together, it somehow prevents theft since everyone in the community will be growing different foods. Most of the people will have their own food leading to limited cases of theft." [FGD 2]

Nutrition education was also considered an important part of the CFBS because participants noted that their community needs to learn more about nutrition, child feeding, food handling, and food preparation if family members and children are to be healthy. Some community members have been trained, while others have not; therefore, sharing information and further sensitisation is important.

> "I never knew how to prepare certain foods, but I came (to a training) and learnt how to prepare different foods. Now my child is very healthy and happy. So, let it (nutrition education) remain in the plan (the CFBS)." [FGD 2]

> "For us we learnt how to feed the children well on different foods so we can now, after learning, be able to teach others too." [FGD 2]

Factors that were proposed by the FGD participants for inclusion in the CFBS included:

1) Addressing household relations and decision-making dynamics to enhance collaboration between spouses. This would enhance participation, learning and adoption of the different practices in the CFBS.

2) Novel ways to engage the community given the poor perception towards learning/training in the community. No specific approach was suggested aside from building the capacity of a few community members from which others can visibly see the impact of the recommended practices.

> "People are more interested in hearing there is a politician coming because they know they may get something. But you call them to attend training which will benefit their lives, they don't want. Therefore, there is need for the plan (the CFBS) to counter this." [FGD 1]

3) Promoting and increasing access to seed of underutilised foods that are no longer widely grown or available in the community. Examples included yams (*Dioscorea sp*. locally referred to as *Balugu*), air yams (*Dioscorea bulbifera* locally referred to as *Kkobe*), yams (*Dioscorea sp*. Indica locally referred to as *Ebikongo*), taro (*Colocasia Esculenta*, locally referred to as O*bukupa*), and giant granadilla (*Passiflora quadrangularis* locally referred to as *Wujju*).

4) Increasing access to production information and seed of nutritious foods like carrots, orange-fleshed sweet potatoes, soybean and iron-rich beans.

5) Inclusion of livestock to increase access to different livestock and learn the management practices and nutritional benefits. Examples of livestock included chicken and goats for milk.

Other factors mentioned by the FGDs that were already part of the CFBS included sensitising the community to increase access to information and skills; and second, using members of the community that have been trained to teach and demonstrate to others (community champions).

> "… plan to have at least four to five members enabled or supported to put what they have learnt in practice. Such that members in the community, can easily be attracted by what they see … 'so and so were trained and you can see what they have done' … that way they are encouraged to try out at in their homes. So, I would want that plan (the CFBS) to include this so that we have such people in the community to learn from." [FGD 1]

Lastly, creating accountability among households to keep track of the diversity available in the households was suggested by the participants.

> "I think they should monitor families so that everyone shows the different types of food available at home. This can be done by politicians, extension workers or

> nutritionists. They can come to homes and inspect the different types of food available." [FGD 1]

In summary, when rating the relevance of the main factors in the CFBS, the reasons given in support of the rating were in line with those considered during the development process. Three aspects were identified. First, factors suggested by the FGDs that were already included in the CFBS included engaging and sensitising the community, especially through fellow community members, addressing household dynamics and increasing accountability among households. In the CFBS, having various actors, like community champions, and using both group and household learning and encouraging farmer-to-farmer interaction are some of the ways social capacity will be built, and sensitisation and accountability fostered. Second, the aspect of livestock, particularly regarding production, was recommended. This aspect was therefore strengthened in the strategy. Lastly, increasing access to and promoting indigenous foods as well as other nutritious foods was emphasised to the CFBS, as suggested by the FGDs.

7.2.2 Discussion of the target actors and beneficiaries of the CFBS by FGDs

Policy makers, particularly politicians, were deemed not important by both FGDs in the success of the CFBS because of previous experiences of corruption. Participants were of the view that their involvement would interfere with or hinder the implementation of the strategy.

> "They are ones who have stalled most of the work/programmes in the community, especially if it involves improving the livelihoods of people." [FGD 1]

> "They will bring people on board who have no/limited capability to manage or participate in the programme (do not meet the criteria), for example giving a goat to someone who can't even feed it well, then later he (the policy maker) buys the goats back like xxx who bought all the heifers, which were given to people without ability to manage them. So, he ended up buying them and now all are at his farm." [FGD 1]

> "It is not good for leaders to be left in the plan (the CFBS), because in case there are benefits, he/she will think of those people who gave him/her votes first, ignoring those who didn't vote for them." [FGD 2]

Government institutions on the other were considered moderately important by the FGDs. Participants noted that their involvement would be more beneficial than that of policy makers and that they should be included because they would be in a position to assist those implementing the strategy. It was also noted that though some are corrupt like policy makers, the strategy cannot be implemented without their support. In addition, it was noted that they too need sensitisation and training so that they use their platforms effectively to promote the different practices in the strategy.

> "When they are hosted like on the radio, they just highlight a few things without giving details. Let's say the season is starting, they (individuals from government institutions) tell people to grow food, but don't specify exactly which types of food. So, if they are also trained, they can be more helpful." [FGD 1]

Development organisations were considered important for the CFBS. It was noted that these organisations would support the strategy because they are more impartial than policy makers, government personnel and local leaders, and can work closely with the communities.

Extension workers were considered very important actors for the CFBS according to the FGDs. This is because they work closely with the communities irrespective of household socio-economic status, assist in the dissemination of information and are accessible.

> "The extension workers should be part (of the CFBS), because they can reach even in your garden and give you advice." [FGD 2]

Community-level groups/networks were also considered important for the CFBS because they are organised groups of people with large membership. This helps in the dissemination of information where many people can be trained at the same time and when group members share information with others.

> "Groups bring together many people, even the one who never knew can learn from the group. Groups bring togetherness … they can discuss together and find a way forward. They also speak with one voice on what they will do." [FGD 1]

Community champions were considered very important, but only when the champions are accessible and of similar status as members of the community. The FGD participants noted that the champions would put the recommended practices into practice and be able to share information. They could be easy to approach and allow one to visit their fields and/or are able to visit other community members' fields.

> "If they are like us (of similar status), they should be included because they would be easy to access, and you can ask him/her what you want to learn anytime." [FGD 2]
>
> "... it will be easier for us to learn from each other." [FGD 2]
>
> "... they are within the village … can spread the knowledge or information to other people … They are easy to approach." [FGD 1]

Smallholder farming households were considered by the FGD participants as very important. It was noted that the CFBS would be beneficial to them and they would be interested in improving their productivity and livelihoods despite the limited land available.

Other stakeholders/influencing actors, like market, health, input providers, financial services, and private sector, were considered important by the FGD participants because they would provide information, products, and loans that assist households in agricultural production and sale of agricultural produce. Access to this category of actors was therefore considered important.

Other actors suggested by the FGDs for inclusion in the CFBS were religious leaders because they lead and interact with several people and can therefore be useful in disseminating information and promoting recommended practices.

According to the FGDs, the actors included in the CFBS all have a role to play and the structure of the strategy seeks to build their capacity and strengthen linkages across actors. Religious

leaders were suggested but were already part of the community leaders referred to in the proposed implementation plan. Community leaders can and should be part of any other interventions designed within the CFBS.

7.3 Validation results of the CFBS by key informants (KIs)

Out of the 15 KIs invited to validate the CFBS based on their expertise in nutrition and related sciences, only six had responded by the end of three months. The six KIs were working in development and academic institutions in four countries: Uganda (3), Zambia (1), South Africa (1), and Norway (1). Using a semi-structured questionnaire, the KIs rated the importance of the approach used to design the strategy, the main factors incorporated in the CFBS, the target actors, and the proposed CFBS implementation plan. They used a scale of one (not important) to five (very important) and provided comments.

The development approach was rated as important with a median rating of four. The process and methods used were deemed important and comprehensive. The KIs noted the seasonal influence on dietary findings, a limitation already acknowledged by the household survey study and explored when determining the community perspective.

> "Understanding the grassroot issues, including household priorities, barriers and motivational factors is fundamental in designing appropriate strategies." [KI]

7.3.1 Discussion of the main factors incorporated in the CFBS by KIs

The main factors incorporated in the CFBS were considered important as the median scores ranged from four to five (Table 7-2). The KIs noted that household production of diverse foods to include fruits and vegetables not only enhances availability and access of diverse foods but is sustainable. It was also recommended that focus is placed on nutrient-dense foods.

> "… specify the kind of vegetables and fruits to grow e.g. that benefit the targeted age group and are nutrient-rich vegetables (not cabbage, tomatoes, onions) and fruits (not lemons, oranges). They should grow deeply coloured vegetables (like pumpkins, amaranth, etc.) and fruits (like pawpaw, mangoes)." [KI]

Table 7-2 Key informant median score ratings of the importance of the CFBS

A	Main factors incorporated in the CFBS	Median score
1	Increasing household production of diverse foods to include fruits and vegetables	5
2	Improving agricultural production practices	4
3	Increasing household access to information and skills	4
4	Increasing social capacity and social support to learn, adopt, implement and share information and skills	4
5	Increasing diversity of foods in the markets that serve the rural community	4
6	Improving household financial literacy and income allocation to food	4
7	Increasing income from both on- and off-farm activities	4
8	Nutrition education to increase consumption of diverse diets and improve food handling and safety	5
B	**Target actors and beneficiaries of the CFBS**	
1	Policy makers	5
2	Government institutions and development organisations	5
3	Extension workers	5
4	Community-level groups/networks	5
5	Community champions	5
6	Smallholder farming households	5
7	Other stakeholders/influencing actors	4
C	**Proposed CFBS implementation plan**	
1	Category of actors involved	5
2	Level and mode of engagement of community champions	5
3	Level and mode of engagement of beneficiary households	5
4	Level and mode of engagement of extension workers and community leaders	5
5	Scope of implementation plan	4

Improving agricultural production practices was considered important because it would boost productivity, income and sustainability, especially when production technologies that address smallholder challenges and resources are included. Increasing household access to information and skills was deemed important as it supports decision making and operationalisation of the strategy.

> "Household access to information and skills is very important as fruits and vegetables need higher skill level, especially disease and pests and postharvest handling." [KI]

> "While increasing households' access to necessary information and skills does not guarantee behavioural change, households are empowered to make better food choices." [KI]

Increasing social capacity and social support to learn, adopt, implement and share information and skills was also considered useful given that households are part of a larger

community. It was noted that the required social capital in the different settings are identified and addressed.

> "Households do not operate in a vacuum. Individuals innovate, implying that in cases where households are well connected and have dense social capacity, learning from each other helps them to borrow best practices that enhance production, storage, safety and nutrition." [KI]

Regarding increasing diversity of foods in the markets that serve the rural community, the KIs noted that markets can contribute to dietary diversity, especially in the lean season. However, market diversity is driven by demand and supply, and the influence of markets is also limited by household income. It was also considered by the KIs that there may already be diversity available in the markets, contrary to study findings.

> "Diverse foods might be readily available, but this does not guarantee availability and access for each household. This often originates from inadequate income and numerous competing things worth purchasing like basic household needs such as school fees, health, etc." [KI]

Improving household income and management of the income and increasing income from both on- and off-farm activities were deemed important by the KIs given that food is a basic need. The food preservation challenges faced by rural smallholder farmers and perishability of foods like fruits and vegetables magnify the need for ready income for these items as needed.

> "Improving household financial literacy and income allocation to food is highly necessary, especially income that is non-agricultural as it flattens consumption through the lean season." [KI]

> "While increasing income would increase household ability to access diverse foods, increasing income alone does not guarantee the purchase of these foods. This would have to be coupled with nutrition education and financial literacy." [KI]

Nutrition education was considered very important as it enables households to make informed decisions and supports behaviour change.

> "Effective nutrition education creates a motivation for change among people to establish desirable food and behaviour for promotion of good health." [KI]

In addition to the above comments, the following recommendations were made by the KIs:

1) To strengthen the availability and/or access to animal-source foods, which are a major challenge when achieving minimum acceptable diets. This can be through own household production or markets.

2) Focus on promotion and production of nutrient-dense crops, for example dark green leafy vegetables, pumpkins, pawpaw, and mangoes, as opposed to cabbage, tomatoes, onions, lemons, and oranges.

3) The need for a behaviour change communication strategy to increase awareness, knowledge and skills and address the negative perception towards meetings and training.

In summary, the KIs also considered the main factors of the CFBS as important, noting the interrelatedness of the factors and promotion of sustainability. Though building social capacity, supporting demand and supply of the foods, particularly fruits and vegetables, were suggested, these aspects were already part of the strategy. The CFBS increases awareness of the importance and production of fruits and vegetables, market diversity, and income use by households. Together, these aspects increase the supply and demand of fruits and vegetables in the community. A behaviour change communication strategy was also recommended by the KIs. The proposed implementation plan in the CFBS was developed based on a synthesis of study results, theory, and literature, including behaviour change strategies. Any other interventions designed within the CFBS should also include social behaviour change methods, in addition to the actors and methods already presented. Enhancement of post-harvest handling, preservation and preparation of fruits and vegetables and availability and access to animal-source foods were also suggested by the KIs. Though these factors were already in the CFBS, preservation and animal-source foods were further emphasised following the validation exercise. Lastly, focus on promotion and production of nutrient-dense crops in the CFBS was strengthened, as recommended by the KIs.

7.3.2 Discussion of the target actors and beneficiaries of the CFBS by KIs

The actors included in the CFBS were all considered important (Table 7-2). Concerning policy makers, though lobbying and awareness creation among policy makers is needed, the existing supporting policy frameworks in the country and the fact that policy making utilises information from various communities/nationwide showed the need for implementation and rigorous analysis of data from several communities.

> “Poor policies create disabling environments for informed decision making. Policy makers should be mobilised so that they understand and create conditions that enable adoption of the CFBS outcomes and goal.” [KI]

While government institutions and development organisations were considered central to policy implementation and are responsible for the health and wellbeing of the people, their inclusion in the CFBS was also considered not to be of much use aside from having them playing their designated roles. It was also noted that focus may be better placed on local/lower-level policy makers and government offices/personnel, and community-based organisations for impact.

The KIs considered extension workers, community-level groups/networks and community champions very useful behaviour change agents in the CFBS. These actors would link

government/development institutions and the community (extension workers), enable exchange of information and skills, create the necessary mass of people and leaders operationalising the CFBS, and foster ownership and sustainability of the strategy programmes and actions. However, their impact would depend on the resources available, their motivation and quality of training they would have received. As such, it was noted that discussions with extension workers, community-level groups, and potential community champions would generate an understanding of their motivations to support the improvement of dietary diversity.

> "Community-level groups are important because of either formal or informal interfaces that enable exchange of information and best practices, including lessons learnt." [KI]

Smallholder farming households were deemed by the KIs as the main beneficiaries that must be involved in operationalisation of the CFBS. As such, their mobilisation and buy-in are a must.

The actors in the CFBS were considered relevant by the KIs. The importance of lower-level/ community-level actors was noted by the KIs and was already part of the strategy. It was recommended that the motivation of extension workers, community-level groups, and potential community champions be established prior to implementation. This was acknowledged in ways to overcome barriers to involve the actors and was also recommended by the researcher prior to implementation of the strategy.

7.3.3 Discussion of the proposed CFBS implementation plan by KIs

The KIs also validated the proposed implementation plan and considered the different aspects as important (Table 7-2). It was noted that the plan would require piloting to create awareness, demonstrate its attributes and allow for modifications. Involvement of the different stakeholders would be important and would build a sense of ownership and reduce potential resistance.

> "Engaging them (extension workers and community leaders) helps create an enabling environment for uptake. Also, the gate-keeping mentality gets managed thus reducing any potential resistance to change." [KI]

> "The extension workers and community leaders are instrumental in supporting good nutrition/agricultural practices, they help address and eliminate barriers to these good practices, and challenge inappropriate traditions." [KI]

It was recommended by KIs that the gender of the actors involved be considered as well as the use of information and communication technology, especially for the extension workers. There were also a few recommendations by KIs that were already included in the CFBS, and these included:

1) individual sessions between community champions and households;

2) ensuring demonstrations and field visits are part of the interaction between community champions and households;

3) including food safety, food preservation and post-harvest handling during the 'food for health' module;

4) use of behavioural change communication. The engagement of the various actors and sequence of learning were selected to enhance learning and behaviour change; and

5) considering time of year for implementation of the plan, that is, planting vs harvest season. The sequence of learning considered the seasons both during training of community champions and households and follow-up of households.

The majority of the recommendations by the KIs were already part of the CFBS. Aspects that were strengthened in the CFBS following the validation exercise included food preservation and the gender of the actors. Use of information and communication technology, especially by the extension workers and community champions, was also added to the strategy.

7.4 Revision of the CFBS following the validation process

Though the majority of the recommendations from the FGDs and KIs were already part of the CFBS, some were identified for inclusion or emphasis in the CFBS. The factors that were added or emphasised in the strategy are presented below.

Animal-source foods were part of the second CFBS objective that looked at access to diverse foods from the market. Based on the validation results, livestock was emphasised in the strategy by adding it to the performance objectives for increasing household access to appropriate information and skills and increasing social capacity to identify and solve agricultural production problems. Animal-source foods were also further emphasised under market outputs and objectives.

Increased access to indigenous foods was recommended. There is a wide variety of indigenous foods available in the region that can be used to enhance household production diversity – a major objective of the CFBS. This is because they not only provide nutritional benefits but can also be climate resilient. Emphasis of these foods was therefore added to the first objective of the CFBS. Engaging seed system actors as part of the other stakeholders/influencing actors will also help address access to indigenous seed.

A focus on promotion of nutrient-dense foods, especially fruits and vegetables, was also proposed during validation. The CFBS aims to improve dietary diversity through increased production of fruits and vegetables and purchase of diverse foods. Focusing on nutrient-dense crops ensures that resources are maximised and both dietary diversity and nutrient requirements are enhanced. Emphasis of nutrient dense foods was therefore made under the third objective of the CFBS.

Considering the required quality of fruits and vegetables, their perishability and limited capacity of smallholder farmers, food preservation was emphasised in the performance objectives for improving food handling and safety.

To enhance information access and actor linkages, use of information and communication technology, particularly mobile technology, was added to the strategy in addition to the use of local and mass media.

The above revisions were made in the CFBS and the resulting validated CFBS is presented in Box 1. The changes that were made in the CFBS are presented in Appendix 7.

Box 1
THE CONTEXTUALISED FOOD-BASED STRATEGY FOR UGANDA

Preamble

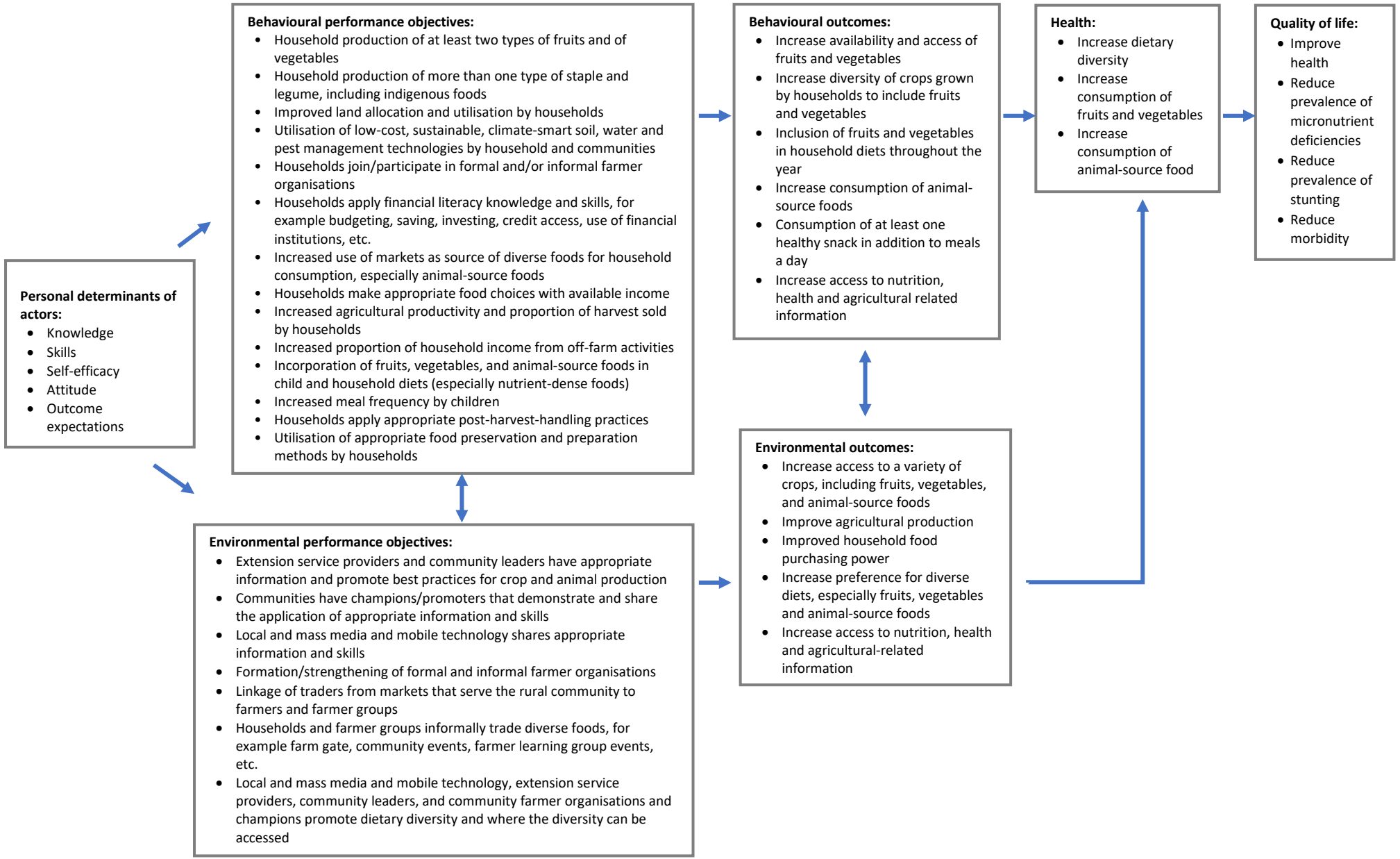
1. The goal of the CFBS is to improve dietary diversity of children in smallholder farming households through improved household production, income utilisation, and food consumption practices.
2. The CFBS is to be used by development and/or community-based organisations, policy makers, and government institutions with a mandate to improve the nutrition and livelihoods of farming communities, particularly in rural areas.
3. The CFBS consists of six sections:
   - Section A outlines the CFBS outcomes, outputs and performance objectives.
   - Section B presents the critical success factors of change.
   - Section C illustrates the target actors and beneficiaries of the CFBS.
   - Section D presents the proposed CFBS implementation plan.
   - Section E presents the process evaluation plan.
   - Section F presents the impact evaluation plan.

SECTION A: CFBS outcomes, outputs and performance objectives

Outcomes	Outputs	Performance objectives
1. Increased availability of diverse foods	1a. Increased diversity of crops produced by households that includes fruits and vegetables	- Household production of at least two types of fruits and of vegetables - Household production of more than one type of staple and legume, including indigenous foods
	1b. Increased use of sustainable production practices that maximise land use	- Improved land allocation and utilisation by households - Utilisation of low-cost, sustainable, climate-smart soil, water and pest management technologies by household and communities
	1c. Increased household access to appropriate information and skills 1d. Increased social capacity to identify and solve agricultural production problems	- Extension service providers and community leaders have appropriate information and promote best practices for crop and animal production - Communities have champions/promoters that demonstrate and share the application of appropriate information and skills - Local and mass media and mobile technology share appropriate information and skills - Formation/strengthening of formal and informal farmer organisations [a]
2. Increased accessibility to diverse foods	2a. Increased diversity of foods in markets for the rural community	- Linkage of traders from markets that serve the rural community to farmers and farmer groups - Households and farmer groups informally trade diverse foods in their communities, for example farm gate, community events, farmer learning group events, etc. - Extension service providers, community leaders, and community farmer organisations and champions promote dietary diversity and where the diversity can be accessed (demand creation) - Local and mass media and mobile technology share appropriate information on market access to diverse foods and enhance market linkages
	2b. Improved household income allocation and utilisation to access diverse foods	- Households apply financial literacy knowledge and skills, for example budgeting, saving, investing, credit access, use of financial institutions etc. - Increased use of markets as source of diverse foods for household consumption, especially animal-source foods - Households make appropriate food choices with available income
	2c. Increased household income through on-farm and/or off-farm activities	- Increased agricultural productivity and proportion of harvest sold by households - Increased proportion of household income from off-farm activities
3. Increased consumption of diverse foods	3a. Increased consumption of fruits, vegetables, and animal-source foods	- Incorporation of fruits, vegetables, and animal-source foods in child and household diets (especially nutrient dense foods) - Increased meal frequency by children
	3b. Improved food handling and safety	- Households apply appropriate post-harvest-handling practices - Utilisation of appropriate food preservation and preparation methods by households - Utilisation of sanitation and hygiene facilities by households

[a] Farmer organisation refers to community-formed groups or organisations such as farmers, saving and credit, traders, women, youth, faith, learning organisations or groups, that can be formal or informal in structure

SECTION B: Critical success factors for change



SECTION C: CFBS target actors

Actor	Characteristics	Role in the CFBS	Barriers to involvement	Overcoming barriers
Policy makers	- Responsible for formulating or amending policies and action plans - Determine areas of focus - Include central government (line ministries) and local government (up to community level)	- Adopt the strategy and make decisions about its application - Support organisations that implement it - Use the CFBS and its results to inform policy and action developments and amendments	- Insufficient knowledge, skills, and self-efficacy linked to CFBS outputs and outcomes - Low output expectations (poor perception about relevance or consequences of CFBS) - Limited funds and resources	- Lobbying - Workshop discussions on CFBS - Strategic goal and action planning, review and feedback meetings - Build/strengthen stakeholder and partner linkages - Linkage to relevant stakeholders and actors - Involvement in plans and review meetings by development organisations
Government institutions and development organisations	- Implement programmes - Funded by government or other agencies - Have nutrition, food security and agriculture in their mandate - Directly engage households, communities and their actors - Include NGOs, CBOs	- Develop and implement programmes that contribute/fit within the CFBS - Link and equip other actors to achieve strategy - Monitor and evaluate the performance of the strategy	- Lack of motivation to adopt the CFBS - Low output expectations (poor perception about relevance or consequences of CFBS) - Limited funds and resources	- Workshop discussions on CFBS - Participatory planning to develop or re-align programmes to incorporate CFBS - Strategic goal and action planning, review and feedback meetings - Build/strengthen stakeholder and partner linkages
Extension workers	- Facilitate community access to agricultural and health services - Deliver services and disseminate information, skills, and practices - Operate at community level - Have basic to advanced knowledge and experience in agriculture, health, and nutrition	- Disseminate practices within the CFBS and its programmes - Incorporate CFBS in their activities - Support community-level groups/networks, community champions, and smallholder households as they adopt and implement strategy actions	- Insufficient skills and up to date knowledge - Lack of motivation - Limited resources, materials and time	- Capacity building and provision of materials - Involvement in plans and review meetings by development organisations - Strategic goal and action planning, review and feedback - Linkage to community-level groups/ networks and community champions who have complementary roles and other extension workers - Utilisation of information technology and mass media
Community-level groups/networks	- Groups of individuals or households in the community with a joint purpose that improve livelihoods - Include farmers, saving and credit, traders, women, youth organisations or groups	- Provide avenues to equip households with strategy information, skills, and practices - Disseminate practices within the CFBS and its programmes in the community	- Limited to current networks/ membership - Limited knowledge, skills, and self-efficacy surrounding application and promotion of recommended practices - Limited resources, materials and time - Gender and social dynamics	- Capacity building and provision of materials - Strategic goal and action planning, review and feedback - Creation/strengthening of linkages with community-level groups/networks/ community champions, extension workers,

Actor	Characteristics	Role in the CFBS	Barriers to involvement	Overcoming barriers
	- Can be formal or informal in structure - Have varying literacy levels, social economic status, and levels of knowledge and experience in agriculture, health, and nutrition	- Link and equip members to services and information - Provide social support as members adopt and implement strategy actions		other stakeholders/service providers to build social support - Understand and address motivation - Actively engage men, women, and youth - Utilisation of information technology and mass media
Community champions	- Smallholder farmers in the community - Willing to share and demonstrate their experiences in agriculture and nutrition - Have basic literacy levels, and knowledge and experience in agriculture and nutrition	- Demonstrate and disseminate practices within the CFBS and its programmes in the community - Provide social support as members adopt and implement strategy actions (relatable/lower-level, and informal interactions with fellow community members)	- Limited knowledge, skills, and self-efficacy surrounding application and promotion of recommended practices - Lack of social support to engage with fellow community members - Lack of motivation to engage with fellow community members - Limited time - Gender and social dynamics	
Smallholder farming households	- Vulnerable smallholder farming households with children below five years - Include labour and resource constrained, and/or with high dependency ratios	- Primary beneficiaries of the strategy - Participate in CFBS and its programmes - Adopt and implement strategy actions - Provide social support to other implementing households	- Household gender and social dynamics that influence decision making, participation and adoption of practices - Limited resources such as labour, land, and time - Limited knowledge, skills, and self-efficacy surrounding application of recommended practices - Lack of social support to adopt and - implement strategy actions	- Capacity building in informal environments with elaborate learning - Demonstration and practice of skills and application of information - Strategic goal and action planning, review and feedback - Building social support through group learning, linkage to community-level groups/networks and community champions - Actively engage men, women, and youth
Other stakeholders/ influencing actors	- Organisations/institutions with roles linked to agriculture and nutrition - Include market, health, input providers, financial services, and private sector	- Link and support CFBS actors - Increase reach of services in the communities	- Limited knowledge of the linkage between CRFS goal and outcomes with their own - Profit margin focused - Inconsistent quality of services - Incorrect information or counterfeit products in the communities - Lack of motivation to engage with other actors	- Workshop discussions on CFBS - Participatory planning to develop or - re-align programmes to incorporate CFBS - Strategic goal and action planning, review and feedback meetings - Build/strengthen stakeholder and partner linkages

SECTION D: CFBS implementation plan

Category	Primary implementers: Community champions		Primary beneficiaries: Beneficiary households		Secondary implementers and beneficiaries:		
	-Volunteer community member -Smallholder farmers -With children aged six months to one year		-Vulnerable rural smallholder farming households -With children aged six months to one year		Extension workers and community leaders		Other stakeholders
Engagement	Training of Community champions by field staff Learning and practice	CC feedback sessions as they train and follow-up beneficiaries	Training by Community champions Learning and practice	Follow up of beneficiary households by Community champions	During training and feedback sessions of Community champions	As they conduct their usual roles/mandate	Throughout implementation
Mode of engagement	Group sessions Household visits	Group sessions	Group sessions Household visits	Group sessions Household visits	Group sessions Information technology [c]	Individual Information technology [c]	Stakeholder workshops; Group/household visits Information technology [c]
Scope	1) Agricultural production module: Food from my home 2) Food access module: Food for the home 3) Nutrition module: Food for health 4) Training module: becoming a food change agent	Share experiences; Feedback on progress; Reinforce information	1) Agricultural production module: Food from my home 2) Nutrition module: Food for health 3) Food access module: Food for the home	Review of progress; Provision of feedback; Barrier identification and problem solving; Community support	Equip extension workers and community leaders 1) Agricultural production module: Food from my home 2) Food access module: Food for the home 3) Nutrition module: Food for health	Create awareness and promote dietary diversity as per beneficiary scope	Create awareness and promote dietary diversity as per beneficiary scope
Materials	CC Manual: A training manual to provide CC with details on recommended practices	CC journal: to track households being trained, goals set and progress during implementation and adoption	Key message booklet and charts: for Community champions to highlight messages and practices being promoted	CC journal: to track households being trained, goals set and progress during implementation and adoption	Key message booklet and charts: Highlight messages and practices being promoted Policy briefs: Highlight the importance of dietary diversity and actions required and/or agreed to by leaders to promote/support it Mass media materials		Policy briefs Reports
Support	Field staff Fellow Community champions Extension workers and Community leaders		Community champions Fellow beneficiaries Extension workers and Community leaders		Fellow extension workers and Community leaders Community champions Field staff		Extension workers and Community leaders Community champions
Assumptions [c]	Period covers one rainy season; one dry season; one harvest period first module on agriculture is during the dry season to enable planning, foresight, and implementation		Period covers one rainy season; one dry season; one harvest period first module on agriculture is during the dry season to enable planning, foresight, and implementation	Period covers one rainy season; two dry seasons; one harvest period Allowing for feedback and support across the different seasons			

CC: Community champions; [b] December to February is a dry season, March to May is rainy, June to August is dry, and September to November is rainy. Harvests are therefore usually around may to June and November to December. [C] Information technology: particularly mobile technology

SECTION E: CFBS process evaluation plan

Variables	Outcomes	Evaluation questions	Indicators	Measure	Data collection
CFBS implementation	Community champions and beneficiary training	Did the Community champions and participating households complete their respective training modules? Were the Community champions and beneficiary training implemented as intended?	Number of Community champions and households that completed the CFBS training modules Number of training sessions/modules conducted by Community champions Number of demonstration sessions held Community champions Number of household visits conducted by Community champions Materials used during implementation by Community champions and beneficiaries Extent to which the modules and training layout were followed	Project records; Community champions records; surveys; interviews; focus group discussions; observations	After training/start of follow up phase End-line
	Follow-up of Community champions and beneficiaries	Was the follow-up Community champions and beneficiary households conducted as intended?	Number of Community champions and households that completed follow up sessions Number of household visits conducted by Community champions Number of Community champions that participated in the CC feedback sessions Goals set vs those achieved (even partially) by Community champions and households	Community champion records; interviews; focus group discussions	End-line
	Extension workers and leaders' engagement	Did extension workers and leaders participate in the CC training and feedback sessions? Did extension workers and leaders participate conduct awareness creation events as planned?	CFBS components and modules conveyed in during awareness creation events Goals set vs those achieved (even partially) by extension workers and leaders Materials used by extension workers and leaders Categories of people targeted and those reached through the awareness creation events	Project records; interviews; focus group discussions	After training/start of follow up phase End-line
	Context and reach of CFBS	Did the environmental context change during implementation? To what extent was the CFBS adapted during implementation? To what extent did the CFBS reach the intended/target groups?	Government and organisational programmes implemented in the target and comparison areas during the strategy timeframe CFBS components and modules that were implemented and those that were not Frequency and duration of CFBS activities Proportion of beneficiaries that were part of the target group	Project records; community champion records; interviews; focus group discussions	After training/start of follow up phase End-line

Variables	Outcomes	Evaluation questions	Indicators	Measure	Data collection
			Proportion of beneficiaries that were not part of the target group		
	Beneficiaries responsiveness to CRBS	Did the target beneficiaries of the CFBS find it relevant? (households, Community champions, extension workers and leaders) Which factors within the CFBS and environment facilitated or hindered participation and implementation?	Proportion of households, Community champions, extension workers and leaders that perceived the CFBS as relevant CFBS components and other factors that encouraged or facilitated participation and implementation CFBS components and other factors that hindered participation and implementation	Survey; project records; community champion records; interviews; focus group discussions	After training/start of follow-up phase End-line

SECTION F: CFBS impact evaluation plan

Variables	Outcomes	Evaluation questions	Indicators	Measure	Data collection
Dietary diversity	Improved dietary diversity	Did CFBS increase child and household dietary diversity?	Proportion of children six to 24 months meeting the minimum dietary diversity and minimum acceptable diets Proportion of children 25-59 months with dietary diversity score >3 Proportion of households with dietary diversity score >3	Surveys	Baseline After training/start of follow-up phase Seasonal End-line
	Increased consumption of animal-source foods	Did CFBS increase consumption of animal-source foods?	Proportion of children consuming animal-source foods at least three times a week	Surveys	Baseline After training/start of follow-up phase Seasonal End-line
	Increased consumption of fruits and vegetables	Did CFBS increase consumption of fruits and vegetables?	Proportion of children consuming at least a fruit or vegetables each day	Surveys	Baseline After training/start of follow-up phase Seasonal End-line
Behaviour outcomes	Increased diversity of crops grown	Did CFBS increase production of diverse crops?	Species diversity species produced by the household as reflected by (i) species richness (count of crop and animal species); (ii) species biodiversity index (Simpson's index of richness and evenness); (iii) number of food groups produced	Surveys	Baseline After training/start of follow-up phase Seasonal End-line
	Increased frequency and safety of meals consumed by children	Did CFBS improve meal frequency of children? Did CFBS improve food handling methods?	Proportion of children consuming four meals a day Proportion of households applying the recommended food handling methods	Surveys	Baseline After training/start of follow-up phase Seasonal End-line
	Increased access to nutrition and agricultural related information	Did CFBS increase household information seeking behaviours?	Number of community champions, extension workers, and leaders that that completed the CFBS training modules Information-seeking practices among target households, Community champions, leaders, and community	Surveys; community champion records; interviews; focus group discussions	Baseline After training/start of follow-up phase End-line

Variables	Outcomes	Evaluation questions	Indicators	Measure	Data collection
Environmental outcomes	Increased access to a variety of crops, including fruits, vegetables, and animal-source foods	Did CFBS increase the diversity of foods sold and bought in target areas?	Diversity of foods sold within the target communities Avenues through which households access food diversity other than home production (both formal and informal markets) Proportion of target households selling and buying diverse foods	Surveys; interviews; focus group discussions	Baseline Seasonal End-line
	Improved agricultural production	Did CFBS improve household land utilisation? Did CFBS increase the use of sustainable agricultural production practices and inputs?	Total area under cultivation Proportion of households applying the recommended agricultural practices Share of crop land under these practices (Recommended agricultural practices include e.g. waste management, intercropping, mulching, organic pesticides, kitchen garden, etc.)	Surveys; community champion records;	Baseline After training/start of follow-up phase End-line
	Increased household purchasing power	Did CFBS increase household allocation of income to food?	Proportion of households allocating more than 10% of income to food	Surveys; interviews; focus group discussions	Baseline End-line
	Increased access to nutritional and agricultural information, training, and support	Did CFBS increase household access to nutritional and agricultural information? Did CFBS increase household social support to improve nutrition and agriculture?	Information-seeking practices and sources among target households, Community champions, leaders, and community Number of people reached with information on dietary diversity and approaches to achieve it by Community champions, extension workers, and leaders Number of events/avenues through which Community champions, extension workers, and leaders promoted dietary diversity and approaches to achieve it Proportion of households reporting an increase in the support they had towards implementation of recommended practices improving nutrition and agriculture	Surveys; community champion records; interviews; focus group discussions	Baseline End-line

Variables	Outcomes	Evaluation questions	Indicators	Measure	Data collection
Change objectives (Personal determinants)	Improved knowledge, skills, self-efficacy and attitude of households, Community champions, extension workers and leaders on: - Production of diverse crops, especially fruits and vegetables - Sustainable agricultural production practices - Household purchasing power and access to diverse diets access to diverse diets - Consumption of diverse diets by children and household - Meal frequency for children and food safety and handling - Access to information and training - Promotion of dietary diversity and approaches to achieve it (among community champions and leaders)	Did CFBS increase household knowledge?	Proportion of households, Community champions, extension workers and leaders who know the correct information for the different aspects Knowledge scores of the community at different levels (households, Community champions, extension workers and leaders)	Surveys; interviews; focus group discussions	Baseline After training/start of follow-up phase End-line
		Did CFBS increase household skills?	Proportion of households, Community champions, extension workers and leaders that report an improvement in skills Proportion of households that applied the skills	Surveys; community champion records; interviews; focus group discussions	Baseline After training/start of follow-up phase End-line
		Did CFBS increase household self-efficacy?	Proportion of households, Community champions, extension workers and leaders with an increase in self-efficacy Self-efficacy scores of the community at different levels (households, Community champions, extension workers and leaders)	Surveys; interviews; focus group discussions	Baseline After training/start of follow-up phase End-line
		Did CFBS improve household attitude?	Proportion of households, Community champions, extension workers and leaders with a positive attitude towards the different aspects Attitude scores of the community at different levels (households, Community champions, extension workers and leaders)	Surveys; interviews; focus group discussions	Baseline After training/start of follow-up phase End-line

7.5 Discussion of the CFBS validation results

The validation approach used comprised FGDs and KIs. The FGDs included participants that were involved in Phase 2 of the study and those that were not. Together, they were able to validate the information obtained from Phase 2 of the study (community perspectives), its incorporation in the CFBS, and appropriateness of the strategy for the study population. The FGDs were forthcoming and were an efficient means of assessing the relevance and feasibility of the strategy. KIs were invited to validate the strategy by assessing the robustness of the development approach used and the relevance and feasibility of the resulting strategy and implementation plan. The KIs were experts in nutrition from different countries and areas of practice, such as university, research, and development organisations. Despite the useful input provided by the different KIs, fewer KIs responded to the invitation, with some requesting their juniors to participate in their place. A self-administered tool was used for the KIs and this required presentation of the CFBS in a concise manner with limited supporting text. This approach limited validation to an extent given that some KIs expressed the need for specificity or recommended aspects that were already part of the strategy. The validation could therefore have been improved by allowing a longer timeframe for the exercise to obtain more responses and allow for further interaction between the KIs and the researcher, as well as key actors in the strategy, like extension workers, community-level groups, and potential community champions.

The factors and actors incorporated in the CFBS were considered important by the FGDs and KIs for improving the productivity, food availability, dietary diversity, livelihoods and health of the communities. It was acknowledged that this would be achieved through increased awareness, capacity building, empowerment of household and communities, and increased availability of and access to diverse foods. The results from the validation verified the underlying motives behind the CFBS objectives and impact pathway and lends to the process used in the design of the strategy.

The responses from the FGDs showed an awareness of the problems at hand and pathways to solutions that corresponded with the KI responses. They echoed the goal of smallholder farmers to increase agricultural productivity, income, food security and improve their livelihoods. This reflected the need for the different factors incorporated in the CFBS. Community members have specialised knowledge and experience that can be used to solve community problems and in fact, locally determined solutions are sustainable (Bogart & Uyeda, 2009; UNDP, 2012). This underscores the importance of participatory approaches that facilitate the utilisation of this knowledge and experience.

A reduction in availability of some indigenous foods was noted by the FGD participants. Uganda has rich agrobiodiversity with an estimated 1,400 indigenous plant species. Of these, 30 are endangered, 43 are rare and 10 are vulnerable. The reduction in forest cover, which provide access to several wild foods and animals from 20% in 2001 to 16% in 2015 due to deforestation, urbanisation and encroachment, has contributed to the loss of diversity. In addition, modern agriculture and improved varieties have also contributed to the loss

because custodianship of indigenous knowledge and seed mainly belongs to local communities (NEMA, 2016; Bioversity International, 2017). Therefore, identification of indigenous foods and wild foods that contribute to the CFBS and are of importance in the target area is imperative and should be included and promoted. The existing concern among farmers can be harnessed in community biodiversity conservation efforts such as community seedbanks (Vernooy, 2015). Through these seedbanks, biodiversity is not only conserved, but farmer access to seed is increased.

Under the second CFBS objective to increase household access to diverse foods through appropriate use of household income and markets, capacity building needs to address household gender dynamics around decision making. As such, household gender and social dynamics that influence decision making, participation and adoption of practices were identified as a barrier to involvement of smallholder households in the CFBS. The validation, however, underscored the importance of addressing gender, household relations and decision-making dynamics throughout the whole strategy. Gender roles in the food environment in any given context need to be understood and harnessed in interventions to empower women and reduce unintended negative impacts on nutrition (Ruel, Quisumbing & Balagamwala, 2017). Gender equity is an important aspect in nutrition strategies and interventions (Wiggins & Keats, 2012; Ruel, Quisumbing & Balagamwala, 2017). Use of the Gender Action Learning System (GALS), for example, offers a participatory way to assess and address gender dynamics in a community and household. In GALS, households and communities are empowered to analyse, understand, and change their gender relations in order to achieve a common vision. Though the methodology was developed for women's rights, it has been adapted for use in village savings and lending associations, agricultural extension and advocacy (Reemer & Makanza, 2014; PELUM Uganda, 2016). It therefore has potential for use in food and nutrition security and dietary diversity and in the different implementation plans within the CFBS.

The FGDs were hesitant to have policy makers as actors in the CFBS, citing corruption and possible hindrance of its implementation. Their moderate importance was also noted by some KI that viewed their participation in the CFBS as playing their designated roles that support the strategy. Policy makers and government institutions are crucial establishments when it comes to improving the livelihoods of people through their political, economic and social power (UNDP, 2012). To achieve growth, good governance and accountability are important and this includes equitable allocation and distribution of public resources and efficient delivery of public services (NPC, 2018). The rate of absence of corruption in government branches in Uganda is at only 40 out of 100, while transparency and accountability is at 36 out of 100 (MIF, 2018). Because corruption impacts the poorest disproportionally, transparency and accountability are vital. Communities need to be empowered to fight corruption and hold leaders accountable, while leaders need capacity strengthening in effective leadership and provided with resources and mechanisms for grassroots participation (UNDP, 2012). Social agency around good governance and accountability can be built or

strengthened by civil society organisations especially those at community level; through social audits where leaders and community members interact, and through media where disseminated information creates awareness, advances social justice, and enhances accountability (UNDP, 2012). As a result, policy makers and government institutions remain key actors of the CFBS, especially those at local levels. In addition, further engagement of extension workers, community-level groups, and potential community champions to understand and address their motivation as actors in the strategy will be beneficial.

The dietary diversity and food security status of smallholder households changes with agricultural seasons (Hillbruner & Egan, 2008; Bioversity International, 2017; Stevens et al., 2017). Stability in food availability and access is vital if adequate nutrition and health are to be achieved. This requires interventions that support stability of food access throughout the year, through the periods of adequate food availability and lean seasons. For this reason, the proposed implementation plan extended across seasons ensuring that households are equipped, and seasonal challenges are addressed.

In addition to interpersonal modes of information and skill transfer, various media can be used to increase awareness and enhance behaviour change. Information and communication technology, particularly mobile technology, enables timely access to information such as market information prices, farming practices, and weather and environmental information, therefore enabling planning and appropriate responses by rural farmers. Mobile phones also facilitate timely communication and coordination, linking smallholder farmers to other farmers, actors and services across the value chain (Maumbe & Okello, 2010; Furuholt & Matotay, 2011; Kiiza, Pederson & Lwasa, 2013). Use of information and communication technology is, however, limited by cost of the technology and its maintenance, low literacy, and lack of awareness (Maumbe & Okello, 2010). However, given the increasing use of mobile phones and internet access even in rural areas, this is an avenue that should be harnessed, accompanied with the necessary capacity building.

Given the strategy development approach that made use of study findings, literature and theory, the resulting strategy included components that have previously been applied in food-based strategies. For example, improving the production capacity of farmers, nutrition education, demand creation, use of group approaches, and use of behaviour change communication strategies (Hotz *et al.*, 2012; Pudasaini *et al.*, 2013; Hillenbrand and Waid, 2014; Neumann *et al.*, 2014; Darrouzet-Nardi *et al.*, 2016; Olney *et al.*, 2016; Osei *et al.*, 2017)

7.6 Summary

The FGDs were an efficient means of assessing the relevance and feasibility of the strategy. They validated information obtained from Phase 2 of the study (community perspectives), its incorporation in the CFBS, and appropriateness of the strategy for the study population. The KIs comprised of experts and though fewer KIs responded than anticipated, they were able to assess the robustness of the development approach used and the relevance and feasibility of the resulting strategy and implementation plan.

The FGDs and KIs considered the factors and actors incorporated in the CFBS important for improving the productivity, food availability, dietary diversity, livelihoods and health of rural farming households and communities. The CFBS increases awareness, information and skills in production, markets/finances, and nutrition, thereby building capacity and empowering the different actors, including smallholder farmers, to improve not only their diets, but their farms and incomes as well. Involvement of the different actors builds a sense of ownership, reduces potential resistance, enhances behaviour change, increases access to information and skills in the community and increases sustainability of the strategy. Some of the recommendations from the validation from the validation process that were added/ emphasised in the CFBS included focus on nutrient-dense foods, underutilised indigenous foods, actively engaging the community and increasing awareness, and understanding the motivation of extension workers, community-level groups, and potential community champions.

Chapter 8 Conclusion and recommendations

8.1 Introduction

This concluding chapter presents a summary and synthesis of the literature, methodology and findings of the study, contribution to knowledge, limitations of the study, conclusion and emanating recommendations.

The aim of the study was to develop a food-based strategy to improve the dietary diversity of children aged 12 to 36 months from rural smallholder farming households in Central Uganda. The study objectives were:

1. To determine the current social and food security status of rural farming households
2. To determine the current dietary diversity and nutritional status of children aged 12 to 36 months in the farming households
3. To ascertain the community's perspective on their current social norms, and food and nutrition situation and identify the possible solutions
4. To design a food-based strategy using the intervention mapping protocol
5. To validate the developed strategy through a participatory approach.

8.2 Synthesis of literature

Poor-quality diets and malnutrition are still prevalent around the globe, especially among smallholder farmers who face poverty, food insecurity, hunger, challenges in agricultural production and effects of climate change (Development Initiatives, 2018; van Wijk et al., 2018; Williams et al., 2018; FAO et al., 2019). Among six to 23-month-old children in Uganda, 70% do not consume with minimum dietary diversity and 85% have diets that do not meet the minimum acceptable diets (UBOS & ICF, 2018). At a national scale, diets are largely composed of starchy staples, are lacking in micronutrients, vitamin A, vitamin B-12, iron, zinc and calcium. In addition, high and rising food costs and limited availability and access hampers consumption of fruits, vegetables, and animal-source foods are prevalent (Harvey, Zo Rambeloson & Dary, 2010; Shiverly & Hao, 2012). The study findings reflect this gap and propose the CFBS to improve dietary diversity. The developed strategy has the potential to contribute to not only the diets but the productivity and livelihoods of smallholder farmers.

Given that smallholder farmers produce the majority of the food in developing countries, their food and nutrition challenges have grave impacts on the health and productivity of their households, communities and nations, both in the current and next generations. The dietary diversity and food security of smallholder farmers are also influenced by the quantity and diversity produced, incomes and market access (Sibhatu, Krishna & Qaim, 2015; Qaim, Matin, Sibhatu, Kibrom & Krishna, Vijesh, 2016; Jones, 2017; Kissoly, Fabe & Grote, 2018). Despite the vulnerability of smallholder farmers, the different factors influencing their dietary diversity and food security, and their intense use of resources which are usually limited, they have the potential to make even greater contributions towards food security and poverty alleviation. This can be achieved through targeted, integrated and sustainable approaches. In

light of farmer engagement in agriculture for both food and income, and reports on the influence of market access on dietary diversity, it is important that the smallholder farmer food environment is evaluated, and key gaps addressed. The study affirmed that the three factors - production of diversity, income access and use, and market access - are linked, and important for dietary diversity. For example, household income can support consumption of diversity produced and that the diversity available in consumer markets needs to be improved.

Diversification is a food-based strategy that aims at improving the availability, access to and utilisation of nutrient-rich foods throughout the year. The evidence of the impact of food-based strategies on nutrition outcomes has, however, been limited by gaps in the design, methodology, evaluation and reporting, limiting the scope of evidence and scale out of successful interventions (Berti, Krasevec & FitzGerald, 2004; Masset et al., 2011; Thompson et al., 2014; Ruel, Quisumbing & Balagamwala, 2017). Because food-based strategies are complex in design, implementation and evaluation, use of frameworks/protocols to systematically identify impact pathways, implementation processes, and indicators have been recommended (Bokhoven, Kok & Weijden, 2003; Ruel et al., 2013; Gibson, 2014; Leroy, Olney & Ruel, 2016). Therefore, the intervention mapping protocol was used to systematically develop a food-based strategy.

Intervention mapping is a protocol that provides a systematic approach to developing theory-based and evidence-based intervention methods and strategies. It facilitates the use of theory, links theory and practice/evidence, and addresses challenges in intervention and strategy development such as those related to determinants of behaviour (Kok & Mesters, 2011; Eldredge et al., 2016; Garba & Gadanya, 2017). Theories can be used to explain or predict behaviour, identify effective change methods, and evaluate why and how change occurred (McEachan et al., 2008). Application of theory together with evidence can therefore yield a focused strategy aimed at determinants central to the behaviours or practices in question and thus are more likely to lead to change. Intervention mapping has been used to design, adapt, implement and evaluate health and nutrition interventions, especially in developed countries (Eldredge et al., 2016) and was hereby applied in a rural setting in a developing country. The approach enabled the systematic merger of the needs-based and asset-based approaches.

8.3 Reflection on the approach and methodology

The study was done in four phases. Phase 1 (Chapter 4) comprised a cross-sectional situation analysis using a quantitative approach that included a survey of 182 households and a survey of six markets in the study communities. Phase 2 (Chapter 5) determined the community perspective through a qualitative approach. This involved separate FGDs with men and women that had and did not have prior involvement with an agricultural and/or nutrition intervention so that the experiences and perspectives of the two groups could be ascertained and incorporated in the strategy. Separating the men and women created a conducive

environment for open expression of ideas and as such, issues regarding household gender dynamics, diets and food security were captured.

Use of both qualitative and quantitative data was beneficial to the study because results from the eight FGDs (Chapter 5) reinforced and expanded upon information from the household survey (Chapter 4), particularly why and how the communities acquired, produced, and prepared food and how they addressed the food- and dietary diversity-related challenges they faced. Given the cross-sectional nature of Phase 1, the FGDs were able to provide information on the situation in different seasons of the year. From this information, gaps that the strategy needed to fill, and practices and methods whose reinforcement could improve dietary diversity were identified. Having two rounds of FGDs with the same participants allowed for validation of the data synthesised from the first round of FGDs. The process also provided insight on the participants' level of awareness with regard to agriculture and nutrition information. This was noted as participants clarified or corrected one another during the discussions. In addition, the information and practices shared during the discussions were gauged against recommended practices, compared across FGDs and incorporated in the development of the CFBS.

The market survey (Chapter 4) informed the study on the availability and access of different food groups within the community in addition to the data obtained in the household survey and FGDs. The market survey results permitted a contrast between the markets the community commonly accessed, the diversity that was available, and the diversity bought. This analysis extended beyond establishing the presence of markets and facilitated identification of specific limitations faced by households when accessing diverse diets. As a result, the current and future potential of markets to contribute to dietary diversity was utilised during the design of the food-based strategy by considering how the demand and supply of key food groups could be created within the community.

Phase 3 of the study focused on the design of the Contextualised Food-based Strategy (CFBS) (Chapter 6). Findings from Phase 1 and Phase 2 together with relevant theory and literature were integrated using the intervention mapping protocol. Use of the intervention mapping protocol facilitated the incorporation of the needs-based and asset-based approaches in order to develop the food-based strategy. This was achieved through a systematic process that where the relevant determinants of low dietary diversity, outcomes and objectives, and pathway to change were identified.

Since no single theory can be applied in all cases, and theories overlap such that more than one theory can be applicable (Glanz, Rimer & Viswanath, 2015a), the protocol used in the study enabled identification of relevant theories at different stages of the strategy development process. For example, the Reasoned Action Approach and Social Cognitive Theory were used to identify determinants of low dietary diversity and changes in the personal determinants that would support the CFBS performance objectives. In addition, the Social Cognitive Theory, Goal Setting Theory and Elaboration Likelihood Model were used to

identify behaviour change methods suited to the study context and informed the design of the proposed implementation plan for the CFBS. CFBS As a result, the performance objectives, critical success factors of change, implementation plan and evaluation plan in the CFBS included appropriate designs, measures, and procedures. They also built on existing structures/resources and practices in order to address the determinants of behaviour and lead to improved dietary diversity (Michie et al., 2008; Glanz, Rimer & Viswanath, 2015b; Eldredge et al., 2016).

The approach used was not only systematic but transparent which enhances its evaluation and replication. The strategy and its development process can be adjusted for use in other smallholder contexts in developing countries by designing and piloting implementation plans based on the CFBS as it is, by re-assessing the key factors in the strategy using the validation process that was used in the study and implementing the revised strategy, or by replicating the whole design process. Also, worth noting is that the intervention mapping protocol is lengthy and iterative and thus costly. It therefore may be better relegated to well-funded or high-level strategies within which several implementation plans can be developed. In this case, efforts must be made to ensure that all implementation plans contribute to the main strategy and make appropriate use of the identified methods and theories.

The developed CFBS was validated in Phase 4 of the study (Chapter 7). Two FGDs and six key informants (KIs) assessed the relevance and feasibility of the strategy. The KIs were experts in the nutrition field, while both FGDs involved community members that were a part of Phase 2 of the study and those that were not. Involving these two categories of FGD participants enabled evaluation of the context of the strategy, especially by participants that were not involved in Phase 2 of the study, as well as validation of the information obtained in Phase 2 and its application in the strategy. The process also generated areas of improvement that were added to the CFBS highlighting the importance of the validation process. Additional perspectives that could have enhanced the validation process include insights from more KIs and from key actors in the strategy like extension workers, community-level groups, and potential community champions. Exploration of these additional perspectives was prohibited by limited time and funds.

8.4 Synthesis of study findings

The household survey (Chapter 4) revealed that the main foods produced, and food consumed were cereals and grains; roots, tubers, cooking bananas; and legumes. Low dietary diversity was noted with 78% of children six to 23-months old not meeting the minimum dietary diversity score and 71% of children ≥24 months consuming less than three food groups in a 24-hour period. There was low consumption of micronutrient-rich foods (vitamin A-rich foods and animal-source foods) among the children and 33% of them were stunted. Household food insecurity was found in 35% of households. Households mainly sourced their food from own production and purchase from markets, and markets played a role in the households' access to micronutrient-rich foods. These results affirmed the need for developing a strategy to improve dietary diversity. They also elaborated on the context within

which the strategy would be built such as food insecurity, low production diversity on individual farms while larger diversity was available in the community and use of both own-production and markets for food. The consumption of diverse diets is influenced by the food environment, from availability, accessibility, affordability of the different food groups, to the convenience, desirability, perceptions, culture and norms around the food (Herforth & Ahmed, 2015). It was therefore important that focus is not only placed on the consumption but that more aspects of the food environment are evaluated and addressed.

Literature shows that improving household production and production diversity is associated with improved dietary diversity and food security. Improving household production has been the primary focus of efforts to improve dietary diversity among smallholder farmers and has shown positive effects in some studies (Ramirez, 2002; Masset *et al.*, 2011; Sekabira, Nalunga and Sibhatu, 2018b). Further studies on the impact of production diversity on dietary diversity have reported a stronger impact for the poor, vulnerable, in remote areas, with low on-farm diversity, or those with poor market access, and a weaker influence for households with income, market access, and with considerable production diversity (Rajendran et al., 2014; Sibhatu, Krishna & Qaim, 2015; Ayenew et al., 2018; Kissoly, Fabe & Grote, 2018; van Wijk et al., 2018). It was therefore important that productivity, production diversity and markets were addressed in the CFBS. This was also affirmed by the results from the FGDs in Chapter 5.

A survey of the markets (Chapter 4, Section 4.7) found a wide range of food groups and food items on sale. However, the most accessed markets by the surveyed households had a limited diversity of food groups available (six out of 11 groups) and a limited variety of food items per food group compared to other markets in the community. Given the increased emphasis on markets and their contribution to dietary diversity in literature, it is important to note that there are other factors in addition to market access that are required. Smallholder farmers need access to both agricultural output markets where they can sell their produce and consumer food markets where they can purchase food (Jones, 2017). They need to be able to consistently access and purchase diverse foods that meet their needs and preferences (Herforth & Harris, 2014). Therefore, policy actions that are linking rural farmers to markets especially agricultural output markets, should also evaluate and improve farmer access to consumer food markets. From the study, it was noted that additional focus on the consumer markets that serve the rural communities and enhancement of the demand and supply of diverse foods within the rural communities is required (Chapter 4). Addressing this gap will enhance the contribution of agricultural income towards food and nutrition security. This is of particular interest given the national and regional emphasis on intensification and commercialisation of smallholder agriculture (Deijl, Djurfeldt & Jirström, 2017), that relies on the premise that incomes earned from agriculture can translate to diet quality and improved livelihoods.

Based on the community perspective (Chapter 5), children ate the same food as the rest of the households. Household food production and consumption was focused on priority crops

that alleviated hunger and contributed to income. Prior experience and personal preference also influenced choice of crops grown and/or animals reared. Agricultural production was influenced by land availability, soil fertility, labour availability, access to inputs, and knowledge and skills. Time was a limiting factor of the production and preparation of diverse foods and child feeding. There was limited household income amidst a wide range of household needs. The cost of food and its availability in the market influenced the type and quantity of food bought. A poor perception towards meetings and/or training and inadequate nutrition information and skills in the community were noted. These elements were crucial in establishing the behavioural and environmental determinants of low dietary diversity during development of the strategy. It also has to be noted, that there are capacity constraints on the levels of production and dietary diversity that can be achieved within a limited resource base. For example, production diversity is limited by land, labour and time, which can be improved by increased access to income or credit. In addition, income also facilitates access to technologies that improve productivity. Therefore, smallholders can benefit from technologies and practices that not only improve their productivity but also their resilience, that is, those that are low cost, climate smart, and sustainable.

Indeed, households need food from own production, income from on- and/or off-farm activities and market access in order to improve their access to diverse foods and achieve food and nutrition security (Rajendran et al., 2014; Jones, 2017). As a result, sustainable production practices and access to appropriate information and skills were incorporated in the strategy. Because agricultural production is a fundamental livelihood, challenges faced by the farmers should also be addressed as part of any attempt to improve their diets and food security. Even in the presence of on- or off-farm income, own food production continues to significantly contribute to food security especially where there is inadequate decision making by women.

Another advantage of expanding the income base of smallholder farmers noted in the study was that off-farm income could facilitate the consumption of the own production diversity by reducing the likelihood that all which was produced was sold. Similar to the use of agricultural income mentioned above, this link is strongly influenced by the household decision making and gender dynamics, reflecting the need for gender-sensitive and gender-transformative approaches. Expanding the income base of smallholder farmers is also compounded by trade-offs between off-farm income and food production. Given the significance of smallholder farmers on food production and their custodianship of diversity in developing countries, a reduction in households and/or household members engaging in agriculture may have negatively impact food production and the availability of diverse foods, especially indigenous foods (IFAD, 2013; FAO, 2018b).

Amidst changing food environments, urbanisation and commercialisation of agriculture, and climate change is a reduction in diversity in production, supply and diets (Lartey et al., 2016; UNSCN, 2019). Promotion of production diversity and diversity in the consumer markets requires structures that support and promote agrobiodiversity. This includes community and

national actions to conserve, avail, and promote agrobiodiversity (Vernooy, 2015; UNSCN, 2019). Creating awareness and generating supply and demand for diverse foods through strategies like the CFBS will promote agrobiodiversity. This is because in addition to household consumption, viable markets for agrobiodiversity act as a motivating factor for their continued production (Herforth, Jones & Pinstrup-Andersen, 2012).

Validation of the CFBS (Chapter 7) showed that the CFBS was sound, addressing pertinent issues faced by smallholder households with a potential to address not only dietary diversity, but also food security and livelihoods. The FGDs and KIs considered the factors and actors incorporated in the CFBS important for improving the productivity, food availability, dietary diversity, livelihoods and health of rural farming households and communities. Some of the recommendations from the validation process that were added or emphasised in the CFBS included focus on nutrient-dense foods, indigenous and underutilised foods, actively engaging the community, and understanding the motivation of extension workers, community-level groups, and potential community champion. These results strengthened the feasibility of the strategy. The validation process could be used to adapt the CFBS to other smallholder contexts as it ascertains the relevance and feasibility of key factors in the strategy.

The goal of the resulting CFBS is to improve dietary diversity of children in smallholder farming households through improved household production, income utilisation, and food consumption practices. This goal is achieved through three overall objectives. The first is to increase the diversity of foods produced by the households, particularly fruits and vegetables, using sustainable production practices that enable smallholder farmers to maximise their available resources. This includes equipping the actors with information, skills and social support to adopt the practices in order to improve productivity, increase household availability and access to diverse foods and contribute to income. The second is to increase household access to diverse foods through the appropriate use of household income and markets. This objective involves increasing the diversity of foods in markets that serve the rural communities, household financial literacy to support allocation of income to diverse foods and increasing household income through on-farm and/or off-farm activities. The last objective is to improve the quality of diets consumed by children and households in terms of diversity, frequency, nutrient quality and safety. This is achieved through nutrition education that includes promotion of and capacity building in incorporation of fruits, vegetables, and animal-source foods in the diets, increase of meal frequency by children, essential nutrition actions, appropriate post-harvest-handling, food preparation, and food safety methods, and appropriate food choices in the market.

Household needs and preferences also influence the foods grown, purchased and consumed. These needs and preferences together with decision-making dynamics around household income and the cost of food influence the foods that are purchased and household nutrition (Dioula *et al.*, 2013; Qaim, Sibhatu & Krishna, 2016). For positive food preferences and choices, households and communities need to be well informed on dietary diversity and

equipped to achieve it. Social behaviour change methods can be used to provide information, change attitudes, perceptions and expectations, and increase skills and self-efficacy of households and communities (Glanz, Rimer & Viswanath, 2015b). The CFBS addresses these determinants to increase the uptake of practices that improve production, production diversity, income allocation, food choice and consumption of diverse foods. These changes not only impact the beneficiary household but can also contribute to creation of demand and supply of diverse foods within other rural farming communities.

The CFBS requires beneficiary households to make various decisions concerning production, agricultural produce, income, and food consumption. Joint decision making between household heads and spouses was noted in the study. Approaches that target the household, rather than individual household members, have been reported (Dioula et al., 2013; Jones, Shrinivas & Bezner-Kerr, 2014; PELUM Uganda, 2016; Ekesa et al., 2018; Acosta et al., 2019). Involving men, women and youth, not only empowers women but also creates a support system within the household. Women empowerment is an important link between agriculture, income, household food security, dietary patterns and nutrition outcomes, and has been incorporated in various interventions (Dioula et al., 2013).

CFBS Actors targeted in the CFBS include policy makers, development organisations, extension workers, community-level groups and networks, community champions, and smallholder farming households. At their different levels, the CFBS, strengthens and/or complements their current actions and objectives, ensures that dietary diversity is improved by enhancing their knowledge, skills, attitude and self-efficacy, and builds their social support.

Within the CFBS, several programmes can be developed to achieve the strategy objectives. An implementation plan was proposed that focuses on capacity building of extension workers, community champions, and beneficiary-vulnerable smallholder farming households using household groups primarily moderated by community champions. Core components within the plan that enhance behaviour change include availing appropriate information, conducting demonstrations, having coping models, having group and individual interactions, providing social support, setting and reviewing of goals, message reinforcement, building knowledge, skills, positive self-efficacy and positive attitude, and conducting effect and process evaluations.

Improving agricultural production and market access among and for smallholder farmers requires policies, investments and actions that: i) increase access to inputs, agricultural support services and information with smallholder farmers in mind (Wiggins & Keats, 2012; Rapsomanikis, 2015; Fiala & Apell, 2017); ii) improve smallholder-market linkages and increase fair and transparent transactions, support collective farmer action, and market types accessed by smallholder farmers (Barrett, 2008; Markelova et al., 2009; Omiti et al., 2009); and iii) build diversified climate-resilient farming systems through development and dissemination of practices that target smallholder farmers, make use of traditional knowledge, and include women and youth (NPA, 2013a; Rapsomanikis, 2015; Valdivia, Antle

& Stoorvogel, 2017). These aspects are further supported by adequate credit access, institutional and physical infrastructure, input quality and safety at all levels from the national level, regional, community, and household levels. Strategies such as that developed in this study should fit within, make use of, and enhance these policies, investments and actions.

Matters concerning the dietary diversity and food security of smallholder farmers have been reported and addressed to various degrees. The prevailing albeit decreasing prevalence still warrants attention. Uganda, for example, has various policies that highlight the gaps and strategies to address them where sustainable and profitable agricultural production, income, livelihoods and food security are a major focus (NPA, 2013b; MAAIF, 2016a). However, there have been challenges in funding, implementation, monitoring and evaluation (MAFAP, 2013; NPA, 2017), highlighting the need for active integration of nutrition in agricultural initiatives and strengthening of sustainable and climate-resilient agriculture (PELUM Uganda, 2010; Herforth, Jones & Pinstrup-Andersen, 2012). Considering the current national focus of strategies on the transformation from subsistence to commercial agriculture, it is imperative that the vulnerable smallholder farmers are not left behind. This is particularly important given the fact that improving agriculture does not inevitably improve dietary diversity, diet quality and nutrition outcomes (Ruel, Quisumbing & Balagamwala, 2017; Fraval et al., 2019). The developed CFBS provides direction on how dietary diversity can be improved in rural smallholder households by addressing production practices and diversity at farm level, diversity in the markets accessed by smallholder farmers, and awareness and capacity building in agriculture and nutrition. The strategy has been designed to complement and make use of existing structures and frameworks, which lends to its feasibility and sustainability.

8.5 Limitations of the study

The situation analysis (Chapter 4) was limited by the design study (cross-sectional study) that did not enable collection of data across seasons. Seasonal data on food production and dietary diversity would have enhanced the study. To respond to this limitation, the researcher probed for differences or similarities across seasons during the FGDs determining the community perspective on their nutrition and food security situation.

The situation analysis (Chapter4) was limited by the number of present and willing households with children in the target age range of 12 to 36 months. Due to the limited number, the study also included children six to 12 months (25%) and 36 to 51 months (9%). The discussions in the FGDs (Chapter 5) and subsequent strategy development therefore explored the target age range of 12 to 36 months.

The market survey (Chapter 4) assessed the formal/recognised markets in the study site. It however, did not explore other points of purchase, such as farm gate and informal shops (food stalls/kiosks) closer to the households. This is acknowledged as a limitation as these informal points of purchase also provide households with access to certain foods. To address this limitation, observations were made and FGDs conducted during Phase 2 of the study. The

informal shops, for example, were noted to sell limited food and non-food household items. Food items commonly sold included those used as condiments, like onions and tomatoes, cooking oil and salt. Other vegetables were sold depending on seasonal availability, like avocado, mangoes, and pineapples. This observation corresponded with the study results that foods from the other fruits and other vegetables food groups were prevalent, and vitamin A rich fruits and vegetables were more seasonally available.

During Phase 2 of the study (Chapter 5), fewer men than planned participated in the FGDs, mainly due to limited availability or unwillingness to participate. This lowered the number of men participating in the study and reduced the scope of men's views that were captured.

Fewer KIs than planned participated in the validation of the study (Chapter 7) due to delayed responses or limited availability. This limited the scope of views that could have been added to the validation exercise. In addition, some KIs tried to delegate their participation to individuals in lower positions within their organisations even though the KIs were selected based on their expertise. Unfortunately, even for those that delegated, their responses were not received in time for the study.

The validation of the strategy (Chapter 7) was also limited by time and funds available. This limited further exploration of FGD and KI findings through engagement of key strategy actors such as policy makers, extension workers and potential community champions. As such, the motivation of these stakeholders to engage in a strategy like the CFBS was only captured in part.

8.6 Contributions to knowledge

The main research question of the study was how needs-based and asset-based approaches can be used to develop a food-based strategy that improves the dietary diversity of children aged 12 to 36 months from rural smallholder farming households in Central Uganda. The study generated the CFBS built on a needs-based and asset-based assessment of the households, markets, community perspective, literature, and theory using the intervention mapping protocol.

Agriculture-dependent households such as rural smallholder farmers face a number of nutrition, food and production challenges (NPA, 2015; Fiala & Apell, 2017; Williams et al., 2018). Discussions on determinants of dietary diversity in the study tended to revert to agricultural production-related challenges that affected the availability and accessibility of diverse food. Therefore, attempts to improve dietary diversity in smallholder farmers need to also address the agricultural challenges they face. This will increase the relevance of any initiative and increase the motivation to participate, implement and adopt practices that enhance their diets.

Aside from the limited production diversity noted in the study, access to diverse diets was also limited by market access and income. Markets in rural communities have the potential to make significant contributions to dietary diversity and the focus on markets as an approach

to addressing dietary diversity is well iterated in literature. To grow the agricultural sector in low-income countries, strides are being made to increase farmer access to produce markets. This study showcases the need to also build access to diversity in rural consumer markets. Diversity in consumer markets in rural areas has previously not been largely reported upon despite their importance in rural access to diverse foods. Diversity in rural consumer markets requires sufficient demand, which is influenced by household nutrition awareness and income availability, as well as convenient access to fairly priced diverse foods. On the other hand, adequate supply of quality-diverse foods can be improved through increased farmer production diversity and farmer participation in different markets, from traders, occasional markets, daily markets, to informal shops (food stalls/kiosks) to increase access to diversity.

Regarding household nutrition awareness and behaviours, the study noted gaps in nutrition information and proactive efforts to attain a balanced diet throughout the year, reinforcing the need for strategies as the one developed in this study. Regrettably, there was also a poor perception towards participating in community training or meetings, especially among men. Community training or meetings are a common avenue for disseminating information and facilitating learning in rural areas. The study highlights the importance of understanding knowledge access so that appropriate plans are made to reinforce existing platforms and extend novel ones like information technology. Rural farming communities are generally social, with information transfer concerning food and agriculture being largely interpersonal, as reflected in the study. This underscored the need to strengthen social support to encourage the adoption and implementation of recommended practices and make use of both formal and informal learning environments.

Smallholder farmers make various decisions concerning their livelihoods and food and nutrition amid set resources and varying socio-economic and cultural settings. Strategies such as the one presented empower these households to achieve the goal of dietary diversity through enhancement of their information, skills, and support on agriculture, nutrition, and finances. Using a household approach in the engagement of smallholder farmers, as opposed to targeting specific household members enhances this empowerment. This included involving men that are usually the decision makers and resource owners, yet not inclined towards community learning; also involving women, who are the main persons responsible for the food and nutrition of the household and child care; and also involving the youth – an active and largely untapped resource. The interplay of household gender dynamics in the study reflects the need for household approaches when targeting agriculture and nutrition and not women alone.

The proposed implementation plan is but one of the plans/projects that can be derived from the CFBS. Other plans/projects include those with larger emphasis on financial literacy and market participation and linkages. It is imperative that the different plans/projects developed are implemented and evaluated in tandem or in a complementary manner. The design of the CFBS also showed the application of the intervention mapping protocol to improve nutrition in developing countries, particularly in rural areas. The majority of the applications of

intervention mapping has previously been done in developed countries or affluent communities. Use of this protocol allowed for a systematic and transparent incorporation of the needs-based and asset-based approaches in order to identify the determinants and pathways to improve dietary diversity. This systematic and transparent approach facilitated appropriate theory selection, and application and enhances strategy evaluation, adaptation and replication. The developed strategy can be piloted in smallholder communities not only in Uganda but in other developing countries as well.

8.7 Conclusion

The developed Contextualised Food-based Strategy (Box 1) outlines how the dietary diversity of children in smallholder farming households can potentially be improved by enhancing the production diversity, use of income and markets for improved diets, and nutrition education, while involving various community-level actors. The strategy development approach highlights the application of the intervention mapping protocol in rural areas of a low-income country. The approach used showed how the needs-based and asset-based approaches can be used to develop a food-based strategy through a systematic, informed and transparent process. From the integrated quantitative and qualitative results, strategies improving dietary diversity in rural smallholder households that also address their food security and production challenges are more likely to increase the strategy relevance and target beneficiary motivation to participate and adopt recommended behaviours and practices. To enhance knowledge, skills, self-efficacy, attitude, and outcome expectations, access to information and social support need to be increased. This can be achieved through the use of appropriate implementation and evaluation designs, measures, and procedures that include context-appropriate behaviour change methods. In addition to increasing production diversity and farm productivity, the diversity in rural consumer markets and access to these markets needs to improve to facilitate contribution of household income to dietary diversity and food security.

8.8 Recommendations

8.8.1 Stakeholder recommendations

The developed CFBS can be operationalised through a number of implementation plans, such as the one proposed in Chapter 6. A pilot of the proposed implementation plan is recommended as this will demonstrate the CFBS and generate data that can be used to create awareness, modify and/or scale out the strategy. This data can also be used in the development of other plans, such as those that have a greater emphasis on markets.

Smallholder farmers need to be availed with appropriate and sustainable agricultural information that addresses their resource settings and enables them to cope and increase their productivity and resilience. This information access requires continuous research and dissemination of low-cost, sustainable practices that smallholder farmers can employ to address their production challenges and build climate resilience.

Promotion of increased production diversity and dietary diversity is supported by functioning seed systems where farmers have timely access to diverse, affordable, adapted and quality seed. There is therefore room to understand and build smallholder awareness, capacity and participation in the seed system as well as to promote the conservation and utilisation of diverse seed. This can include the promotion of quality-declared seed produced by smallholder farmers, establishment and/or utilisation of community seed banks, linkages between farmers and seed companies and distributors, and advocacy for policy that supports farmer-managed seed systems.

8.8.2 Further research

Further studies into the rural consumer markets and the demand and supply of diverse foods for the smallholder farmers within these markets is required. This can include in-depth analyses of the rural food environment, especially the physical access, purchasing power, affordability, desirability and quality of diverse foods. Such studies will yield information that can be used to enhance the food environment and ensure that the food supply system outside smallholder household production supports dietary diversity and food security. This information will also contribute to the second CFBS strategy objective and enable refining of the relevant performance objectives.

Studies that further explore knowledge sharing and access, and attitudes towards learning in households and communities, will inform communication strategies, build social support and enhance empowerment. This is because learning and knowledge sharing are central to the growth of household and community productivity, health, nutrition, welfare and development. Existing knowledge sharing and access methods such us those reported in the study (one on one, groups, meetings, media) can be appropriately reinforced even as the application and reach of 'novel' ones like information and mobile technology are increased. In addition, the motivation of actors such as extension workers, community-level groups, and potential community champions needs to be understood further through direct discussions prior to piloting of the proposed implementation plan. This will ensure that implementation harnesses and/or addresses their motivation.

Agrobiodiversity studies that assess the available, underutilised and potential agrobiodiversity in different regions, followed by awareness creation, promotion and conservation of this diversity, will support the production, sale and consumption of diverse foods and contribute to the first objective of the CFBS. These studies will also elaborate on the benefits of agrobiodiversity including traditional and indigenous foods that can be used to increase dietary diversity especially in the lean seasons and those that can be used in the sustainable management of soil, water and pests. These studies and their findings would support the resilience of smallholder farmers and contribute to their food and nutrition security.

Following a pilot of the proposed implementation plan, it is recommended that the impact and process evaluations are conducted using the indicators presented in the study. CFBS This

will provide evidence of whether and how an intervention within the CFBS achieved the desired outcomes, its relevance, efficacy and effectiveness.

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Appendix

Appendix 1. Consent forms

1.1 Household survey consent form

TITLE OF RESEARCH PROJECT:

Development of a food-based strategy to improve dietary diversity and nutritional status of children aged 12 to 36 months in rural, farming households in Central Uganda

Reference number: S16/06/099

Principal Investigator: Deborah Nabuuma

Address: Faculty of Medicine and Health Sciences, Division of Human Nutrition, Stellenbosch University, Room 3088, Clinical Building, Francie van Zyl Drive, Tygerberg, South Africa.

Contact number: 0782480411 / 0704818695

Hello, my name is …… and I am part of a research team that is carrying out a study to determine the current social, nutrition and food security status of households, as well as the nutritional status of children aged 12 to 36 months in Kiboga district. This survey is part of a larger study that is seeking to develop a food-based strategy to improve dietary diversity and nutritional status of children aged 12 to 36 months in rural, farming households in Central Uganda.

This study has been approved by the Health Research Ethics Committee at Stellenbosch University and the Uganda council for Science and technology. It will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki; South African and Ugandan Guidelines for Good Clinical Practice; and the Medical Research Council Ethical Guidelines for Research.

I would like to invite your household to participate in this study. If you agree to participate, I will proceed to ask you some questions concerning you and your household, sources of income, crops and livestock on your farm, food consumption, the health and diet of your children between 12 to 36 months of age, and other topics related to your household's general living situation. I will also carry out weight, height and Mid Upper Arm circumference measurements of your children that are aged 12 to 36 months.

Your household is one of 250 households in Kiboga district that were selected using a non-biased, randomized process. Your participation in this survey is completely voluntary. You may decide not to participate at any time. If there are any questions you do not feel like answering, then do not answer them. You will not be penalised in any way for not participating. You are allowed to ask any questions now, before agreeing to participate and also during the exercise.

The information you provide will not be shared with anyone in the community or shared with anyone else not involved in the study. Your names will be kept separate from the data so that only general information about everyone will be studied and reported.

There are no direct benefits to you or your household. The study will help the researcher develop a food-based strategy to improve dietary diversity and nutritional status of children aged 12 to 36 months in

rural, farming households in Central Uganda. There are also no risks to you or your household. The process of measuring your child is harmless but may agitate them and at this point, I will ask you to be part and comfort them. At this point you are still free to refrain from this exercise.

Ask the respondent if they consent to participate in the study.

By signing below, you here by agree that:

> **You have understood the information I have read to you and agree to participate in the study. Participation is voluntary and you have not been pressured to take part. You are free to ask questions and may opt to leave the study at any time and will not be penalised in any way.**

DATE: ……..

RESPONDENT NAME: ……..

SIGN: ……

NAME OF ENUMERATOR: ……..

1.2 Market survey consent form

TITLE OF RESEARCH PROJECT:

Development of a food-based strategy to improve dietary diversity and nutritional status of children aged 12 to 36 months in rural, farming households in Central Uganda

Reference number: S16/06/099

Principal Investigator: Deborah Nabuuma

Address: Faculty of Medicine and Health Sciences, Division of Human Nutrition, Stellenbosch University, Room 3088, Clinical Building, Francie van Zyl Drive, Tygerberg, South Africa.

Contact number: 0782480411 / 0704818695

Hello, my name is ……. and I am part of a research team that is carrying out a survey of the different foods sold in markets in Kiboga district. This survey is part of a larger study that is seeking to develop a food-based strategy to improve dietary diversity and nutritional status of children aged 12 to 36 months in rural, farming households in Central Uganda.

This study has been approved by the Health Research Ethics Committee at Stellenbosch University and the Uganda council for Science and technology. It will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki; South African and Ugandan Guidelines for Good Clinical Practice; and the Medical Research Council Ethical Guidelines for Research.

I would like to invite you to participate in this study. If you agree to participate, I will proceed to ask you some questions concerning the foods sold in the market, particularly those you sell, their prices, the source and market of these foods. You will be part of 50 market vendors selected in Kiboga district based on the villages your market serves and the foods you sell.

Your participation in this survey is completely voluntary. You may decide not to participate at any time. If there are any questions you do not feel like answering, then do not answer them. You will not be penalised in any way for not participating. You are allowed to ask any questions now before agreeing to participate and also during the exercise. This interview is estimated to take not more than one hour of your time.

The information you provide will not be shared with anyone in the community or shared with anyone else not involved in the study. Your names will be kept separate from the data so that only general information about everyone will be studied and reported.

There are no direct benefits to you, your business or your household. The study will help the researcher develop a food-based strategy to improve dietary diversity and nutritional status of children aged 12 to 36 months in rural, farming households in Central Uganda. There are also no risks to you, your business or your household.

Ask the respondent if they consent to participate in the study.

By signing below, you here by agree that:

You have understood the information I have read to you and agree to participate in the study. Participation is voluntary and you have not been pressured to take part. You are free to ask questions and may opt to leave the study at any time and will not be penalised in any way.

DATE: ……..

RESPONDENT NAME: ……

SIGN: ……..

NAME OF ENUMERATOR: ……

1.3 Focus group discussion part one consent form

TITLE OF RESEARCH PROJECT:

Development of a food-based strategy to improve dietary diversity and nutritional status of children aged 12 to 36 months in rural, farming households in Central Uganda

Reference number: S16/06/099

Principal Investigator: Deborah Nabuuma

Address: Faculty of Medicine and Health Sciences, Division of Human Nutrition, Stellenbosch University, Room 3088, Clinical Building, Francie van Zyl Drive, Tygerberg, South Africa.

Contact number: 0782480411 / 0704818695

Hello, my name is …….. and I am part of a research team that is carrying out a study to determine the community perspectives on the current community food and nutrition situation. This exercise is part of a larger study that is seeking to develop a food-based strategy to improve dietary diversity and nutritional status of children aged 1 to 3 years in rural, farming households in Central Uganda.

This study has been approved by the Health Research Ethics Committee at Stellenbosch University and the Uganda council for Science and technology. It will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki; South African and Ugandan Guidelines for Good Clinical Practice; and the Medical Research Council Ethical Guidelines for Research.

I would like to invite you to be part of a group of 10 male/female community members that will discuss any food and nutritional status in the community as well as the patterns of behaviour in relation to food consumption and nutrition status. This discussion is the first of a series of discussions and if you agree to participate, you will be informed of a second discussion of the same nature in due course.

Your participation in this discussion is completely voluntary. You may decide not to participate at any time. If there are any questions you do not feel like answering, then do not answer them. You will not be penalised in any way for not participating. You are allowed to ask any questions now before agreeing to participate and also during the exercise. This discussion is estimated to take 3 hours.

The information you provide will not be shared with anyone in the community or shared with anyone else not involved in the study. Your names will be kept separate from the data so that only general information about everyone will be studied and reported. In addition, if you agree to participate, I would like to request you to ensure confidentiality of what your fellow group members discuss and not to share this information outside the discussion.

There are no direct benefits to you or your household. The study will help the researcher develop a food-based strategy to improve dietary diversity and nutritional status of children aged 1 to 3 years in rural, farming households in Central Uganda. There are also no risks to you or your household.

Ask the respondent if they consent to participate in the study.

By signing below, you here by agree that:

You have understood the information I have read to you and agree to participate in the study. Participation is voluntary and you have not been pressured to take part. You are free to ask questions and may opt to leave the study at any time and will not be penalised in any way. You may be asked to leave the study before it is finished, if the researcher feels it is in your best interests or that of the group and/or study.

DATE: ……..

NAME: ……..

SIGN: ……

NAME OF FACILITATOR: ……

1.4 Focus group discussion part two consent form

TITLE OF RESEARCH PROJECT:

Development of a food-based strategy to improve dietary diversity and nutritional status of children aged 12 to 36 months in rural, farming households in Central Uganda

Reference number: S16/06/099

Principal Investigator: Deborah Nabuuma

Address: Faculty of Medicine and Health Sciences, Division of Human Nutrition, Stellenbosch University, Room 3088, Clinical Building, Francie van Zyl Drive, Tygerberg, South Africa.

Contact number: 0782480411 / 0704818695

Hello, my name is …….. and I am part of a research team that is carrying out a study to explore the possible solutions to the food and nutrition situation in the community particularly dietary diversity. This exercise is part of a larger study that is seeking to develop a food-based strategy to improve dietary diversity and nutritional status of children aged 1 to 3 years in rural, farming households in Central Uganda.

This study has been approved by the Health Research Ethics Committee at Stellenbosch University and the Uganda council for Science and technology. It will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki; South African and Ugandan Guidelines for Good Clinical Practice; and the Medical Research Council Ethical Guidelines for Research.

I would like to invite you to be part of a group of 10 male/female community members that will discuss possible solutions to the food and nutrition situation in the community, particularly dietary diversity and find out what has been successful in the past. This discussion is the second of a series of discussions and if you agree to participate, you may be informed of another discussion of a similar nature in due course.

Your participation in this discussion is completely voluntary. You may decide not to participate at any time. If there are any questions you do not feel like answering, then do not answer them. You will not be penalised in any way for not participating. You are allowed to ask any questions now before agreeing to participate and also during the exercise. This discussion is estimated to take 3 hours.

The information you provide will not be shared with anyone in the community or shared with anyone else not involved in the study. Your names will be kept separate from the data so that only general information about everyone will be studied and reported. In addition, if you agree to participate, I would like to request you to ensure confidentiality of what your fellow group members discuss and not to share this information outside the discussion.

There are no direct benefits to you or your household. The study will help the researcher develop a food-based strategy to improve dietary diversity and nutritional status of children aged 1 to 3 years in rural, farming households in Central Uganda. There are also no risks to you or your household.

Ask the respondent if they consent to participate in the study.

By signing below, you here by agree that:

You have understood the information I have read to you and agree to participate in the study. Participation is voluntary and you have not been pressured to take part. You are free to ask questions and may opt to leave the study at any time and will not be penalised in any way. You may be asked to leave the study before it is finished, if the researcher feels it is in your best interests or that of the group and/or study.

DATE: …….

NAME: ……..

SIGN: ……..

NAME OF FACILITATOR: ……

1.5 Validation focus group discussion consent form

TITLE OF RESEARCH PROJECT:

Development of a food-based strategy to improve dietary diversity and nutritional status of children aged 12 to 36 months in rural, farming households in Central Uganda

Reference number: S16/06/099

Principal Investigator: Deborah Nabuuma

Address: Faculty of Medicine and Health Sciences, Division of Human Nutrition, Stellenbosch University, Room 3088, Clinical Building, Francie van Zyl Drive, Tygerberg, South Africa.

Contact number: 0782480411 / 0704818695

Hello, my name is …….. and I am part of a research team that is carrying out a study to validate a strategy that has been designed to improve the dietary diversity and nutritional status of children aged 1 to 3 years. This exercise is part of a larger study that is seeking to develop a food-based strategy to improve dietary diversity and nutritional status of children aged 1 to 3 years in rural, farming households in Central Uganda.

This study has been approved by the Health Research Ethics Committee at Stellenbosch University and the Uganda council for Science and technology. It will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki; South African and Ugandan Guidelines for Good Clinical Practice; and the Medical Research Council Ethical Guidelines for Research.

I would like to invite you to be part of a group of 10 community members that will discuss whether the developed strategy has the potential to address dietary diversity in the community.

Your participation in this discussion is completely voluntary. You may decide not to participate at any time. If there are any questions you do not feel like answering, then do not answer them. You will not be penalised in any way for not participating. You are allowed to ask any questions now before agreeing to participate and also during the exercise. This discussion is estimated to take 3 hours.

The information you provide will not be shared with anyone in the community or shared with anyone else not involved in the study. Your names will be kept separate from the data so that only general information about everyone will be studied and reported. In addition, if you agree to participate, I would like to request you to ensure confidentiality of what your fellow group members discuss and not to share this information outside the discussion.

There are no direct benefits to you or your household. The study will help the researcher develop a food-based strategy to improve dietary diversity and nutritional status of children aged 1 to 3 years in rural, farming households in Central Uganda. There are also no risks to you or your household.

Ask the respondent if they consent to participate in the study.

By signing below, you here by agree that:

> **You have understood the information I have read to you and agree to participate in the study. Participation is voluntary and you have not been pressured to take part. You are free to ask questions and may opt to leave the study at any time and will not be penalised in any way. You**

may be asked to leave the study before it is finished, if the researcher feels it is in your best interests or that of the group and/or study.

DATE: ……..

NAME: ……

SIGN: ……..

NAME OF FACILITATOR: ……

1.6 Validation key informant interview consent form

TITLE OF RESEARCH PROJECT:

Development of a food-based strategy to improve dietary diversity and nutritional status of children aged 12 to 36 months in rural, farming households in Central Uganda

Reference number: S16/06/099

Principal Investigator: Deborah Nabuuma

Address: Faculty of Medicine and Health Sciences, Division of Human Nutrition, Stellenbosch University, Room 3088, Clinical Building, Francie van Zyl Drive, Tygerberg, South Africa.

Contact number: 0782480411 / 0704818695

Hello, my name is …….. and I am part of a research team that is carrying out a study to validate a strategy that has been designed to improve the dietary diversity and nutritional status of children aged 1 to 3 years. This exercise is part of a larger study that is seeking to develop a food-based strategy to improve dietary diversity and nutritional status of children aged 1 to 3 years in rural, farming households in Central Uganda.

This study has been approved by the Health Research Ethics Committee at Stellenbosch University and the Uganda council for Science and technology. It will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki; South African and Ugandan Guidelines for Good Clinical Practice; and the Medical Research Council Ethical Guidelines for Research.

I would like to invite you to be part of this study. You have been selected as a key informant based on your expertise in the field. If you agree to participate, I will proceed to ask you some questions validate the designed strategy and assess its suitability and feasibility for the study population and identify any possible barriers in the proposed implementation plan as based on your experience in nutrition.

Your participation in this discussion is completely voluntary. You may decide not to participate at any time. If there are any questions you do not feel like answering, then do not answer them. You will not be penalised in any way for not participating. You are allowed to ask any questions now before agreeing to participate and also during the exercise. This discussion is estimated to take 2 hours of your time.

The information you provide will not be shared with anyone in the community or shared with anyone else not involved in the study. Your names will be kept separate from the data so that only general information about everyone will be studied and reported.

There are no direct benefits to you, your work or your household. The study will help the researcher develop a food-based strategy to improve dietary diversity and nutritional status of children aged 12 to 36 months in rural, farming households in Central Uganda. There are also no risks to you, your work or your household.

Ask the respondent if they consent to participate in the study.

By signing below, you here by agree that:

You have understood the information I have read to you and agree to participate in the study. Participation is voluntary and you have not been pressured to take part. You are free to ask questions and may opt to leave the study at any time and will not be penalised in any way.

DATE: ……..

NAME: ……..…

SIGN: ……

NAME OF ENUMERATOR: ……

Appendix 2. Letter of approval and support from The Alliance of Bioversity International and CIAT*

Bioversity International

Improving lives through biodiversity research

October 12, 2015

Ms. Deborah Nabuuma
Kampala, Uganda

Dear Deborah,

RE: AUTHORISATION TO USE TOOLS FOR YOUR PhD RESEARCH DATA COLLECTION

The above refers.

Following from your request to use and adopt the following tools for your PhD research data collection including;

- Household survey questionnaire for nutrition studies
- Market Survey questionnaire

Important to note, in any publication relating to the use of the tools, you will acknowledge Bioversity International and Staff. Also, if any of the Bioversity International staff makes a significant contribution, they should be co-author on the resulting publications.

In light of the above therefore, this is to permit you to use the said Bioversity tools which have been developed for data collection in Uganda for only your research study purposes.

Yours Sincerely,

Dr. Eldad Karamura
REGIONAL REPRESENTATIVE

IPGRI and INIBAP operate under the name Bioversity International a member of the CGIAR Consortium

Commodity Systems and Genetic Resources Programme, Bioversity-Uganda,
PO Box 24384, Plot 106, Katalima Road, Naguru, Kampala, Uganda
Tel.: (256) 414 286213/286948 – Fax: (256) 414 286949 – Email: bioversity-uganda@cgiar.org
Headquarters: Via dei Tre Denari, 472/a, 00057 Maccarese, Rome, Italy
Tel.: (39) 0661181 Email: bioversity@cgiar.org www.bioversityinternational.org

*Bioversity International and the International Center for Tropical Agriculture (CIAT), two CGIAR research centres established an Alliance in 2018 and are now one organisation: The Alliance of Bioversity International and CIAT (The Alliance, 2020).

Appendix 3. Ethical clearance letter

UNIVERSITEIT·STELLENBOSCH·UNIVERSITY
jou kennisvennoot • your knowledge partner

Approval Notice
Response to Modifications- (New Application)

05-Dec-2016
Nabuuma, Deborah DS

Ethics Reference #: S16/06/099

Title: **Development of a food based strategy to improve dietary diversity and nutritional status of children aged 12 to 36 months in rural, farming households in Central Uganda**

Dear Miss Deborah Nabuuma,

The **Response to Modifications -** ***(New Application)*** received on **12-Sep-2016**, was reviewed by members of **Health Research Ethics Committee 2** via Expedited review procedures on **13-Oct-2016** and was approved.
Please note the following information about your approved research protocol:

Protocol Approval Period: **13-Oct-2016 -12-Oct-2017**

Please remember to use your **protocol number** (**S16/06/099**) on any documents or correspondence with the HREC concerning your research protocol.

Please note that the HREC has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

After Ethical Review:
Please note a template of the progress report is obtainable on www.sun.ac.za/rds and should be submitted to the Committee before the year has expired. The Committee will then consider the continuation of the project for a further year (if necessary). Annually a number of projects may be selected randomly for an external audit.
Translation of the consent document to the language applicable to the study participants should be submitted.

Federal Wide Assurance Number: 00001372
Institutional Review Board (IRB) Number: IRB0005239

The Health Research Ethics Committee complies with the SA National Health Act No.61 2003 as it pertains to health research and the United States Code of Federal Regulations Title 45 Part 46. This committee abides by the ethical norms and principles for research, established by the Declaration of Helsinki, the South African Medical Research Council Guidelines as well as the Guidelines for Ethical Research: Principles Structures and Processes 2004 (Department of Health).

Provincial and City of Cape Town Approval

Please note that for research at a primary or secondary healthcare facility permission must still be obtained from the relevant authorities (Western Cape Department of Health and/or City Health) to conduct the research as stated in the protocol. Contact persons are Ms Claudette Abrahams at Western Cape Department of Health (healthres@pgwc.gov.za Tel: +27 21 483 9907) and Dr Helene Visser at City Health (Helene.Visser@capetown.gov.za Tel:

+27 21 400 3981). Research that will be conducted at any tertiary academic institution requires approval from the relevant hospital manager. Ethics approval is required BEFORE approval can be obtained from these health authorities.

We wish you the best as you conduct your research.
For standard HREC forms and documents please visit: www.sun.ac.za/rds

If you have any questions or need further assistance, please contact the HREC office at .

Included Documents:

1Cover letter.pdf
6 PhD Research Protocol.pdf
12 XikombisoMbhenyaneCVOctober2014Academic.pdf
20160919 MOD Response from researcher
20160919 MOD Protocol
2.1 Final report from Evaluation Committee - Ms D Nabuuma 19-5-2016 (2).pdf
5 PhD Protocol synopsis_D.Nabuuma_April 2016.pdf
7 Participant Informed consent forms-Deborah Nabuuma_May 2016.pdf
9 Mbhenyane 20150224 Investigator Declaration V4.2 (Eng).pdf
3 Application form.pdf
8 investigator declaration_Deborah Nabuuma.pdf
10 M Farber declaration.pdf
20160919 MOD Cover letter
15 Ekesa Supervisor Declaration-BE.pdf
13Curriculum Vitae -Beatrice Ekesa-Onyango 5th Nov 2014.pdf
2 Cover letter_response to comments.pdf
4 Deborah Nabuuma_General Checklist(Eng)_V2.1 April 2016.pdf
11 Deborah Nabuuma CV_July 2015_short CV.pdf
14 CV MFaber October 2014.pdf
20160919 MOD HREC mods required letter
20160919 MOD Budget

Sincerely,

Francis Masiye
HREC Coordinator
Health Research Ethics Committee 2

Investigator Responsibilities

Protection of Human Research Participants

Some of the responsibilities investigators have when conducting research involving human participants are listed below:

1.Conducting the Research. You are responsible for making sure that the research is conducted according to the HREC approved research protocol. You are also responsible for the actions of all your co-investigators and research staff involved with this research.

2.Participant Enrolment. You may not recruit or enrol participants prior to the HREC approval date or after the expiration date of HREC approval. All recruitment materials for any form of media must be approved by the HREC prior to their use. If you need to recruit more participants than was noted in your HREC approval letter, you must submit an amendment requesting an increase in the number of participants.

3.Informed Consent. You are responsible for obtaining and documenting effective informed consent using **only** the HREC-approved consent documents, and for ensuring that no human participants are involved in research prior to obtaining their informed consent. Please give all participants copies of the signed informed consent documents. Keep the originals in your secured research files for at least fifteen (15) years.

4.Continuing Review. The HREC must review and approve all HREC-approved research protocols at intervals appropriate to the degree of risk but not less than once per year. There is **no grace period.** Prior to the date on which the HREC approval of the research expires, **it is your responsibility to submit the continuing review report in a timely fashion to ensure a lapse in HREC approval does not occur.** If HREC approval of your research lapses, you must stop new participant enrolment, and contact the HREC office immediately.

5.Amendments and Changes. If you wish to amend or change any aspect of your research (such as research design, interventions or procedures, number of participants, participant population, informed consent document, instruments, surveys or recruiting material), you must submit the amendment to the HREC for review using the current Amendment Form. You **may not initiate** any amendments or changes to your research without first obtaining written HREC review and approval. The **only exception** is when it is necessary to eliminate apparent immediate hazards to participants and the HREC should be immediately informed of this necessity.

6.Adverse or Unanticipated Events. Any serious adverse events, participant complaints, and all unanticipated problems that involve risks to participants or others, as well as any research-related injuries, occurring at this institution or at other performance sites must be reported to the HREC within **five (5) days** of discovery of the incident. You must also report any instances of serious or continuing problems, or non-compliance with the HRECs requirements for protecting human research participants. The only exception to this policy is that the death of a research participant must be reported in accordance with the Stellenbosch Universtiy Health Research Ethics Committee Standard Operating Procedures www.sun025.sun.ac.za/portal /page/portal/Health_Sciences/English/Centres%20and%20Institutions/Research_Development_Support/Ethics/Application_package All reportable events should be submitted to the HREC using the Serious Adverse Event Report Form.

7.Research Record Keeping. You must keep the following research-related records, at a minimum, in a secure location for a minimum of fifteen years: the HREC approved research protocol and all amendments; all informed consent documents; recruiting materials; continuing review reports; adverse or unanticipated events; and all correspondence from the HREC

8.Reports to the MCC and Sponsor. When you submit the required annual report to the MCC or you submit required reports to your sponsor, you must provide a copy of that report to the HREC. You may submit the report at the time of continuing HREC review.

9.Provision of Emergency Medical Care. When a physician provides emergency medical care to a participant without prior HREC review and approval, to the extent permitted by law, such activities will not be recognised as research nor will the data obtained by any such activities should it be used in support of research.

10.Final reports. When you have completed (no further participant enrolment, interactions, interventions or data analysis) or stopped work on your research, you must submit a Final Report to the HREC.

11.On-Site Evaluations, MCC Inspections, or Audits. If you are notified that your research will be reviewed or audited by the MCC, the sponsor, any other external agency or any internal group, you must inform the HREC immediately of the impending audit/evaluation.

Appendix 4. Data collection tools

4.1 Household survey

1.	Questionnaire ID	
2.	Name of respondent	
3.	Date of Interview (Dd/mm/yyyy)	
4.	Enumerator's name	

HOUSEHOLD LOCATION

	Variable	Codes	Reply
5.	Sub-county		
6.	Parish		
7.	Village	Specify	

SECTION 1. GENERAL HOUSEHOLD INFORMATION

Qn	Question	Codes	Reply
8.	What is the gender of respondent?	1=Female, 2=Male	
9.	How old are you?	In years	
10.	Are you [respondent] the household head? If yes, skip to Q12.	0=No, 1=Yes,	
11.	If the respondent is not HHH, who is the household head?	1=Spouse, 2=Mother, 3=Father, 4=Sister, 5=Brother, 6=Grandmother, 7=grandfather, 8=Auntie, 9=Uncle, 66=Other (Specify)	
12.	What is your marital status? If not married, skip to Q14.	1=Single, 2=Monogamously married, 3=Polygamous married, 4= Widowed, 5=Separated/Divorced, 66=Other (Specify) ……	
13.	If married, what is the age of the spouse? (if polygamous Spouse in the HH)		
14.	How many members are currently in your household?	All members of household that normally share food from the same pots	
15.	Has any member of the household taken part in an agricultural or nutrition intervention by a government or Non-government organization?	0=No, 1=Yes *If No, skip to Q19*	

Qn.	(a) What was the name the project?	(b) Which HH member involved?	c) How long did you take part in this project? (*in months*)

16	a)	b)	c)
17	a)	b)	c)
18	a)	b)	c)
	HH member codes: 1=HHH, 2=Spouse, 3=male child, 4=female child, 5= Both HHH & spouse, 6= whole HH 66=Other, .88= NA		

Qn19: Information on other household members

Please now tell us more about each of the household members in this house beginning with you.

19	a). Initials	b) ACIAR project – What is the relationship of [name] to HHH?	c). How old is [name] ?	d). Is [name] male or female?	e). What is the highest education level [name] has attained?	f). What is [name]'s current occupation?	g). In which agricultural tasks does [name] participate in regularly?	h). In which food preparation and service tasks does [name] participate regularly?	i). Which non-farm income generating activity does [name] participate in regularly?
19.1									
19.2									
19.3									
19.4									
19.5									
19.6									
19.7									
19.8									
19.9									
19.10									
		0= HHH 1= HHH Spouse, 2=Child, 3=Sister/Brother, 4=Parent, 5=Niece or Nephew, 6=Grandchild, 7=In-law, 8=Aunt/Uncle, 66= Other (specify)……	Years	1=F 2=M	1=no formal education, 2=Primary, 3=Secondary, 4=Tertiary/vocational, 5=University, 77= don't know 88=NA	0=None, 1=farmer (crop &/livestock), 2=housewife, 3=salaried employment, 4=self-employed off-farm, 5=casual labourer on-farm 6=casual labourer off-farm 66=other (specify)…….	0=None 1=land preparation, 2=planting, 3=weeding, 4=Harvesting, 5=processing 6=fertilization, 7=pest control, 8= animal feeding, 9=all activities 66= Other (specify)… 88=NA Can give 2 main activities	0=None 1= getting firewood 2= getting water, 3=purchase of food 4=food preparation, 5=, 6=serving food, 7=washing dishes, 8=all activities 66=Other (Specify)…… 88=NA Can give 2 main activities	0=None 1= brick making, 2=Mat/broom making, 3= Pottery, 4=business 5=Employment, 6=Casual labour, 66=Other (specify)…… 88=NA

Qn20: Household's access to agricultural land

How much agricultural land do you have access to as a household (Both you and your spouse) in acres?
If the land is divided into plots, list the number of plots that the household has that make up the total land holding beginning with where the homestead is located as you move further.

20.	**a) Plot number**	**b). How large is this plot of land?**	**c) Unit of plot size**	**d). Does the plot belong to your family? If No, skip to (f)**	**e). Who owns the land?**	**f). Who mostly works on this land?**	**g). Who decides what to do on the land?**
20.1	**1**						
20.2	**2**						
20.3	**3**						
20.4	**4**						
20.5	**5**						
20.6	**6**						
			1=Acre, 2=Hectare, 3=Meters squared, 4=Feet squared, 66=Other (Specify	1=Yes, 2=No, it is Rented, 3=No, it is Borrowed 4=No, it is share-cropped 66=Other (specify)……	1=Male HHH, 2=Female HHH, 3=Spouse of HHH 4=parents to HHH/spouse, 5= grandparents to HHH/spouse, 6= sibling to HHH/spouse other, 66=Other (Specify), 88= NA	1= Male HHH, 2=Female HHH, 3=Spouse of HHH, 4= male child, 5=female child, 6=All children, 7= Whole family, 8= both HHH & spouse 9=Parent /sibling to the HHH/Spouse, 10=hired labourers, 66=Other (specify), 88=NA	1= Male HHH 2=Female HHH, 3=Spouse of HHH, 4=parents to HHH/spouse, 5= grandparents to HHH/spouse, 6= sibling to HHH/spouse, 7= both HHH & spouse 66=Other (Specify), 88=NA

Qn21: Household source and level of income

Beginning with the most important source of income please indicate at the 3 main sources of income in your household

Qn21	a). Sources of income	b). Rank in order of importance	c). Who is mainly involved in the activity?
21.1			
21.2			
21.3			
	1=Arable farming, 2=Livestock farming, 3=Mixed farming, 4= Brick making, 5=Casual labour, 6=Business, 7=Employment, 66=Other (specify) 8= fishing 88=NA	1 being the most important	1=Male HHH, 2=female HHH, 3=male child, 4=female child, 5= Parent /sibling to the HHH/Spouse, 66=other (specify) 6= spouse, 7= Both HHH & spouse

Qn22. Livestock Ownership by Household

Does your household own any of the following livestock? If yes, how many do you own? *If no, skip to the next type of livestock*

Qn22	Type of livestock	Number
22.1	Cattle	
22.2	Goat	
22.3	Sheep	
22.4	Pigs	
22.5	Poultry	
22.6	Rabbits	
22.7	Other (specify)	

Qn23: Asset ownership by the Household

Does your household own any of the following assets? If yes, how many do you own? *If no, skip to the next asset*

Qn 23.	Asset	Attribute	Description codes	Reply
23.1.1	House	Wall	1=Mud/un-burnt bricks, 2=Burnt Brick/Blocks, 3= Stone	
23.1.2		Roof	1= Grass,2= Iron sheet, 3=Tiles	
23.1.3		Floor	1=Mud, 2=Cement, 3=Tiles	
23.2.1	Transport	Bicycle	No=0, If yes Indicate number)	
23.2.2		Motorcycle	No=0, If yes indicate number)	
23.2.3		Car/truck	No=0, If yes indicate number)	
23.3.1	Cooking appliances	Traditional stove	No=0, If Yes indicate number)	
23.3.2		Kerosene stove	No=0, If yes indicate number)	
23.3.3		Charcoal stove	No=0, If yes indicate number)	
23.3.4		Gas stove/cooker	No=0, If yes indicate number)	
23.3.5		Other	No=0, If yes indicate number)	
23.4.1	Communication, Information and entertainment	Mobile phone	No=0, If yes indicate number)	
23.4.2		Radio	No=0, If yes indicate number)	
23.4.3		Television	No=0, If yes indicate number)	

Qn.24 to Qn.28

Qn.	Question	Codes	Reply
24.a	How much time does it take you or any other household member to walk to and from the nearest safe water source?	1= On your property, 2=<15minutes, 3=30minutes, 4=1hour, 5= >1hour	
		1=<0.1km, 2=0.2-0.5km, 3=0.6-1.0km, 4= 1.1-2.0kmkm, 5=2.1-3.0km, 6=>3km	
24.b	What is the kind of water source nearest to you/mentioned above?	1=Spring, 2=Shallow well, 3=bow hole/Pump well, 4=Dam, 5=Tank at home, 6=Tap/piped water, 66=Other (Specify).....	
25.a	In which village is the nearest weekly market?		
25.b	What is the walking distance to this weekly market?	1=<0.5km, 2=0.5-1.0km, 3=1.1-2.0km, 4= 2.1-3.0km, 5=>3km	
26.a	In which village is the nearest daily market?		
26.b	What is the walking distance to this daily market?	1=<0.5km, 2=0.5-1.0km, 3=1.1-2.0km, 4= 2.1-3.0km, 5=>3km	
27.	Do you go to other markets apart from those mentioned above?	No=0, Yes=1	
28.	What is the walking distance to the nearest Health facility?	1=<0.5km, 2=0.5-1.0km, 3=1.1-2.0km, 4= 2.13.0km, 5=>3km	

SECTION 2. FOOD PRODUCTION

Qn29. Crops grown on household farmland

What crops are currently grown on each of the plots of land that the household has access to, as identified in **Qn20**? Each crop should be filled on a separate row

Qn29.	a). Plot Number	b). Crop grown	c). Percentage of plot occupied by crop	d) What is the main purpose of growing the crop?	e) Who in the household has the main responsibility for this crop?
29.1					
29.2					
29.3					
29.4					
29.5					
29.6					
29.7					
29.8					
29.9					
29.10					
29.11					
29.12					
	Refer to Plot numbers in Q24	1=Cooking bananas, 2=Maize, 3=Cassava, 4=sorghum, 5=Sweet potatoes, 6=Irish potatoes, 7=Arrow root, 8=Cocoyam, 9=Beans, 10=Groundnuts, 11=soybean, 12=Amaranth, 13=Fruit trees, 14=Vegetables, 15=Coffee, 16= Rice, 66=Others (Specify), 88= NA		1=Home consumption, 2=for sale, 3=for Seed, 4=Animal feed, 5=both home consumption and sale, 66=other (specify), 88= NA	1= Male HHH; 2=Female HHH, 3=Spouse of HHH, 4= male child, 5=female child, 6=parent/sibling to the HHH/Spouse, 7= Both HHH & spouse, 66=Other (specify), 88= NA

SECTION 3. INFANT AND YOUNG CHILD HEALTH AND NUTRITION

Introduction: We are now going to discuss about the health and nutrition of the children in your household that are between 12 to 36 months of age. (Refer to section 1 for this child/children) Ask the respondent if [name] has a Child Health Card and ask them to bring it for reference during the following questions.

Qn30: Basic information about the index child

30.1	First Name of child			
30.2	Gender of child	1=F 2=M		
30.3	Date of birth	DD/MM/YEAR		
30.4	Weight in kilograms at birth	(One decimal point)		
30.5	Age in Months			
30.6	Is the Health Card available?	0=No 1=Yes		

Qn31 to Qn36

Qn.	Question	Codes	Reply
31.a	Was [name] immunized? If No, skip to Qn32	0=No 1=Yes	
31.b	Has [name] receive all the immunizations as per the health card? *Cross check health card*	0=No 1=Yes	
32.	Did [name] receive any Vitamin A supplementation in the last 12 months?	0=No 1=Yes	
33.	If [name] was **not immunized and/or not supplemented**, what is the reason? *Skip if Qn31 and Qn32 are Yes*	1=Health facility too far 2= Not aware of its importance 3=Not aware of health day/visit of health worker 4=may harm my child, 5= had no time to take the child, 66= other (specify)_____	
34	Was [name] ever breast fed? *If No, skip to Qn36*	0=No 1=Yes	
35.a	Was [name] breastfed yesterday during the day or night? *If yes, skip to Qn36*	0=No 1=Yes	
35.b	If No, how many months was the [name] breast fed?		
36.	At what age did you introduce solid/semi-solid foods in [name] diet? *(this refers to all food items that were given in addition to breast milk)*	Age in months	

Qn37. Child morbidity

Ask whether the child had manifested any of the symptoms below in the last 2 weeks.
If Yes, get the frequency and information on whether the child was taken to hospital
If No, proceed to next symptom, skip b, c and d.

37	**a) Did [name] have this symptom in the last 2 weeks?**		**b) How many times did [name] have this symptom?**	**c) What Source of treatment did [name] receive?**	**d) Who decided what to do when the [name] falls ill?**
37.1	Fever/high temperature				
37.2	Difficulty in breathing				
37.3	Cough				
37.4	Flu				
37.5	Diarrhoea, loose stool				
37.6	Vomiting				
		0=No, 1=Yes		1=none, 2=Hospital, 3=Traditional healer	1=father, 2=mother, 3=sibling, 4=grandparent, 66=Other

Qn38. 24-hour Recall

Introduction: The following questions examine the food consumed by the index child [name] in the last 24 hours. Please describe the foods (meals, drinks and snacks) that [name] ate yesterday during the day and night. Include all foods consumed by the child whether at home and/or those consumed outside of the home. Start with the first food eaten/ drunk in the morning until [name] woke up this morning. When composite dishes are mentioned ask for the main ingredients.

To estimate amount of food consumed, the household measures used to serve the child will be used. The enumerator will also refer to the sets of cups, bowls and spoons of known quantity that are in their possession.

38	a) Time	b) Foot item	c) Description	Amount consumed		f) Source of food
				d) Amount	e) Unit	
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						

20					
Time: 1=breakfast, 2=mid-morning snack, 3=lunch, 4=mid-afternoon snack, 5=dinner, 6=snack before bed, 7=meal during night	See food codes below		**Unit**: 1=piece/number, 2= 250g cup, 3=500g cup, 4=200g bowl, 5=500g bowl, 6=levelled teaspoon, 7=heaped teaspoon, 8=levelled teaspoon, 9=heaped tablespoon, 10=levelled serving spoon, 66=Other (specify)	**Source of food**: 1=Own production & preparation, 2=bought at market/shop & prepared at home, 3= bought at market/shop ready to eat, 4=Gift, borrowed, bartered, exchanged for labour & prepared at home, 5= Gift, borrowed, bartered, exchanged for labour ready to eat, 66=Other (Specify)…	
Food Codes for Qn 38 (b) – food item					
Cereals &Grains: 1a= dry Maize (grains/ flour), 1b=fresh maize 1c=Millet, 1d=Sorghum, 1e=Rice, 1f=Wheat & Products, 66=other	**Roots &Tubers** 2a= cooking bananas, 2b=cassava, 2c=Irish potatoes, 2d=White sweet potatoes, 2e=Orange-sweet potatoes, 2f=Yam, 2g=Arrow roots, 2h=Cocoyam, 66=other	**Vegetables** 3a=Cow pea leaves, 3b=pumpkin leaves 3c=yam leaves, 3d=Bean leaves 3e=Sweet potato leaves 3f= Cassava leaves, 3g=Kale/Sukuma, 3h=Amaranth leaves, 3i=Cabbage, 3j=Mushrooms, 3k=Tomatoes 3l=Onions, 3j=Nakati, 66=other	**Legumes &Nuts** 4a=Beans, 4b=groundnuts, 4c=Soya beans, 4d=pigeon peas, 4e=field peas, 4f=sesame, 66=other	**Animal protein** 5a=Termites, 5b=Grasshoppers 5c=Large fish 5d=Small Fish, 5e=Eggs, 5f=Flesh meat 5g=Organ meats 5h=Milk, 5i=yoghurt, 66=other	**Fruits** 6a=Mangoes, 6b=pawpaw, 6c=Avocado, 6d=Passion fruits 6e=jambula 6f=Oranges, 6g=Jack fruit 6h=guavas, 6i= dessert bananas 66=other

SECTION 4. DIETARY INTAKE AND FOOD SECURITY

Qn39. Food frequency questionnaire for child. During the past 7 days, did [child's name] consume any of these foods? If Yes, how many days did they consume them?

39		a) Consumed 0=No, 1=Yes	b) Number of days	c) source of foods
A	**GRAINS**			
1	maize grains			
2	maize flour			
3	rice			
4	millet			
5	sorghum			
6	wheat			
7	other (specify)			
B	**BANANAS, ROOTS, TUBERS**			
1	cooking banana			
2	white sweet potato			
3	cassava			
4	cassava flour			
5	Irish potatoes			
6	cocoyam			
7	arrow root			
8	other (specify)			
C	**ORANGE & DARK YELLOW FOODS**			
1	pumpkin			
2	carrots			
3	orange fleshed sweet potatoes			
4	mangoes			
5	pawpaw			
6	other (specify)			

39		a) Consumed 0=No, 1=Yes	b) Number of days	c) source of foods
D	**DARK GREEN VEGETABLES**			
1	amaranth			
2	nakati			
3	gyobyo			
4	kale			
5	spinach			
6	pumpkin leaves			
7	bean leaves			
8	yam leaves			
9	cassava leaves			
10	other (specify)			
E	**LEGUMES AND NUTS**			
1	beans			
2	groundnuts			
3	field peas			
4	pigeon peas			
5	soybean			
6	sesame			
7	other (specify)			
	If a) is No, Skip b) and c) and proceed to the next food	***Source of foods:*** *1=Own production, 2=market/shop, 3= Gift, borrowed, bartered, exchanged for labour, 4= food aid, 66=Other (Specify)…*		

39		a) Consumed 0=No, 1=Yes	b) Number of days	c) source of foods
F	**OTHER FRUITS**			
1	Dessert bananas			
2	pineapples			
3	jackfruit			
4	oranges			
5	Passion fruit			
6	avocado			
7	guavas			
8	jambula			
10	other (specify)			
G	**OTHER VEGETABLES**			
1	cabbage			
2	eggplant			
3	Bitter tomato			
4	African eggplant			
5	bitter tomato			
6	tomato			
7	onions			
8	mushrooms			
9	other (specify)			
H	**MEAT AND ORGANS**			
1	liver			
2	kidney			
3	intestines			
4	beef			
5	goat			
6	pork			
7	chicken			
8	other (specify)			

39		a) Consumed 0=No, 1=Yes	b) Number of days	c) source of foods
I	**DIARY AND EGGS**			
1	milk			
2	yoghurt			
3	eggs			
4	other (specify)			
J	**FISH**			
1	Silver fish			
2	nile perch			
3	tilapia			
4	nkeje			
	other (specify)			
K	**OTHER FOODS**			
1	cooking oil			
2	margarine			
3	sugar			
4	salt			
5	grasshoppers			
6	white ants			
	If a) is No, Skip b) and c) and proceed to the next food	***Source of foods:*** *1=Own production, 2=market/shop, 3= Gift, borrowed, bartered, exchanged for labour, 4= food aid, 66=Other (Specify)…*		

Qn40. Food frequency questionnaire for Household.

During the past 7 days, where any of these foods consumed at home by any member of the household? If Yes, how many days where they consumed?

40		a) Consumed 0=No, 1=Yes	b) Number of days	c) source of foods
A	**GRAINS**			
1	maize grains			
2	maize flour			
3	rice			
4	millet			
5	sorghum			
6	wheat			
7	other (specify)			
B	**BANANAS, ROOTS, TUBERS**			
1	cooking banana			
2	white sweet potato			
3	cassava			
4	cassava flour			
5	Irish potatoes			
6	cocoyam			
7	arrow root			
8	other (specify)			
C	**ORANGE & DARK YELLOW FOODS**			
1	pumpkin			
2	carrots			
3	orange fleshed sweet potatoes			
4	mangoes			
5	pawpaw			
6	other (specify)			

40		a) Consumed 0=No, 1=Yes	b) Number of days	c) source of foods
D	**DARK GREEN VEGETABLES**			
1	amaranth			
2	nakati			
3	gyobyo			
4	kale			
5	spinach			
6	pumpkin leaves			
7	bean leaves			
8	yam leaves			
9	cassava leaves			
10	other (specify)			
E	**LEGUMES AND NUTS**			
1	beans			
2	groundnuts			
3	field peas			
4	pigeon peas			
5	soybean			
6	sesame			
7	other (specify)			
	If a) is No, Skip b) and c) and proceed to the next food	***Source of foods:*** *1=Own production, 2=market/shop, 3= Gift, borrowed, bartered, exchanged for labour, 4= food aid, 66=Other (Specify)…*		

40		a) Consumed 0=No, 1=Yes	b) Number of days	c) source of foods
F	**OTHER FRUITS**			
1	Dessert bananas			
2	pineapples			
3	jackfruit			
4	oranges			
5	Passion fruit			
6	avocado			
7	guavas			
8	jambula			
10	other (specify)			
G	**OTHER VEGETABLES**			
1	cabbage			
2	eggplant			
3	Bitter tomato			
4	African eggplant			
5	bitter tomato			
6	tomato			
7	onions			
8	mushrooms			
9	other (specify)			
H	**MEAT AND ORGANS**			
1	liver			
2	kidney			
3	intestines			
4	beef			
5	goat			
6	pork			
7	chicken			
8	other (specify)			

40		a) Consumed 0=No, 1=Yes	b) Number of days	c) source of foods
I	**DIARY AND EGGS**			
1	milk			
2	yoghurt			
3	eggs			
4	other (specify)			
J	**FISH**			
1	Silver fish			
2	nile perch			
3	tilapia			
4	nkeje			
	other (specify)			
K	**OTHER FOODS**			
1	cooking oil			
2	margarine			
3	sugar			
4	salt			
5	grasshoppers			
6	white ants			
	If a) is No, Skip b) and c) and proceed to the next food	***Source of foods:*** *1=Own production, 2=market/shop, 3= Gift, borrowed, bartered, exchanged for labour, 4= food aid, 66=Other (Specify)…*		

Qn41: Household Hunger Scale

Q41.	Question	Response	Code
41.1a	In the past month [4 weeks/30 days] did you worry that your household would not have enough food?	0 = No (Skip to 41.2a) 1 = Yes	
41.1b	How often did this happen in the past [4 weeks/30 days]?	1 = Rarely (1-2 times) 2 = Sometimes (3-10 times) 3 = Often (more than 10 times); 88= NA	
41.2a	In the past [4 weeks/30 days] were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	0 = No (Skip to Q41.3a) 1 = Yes	
41.2b	How often did this happen in the past [4 weeks/30 days]?	1 = Rarely (1-2 times) 2 = Sometimes (3-10 times) 3 = Often (more than10 times) 88= NA	
41.3a	In the past [4 weeks/30 days] did you or any household member have to eat a limited variety of food due to a lack of resources?	0 = No (Skip to 41.4) 1 = Yes	
41.3b	How often did this happen in the past [4 weeks/30 days]?	1 = Rarely (1-2 times) 2 = Sometimes (3-10 times) 3 = Often (more than 10 times), 88= NA	
41.4a	In the past [4 weeks/30 days] did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	0 = No (Skip to 41.5) 1 = Yes	
41.4b	How often did this happen in the past [4 weeks/30 days]?	1 = Rarely (1-2 times) 2 = Sometimes (3-10 times) 3 = Often (more than 10 times) 88= NA	
41.5a	In the past [4 weeks/30 days] did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	0 = No (Skip to 41.6) 1 = Yes	
41.5b	How often did this happen in the past [4 weeks/30 days]?	1 = Rarely (1-2 times) 2 = Sometimes (3-10 times) 3 = Often (more than 10 times) 88= NA	
41.6a	In the past [4 weeks/30 days] did you or any household member have to eat fewer meals in a day because there was not enough food?	0 = No (Skip to 41.7) 1 = Yes	
41.6b	How often did this happen in the past [4 weeks/30 days]?	1 = Rarely (1-2 times) 2 = Sometimes (3-10 times) 3 = Often (more than 10 times) 88= NA	
41.7a	In the past [4 weeks/30 days] was there ever no food to eat of any kind in your household because of a lack of resources to get food?	0 = No (Skip to 41.8) 1 = Yes	
41.7b	How often did this happen in the past [4 weeks/30 days]?	1 = Rarely (1-2 times) 2 = Sometimes (3-10 times) 3 = Often (more than 10 times) 88= NA	
41.8a	In the past [4 weeks/30 days] did you or any household member go to sleep at night hungry because there was not enough food?	0 = No (Skip to 41.9) 1 = Yes	
41.8b	How often did this happen in the past [4 weeks/30 days]?	1 = Rarely (1-2 times) 2 = Sometimes (3-10 times) 3 = Often (more than 10 times) 88= NA	

41.9a	In the past [4 weeks/30 days] did you or any household member go a whole day and night without eating anything at all because there was not enough food?	0 = No (Skip to 42) 1 = Yes	
41.9b	How often did this happen in the past [4 weeks/30 days]?	1 = Rarely (1-2 times) 2 = Sometimes (3-10 times) 3 = Often (more than 10 times) 88= NA	

Qn42: Annual household food availability

What was the level of food available for consumption in your household during the course of past year?

42.	Codes: 1= very little, 2= Just enough, 3=Enough to feed and store (store: in store/on farm and ready for harvest)											
42	a) Jan	b) Feb	c) Mar	d) April	e) May	f) June	g) July	h) Aug	i) Sept	j) Oct	k) Nov	l)Dec

Qn43. For each of the months that the highest levels of food available in Q42, what three foods items are mostly available for consumption by your household during these months?

43	a) Jan	b) Feb	c) Mar	d) April	e) May	f) June	g) July	h) Aug	i) Sept	j) Oct	k) Nov	l)Dec
43.1												
43.2												
43.3												

Cereals &Grains:	**Roots &Tubers**	**Vegetables**	**Legumes &Nuts**	**Animal protein**	**Fruits**
1a= dry Maize (grains/ flour), 1b=fresh maize 1c=Millet, 1d=Sorghum, 1e=Rice, 1f=Wheat & Products, 66=other	2a= cooking bananas, 2b=cassava, 2c=Irish potatoes, 2d=White sweet potatoes, 2e=Orange-sweet potatoes, 2f=Yam, 2g=Arrow roots, 2h=Cocoyam, 66=other	3a=Cow pea leaves, 3b=pumpkin leaves 3c=yam leaves, 3d=Bean leaves 3e=Sweet potato leaves 3f= Cassava leaves, 3g=Kale/Sukuma, 3h=Amaranth leaves, 3i=Cabbage, 3j=Mushrooms, 3k=Tomatoes 3l=Onions, 3j=Nakati, 66=other	4a=Beans, 4b=groundnuts, 4c=Soya beans, 4d=pigeon peas, 4e=field peas, 4f=sesame, 66=other	5a=Termites, 5b=Grasshoppers 5c=Large fish 5d=Small Fish, 5e=Eggs, 5f=Flesh meat 5g=Organ meats 5h=Milk, 5i=yoghurt, 66=other	6a=Mangoes, 6b=pawpaw, 6c=Avocado, 6d=Passion fruits 6e=jambula 6f=Oranges, 6g=Jack fruit 6h=guavas,6i= dessert banana, 66=other

SECTION 5. Anthropometric measurements

Introduction: I will now take measurements of [name] [This should be the same child whose information was captured in Section 3]. These include the weight, the Mid Upper Arm Circumference, and the height

Qn44 to Qn47. Anthropometric measurements

Survey date (dd/mm/yyyy)				
First name				
Birth date (dd/mm/yyyy)				
44	Oedema 0=No, 1=Yes			
		a) first reading	**b) second reading**	**c) third reading**
45	Weight (Kg)			
46	Height (cm)			
47	MUAC (cm)			

Notes:

Age: Refer to the age recorded from the child health card in section 3

For weight, height and MUAC: take 2 measurements. If they are vastly different, take 2 more measurements and cross out the first readings.

MUAC: If the measurements are less than 11.5, refer this child to the nearest health facility.

Height: If the child is below 2 years (<24 months), the length of the child shall be measured, that is the measuring board shall be placed horizontally, for the child to lie flat.

Oedema: Check to see if the skin on the limbs (arms, legs, or feet) appears stretched, shiny and swollen. Using the fore finger, press both limbs gently for about 10 seconds when a dimple/depression appears and takes about 15 seconds to fill there is oedema. It must appear in both limbs for oedema as a clinical sign of severe malnutrition is to be considered present. If present, refer this child to the nearest health facility.

Thank you for participating in this study

4.2 Market survey

1.	Questionnaire ID	
2.	First name of respondent	
3.	Date of Interview (Dd/mm/yyyy)	
4.	Enumerator's name	

MARKET LOCATION

		Codes	Reply
5.	Sub-county		
6.	Parish		
7.	Village	Specify	

RESPONDENT DETAILS

Qn	Question	Codes	Reply
8.	Gender of respondent	1=Female, 2=Male	
9.	Age of respondent in years		
10.	How long have you worked in this market?	years	
11.	Do you work in any other markets in Kiboga district? If No, skip to Q15	0=No, 1=Yes	

MARKET DETAILS

Qn	Question	Codes	Reply
12.	What is the name of this market?		
13.	What is the nature of this market?	1=Permanent /daily market 2=Weekly market 3= Fortnightly market 4=Seasonal market 66=other (specify)……	
14.	Which villages does this market serve?		

Foods sold in the market

		15) Sold in this market	16) Do you sell these items?	17) At what price do you sell these items?		18) Main source of this item	19) Main market for this item	20) Availability of these foods during the year*	
		0=No, 1=Yes	0=No, 1=Yes	UGX per unit	Unit			a) Seasonal	b) All year round
A	**GRAINS**								
1	maize grains								
2	maize flour								
3	rice								
4	millet								
5	sorghum								
6	wheat								
7	other (specify)								
B	**ROOTS, TUBERS COOKING BANANAS**								
1	cooking banana								
2	white sweet potato								
3	cassava								
4	cassava flour								
5	Irish potatoes								
6	cocoyam								
7	arrow root								
8	other (specify)								
	If Q15 is No, preceding questions should be 88=NA			**Unit:** 1=kilogram, 2= 25 kg bag, 3=50kg bag, 4=100kg bag, 5=litre,		**Source of item**: 1=neighbouring villages, 2=Kiboga district, 3=neighbouring districts, 4=far off districts, 5=imported into the country, 66=other (specify)……	**Main market**: 1=neighbouring villages, 2=Kiboga district, 3=traders taking to neighbouring districts, 4=traders taking to Kampala, 66=other (specify)…….	*For each category, fill either the seasonal column or available all year round*	

		15) Sold in this market	16) Do you sell these items?	17) At what price do you sell these items		18) Main source of this item	19) Main market for this item	20) Availability of these foods during the year*	
		0=No, 1=Yes	0=No, 1=Yes	UGX per unit	Unit			a) Seasonal	b) All year round
C	**ORANGE & DARK YELLOW FOODS**								
1	pumpkin								
2	carrots								
3	orange fleshed sweet potatoes								
4	mangoes								
5	pawpaws								
6	other (specify)								
D	**DARK GREEN VEGETABLES**								
1	amaranth								
2	nakati								
3	bugga								
4	gyobyo								
5	kale								
6	spinach								
7	pumpkin leaves								
8	bean leaves								
9	yam leaves								
10	cassava leaves								
11	other (specify)								
	If Q15 is No, preceding questions should be 88=NA			**Unit:** 1=kilogram, 2= 25 kg bag, 3=50kg bag, 4=100kg bag, 5=litre,		**Source of item**: 1=neighbouring villages, 2=Kiboga district, 3=neighbouring districts, 4=far off districts, 5=imported into the country, 66=other (specify)	**Main market**: 1=neighbouring villages, 2=Kiboga district, 3=traders taking to neighbouring districts, 4=traders taking to Kampala, 66=other (specify)	*For each category, fill either the seasonal column or available all year round*	

		15) Sold in this market	16) Do you sell these items?	17) At what price do you sell these items		18) Main source of this item	19) Main market for this item	20) Availability of these foods during the year*	
		0=No, 1=Yes	0=No, 1=Yes	UGX per unit	Unit			a) Seasonal	b) All year round
E	**LEGUMES AND NUTS**								
1	beans								
2	groundnuts								
3	field peas								
4	pigeon peas								
5	soybean								
6	sesame								
7	other (specify)								
F	**OTHER FRUITS**								
1	Dessert bananas								
2	pineapples								
3	jackfruit								
4	oranges								
5	passionfruit								
6	avocado								
7	guavas								
8	jambula								
9	other (specify)								
	If Q15 is No, preceding questions should be 88=NA			**Unit:** 1=kilogram, 2= 25 kg bag, 3=50kg bag, 4=100kg bag, 5=litre,		**Source of item**: 1=neighbouring villages, 2=Kiboga district, 3=neighbouring districts, 4=far off districts, 5=imported into the country, 66=other (specify)	**Main market**: 1=neighbouring villages, 2=Kiboga district, 3=traders taking to neighbouring districts, 4=traders taking to Kampala, 66=other (specify)	*For each category, fill either the seasonal column or available all year round*	

		15) Sold in this market	16) Do you sell these items?	17) At what price do you sell these items		18) Main source of this item	19) Main market for this item	20) Availability of these foods during the year*	
		0=No, 1=Yes	0=No, 1=Yes	UGX per unit	Unit			a) Seasonal	b) All year round
G	**OTHER VEGETABLES**								
1	cabbage								
2	eggplant								
3	katunkuma								
4	ntula								
5	bitter tomato								
6	tomatoes								
7	onions								
8	mushrooms								
9	other (specify)								
H	**MEAT AND ORGANS**								
1	liver								
2	kidney								
3	intestines								
4	beef								
5	goat								
6	pork								
7	chicken								
8	other (specify)								
	If Q15 is No, preceding questions should be 88=NA			**Unit:** 1=kilogram, 2= 25 kg bag, 3=50kg bag, 4=100kg bag, 5=litre,		**Source of item**: 1=neighbouring villages, 2=Kiboga district, 3=neighbouring districts, 4=far off districts, 5=imported into the country, 66=other (specify)	**Main market**: 1=neighbouring villages, 2=Kiboga district, 3=traders taking to neighbouring districts, 4=traders taking to Kampala, 66=other (specify	*For each category, fill either the seasonal column or available all year round*	

		15) Sold in this market	16) Do you sell these items?	17) At what price do you sell these items		18) Main source of this item	19) Main market for this item	20) Availability of these foods during the year*	
		0=No, 1=Yes	0=No, 1=Yes	UGX per unit	Unit			a) Seasonal	b) All year round
I	**DIARY AND EGGS**								
1	milk								
2	yoghurt								
3	eggs								
4	other (specify)								
J	**FISH**								
1	mukene								
2	nile perch								
3	tilapia								
4	nkeje								
	other (specify)								
K	**OTHER FOODS**								
1	cooking oil								
2	margarine								
3	sugar								
4	salt								
5	grasshoppers								
6	white ants								
	If Q15 is No, preceding questions should be 88=NA			**Unit:** 1=kilogram, 2= 25 kg bag, 3=50kg bag, 4=100kg bag, 5=litre,		**Source of item**: 1=neighbouring villages, 2=Kiboga district, 3=neighbouring districts, 4=far off districts, 5=imported into the country, 66=other (specify)	**Main market**: 1=neighbouring villages, 2=Kiboga district, 3=traders taking to neighbouring districts, 4=traders taking to Kampala, 66=other (specify)	*For each category, fill either the seasonal column or available all year round*	

Thank you for participating in this study

4.3 Focus group discussion guide: Part one

AIM: To understand the community perspectives on the current community food and nutrition situation as well as understand the key dynamics or factors influencing the situation in the community

Introduction

- Welcome the participants and introduce the research team
- Give a background of the project and objective of the activity as provided in the consent form
- Seek informed consent and answer any arising questions
- After obtained consent, thank the participants and proceed with group participant introductions and filling in of the participant information.
- As the participant information is being filled, lay out and agree on the ground rules of the discussion. They can include and are not limited to:
  i. There are no right or wrong answers to questions
  ii. All sides of an issue are important, negative and positive, those that occur often and those that occur rarely
  iii. Listen and respect one another's opinions and ideas
  iv. Every one's response is important. No participant has a more important or valid opinion/idea than another
  v. One person should speak at a time
  vi. What is shared by fellow group members is confidential
  vii. Avoid distractions like phones and side discussions

- Cross check that the recorder is on and note taker is ready
- Start the main discussion

Theme 1. Food consumption patterns of infants and young children

1. What are the foods eaten by children aged 6 months to 3 years of age?
2. How do the foods eaten by children change during the year? If so, how do they change?
3. Do you think these meals/diets are good/adequate?

Theme 2. Food availability in the household

1. How do households obtain the foods eaten by the children and the rest of the members?
2. What determines the food you give to the children?

Theme 3. Factors affecting food availability in the community

1. Summarise and list the factors that have come out of the discussion
2. Introduce the four-cell (drawn and labelled prior to the discussion), explaining the four parts (cells) in which the group shall place each of the factors/problems identified.
   - Those faced by many households frequently; many households less frequently; few households frequently; and few households less frequently
3. Write each factor on a card and for each factor, ask the participants whether this factor is faced by many or few households in this community?
4. Is faced by these households frequently or less frequently?
   - Place the card in the appropriate cell and move to the next factor.
5. What do you mean by many and few households; frequently or less frequently?

Closing remarks

Thank the participants for their time and input, and inform them of the following:

- The research team will analyse the information shared from this discussion together with 3 other discussions that are being conducted
- This information will be used to guide a second discussion, to which the participants will be invited
- The mobiliser will inform the participants the date of the second discussion, and research team hopes they will be available and willing to participate.

NOTES: PART ONE

Theme 1. Food consumption patterns of infants and young children

1. What are the foods eaten by children aged 6 months to 3 years of age?
   - The meals and not just foods. That is, how the foods are consumed e.g. rice served with beans and avocado
   - Cooking method of the meal/foods
   - Consumption pattern: time of day, when they are consumed and number of times (in a day or week or month or season)
   - Whether part of the main household meals or not
2. How do the foods eaten by children change during the year?
   - Focus is on the calendar year
   - Periods of adequate food availability versus lean food availability. Note the foods and the months/ periods
   - Note the factors causing the change, the increase or decrease in consumption of different foods
   - Has this scenario changed over the last 10-20 years? Would a child of the same age have eaten the same food 10-20 years ago?
3. Do you think these meals/diets are good/adequate?
   - What makes them good/adequate
   - What makes them inadequate
   - The source of this information or perception (e.g. Experience, family member, health worker, program, etc.)

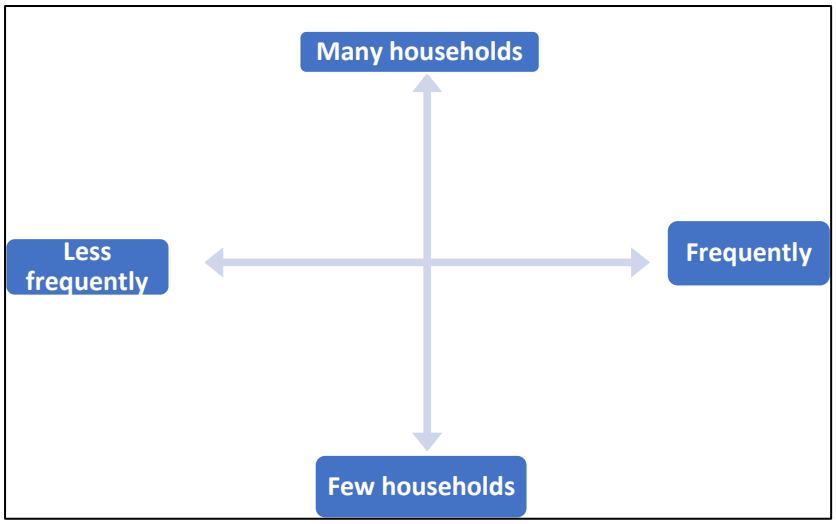
Theme 2. Food availability in the household

1. How do households obtain the foods eaten by the children and the entire households?
   - Refer first to foods that were noted as eaten by children
   - Are there additional/separate foods eaten by the household and not children?
   - Note the sourcing mechanisms used to obtain different foods. Each food group should be covered
     - Cereals; legumes, roots & tubers; cooking bananas; vitamin A-rich foods; fruits; vegetables; animal foods/products
   - Are the mentioned sources able to provide adequate food as needed by the households?
   - If more than one mechanism applies to a food, what factors determines which source is used?
   - Challenges faced with the different sourcing mechanisms
2. What determines the food given to the children?
   - Additional factors to those mentioned above

- Do these factors affect only the children aged 1-3 years only, or the entire household?
- Does the factor affect certain foods, food groups, times of the year?
- Did the factor also influence the particular food/food group 10-20 years ago? Was the magnitude the same?

Theme 3. Food availability in the community

1. Summarise and list the factors that have come out of the discussion
   - Inquire and note if there are crucial ones that had been left out previously
2. Using the four-cell
   - Why does this factor affect many or few households?
   - Why frequently or less frequently? (why they were placed in the particular cell)
   - Define the axes of the four-cell



Closing remarks

Thank participants and dispense the compensation for their time and travel expenses

4.4 Focus group discussion guide: Part two

AIM: To explore the possible solutions to the food and nutrition situation in the community, particularly dietary diversity and find out what has been successful in the past

Introduction

- Welcome back the participants and re-introduce the research team
- Give a background of the project and objective of the activity as provided in the consent form
- Seek informed consent and answer any arising questions
- After obtained consent, thank the participants and proceed with group participant introductions and filling in of the participant information.
- As the participant information is being filled, lay out and agree on the ground rules of the discussion. They can include and are not limited to:
  i. There are no right or wrong answers to questions
  ii. All sides of an issue are important, negative and positive, those that occur often and rarely
  iii. Listen and respect one another's opinions and ideas
  iv. Every one's response is important. No participant has a more important or valid opinion/idea than another
  v. One person should speak at a time
  vi. What is shared by fellow group members is confidential
  vii. Avoid distractions like phones and side discussions
- Cross check that the recorder is on and note taker is ready
- Start the main discussion

Theme 1: Review of main factors that affect the food availability

1. Give a summary of the factors obtained from all the FGDs carried out in the first part of the study
2. Does this list adequately reflect the situation in your households and community?

Theme 2: Overcoming these factors

1. How have you as a household overcome or addressed these factors to ensure you have food for your children and household?

Theme 3: Improving the food availability and consumption in the households

1. What do you think can be done at household and/or community level to improve the food given to the children?

Closing remarks

Thank the participants for their time and input, and inform them of the following:

- The research team will analyse the information shared from this discussion together with 3 other discussions that are being conducted
- This information will be used to guide the development of a strategy to improve the dietary diversity of children in this community and similar communities
- Some of the participants will be invited for a final discussion to evaluate the developed strategy
- After the whole study is completed, the research team will convene community meetings to share the results and the way forward.

NOTES: PART TWO

Theme 1: Review of main factors that affect the food availability

1. Give a summary of the factors given in all FGDs in the first part of the study
   - Present them using the four-cell so that the magnitude of each factor is also presented
   - Results include factors and magnitude presented in this FGD when added to responses received in other group discussions
2. Does this list adequately reflect the situation in your households and community?
   - What was added (not mentioned by the siting FGD) or is missing?
   - What is their impression of the magnitude of the factors? What do they agree or disagree with? And why?

Theme 2: Overcoming these factors

1. How has your household overcome or addressed these factors to ensure you have food for your children?
   - What factor or factors they were trying to address and how?
   - Were the efforts successful? How or why not?
   - Who in the household was involved?
   - What/who was the source of this knowledge or skill or input?
   - Inquire about all factors affecting many households and those occurring frequently as presented in theme 1

Theme 3: Improving food availability and consumption in the household

1. What do you think can be done at household and/or community level to improve the food given to the children?
   - Especially those that address factors affecting many households and those occurring frequently
   - Which solutions can be implemented together (go hand in hand) or address more than one factor?
   - Which solutions require outside influence/assistance and which ones don't (outside the community)
   - Note any possible hindrances brought up regarding the solutions
   - Note the level of the solution, individual, household, community, etc.

Closing remarks

Thank participants and Dispense the compensation for their time and travel expenses

4.5 Validation focus group discussion guide

Aim: To evaluate the developed Contextualised Rural Food Based Strategy to determine whether it incorporates the context of the study population and whether it has the potential to address dietary diversity

Introduction

- Welcome the participants and introduce the research team
- Give a background of the project and objective of the activity as provided in the consent form
- Seek informed consent and answer any arising questions
- After consent, thank the participants and proceed with group participant introductions and filling in of the participant information.
- As the participant information is being filled, lay out and agree on the ground rules of the discussion. They can include and are not limited to:
  i. There are no right or wrong answers to questions
  ii. All sides of an issue are important, negative and positive, those that occur often and those that occur rarely
  iii. Listen and respect one another's opinions and ideas
  iv. Every one's response is important. No participant has a more important or valid opinion/idea than another
  v. One person should speak at a time
  vi. What is shared by fellow group members is confidential
  vii. Avoid distractions like phones and side discussions

- Cross check that the recorder is on and note taker is ready
- Start the main discussion

Theme 1: Review of the main factors incorporated in the CFBS

1. Give a summary of the main factors obtained from Phase 1 and two of the study (household survey, market survey, and FGDs) that were incorporated in the CFBS as laid out in the FGD guide notes
2. What is the importance of each output in the theme 1 table with respect to the study context?
   - How relevant is each factor when addressing dietary diversity in the community?
   - How effective is addressing each of the main factors in order to improve the dietary diversity in the community?

   Discuss one output at a time before moving on to the next. Describe the output in the theme 1 table with reference to the corresponding performance objective and proceed to ask the importance and relevance.
   a) Increasing household production of diverse foods
   b) Improving agricultural production practices
   c) Increasing household access to information and skills

d) Increasing social capacity and social support to learn, adopt, implement and share information and skills
e) Increasing diversity in the markets that serve the rural community
f) Improving household financial literacy and income allocation to food
g) Increasing income from both on- and off-farm activities
h) Nutrition education

3. What other key factors do you think should be part of the CFBS and why?

Theme 2: Review of the target actors and beneficiaries of the CFBS

1. How important is the involvement of each actor towards achieving the CFBS goal and objectives?
   – Would they be in position to contribute towards the CFBS?
   – Also discuss the role of the primary beneficiaries: vulnerable farming households

   Discuss one actor at a time before moving on to the next. Describe the actor in the theme 2 table with reference to their role in the CFBS and proceed to ask the importance and relevance of their involvement.

   a) Policy makers
   b) Government institutions and Development organisations
   c) Extension workers
   d) Community-level groups/ networks
   e) Community champions
   f) Smallholder farming households
   g) Other stakeholders/ influencing actors

2. What other actors and/or roles do you think should be part of the CFBS?

Closing remarks

Thank the participants for their time and input, and inform them of the following:
– The research team will analyse the information shared from this discussion together with another discussion that are being conducted
– This information will be used to guide the development of a strategy to improve the dietary diversity of children in this community and similar communities
– After the whole study is completed, the research team will convene community meetings to share the results and the way forward

FGD Notes

Background information

Steps in the development process	Key findings
Household survey *174 rural smallholder households*	- Food production and food consumption were mainly cereals and grains; roots, tubers, cooking bananas; and legumes - Low dietary diversity: only 22% of 6 to 23-month old met the minimum dietary diversity and only 29% of ≥24 months ate >3 food groups - Low consumption of micronutrient rich foods (vitamin A-rich foods and animal-source foods) - 35% of households were food insecure - Households mainly sourced their food from own production followed by purchase from markets
Market survey *6 markets surrounding surveyed communities*	- Wide range of food groups and food items on sale - However, the most accessed markets by the households surveyed had a limited diversity of food groups available (6 out of 11 groups) - Most accessed markets also had a limited variety of food items per food group compared to other markets
Focus group discussions *Participants from rural smallholder households* *With and without prior involvement in an agricultural and/or nutrition intervention* *first round focused on the issues in the community* *second round focused on what communities are doing to address the issues*	- Children ate the same food as the rest of the households - Household food production and consumption were focused on priority crops that alleviated hunger and contributed to income - Prior production experience and personal preference also influenced choice of crops grown and/or animals reared - Priority crops included maize, cooking bananas, sweet potatoes, cassava, and beans - Agricultural production was influenced by the land available, soil fertility, labour available, access to inputs, and knowledge and skills - Time was a limiting factor of production of diverse foods, food preparation and child feeding - Limited household income amidst a wide range of household needs and the cost of food and its availability in the market influenced the type and quantity of food bought - A poor perception towards meetings and/or training was noted - Inadequate nutrition information and skills and training in the community
Strategy design	- Results from the household and market surveys, focus group discussion together with relevant theory and literature were applied using the intervention mapping protocol to systematically identify the determinants, outcomes, objectives, and pathway to change

Theme 1: Review of the main factors incorporated in the CFBS

Outcomes	Outputs	Performance objectives
1. Increased availability of diverse foods	1a. Increase diversity of crops produced by households to include fruits and vegetables	- Household production of at least two types of fruits and of vegetables - Household production of more than one type of staple and legume
	1b. Increased use of sustainable production practices that maximise land use	- Improved land allocation and utilisation by households - Utilisation of low cost, sustainable, climate smart soil, water and pest management technologies by household and communities
	1c. Increased household access to appropriate information and skills 1d. Increased social capacity to identify and solve agricultural production problems	- Extension service providers and community leaders have appropriate information and promote best practices - Communities have champions/promoters that demonstrate and share the application of appropriate information and skills - Local media shares appropriate information and skills - Formation/strengthening of formal and informal farmer organisations [a]
2. Increased accessibility to diverse foods	2a. Increased diversity of foods in markets for the rural community	- Linkage of traders from markets that serve the rural community to farmers and farmer groups - Households and farmer groups informally trade diverse foods in their communities for example farm gate, community events, farmer learning group events etc. - Local media, extension service providers, community leaders, and community farmer organisations and champions promote dietary diversity and where the diversity can be accessed (demand creation)
	2b. Improved household income allocation and utilisation to access diverse foods	- Households apply financial literacy knowledge and skills for example budgeting, saving, investing, credit access, use of financial institutions etc. - Increased use of markets as source of diverse foods for household consumption - Households make appropriate food choices with available income
	2c. Increased household income through on-farm and/or off-farm activities	- Increased agricultural productivity and proportion of harvest sold by households - Increased proportion of household income from off-farm activities
3. Increased consumption of diverse foods	3a. Increased consumption of fruits, vegetables, and animal-source foods	- Incorporation of fruits, vegetables, and animal-source foods in child and household diets - Increased meal frequency by children
	3b. Improved food handling and safety	- Households apply appropriate post-harvest-handling practices - Utilisation of appropriate food preparation methods by households - Utilisation of sanitation and hygiene facilities by households

Theme 2: Review of the target actors and beneficiaries of the CFBS

Actor	Characteristics	Role in the CFBS
Policy makers	- Responsible for formulating or amending policies and action plans - Determine areas of focus - Include central government (line ministries) and local government (up to community level)	- Adopt the strategy and make decisions about its application - Support organisations that implement it - Use the CFBS and its results to inform policy and action developments and amendments
Government institutions and Development organisations	- Implement programs - Funded by government or other agencies - Have nutrition, food security and agriculture in their mandate - Directly engage households, communities and their actors - Include NGOs, CBOs,	- Develop and implement programs that contribute/fit within the CFBS - Link and equip other actors to achieve strategy - Monitor and evaluate the performance of the strategy
Extension workers	- Facilitate community access to agricultural and health services - Deliver services and disseminate information, skills, and practices - Operate at community level - Have basic to advanced knowledge and experience in agriculture, health, and nutrition	- Disseminate practices within the CFBS and its programs - Incorporate CFBS in their activities - Support community-level groups/ networks, community champions, and smallholder households as they adopt and implement strategy actions
Community-level groups/ networks	- Groups of individuals or households in the community with a joint purpose that improve livelihoods - Include farmer, saving and credit, trader, women, youth organisations or groups - Can be formal or informal in structure - Have varying literacy levels, social economic status, and levels of knowledge and experience in agriculture, health, and nutrition	- Provide avenues to equip households with strategy information, skills, and practices - Disseminate practices within the CFBS and its programs in the community - Link and equip members to services and information - Provide social support as members adopt and implement strategy actions
Community champions	- Smallholder farmers in the community - Willing to share and demonstrate their experiences in agriculture and nutrition - Have basic literacy levels, and knowledge and experience in agriculture and nutrition	- Demonstrate and disseminate practices within the CFBS and its programs in the community - Provide social support as members adopt and implement strategy actions (relatable/ lower level, and informal interactions with fellow community members)
Smallholder farming households	- Vulnerable smallholder farming households with children below 5 years - Include labour and resource constrained, and/or with high dependency ratios	- Primary beneficiaries of the strategy - Participate in CFBS and its programs - Adopt and implement strategy actions - Provide social support to other implementing households
Other stakeholders/ influencing actors	- Organisations/institutions with roles linked to agriculture and nutrition - Include market, health, input providers, financial services, and private sector	- Link and support CFBS actors - Increase reach of services in the communities

4.6 Validation key informant tool

Instructions

This study seeks to systematically develop a strategy to improve dietary diversity of children in smallholder farming households in rural central Uganda. The strategy incorporates the needs and assets identified in the community, the community's input and perception, as well as literature and theory to increase the foundation for behaviour change and impact.

The researcher seeks to validate the designed strategy and assess its suitability and feasibility for the study population and identify any possible barriers in the proposed implementation plan.

This validation exercise is divided into four main parts that guide you through the strategy development process and allow you to evaluate the importance of key aspects that were included in the strategy. The parts are:

5. The development approach
6. The CFBS outcomes, outputs and performance objectives and critical success factors of change
7. Target actors and beneficiaries of the CFBS
8. Proposed CFBS implementation plan.

For each part, you be requested to review the relevant section in the attached strategy summary document and rate the importance of the aspects outlined in this tool using a scale of 1 to 5 where: 1 - Not important; 2 - Of little importance; 3 - Moderately important; 4 – Important; and 5 - Very Important.

Each part also has a section for you to expand on the rating given. In addition, space has been provided for additional comments.

Part 1: The development approach

The table below presents a summary of the strategy development process and approach

Steps	Key findings
Household survey *174 rural smallholder households*	- Food production and food consumption were mainly cereals and grains; roots, tubers, cooking bananas; and legumes - Low dietary diversity: only 22% of 6 to 23-month old met the minimum dietary diversity and only 29% of ≥24 months ate >3 food groups - Low consumption of micronutrient rich foods (vitamin A-rich foods and animal-source foods) - 35% of households were food insecure - Households mainly sourced their food from own production followed by purchase from markets
Market survey *6 markets surrounding surveyed communities*	- Wide range of food groups and food items on sale in the surveyed markets - However, the most accessed markets by the households surveyed had a limited diversity of food groups available (6 out of 11 groups) - Most accessed markets also had a limited variety of food items per food group compared to other markets
Focus group discussions *Participants from rural smallholder households* *first round focused on the issues in the community (4 FGDs)* *second round focused on what communities are doing to address the issues (4 FGDs)*	- Children ate the same food as the rest of the households - Household food production and consumption were focused on priority crops that alleviated hunger and contributed to income - Prior production experience and personal preference also influenced choice of crops grown and/or animals reared - Priority crops included maize, cooking bananas, sweet potatoes, cassava, and beans - Agricultural production was influenced by the land available, soil fertility, labour available, access to inputs, and knowledge and skills - Time was a limiting factor of production of diverse foods, food preparation and child feeding - Limited household income amidst a wide range of household needs and the cost of food and its availability in the market influenced the type and quantity of food bought - A poor perception towards meetings and/or training was noted - Inadequate nutrition information and skills and training in the community
Strategy design	- Results from the household and market surveys, focus group discussion together with relevant theory and literature were applied using the intervention mapping protocol to systematically identify the determinants, outcomes, objectives, and pathway to change

		Rating	Motivation of rating
1	With reference to the above table summarising the development approach, how would you rate the importance or relevance of the process?		
2	Additional comments		

Rating: 1 - Not important; 2 - Of little importance; 3 - Moderately important; 4 – Important; 5 - Very Important

Part 2: CFBS outcomes, outputs and performance objectives and critical success factors of change

With reference to section A and B in the attached strategy document, how would you rate the importance of the outputs listed below and their corresponding performance objectives towards achieving the CFBS outcomes and goal?

Rating: 1 - Not important; 2 - Of little importance; 3 - Moderately important; 4 – Important; 5 - Very Important

		Rating	**Motivation of rating**
1	Increasing household production of diverse foods to include fruits and vegetables		
2	Improving agricultural production practices		
3	Increasing household access to information and skills		
4	Increasing social capacity and social support to learn, adopt, implement and share information and skills		
5	Increasing diversity of foods in the markets that serve the rural community		
6	Improving household financial literacy and income allocation to food		
7	Increasing income from both on- and off-farm activities		
8	Nutrition education to increase consumption of diverse diets and improve food handling and safety		
9	Additional comments		

Part 3: Target actors and beneficiaries of the CFBS

With reference to section C in the attached strategy document, how would you rate the importance of target actors and beneficiaries towards achieving the CFBS outcomes and goal?

Rating: 1 - Not important; 2 - Of little importance; 3 - Moderately important; 4 – Important; 5 - Very Important

		Rating	**Motivation of rating**
A	Inclusion and role of:		
	Policy makers		
	Government institutions and Development organisations		
	Extension workers		
	Community-level groups/ networks		
	Community champions		
	Smallholder farming households		
	Other stakeholders/ influencing actors		
B	Additional comments		

Part 4: Proposed CFBS implementation plan

With reference to section D in the attached strategy document, how would you rate the importance of the aspects in the proposed implementation plan towards achieving the CFBS outcomes and goal?

Rating: 1 - Not important; 2 - Of little importance; 3 - Moderately important; 4 – Important; 5 - Very Important

		Rating	**Motivation of rating**
1	Category of actors involved		
2	Level and mode of engagement of community champions		
3	Level and mode of engagement of beneficiary households		
4	Level and mode of engagement of extension workers and community leaders		
5	Scope of implementation plan		
6	Additional comments		

Thank you for participating in this study

Appendix 5. Coding framework used in first round of FGDs

Theme	Sub-theme	Code group	Codes	Supporting codes
1. Child food consumption	Child food consumption	Meal dynamics	Food for adults/ older children	
			Food specifically for children	
			Food in between main meal	
			Foods for more than 1 meal (multiple use)	
			Food for both child & household	
			Mealtimes	
		Food groups	Animal-source foods	-Meal enrichment -Foods limited by cost -Seasonal foods
			Starchy staples	
			Fruits	
			Plant protein	
			Vegetables	
			Oil	
		Diets adequate or not	Diets not adequate	
			Diets adequate	
		Definition of an adequate diet	Suitable for children	
			Quantity of food	
			Type of food	
		Food beliefs	Use of leftovers/cold food	-Meal choice -Other child feeding practices
			Animal-source foods	
			Starchy foods	
			Texture of food	
			Type of food	

Theme	Sub-theme	Code group	Codes	Supporting codes
2. Food availability and consumption in the household	Dietary diversity	Dietary diversity	What is grown or reared	-Changes in quantity & type of food produced -Changes in quantity & type of food harvested/ available -Changes in household size
			Season; climate; drought	
			Seasonal foods	
			Effort put into farming	
			Information	
			Foods limited by cost	
			Time	
			Child preference	
			Food beliefs	
	Food production	Source of food	Food from own production	-What is grown or reared -Effort put into farming -Information -Time
			Food from market	
			Food from the wild	
			Food from exchange of labour	
			Market access	
		Environmental factors	Land availability & soil fertility	
			Pest & disease prevalence	
			Weather patterns	
			Access to inputs	
			Cost of production	
			Raising income	
		Changes in:	Low yields due to climate change/drought	
			Low yields due to land availability & soil fertility	
			Low yields due to pest & diseases	
			Quantity & type of food produced	
			Quantity & type of food harvested/ available	
			Participating in farming	
			Cost	

Appendix 6. Impact evaluation plan

Variables	Outcomes	Evaluation questions	Indicators	Measure	Data collection
Dietary diversity	Improved dietary diversity	Did CFBS increase child and household dietary diversity?	Proportion of children 6-24 months meeting the minimum dietary diversity and minimum acceptable diets Proportion of children 25-59 months with dietary diversity score >3 Proportion of households with dietary diversity score >3 (Swindale and Bilinsky, 2006; WHO *et al.*, 2010)	Surveys	Baseline After training/start of follow up phase Seasonal End-line
	Increased consumption of animal-source foods	Did CFBS increase consumption of animal-source foods?	Proportion of children consuming animal-source foods at least three times a week	Surveys	Baseline After training/start of follow up phase Seasonal End-line
	Increased consumption of fruits & vegetables	Did CFBS increase consumption of fruits & vegetables?	Proportion of children consuming at least a fruits or vegetables each day	Surveys	Baseline After training/start of follow up phase Seasonal End-line
Behaviour outcomes	Increased diversity of crops grown	Did CFBS increase production of diverse crops?	Species diversity species produced by the household as reflected by (i) specie richness (Count of crop and animal species); (ii) Species biodiversity index (Simpson's index of richness and evenness); (iii) Number of food groups produced (Jones, Shrinivas and Bezner-Kerr, 2014; Last *et al.*, 2014; Sibhatu, Krishna and Qaim, 2015; Ayenew *et al.*, 2018; Kissoly, Fabe and Grote, 2018)	Surveys	Baseline After training/start of follow up phase Seasonal End-line
	Increased frequency and safety of meals consumed by children	Did CFBS improve meal frequency of children? Did CFBS improve food handling methods?	Proportion of children consuming four meals a day Proportion of households applying the recommended food handling methods	Surveys	Baseline After training/start of follow up phase Seasonal End-line
	Increased access to nutrition and agricultural related information	Did CFBS increase household information seeking behaviours?	Number of CCs, extension workers, and leaders that that completed the CFBS training modules Information seeking practices among target households, CCs, leaders, and community (Islam and Ahmed, 2012; Ezeh and Ezeh, 2017)	Surveys; CC records; interviews; focus group discussions	Baseline After training/start of follow up phase End-line
Environmental outcomes	Increased access to a variety of crops, including fruits, vegetables, and animal-source foods	Did CFBS increase the diversity of foods sold and bought in target areas?	Diversity of foods sold within the target communities Avenues through which households access food diversity other than home production (both formal and informal markets)	Surveys; interviews; focus group discussions	Baseline Seasonal End-line

Variables	Outcomes	Evaluation questions	Indicators	Measure	Data collection
			Proportion of target households selling and buying diverse foods		
	Improved agricultural production	Did CFBS improve household land utilisation? Did CFBS increase the use of sustainable agricultural production practices and inputs?	Total area under cultivation (Jones, Shrinivas and Bezner-Kerr, 2014; Last *et al.*, 2014; Sibhatu, Krishna and Qaim, 2015) Proportion of households applying the recommended agricultural practices Share of crop land under these practices (Recommended agricultural practices include e.g. Waste management, intercropping, mulching, organic pesticides, kitchen garden, etc.) (Nelson and Swindale, 2013)	Surveys; CC records;	Baseline After training/start of follow up phase End-line
	Increased household purchasing power	Did CFBS increase household allocation of income to food?	Proportion of households allocating more than 10% of income to food	Surveys; interviews; focus group discussions	Baseline End-line
	Increased access to nutritional and agricultural information, training, and support	Did CFBS increase household access to nutritional and agricultural information? Did CFBS increase household social support to improve nutrition and agriculture?	Information seeking practices and sources among target households, CCs, leaders, and community Number of people reached with information on dietary diversity and approaches to achieve it by CCs, extension workers, and leaders Number of events/avenues through which CCs, extension workers, and leaders promoted dietary diversity and approaches to achieve it Proportion of households reporting an increase in the support they had towards implementation of recommended practices improving nutrition and agriculture (Islam and Ahmed, 2012; Ezeh and Ezeh, 2017; Badstue *et al.*, 2018; Petesch *et al.*, 2018)	Surveys; CC records; interviews; focus group discussions	Baseline End-line
Change objectives (Personal determinants)	Improved knowledge, skills, self-efficacy and attitude of households, CCs, extension workers and leaders on: - Production of diverse crops, especially fruits and vegetables - Sustainable agricultural production practices	Did CFBS increase household knowledge?	Proportion of households, CCs, extension workers and leaders who know the correct information for the different aspects Knowledge scores of the community at different levels (households, CCs, extension workers and leaders) (Macías and Glasauer, 2014)	Surveys; interviews; focus group discussions	Baseline After training/start of follow up phase End-line
		Did CFBS increase household skills?	Proportion of households, CCs, extension workers and leaders that report an improvement in skills Proportion of households that applied the skills (Nelson and Swindale, 2013)	Surveys; CC records; interviews; focus group discussions	Baseline After training/start of follow up phase End-line

Variables	Outcomes	Evaluation questions	Indicators	Measure	Data collection
	- Household purchasing power and access to diverse diets access to diverse diets - Consumption of diverse diets by children and household - Meal frequency for children and food safety and handling - Access to information and training - Promotion of dietary diversity and approaches to achieve it (among CCS and leaders)	Did CFBS increase household self-efficacy?	Proportion of households, CCs, extension workers and leaders with an increase in self-efficacy Self-efficacy scores of the community at different levels (households, CCs, extension workers and leaders) (Bandura, 2006a; Schwarze and Britta Renner, 2009; Macías and Glasauer, 2014)	Surveys; interviews; focus group discussions	Baseline After training/start of follow up phase End-line
		Did CFBS improve household attitude?	Proportion of households, CCs, extension workers and leaders with a positive attitude towards the different aspects Attitude scores of the community at different levels (households, CCs, extension workers and leaders) (Macías and Glasauer, 2014)	Surveys; interviews; focus group discussions	Baseline After training/start of follow up phase End-line

Appendix 7. CFBS highlighting revisions following the validation process

Text in *italics* and <u>underlined</u> was added after the validation process in chapter 7

THE CONTEXTUALISED RURAL FOOD BASED STRATEGY FOR UGANDA

Preamble

1. The goal of the CFBS is to improve dietary diversity of children in smallholder farming households through improved household production, income utilisation, and food consumption practices.

2. The CFBS is to be used by development and/or community-based organisations, policy makers, and government institutions with a mandate to improve the nutrition and livelihoods of farming communities particularly in rural areas.

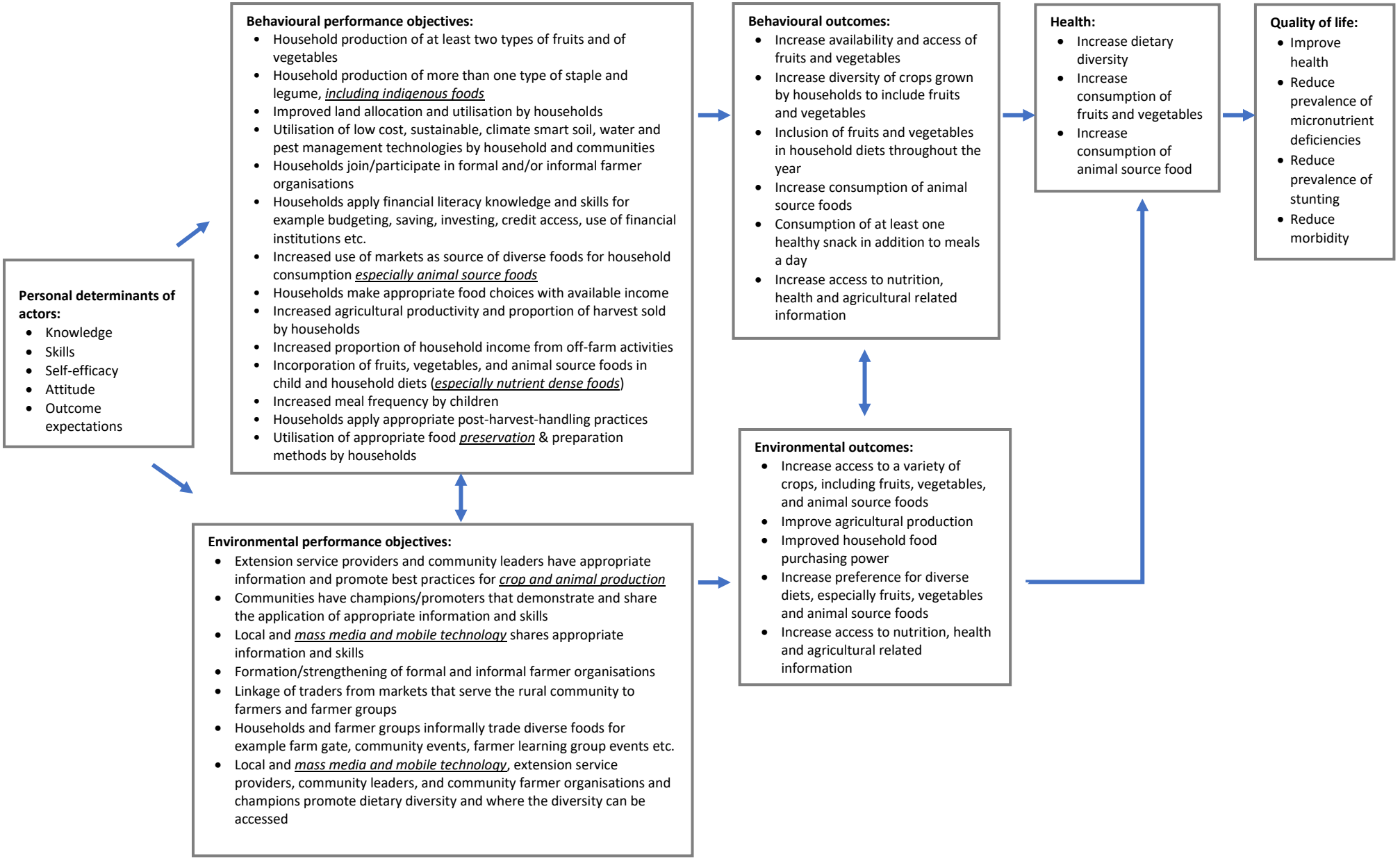
3. The CFBS consists of six sections:
   - Section A outlines the CFBS outcomes, outputs and performance objectives
   - Section B presents the critical success factors of change
   - Section C illustrates the target actors and beneficiaries of the CFBS
   - Section D presents the proposed CFBS implementation plan
   - Section E presents the process evaluation plan
   - Section F presents the impact evaluation plan

SECTION A: CFBS outcomes, outputs and performance objectives

Outcomes	Outputs	Performance objectives
1. Increased availability of diverse foods	1a. Increase diversity of crops produced by households to include fruits and vegetables	- Household production of at least two types of fruits and of vegetables - Household production of more than one type of staple and legume, *including indigenous foods*
	1b. Increased use of sustainable production practices that maximise land use	- Improved land allocation and utilisation by households - Utilisation of low cost, sustainable, climate smart soil, water and pest management technologies by household and communities
	1c. Increased household access to appropriate information and skills 1d. Increased social capacity to identify and solve agricultural production problems	- Extension service providers and community leaders have appropriate information and promote best practices *for crop and animal production* - Communities have champions/promoters that demonstrate and share the application of appropriate information and skills - Local *and mass* media *and mobile technology* share appropriate information and skills - Formation/strengthening of formal and informal farmer organisations [a]
2. Increased accessibility to diverse foods	2a. Increased diversity of foods in markets for the rural community	- Linkage of traders from markets that serve the rural community to farmers and farmer groups - Households and farmer groups informally trade diverse foods in their communities for example farm gate, community events, farmer learning group events etc. - Extension service providers, community leaders, and community farmer organisations and champions promote dietary diversity and where the diversity can be accessed (demand creation) - *Local and mass media and mobile technology share appropriate information on market access to diverse foods and enhance market linkages*
	2b. Improved household income allocation and utilisation to access diverse foods	- Households apply financial literacy knowledge and skills for example budgeting, saving, investing, credit access, use of financial institutions etc. - Increased use of markets as source of diverse foods for household consumption, *especially animal-source foods* - Households make appropriate food choices with available income
	2c. Increased household income through on-farm and/or off-farm activities	- Increased agricultural productivity and proportion of harvest sold by households - Increased proportion of household income from off-farm activities
3. Increased consumption of diverse foods	3a. Increased consumption of fruits, vegetables, and animal-source foods	- Incorporation of fruits, vegetables, and animal-source foods in child and household diets (*especially nutrient dense foods*) - Increased meal frequency by children
	3b. Improved food handling and safety	- Households apply appropriate post-harvest-handling practices - Utilisation of appropriate food *preservation* & preparation methods by households - Utilisation of sanitation and hygiene facilities by households

[a] Farmer organisation refer to community formed groups or organisations such as farmer, saving and credit, trader, women, youth, faith, learning organisations or groups, that can be formal or informal in structure

SECTION B: Critical Success factors for change



SECTION C: CFBS target actors

Actor	Characteristics	Role in the CFBS	Barriers to involvement	Overcoming barriers
Policy makers	- Responsible for formulating or amending policies and action plans - Determine areas of focus - Include central government (line ministries) and local government (up to community level)	- Adopt the strategy and make decisions about its application - Support organisations that implement it - Use the CFBS and its results to inform policy and action developments and amendments	- Insufficient knowledge, skills, and self-efficacy linked to CFBS outputs and outcomes - Low output expectations (poor perception about relevance or consequences of CFBS) - Limited funds and resources	- Lobbying - Workshop discussions on CFBS - Strategic goal and action planning, review and feedback meetings - Build/ strengthen stakeholder and partner linkages - Linkage to relevant stakeholders and actors - Involvement in plans and review meetings by development organisations
Government institutions and Development organisations	- Implement programs - Funded by government or other agencies - Have nutrition, food security and agriculture in their mandate - Directly engage households, communities and their actors - Include NGOs, CBOs,	- Develop and implement programs that contribute/fit within the CFBS - Link and equip other actors to achieve strategy - Monitor and evaluate the performance of the strategy	- Lack of motivation to adopt the CFBS - Low output expectations (poor perception about relevance or consequences of CFBS) - Limited funds and resources	- Workshop discussions on CFBS - Participatory planning to develop or re-align programs to incorporate CFBS - Strategic goal and action planning, review and feedback meetings - Build/ strengthen stakeholder and partner linkages
Extension workers	- Facilitate community access to agricultural and health services - Deliver services and disseminate information, skills, and practices - Operate at community level - Have basic to advanced knowledge and experience in agriculture, health, and nutrition	- Disseminate practices within the CFBS and its programs - Incorporate CFBS in their activities - Support community-level groups/ networks, community champions, and smallholder households as they adopt and implement strategy actions	- Insufficient skills and up to date knowledge - Lack of motivation - Limited resources, materials and time	- Capacity building and provision of materials - Involvement in plans and review meetings by development organisations - Strategic goal and action planning, review and feedback - Linkage to community-level groups/ networks and community champions who have complementary roles and other extension workers - *Utilisation of information technology and mass media*
Community-level groups/ networks	- Groups of individuals or households in the community with a joint purpose that improve livelihoods - Include farmer, saving and credit, trader, women, youth organisations or groups	- Provide avenues to equip households with strategy information, skills, and practices - Disseminate practices within the CFBS and its programs in the community	- Limited to current networks/ membership - Limited knowledge, skills, and self-efficacy surrounding application and promotion of recommended practices - Limited resources, materials and time - *Gender and social dynamics*	- Capacity building and provision of materials - Strategic goal and action planning, review and feedback - Creation/ strengthening of linkages with community-level groups/ networks/ community champions extension workers,

Actor	Characteristics	Role in the CFBS	Barriers to involvement	Overcoming barriers
	- Can be formal or informal in structure - Have varying literacy levels, social economic status, and levels of knowledge and experience in agriculture, health, and nutrition	- Link and equip members to services and information - Provide social support as members adopt and implement strategy actions		other stakeholders/service providers to build social support - *Understand and address motivation* - *Actively engage men, women, and youth* - *Utilisation of information technology and mass media*
Community champions	- Smallholder farmers in the community - Willing to share and demonstrate their experiences in agriculture and nutrition - Have basic literacy levels, and knowledge and experience in agriculture and nutrition	- Demonstrate and disseminate practices within the CFBS and its programs in the community - Provide social support as members adopt and implement strategy actions (relatable/ lower level, and informal interactions with fellow community members)	- Limited knowledge, skills, and self-efficacy surrounding application and promotion of recommended practices - Lack of social support to engage with fellow community members - Lack of motivation to engage with fellow community members - Limited time - *Gender and social dynamics*	
Smallholder farming households	- Vulnerable smallholder farming households with children below 5 years - Include labour and resource constrained, and/or with high dependency ratios	- Primary beneficiaries of the strategy - Participate in CFBS and its programs - Adopt and implement strategy actions - Provide social support to other implementing households	- Household gender and social dynamics that influence decision making, participation and adoption of practices - Limited resources such as labour, land, and time - Limited knowledge, skills, and self-efficacy surrounding application of recommended practices - Lack of social support to adopt and - implement strategy actions	- Capacity building in informal environments with elaborate learning - Demonstration and practice of skills and application of information - Strategic goal and action planning, review and feedback - Building social support through group learning, linkage to community-level groups/ networks and community champions - *Actively engage men, women, and youth*
Other stakeholders/ influencing actors	- Organisations/institutions with roles linked to agriculture and nutrition - Include market, health, input providers, financial services, and private sector	- Link and support CFBS actors - Increase reach of services in the communities	- Limited knowledge of the linkage between CRFS goal and outcomes with their own - Profit margin focused - Inconsistent quality of services - Incorrect information or counterfeit products in the communities - Lack of motivation to engage with other actors	- Workshop discussions on CFBS - Participatory planning to develop or - re-align programs to incorporate CFBS - Strategic goal and action planning, review and feedback meetings - Build/ strengthen stakeholder and partner linkages

SECTION D: CFBS implementation plan

Category	Primary implementers: Community champions		Primary beneficiaries: Beneficiary households		Secondary implementers and beneficiaries:		
	-Volunteer community member -Smallholder farmers -With children aged 6 months to 1 year		-Vulnerable rural smallholder farming households -With children aged 6 months to 1 year		Extension workers and community leaders		Other stakeholders
Engagement	Training of Community champions by field staff Learning and practice	CC feedback sessions as they train and follow-up beneficiaries	Training by Community champions Learning and practice	Follow up of beneficiary households by Community champions	During training and feedback sessions of Community champions	As they conduct their usual roles/mandate	Throughout implementation
Mode of engagement	Group sessions Household visits	Group sessions	Group sessions Household visits	Group sessions Household visits	Group sessions *Information technology* [c]	Individual *Information technology* [c]	Stakeholder workshops; Group/household visits *Information technology* [c]
Scope	1) Agricultural production module: Food from my home; 2) Food access module: Food for the home 3) Nutrition module: Food for health; 4) Training module: becoming a food change agent	Share experiences; Feedback on progress; Reinforce information	1) Agricultural production module: Food from my home; 2) Nutrition module: Food for health; 3) Food access module: Food for the home	Review of progress; Provision of feedback; Barrier identification and problem solving; Community support	Equip extension workers and community leaders 1) Agricultural production module: Food from my home; 2) Food access module: Food for the home 3) Nutrition module: Food for health;	Create awareness and promote dietary diversity as per beneficiary scope	Create awareness and promote dietary diversity as per beneficiary scope
Materials	CC Manual: A training manual to provide CC with details on recommended practices	CC journal: to track of households being trained, goals set and progress during implementation and adoption	Key message booklet and charts: for Community champions to highlight messages and practices being promoted	CC journal: to track of households being trained, goals set and progress during implementation and adoption	Key message booklet and charts: Highlight messages and practices being promoted Policy briefs: Highlight the importance of dietary diversity and actions required and/or agreed to by leaders to promote/support it Mass media materials		Policy briefs Reports
Support	Field staff Fellow Community champions Extension workers and Community leaders		Community champions Fellow beneficiaries Extension workers and Community leaders		Fellow extension workers and Community leaders Community champions Field staff		Extension workers and Community leaders Community champions
Assumptions [c]	Period covers 1 rainy season; 1 dry season; 1 harvest period first module on agriculture is during the dry season to enable planning, foresight, and implementation		Period covers 1 rainy season; 1 dry season; 1 harvest period first module on agriculture is during the dry season to enable planning, foresight, and implementation	Period covers 1 rainy season; 2 dry seasons; 1 harvest period Allowing for feedback and support across the different seasons			

CC: Community champions; [b] December to February is a dry season, March to May is rainy, June to august is dry, and September to November is rainy. Harvests are therefore usually around may to June and November to December. [C] Information technology: particularly mobile technology

SECTION E: CFBS process evaluation plan

Variables	Outcomes	Evaluation questions	Indicators	Measure	Data collection
CFBS implementation	Community champions and beneficiary training	Did the Community champions and participating households complete their respective training modules? Were the Community champions and beneficiary training implemented as intended?	Number of Community champions and households that completed the CFBS training modules Number of training sessions/modules conducted by Community champions Number of demonstration sessions held Community champions Number of household visits conducted by Community champions Materials used during implementation by Community champions and beneficiaries Extent to which the modules and training layout were followed	Project records; Community champions records; surveys; interviews; focus group discussions; observations	After training/start of follow up phase End-line
	Follow up of Community champions and beneficiaries	Was the follow up Community champions and beneficiary households conducted as intended?	Number of Community champions and households that completed follow up sessions Number of household visits conducted by Community champions Number of Community champions that participated in the CC feedback sessions Goals set vs those achieved (even partially) by Community champions and households	Community champion records; interviews; focus group discussions	End-line
	Extension workers and leaders' engagement	Did extension workers and leaders participate in the CC training and feedback sessions? Did extension workers and leaders participate conduct awareness creation events as planned?	CFBS components and modules conveyed in during awareness creation events Goals set vs those achieved (even partially) by extension workers and leaders Materials used by extension workers and leaders Categories of people targeted and those reached through the awareness creation events	Project records; interviews; focus group discussions	After training/start of follow up phase End-line
	Context and reach of CFBS	Did the environmental context change during implementation? To what extent was the CFBS adapted during implementation? To what extent did the CFBS reach the intended/target groups?	Government and organisational programs implemented in the target and comparison areas during the strategy timeframe CFBS components and modules that were implemented and those that were not Frequency and duration of CFBS activities Proportion of beneficiaries that were part of the target group	Project records; community champion records; interviews; focus group discussions	After training/start of follow up phase End-line

Variables	Outcomes	Evaluation questions	Indicators	Measure	Data collection
			Proportion of beneficiaries that were not part of the target group		
	Beneficiaries responsiveness to CRBS	Did the target beneficiaries of the CFBS find it relevant? (households, Community champions, extension workers and leaders) What factors within the CFBS and environment facilitated or hindered participation and implementation?	Proportion of households, Community champions, extension workers and leaders that perceived the CFBS as relevant CFBS components and other factors that encouraged or facilitated participation and implementation CFBS components and other factors that hindered participation and implementation	Survey; project records; community champion records; interviews; focus group discussions	After training/start of follow up phase End-line

SECTION F: CFBS impact evaluation plan

Variables	Outcomes	Evaluation questions	Indicators	Measure	Data collection
Dietary diversity	Improved dietary diversity	Did CFBS increase child and household dietary diversity?	Proportion of children 6-24 months meeting the minimum dietary diversity and minimum acceptable diets Proportion of children 25-59 months with dietary diversity score >3 Proportion of households with dietary diversity score >3	Surveys	Baseline After training/start of follow up phase Seasonal End-line
	Increased consumption of animal-source foods	Did CFBS increase consumption of animal-source foods?	Proportion of children consuming animal-source foods at least three times a week	Surveys	Baseline After training/start of follow up phase Seasonal End-line
	Increased consumption of fruits & vegetables	Did CFBS increase consumption of fruits & vegetables?	Proportion of children consuming at least a fruit or vegetables each day	Surveys	Baseline After training/start of follow up phase Seasonal End-line
Behaviour outcomes	Increased diversity of crops grown	Did CFBS increase production of diverse crops?	Species diversity species produced by the household as reflected by (i) specie richness (Count of crop and animal species); (ii) Species biodiversity index (Simpson's index of richness and evenness); (iii) Number of food groups produced	Surveys	Baseline After training/start of follow up phase Seasonal End-line
	Increased frequency and safety of meals consumed by children	Did CFBS improve meal frequency of children? Did CFBS improve food handling methods?	Proportion of children consuming four meals a day Proportion of households applying the recommended food handling methods	Surveys	Baseline After training/start of follow up phase Seasonal End-line
	Increased access to nutrition and agricultural related information	Did CFBS increase household information seeking behaviours?	Number of community champions, extension workers, and leaders that that completed the CFBS training modules Information seeking practices among target households, Community champions, leaders, and community	Surveys; community champion records; interviews; focus group discussions	Baseline After training/start of follow up phase End-line

Variables	Outcomes	Evaluation questions	Indicators	Measure	Data collection
Environmental outcomes	Increased access to a variety of crops, including fruits, vegetables, and animal-source foods	Did CFBS increase the diversity of foods sold and bought in target areas?	Diversity of foods sold within the target communities Avenues through which households access food diversity other than home production (both formal and informal markets) Proportion of target households selling and buying diverse foods	Surveys; interviews; focus group discussions	Baseline Seasonal End-line
	Improved agricultural production	Did CFBS improve household land utilisation? Did CFBS increase the use of sustainable agricultural production practices and inputs?	Total area under cultivation Proportion of households applying the recommended agricultural practices Share of crop land under these practices (Recommended agricultural practices include e.g. Waste management, intercropping, mulching, organic pesticides, kitchen garden, etc.)	Surveys; community champion records;	Baseline After training/start of follow up phase End-line
	Increased household purchasing power	Did CFBS increase household allocation of income to food?	Proportion of households allocating more than 10% of income to food	Surveys; interviews; focus group discussions	Baseline End-line
	Increased access to nutritional and agricultural information, training, and support	Did CFBS increase household access to nutritional and agricultural information? Did CFBS increase household social support to improve nutrition and agriculture?	Information seeking practices and sources among target households, Community champions, leaders, and community Number of people reached with information on dietary diversity and approaches to achieve it by Community champions, extension workers, and leaders Number of events/avenues through which Community champions, extension workers, and leaders promoted dietary diversity and approaches to achieve it Proportion of households reporting an increase in the support they had towards implementation of recommended practices improving nutrition and agriculture	Surveys; community champion records; interviews; focus group discussions	Baseline End-line

Variables	Outcomes	Evaluation questions	Indicators	Measure	Data collection
Change objectives (Personal determinants)	Improved knowledge, skills, self-efficacy and attitude of households, Community champions, extension workers and leaders on: - Production of diverse crops, especially fruits and vegetables - Sustainable agricultural production practices - Household purchasing power and access to diverse diets access to diverse diets - Consumption of diverse diets by children and household - Meal frequency for children and food safety and handling - Access to information and training - Promotion of dietary diversity and approaches to achieve it (among community champions and leaders)	Did CFBS increase household knowledge?	Proportion of households, Community champions, extension workers and leaders who know the correct information for the different aspects Knowledge scores of the community at different levels (households, Community champions, extension workers and leaders)	Surveys; interviews; focus group discussions	Baseline After training/start of follow up phase End-line
		Did CFBS increase household skills?	Proportion of households, Community champions, extension workers and leaders that report an improvement in skills Proportion of households that applied the skills	Surveys; community champion records; interviews; focus group discussions	Baseline After training/start of follow up phase End-line
		Did CFBS increase household self-efficacy?	Proportion of households, Community champions, extension workers and leaders with an increase in self-efficacy Self-efficacy scores of the community at different levels (households, Community champions, extension workers and leaders)	Surveys; interviews; focus group discussions	Baseline After training/start of follow up phase End-line
		Did CFBS improve household attitude?	Proportion of households, Community champions, extension workers and leaders with a positive attitude towards the different aspects Attitude scores of the community at different levels (households, Community champions, extension workers and leaders)	Surveys; interviews; focus group discussions	Baseline After training/start of follow up phase End-line