



MAKERERE

UNIVERSITY

**TRIALS OF IMPROVED PRACTICES COMPLEMENTED WITH MODIFIED
RECIPES TO IMPROVE DIETARY DIVERSITY OF WOMEN AND CHILDREN IN
FARMING HOUSEHOLDS IN KAPCHORWA, UGANDA**

BY

Alum, D. BVOC. Home Economics, (HONS). Kya.

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DECLARATION

I, Daizy Alum, hereby declare that the material presented in this thesis is genuinely my work unless otherwise stated and has never been offered by any other person for any academic award of Makerere University or any other institution of learning.

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LIST OF ABBREVIATIONS

BCC	Behaviour Change Communication
DD	Dietary Diversity
DDS	Dietary Diversity Score
DGLV	Dark Green Leafy Vegetables
FAO	Food and Agricultural Organisation
IYCF	Infant and Young Child Feeding
MAAIF	Ministry of Agriculture Animal Industry and Fisheries
MAD	Minimum Acceptable Diet
MDD-W	Minimum Dietary Diversity (Score) for women
TIPs	Trials of Improved Practices
UBOS	Uganda Bureau of Statistics
UDHS	Uganda Demographic and Health Survey
UNICEF	United Nations International Children's Emergency Fund
WHO	World Health Organisation

MAIN OPERATIONAL DEFINITIONS

Behaviour Change Communication: This is a behaviour-focused approach to nutrition education that uses a set of educational strategies, accompanied by relevant environmental supports, to facilitate dietary behaviour change or actions related to food and health.

Condensed meaning units: These are short texts developed with the aim of preserving the core meaning of the original statement of the participant.

Farming households: Rural households whose main livelihood is subsistence agriculture.

Meaning units: These are summaries of key results that maintain the core meanings of the study. The units were all summarized to make the condensed meaning units.

Modified recipes: This is a local recipe that may be cooked using somewhat different cooking method or one or more ingredients have been added to adjust from the customary ingredients.

Trials of Improved Practices (TIPs) is a formative research technique. The procedure consists of a series of visits in which the interviewer and the participant jointly analyse current practices, discuss what could be improved and together reach an agreement on one or a few solutions to be tried by a participant over a given period.

ABSTRACT

Diets in rural households are usually less diverse with a higher percentage composed of starchy staples and are low in cheap sources of proteins and micronutrients such as legumes, fruits and vegetables.

The main objective of this study was to determine how behaviour change messages and nutritionally improved recipes facilitate diversification of legumes, vegetables and fruits in complementary feeding and meals of farming households in Kapchorwa district.

A mixed-method research design was used whereby dietary behaviour was assessed using the 24-hour recall method during a cross-sectional baseline survey. This was followed by “Trials of Improved Practices (TIPs)” to determine barriers and facilitators to uptake of dietary behaviour change messages. Lastly, participatory cooking demonstrations were conducted to determine the acceptability of nutritionally improved local recipes.

Quantitative analysis of Minimum Dietary Diversity of Women (MDD-W) of reproductive age showed that 61% of women assessed consumed at least five out of ten food groups. The mean frequency of food group consumption was 4.73 and SD ± 1.00 . Generally, all participating women consumed at least starchy staples. Vitamin A-rich fruits and vegetables were consumed by only 4% of the women and 19% ate “other fruits”. Qualitative data were analysed using Thematic Content Analysis (TCA). During the TIPs household visits, the majority of the women either tried or demonstrated a willingness to eat a variety of legumes, vegetables and fruits. They were motivated by factors such as access, availability, usual dietary practice, reduced monotony and perceived health benefits. However, uptake of recommendations were hindered by seasonality, long cooking time for legumes, cost of ingredients, lack of income, distance to the food market, previous skills. Overall, practical cooking sessions showed high acceptability of recipes with a proportion of 93% and 89% of the women selecting modified legume and vegetable dishes respectively. The acceptability of modified recipes was motivated by improved sensory attributes, reduced overall preparation time, compatibility with the local dietary practices, solid fuel saving and perceived health benefits. Conversely, cost of ingredients and distance to the market were cited as barriers to recipe acceptability.

In conclusion, behaviour change messages accompanied by practical cooking and tasting of modified recipes is one of the feasible means for the adoption of improved diet-related practices that can lead to improved dietary diversification.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

In 2020 there were about 720 and 811 million hungry people around the world with 282 million living in Africa. As a result, children and women of reproductive age were the most affected with stunting and anaemia respectively (FAO, IFAD, UNICEF, WFP, 2021). The 2016 Uganda Demographic Health Survey (UBOS, 2016 & ICF, 2017) reported that 29% of children under five were stunted. One in three women and 53% of the children aged 6-59 months suffered from some degree of anaemia. It was also reported that 15% of the last-born children aged 6-23 months living with their mothers were fed a minimum acceptable diet. Only three in ten 30% were fed a diet adequate in diversity (MDD) and only four in ten 42% were fed the minimum number of meals (MMF) according to their age and breastfeeding status (UBOS, 2016 & ICF, 2017).

The above hunger and nutrition situation reflect a high risk for micro-nutrient deficiencies however, there is scarce information on the prevalence of most micro-nutrient deficiencies amongst women and children. Micro-nutrient deficiencies are common in children because of the high nutrient requirement needed for growth. Similarly, women are at risk of micronutrient deficiencies because of increased nutrient needs during lactation and pregnancies. Adequate dietary diversity and meal frequency for infants and young children reduce the risk of undernutrition, especially stunting, micronutrient deficiencies and increased morbidity and mortality. In developing countries, poor rural households consume diets that are monotonous and have low diversity. A review study on various countries of Africa, South or Southeast Asia, the Latin America/Caribbean region confirmed that diets high in starch-based staples but low in animal products, fresh fruits or vegetables result in micronutrient deficiencies which leave children and women vulnerable to undernutrition and its consequences (Arimond et al., 2010; Sié et al., 2018). Research in Uganda has also confirmed that diets of women are low in meats and milk products, vitamin A rich fruits, dairy, milk and milk products, meat and eggs (Ekesa et al., 2020; Nabumma et al., 2018). Results showed that low dietary diversity is common amongst women in rural areas and this is more common in the lean season. (Jordan et al., 2022). Other studies reported that women with low educational status were also more likely to be food insecure (Tamale & Kagoro-

Rugunda, 2019). FAO also mentioned that change in dietary pattern is partly determined by changing food preferences. In low income countries, the lack of wood fuel has led to a change in cooking habits. In addition, perceived cultural knowledge, skills and values related to foods greatly affect food choices (FAO, 2010).

According to the Sustainable Development Goal 2 (SDG 2) which aims to end hunger, achieve food security, improve nutrition and promote sustainable agriculture (United Nations, 2017). Uganda has therefore set several national development plans to achieve the above aim. These include; the Uganda Vision 2040 (2014), the National Development Plan (NDP II 2015) and a Maternal Infant Young Child and Adolescent Nutrition action plan (MIYCAN, 2020-2025) among others. To achieve the SDG 2, increased agricultural production which is suggested to address malnutrition by improving food access and availability does not necessarily single-handedly lead to improved nutrition (Muehlhoff et al., 2017; Waswa, 2016). Besides agricultural production, it is known that nutrition is also influenced by factors such as dietary diversity and therefore linking agriculture to nutrition is necessary (Reinbott et al., 2016). This can also be achieved by diversifying the production of nutritious foods (Adubra et al., 2019;

Dietary diversity is suggested as something all people from different socio- economic statuses can achieve especially when combined in local concepts and knowledge (Powell et al., 2017). Food and Agriculture Organization of the United Nations (FAO) defines dietary diversity as a qualitative measure of food consumption that reflects household access to a variety of foods and is also an indicator for nutrient adequacy of the diet of individuals (FAO, 2010). It is associated with improved nutrition outcomes as higher dietary diversity increases the likelihood that nutrient intake levels shall be met (Najjumba, Bunjo, Kyaddondo & Musinde, 2013). In low-income countries, dietary diversity is associated with the overall quality and nutrient adequacy of the diet (Rah et al., 2010). However, in developing countries data on the dietary intake of women is scarce this is because of the complexity of dietary surveys. Validation studies have confirmed that dietary survey using food group indicators is reliable (Arimond et al., 2010; Ruel, Deitchler, & Arimond, 2010). The method has been proved to be easy in terms of data collection, interpretation and analysis.

Dietary diversity is an important immediate determinant of undernutrition. Improving the dietary diversity of all family members may improve the overall health of the entire household members. Hence, participatory community-based nutrition education approaches with caregivers is suggested to improve child dietary diversity (Kuchenbecker, Reinbott, Mtimuni, Krawinkel & Jordan, 2017). Likewise, participation in practical nutrition education for behaviour change and practical cooking sessions improves young child and family diets (Muehlhoff et al., 2017).

1.2 Problem statement

The 2016 Demographic Health Survey reported a 36% prevalence of stunting in the Bugisu region in which Kapchorwa district is inclusive (UBOS, 2016 & ICF, 2017). The same survey reported that about 15% of the children aged 6-23 months were fed a minimum acceptable diet within the 24 hours before the survey in Uganda (UBOS, 2016 & ICF, 2017). The survey also showed that poor diets are common in rural areas. Other studies done in Uganda here reported that diets of rural households are low in diversity with a greater portion of starchy staples and legumes being the main source of protein. There are also reports of limited household consumption of animal source foods and vitamin A rich fruits and vegetables (Nabuuma et al., 2018). A nutrition-related survey in Kapchorwa district confirmed that diets of women in rural households are majorly composed of starchy staples, other vegetables and dark green leafy vegetables and low in nuts and seeds, eggs, meat and vitamin A-rich fruits and vegetables (Glas, Röhlig, Waswa, Krawinkel & Nuppenau, 2018; Jordan et al., 2022).

In a dietary survey by Jordan (2022), poorer households in rural Kapchorwa were even more likely to consume less diverse legumes, vegetables and fruits and this highly depends on the agricultural seasons. Poor diets are common in rural areas because of the lack of variety of fruits and vegetables in the market (Ekesa, Nabuuma & Namukose, 2020; Nabuuma et al., 2018). Another study concluded that lack of knowledge, skills, beliefs and behaviour amongst rural caregivers on how appropriately to use foods while feeding young children, predominantly during the complementary period was a major challenge (Kabahenda, Andress, Nickols, Kabonesa & Mullis, 2014).

The effects of malnutrition on children include impaired brain development or lower intelligence quotient, weakened immune system, micro-nutrient deficiency. Amongst women effects include increased incidence of micro-nutrient deficiency and its consequences. For this reason, reforming approaches to malnutrition through improved interventions are considered to be an answer to end

all forms of poor nutrition (Breda Gavin-Smith, 2018). Nutrition education through behaviour change communication is therefore considered an appropriate intervention to change behaviours that affect food choices and hinder consumption of diverse diets. However, several studies have shown that nutrition education campaigns struggle to substantially enhance the consumption of vegetables, legumes and fruits because availability and access to nutritious, affordable foods remains a major barrier (Kuchenbecker et al., 2017; Reinbott et al., 2016; Waswa, 2016).

1.3 Main objective

To determine how Behaviour Change Messages (BCC) and nutritionally improved recipes facilitate consumption of legumes, vegetables and fruits in complementary feeding and the family meals of farming households in Kapchorwa district.

1.3.1 Specific objectives

- i. To determine the consumption patterns for fruits, legumes and vegetables among women and children in the farming households in Kapchorwa district.
- ii.
 - a) To determine barriers and facilitators to consumption of diverse legumes, vegetables and fruits in household diets and complementary feeding.
 - b) To determine barriers and facilitators to practice improved food preparation and nutrient conservation methods amongst women in farming families.
- iii. To determine the perceptions on the acceptability of nutritionally improved local recipes developed from seasonally available legumes, vegetables and fruits among the women in farming households.

1.4 Research questions

- i. What are the barriers and facilitators to the consumption of diverse legumes, vegetables and fruits in household and complementary diet?
- ii. What are the barriers and facilitators to practice improved food preparation and nutrient conservation methods amongst women in farming families?
- iii. What are the perceptions of women on the acceptability of nutritionally improved local recipes developed from seasonally available legumes, vegetables and fruits?

1. 5 Justification

Despite the Uganda national effort to promote the consumption of diverse nutritious and indigenous foods at the household and community levels by promoting appropriate farming and, processing technologies, and reducing post-harvest losses along the entire commodity value chain, food insecurity and malnutrition still exist in Ugandan communities (MAAIF, 2016). One region that faces a range of distinctive challenges is Kapchorwa in Eastern Uganda, a mountainous area highly vulnerable to climate hazards, soil erosion, landslides, floods and droughts. Crop diversification for diverse diets is low among many households simply because they mainly grow coffee, beans, maize and bananas to lesser level sweet potatoes and cassava (MAAIF, 2016). As a result, households typically consume a diet composed of maize meal, plantain, potatoes accompanied with either beans or a leafy vegetable usually collard green (*Kale*). However, consumption of either vegetables or legume as a supplement to the staples highly depends on the season of availability (Jordan et al., 2022). Although the households probably eat adequate food, knowledge for food choice and skills for meal preparation is still a challenge which results in the overall low nutrient quality (MAAIF, 2016). Specifically, lack of knowledge and skills and poor attitude affect diet diversity and nutrient intake leading to poor nutritional status (UNICEF, 1991). Access to food has been affected by the increasing prices that result from increased demand and reduced supply. Likewise, being a mountainous area food accessibility is challenged by the topography that has led to expensive and poor transport facilities. Food availability in the region has been affected by unfavourable weather and temperature changes. These affect all farmers as almost all of them are engaged in rain-fed agriculture leading to food insecurity due to crop failure, soil erosion and change in the spread of diseases (MAAIF, 2016). According to the aim of the Ugandan Ministry of Agriculture, improving agricultural diversification and household food security promotes the consumption of adequate and diversified foods for better nutrition and health (MAAIF, 2016). Nutrition specific and sensitive interventions are therefore considered to be important for improving household food dietary diversity by changing food culture and tackling challenges along the whole food system (Lang, 2009 & Meier-Ploeger, 2001). Therefore, this study mainly concentrated on the consumer or individual determinants of dietary diversity promoted through BCC and nutritionally improved recipes that target perceptions on sensory attributes, affective factors, beliefs, attitudes, norms, knowledge and skills.

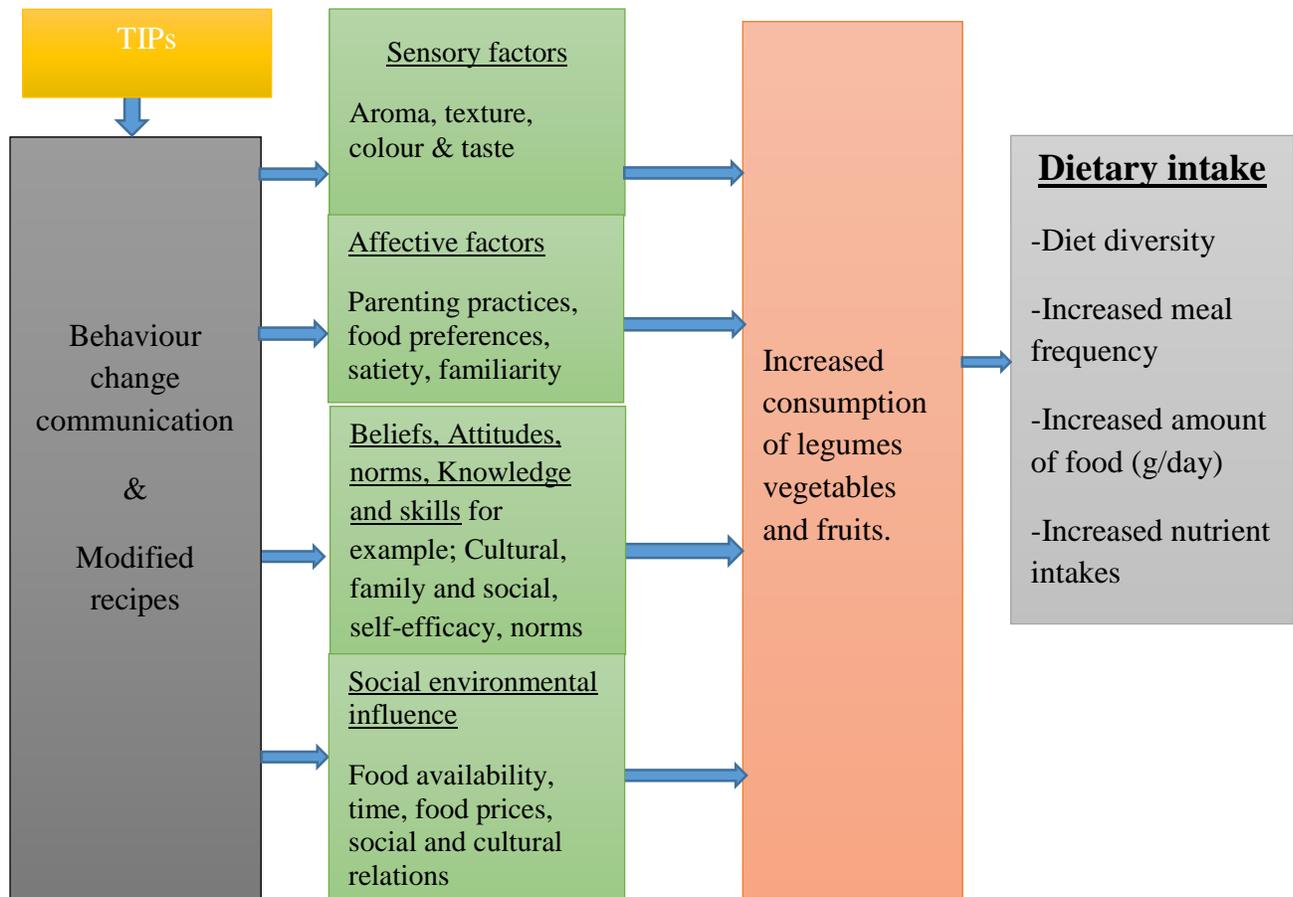


Figure 1: Conceptual framework for the effectiveness of behaviour change communication and modified recipes on improving determinants of dietary diversity. (Adapted from Contento, 2011)

CHAPTER TWO

LITERATURE REVIEW

Literature was reviewed on three major areas that are; dietary diversity, concepts of TIPs and its efficiency, and lastly the effectiveness of cooking demonstration and modified recipes.

2.1 The diet of children in Uganda

In Uganda, the foods given to children are those mainly prepared from grains. Consumption of grains is at 52% for breastfed children and 82% for non-breastfed children (UBOS, 2016 & ICF; 2017). According to Ekesa (2020), among others, poverty is one of the contributors to poor diets meaning impoverished households have conflicting needs that make it challenging to decide how best to apportion their income for purchasing other nutritious foods. Generally, household poverty leads to significant changes in malnutrition (Ashagidigbi & Dahunsa, 2018). In Uganda households commonly cultivate and eat larger quantities of staples that are filling but have a low nutritional quality which leaves the diet of children on complementary feeding at risk (Nabumma et al., 2018). A nutrition-related survey in Kapchorwa district reported that diets of women are majorly composed of starchy staples, other vegetables and low in legumes, eggs, meat and vitamin A-rich fruits and vegetables (Glas et al., 2018). Another survey in Tanzania also confirmed high consumption of Starchy staples, low consumption of meat, poultry, fish, vitamin-A rich fruits, vegetables (Khamis et al., 2019). This is a risk factor of malnutrition since children one year and above usually feed on the family pot and therefore improving dietary diversity of household meals can lead to substantial improvement in complementary feeding and general family meal (Waswa, 2016).

Complementary feeding should always be timely; infants start receiving foods in addition to breast milk from 6 months onwards because breast milk alone is no longer sufficient to meet the nutritional needs (WHO, 2017). This led to the development of the new assessment tool of MDD to include breast milk in the previous seven food groups therefore a child should eat at least five food groups out of the eight (WHO, 2017). Infants and young children should be fed a minimum acceptable diet (MAD) to ensure appropriate growth and development (WHO, 2010). Without adequate diversity and meal frequency, infants and young children are vulnerable to undernutrition especially stunting, micronutrient deficiencies, increased morbidity and mortality (Sié et al., 2018).

WHO recommends that appropriate complementary feeding should include feeding children a variety of foods on demand to ensure that requirements for nutrients are met. Eating a range of fruits and vegetables daily in addition to those rich in vitamin A, is a low-cost measure to achieve an adequate diet (WHO, 2008).

2.2 Dietary diversity and Dietary Diversity Scores (DDS)

Dietary diversity scores are used for assessing individual or household food consumption. Household food consumption has been defined as “the total amount of food available for consumption in the household, generally excluding food eaten away from home (FAO, 2018). FAO defines Dietary diversity as a qualitative measure of food consumption that reflects household access to a variety of foods and is a proxy for nutrient adequacy of the diet of individuals (FAO, 2010). Dietary diversity score (DDS) refers to the number of food groups consumed in a given time. The cut off levels to determine the minimum acceptable level of dietary diversity are at least five out of ten food groups for adult women and four out of seven for children below two years of age (FAO and FHI 360, 2016). DDS such as MDD-W is a valid and reliable instrument to measure nutritional adequacy (Hanley-Cook et al., 2020).

To assess the dietary diversity of children, World Health Organisation (WHO) developed a new Minimum dietary diversity (MDD) assessment tool that adds breast milk to the previous seven food groups. Therefore, a breast-fed child should consume at least five food groups out of eight to meet the MDD (WHO, 2017). Previously MDD meant a breastfed child was supposed to receive food from at least four out of a total of seven food groups (WHO, 2010). Minimum Acceptable Diet (MAD) is a composite indicator composed of MDD and Minimum Meal Frequency (MMF). MMF means the child receives solid, semi-solid or soft foods including milk a minimum number of times a day and it is a composite indicator for children below two years. This indicator acknowledges the specific age of the child and whether it is breastfed or not. It then counts the number of meals per day the child is receiving and judges whether the respective child received the minimum number of solid, semi-solid or soft foods during the day (WHO, 2010). Thus, MAD describes whether the diet of a child below two years of age is covering the minimum dietary requirements for a healthy and active life.

Scientifically diverse animal and plant foods (legumes, vegetables and fruits) contain different nutrients in various structures and also have various concentrations of nutrients. This means that a

mixed supply at the suggested levels can satisfy the requirements of all ages and gender of humans (Krawinkel, 2017). DDS has therefore been chosen as a key element for comprehensive analysis of food security situations at the individual, household or community level and is linked to economic access and nutritional vulnerability to food insecurity (FAO, 2010).

Food variety: Food variety (FV) is defined as a simple count of food items consumed. This is a good indicator of the nutrient adequacy of the diet. Consumption of higher numbers of food items and food groups is related to enhanced micronutrient adequacy of the diet (FAO, 2016). Evidence also shows that FV is associated with malnutrition and can predict a healthier diet in children. For example a study in Tobago successfully applied food variety scores to assess dietary diversity, food variety and its relationship to the nutritional status of preschool children . (Sealey-Potts & Potts, 2014).

2.2.1 Dietary diversity and food security in Elgon Region

Food insecurity in the Elgon region is partly linked to poverty. Poverty reduces access to food therefore, poor households can only afford to have a meal or two a day (IPC, 2017). A report on integrated food security phase classification in Uganda in 2017 reported that only 14% of the households in the Elgon region were able to have three or more meals a day while 65% were having two meals a day only (IPC, 2017). The household food consumption score was 55.5 with over 70% of the households reported to be consuming four or more food groups (IPC, 2017). Households consume cereals, tubers, vegetables, fruits, pulses, meat, milk, oils/fat and sugar but at minimum frequencies. Distinctly, leafy vegetables are the most consumed food by all households in the Sebei sub-region (IPC, 2017).

2.2.2 Determinants of dietary diversity

According to the socio-ecological model, individual, interpersonal, community and societal factors determine dietary behaviours (Schmied, 2017). On the other hand, the lack of information on the positive environmental and nutritional outcomes of crop diversification and access to relevant technologies and services affect the food choice, availability and access. The lack of coordination of actors in the food system, socio-cultural factors such as gender relationships affects the household food environment. These result in low dietary diversity and low energy intake, affecting farmers' capability to even improve food production. Factors such as household size determine the number of persons in a family to be fed, this leaves the conflict in the decision to allocate money

to food (Powell et al., 2017). Several studies have also confirmed a lack of knowledge on food selection (Kabahenda et al., 2013; Kretz & Jordan, 2020; Waswa, 2016). A study in Tanzania confirmed that inadequate knowledge on food selection is also related to a lack of school education (Ogbo, Ogeleka & Awoemo, 2018). A study in eastern Uganda reported that the dietary intake of children was determined by factors such as time resources allocated to child care and feeding practices (Tidemann-Andersen; Acham, Maage & Malade, 2011). A study in Burkina Faso revealed that malnutrition is seasonal with high prevalence in the rainy or pre-harvest seasons when crops are still in the garden (Abizari, Azupogo, Nagasu, Creemers & Brouwer, 2017; Savy, Martin-Prevel, Traissac, Eymard-Duvernay & Delpeuch, 2006; Sié et al., 2018; Somé & Jones, 2018). Particular foods are also seasonal for example availability of beans was determined by the season of production (Larochelle, Katungi & Beebe, 2015). On farm diversity also contributes to diet diversity (Adubra et al., 2019). Agrobiodiversity can lead to increased production and in the end enhance income by the sale of produce hence higher diet diversity (Powell et al, 2017). In East Africa, the low availability of crops and the over-dependence on staple foods has caused diets that are deficient in vitamin A, riboflavin, folic acid, vitamin C, calcium and iron (Petry et al., 2015). The distance to the markets and market diversity also determine the choice of food (Koppmair, Kassie & Qaim, 2017). However, livelihood in Kapchorwa includes a mixed farming approach with significant production of variety of foods (Oduol et., 2017). Therefore, enriching farmer's knowledge, attitudes and perceptions on legumes, vegetables and fruits in terms of taste, health benefits and preparation options, assessed and tested in participatory cooking demonstrations is an essential approach.

2.3 Behaviour Change Communication (BCC)

Behaviour change is simply awareness that leads to improved practices (Contento, 2011). Ekesa in her report in Uganda reported that the main contributor to malnutrition was low awareness of the available options to improve nutrition in addition to diseases and inadequate access to food in the right quantities and quality (Ekesa et al., 2020). Research has suggested a combination of nutrition sensitive and nutrition specific interventions as a sensible means to achieve sustainable development goals. Kennedy, Stickland, Kershaw & Biadgilign (2018) analysed the validity of the Social Behaviour Change Communications (SBCC) as effective means of nutrition sensitive interventions. Amongst various measures, the authors recommended interpersonal

communications such as home visits and individual counselling as appropriate means (Kennedy et al., 2018).

Eating habits are determined by factors beyond food availability. This explains that though food can be accessible in various nutritious qualities and quantities it is neither a guarantee for people to make a healthy selection nor eat the required frequencies or servings. In one theoretical study by Contento (2011), food choice determinants were categorized as biological predispositions, experience with food, physiological conditioning, social conditioning, intrapersonal, person-related, interpersonal and social-environmental (Contento, 2011). Behaviour change communications that target these determinants can lead to improved food selection and behaviours. Key messages are identified, developed and guided by using systemic approaches like TIPs, which enable the understanding of barriers and motivators to practice improved dietary behaviours. Several studies in Uganda showed positive feedback with SBBC. One study to improve underweight included interpersonal counselling sessions to promote the consumption of locally produced ready to eat therapeutic foods to improve children's weight (Jilcott, Ickes, Ammerman & Myhre, 2010). Another randomised controlled intervention reported improved dietary diversity and meal frequencies of participating children and an improvement in caregivers' knowledge (Ickes et al., 2017). In 2012, Ickes also applied a communication approach in Uganda whereby individual interviews were conducted to understand the factors that influence in-home use and consumption of ready-to-use therapeutic foods as supplements. However, BCC should appropriately be targeted to influence dietary practices and select the relevant stakeholders (Contento, 2011).

2.3.1 TIPs approach to achieve Behaviour Change Communication

TIPs is a formative research technique developed by the Manhoff Group (Manoff Group, 2001). The procedure consists of a series of visits in which the interviewer and the participant jointly analyse current practices, discuss what could be improved and together reach an agreement on one or a few solutions to try over a given period. The trial experiences are then assessed together at the end of the trial period. TIPs is an effective approach to derive behaviour change communication messages and a useful component of infant and young child feeding (IYCF) interventions (Muehlhoff et al., 2017). TIPs focus on behaviour and what people do rather than knowledge or belief. The trials are the best way to gauge the acceptability of new practices and learn how to

promote and support them (Manoff Group, 2001). The tool relies on a collective, directive, person-centred counselling style for inciting behaviour change. An interviewer-participant setting can provide a private environment to discuss sensitive topics. Individuals are offered a chance to explore their behaviours and voluntarily choose to change. TIPs provide BCC techniques such as reflective listening, expressing acceptance and reinforcing the individual's self-motivational statements. The focus is to help people individually work through their contradictions and enhance their commitment to behaviour change. Exploring barriers and strategies for achieving the selected behaviour change and finally assisting and setting a personal goal to work towards before the next visit provides targeted and tailored intervention messages (Flattum, Friend, Story & Neumark-Sztainer, 2011).

The core piece of TIPs is that it enables testing of new or modified practices, assessing feasibility and acceptability within an actual home environment hence yielding important information which may be used for example in nutrition education intervention and agriculture extension trials (Dickin et al., 1997; FAO, 2014). Hence, an infant and young child feeding intervention in Bangladesh from 2010 to 2014 applied TIPs, including improved counselling during home visits, reaching mothers, fathers and opinion leaders. This led to rapid and significant improvements in key practices related to breastfeeding and complementary feeding (Sanghvi et al, 2016). In Uganda, Bekele & Turyashemererwa (2019) used TIPs to explore the feasibility of recipes and therefore mothers proved that they were open to trying new ways of improving their children's nutrition. Another study in the western highlands of Guatemala by the Process for Promotion of Child Feeding (ProPAN) resource incorporated the TIPs methodology to evaluate whether Opti-food-generated Food Based Recommendations (FBRs) were feasible and acceptable. The household trials confirmed that the new FBRs were feasible and viable choice for promotion (FANTA, 2015). In Tanzania, TIPs was feasibly applied to determine barriers and facilitating factors to practice exclusive breastfeeding with mothers and fathers. After counselling, majority of mothers reported breastfeeding was more optimal. Some reported improved breast milk supply. Fathers acknowledged their roles as providers of food to mothers to ensure sufficient breast milk and encouraging new practices. (Matare et al., 2019). The above studies among others confirm the effectiveness of TIPs in conveying behaviour change messages.

2.4 Modified recipes

In the study area, the sauce predominantly consumed is shallow fried bean stew, cooked usually with onions and once in a while tomatoes are added. The vegetable mainly consumed is sautéed collard greens (*Kale*). These recipe combinations are usually monotonous and low in variety. Other disadvantages of local recipes may include; low nutritive value, negative health consequences, undesirable sensory attributes such as roughness, bitterness, sourness and cost hence a need for modification. Modified recipes are indigenous recipes that usually have new ingredients added to them or are cooked in a somewhat different method. Recipes are usually modified to improve nutritive quality, enhance sensory attributes and improve health benefits and affordability. Studies in Tanzania and Uganda have confirmed that modified local recipes which have familiar sensory qualities, are locally available, easy to access, and cooked in an easy and common method are distinctly acceptable (Bekele & Turyashemererwa, 2019; Mbela, Kinabo, Mwanri & Ekesa, 2018). In this study, seasonally available legumes, vegetables and fruits were used to modify local legumes and vegetable dishes. Legumes are cheap sources of proteins and vegetables are abundant sources of micro-nutrients. Although in developing countries legumes, vegetables and fruits usually used in recipes are low in variety and availability is affected by seasonality. Therefore, nutrition interventions that apply modified recipes should focus on improving sensory attributes, food preferences, parenting practices, cooking skills, knowledge on health and nutrition benefits, food availability, cultural norms among others (Contento, 2011). These can be done by application of nutrition related Knowledge, Attitude and Practice (KAP) interventions. Additionally, interventions that focus on the entire food system would also be a helpful approach.

2.5 Effectiveness of participatory cooking demonstrations

In a FAO brief Ellen Muehlhoff explained that nutrition Knowledge alone may be complex and difficult to understand therefore practical cooking approach to nutrition education can be a better means of improving nutritional knowledge, attitudes and skills (FAO, n.d). When participants cook food practically following recommended procedures in form of recipes and especially when accompanied with sensory-testing sessions; this improves the three domains of learning that is cognitive, psychomotor and affective domains. According to Garcia, Reardon, McDonald & Vargas-Garcia (2016), participatory cooking sessions enable participants to develop self-efficacy

hence confidence. Likewise, knowledge of good nutritional practices are acquired (Talavera, Orillo, Domingo & Abacan, 2020).

Successful participatory cooking demonstrations by FAO in countries such as Zambia, Malawi, Afghanistan, Cambodia, Philippines have helped mothers and caregivers learn new skills, improve awareness of underutilised local ingredients in complementary feeding. Besides, the sessions enable women to learn other food-related practices such as food and kitchen hygiene, cutting, sorting and food cleaning skills. The individuals are likewise able to learn how to serve diverse diets.

In the Philippines, cooking sessions were conducted and the participants were allowed to taste the foods that enabled them to evaluate tastes, aroma, appearance and make informed choices, therefore, feedback on feasibility recipes was collected (FAO, 2017). However, studies have noted gaps in the validity of results from participatory cooking demonstrations therefore, it is advisable where possible to include large samples, have control groups, and apply random sampling and long-term follow-ups (Garcia et al., 2016). It has also been observed that cooking demonstrations may simply enhance short term behaviour changes (Hollywood et al., 2018). Therefore, this study partly sought to determine the perceptions of women on the acceptability of nutritionally improved local recipes tested during a participatory session.

CHAPTER THREE

METHODOLOGY

The objective of this particular study was drawn from a larger study called Education and Training for Sustainable Agriculture and Nutrition in East Africa (EaTSANE). The EaTSANE project was based on findings from a former project called HealthyLAND which ended in 2019. EaTSANE started in 2018 and ended in 2021. This study contributed to diversifying the food system by focusing on dietary behaviour and options for change applying a mixed-method approach in Kapchorwa District. Further project details can still be found in the link at the reference as (EaTSANE, 2018-2021).

3.1 Research design and approaches

This study used an explanatory sequential design. The results of quantitative data were used to design a qualitative data collection phase. The findings of the qualitative research data were then used to provide a more detailed explanation of the quantitative findings. Figure 2 shows the sequence which was adapted from Creswell (2013) and Teddlie & Tashakkori (2009).

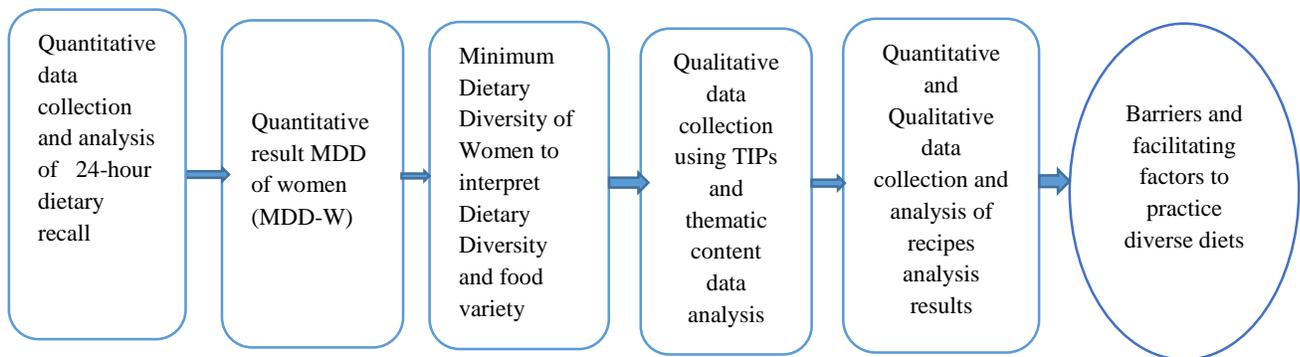


Figure 2: Explanatory mixed-method design

Following this explanatory sequential design, the approach started with the analysis of a quantitative 24-hour recall secondary data from the EatSANE baseline survey in 2018. This led to quantitative results of minimum dietary diversity, daily meal pattern and food variety to respond to objective one.

Objective two involved qualitative data collection using an approach called “Trials of Improved Practices” (TIPs) (Refer to figure 5). This TIPs procedure covered two different agriculture seasons that is; TIPs Round 1 which was done in the dry /postharvest season from February to

June and TIPs Round 2 in the wet season from July to November in the year 2019 (Details of TIPs are shown Figure 5. *“This study mainly concentrated on TIPs Round 1” and shall be referred to as Round 1.* Interviews using semi-structured questionnaires and notes were used for qualitative data collection. Thereafter data was analysed qualitatively using thematic content analysis. Thematic Content Analysis (TCA) which is a descriptive presentation of qualitative data. It majorly focuses on textual data analysed using software to identify the frequencies of common texts.

The third objective involved determining the acceptance of recipes. Data was collected using group discussion during onsite cooking and sensory-testing sessions after which it was analysed by documenting the number of participants who chose the modified recipes. In addition, themes to determine barriers and facilitating factors for the acceptance of recipes were reported qualitatively.

3.2 Description of the study area

Kapchorwa is located in Eastern Uganda, several surveys most times refer to the part of the Eastern Uganda region where Kapchorwa is located as Sebei, Elgon or Bugisu region. Kapchorwa district has seven sub-counties, 39 parishes and 324 villages. The district is located in Eastern Uganda at latitudes 1007'N to 1036'N and longitudes 4014'E to 34048'E at the slopes of Mt Elgon and occupies an area of 1731.7 km². It is approximately 65 kilometres northeast of Mbale city. The district is divided into four agro-ecological zones namely (uppermost, mid-upper, mid-lower and lowermost).

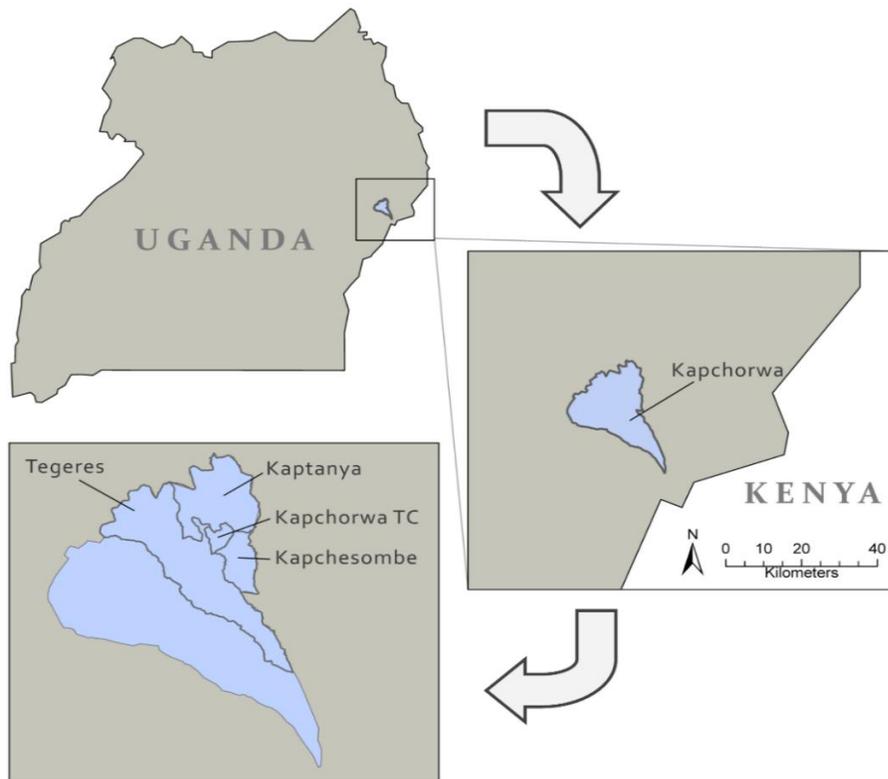


Figure 3: Map of Uganda showing Kapchorwa district designed by Dr. Björn Weeser, © Centre for International Development and Environmental Research 2019

The district experiences dry windy conditions from December to February. Rainfall is received in the month of April to July then September to December. The main crops cultivated in the agro-ecological zones include; potatoes, vegetables (onions and cabbage) and bananas in the highlands, bananas and coffee in the midlands and bananas and maize in the lowlands.

3.3 Description of sample population

The study presented in this dissertation included women 21-49 years from farming households chosen from rural households in Kapchorwa. The children from the households were between 6 months-8 years of age. The selection of the target children was based on the follow-up of a former HealthyLAND project which had been implemented for three years with target children between 0-59 months. By the start of the following project, the former children who were five years at the start of HealthyLAND had already made eight years. This made the maximum age of the selected children become eight. Men and youth whose families were participating in the EaTSANE project also took part in the focus group discussions.

Sample size calculation

The EaTSANE project was a succeeding project of HealthyLAND. Therefore, sample size for the current study was the same as that of the overall HealthyLAND project.

The sample size calculation for cluster randomised trials aimed at testing intervention effects in HealthyLAND project (Jordan et al., 2022).

$$N = a * b * 2 * \left(\left(z\left(\frac{\alpha}{2}\right) + z(\beta) \right)^2 \times (SD1^2 + SD2^2) / (M1 - M2)^2 \times (1 + ICC \times (m - 1)) \right) \quad \text{Equation 1}$$

Whereby

N stands for total sample size

a = the constant for drop out (1.12)

b = the constant to adjust for the unequal sample sizes in both groups (allocation ratio (:2; b = 1.125))

$SD1$ and $SD2$ describes the expected standard deviation for the change in the women's dietary diversity score in two different groups (1.5)

$M1$ and $M2$ are the respective mean values of the change (0 and 0.75, respectively). Each village was assumed to be a cluster unit.

Alpha was set to 5% (without any adjustments for multiple comparisons and power on 80%).

To be able to adjust for intra-class correlation (ICC), a design effect (DEFF) was included and defined as: $DEFF = 1 + ICC (m - 1)$.

Considering, that 11 households (m) per cluster would be measured, using a conservatively estimated ICC of 0.15, the $DEFF$ was calculated = $1 + 0.15 \times 11 = 2.5$.

The required sample size was therefore $n = 396$ farm-households (Jordan et al., 2022).

Eligibility criteria to participate in the HealthyLAND study included being a member of a farm-household with at least one child aged between 0 and 59 months, randomly selected from sampled villages identified by the agriculture research team (Jordan et al., 2022).

As a result of the power calculation, the baseline study aimed at a minimum of 400 farm-households.

During the first sampling stage, four sub-counties were purposively selected from the Kapchorwa District to cover all agro-ecological zones (uppermost, mid-upper, mid-lower and lowermost). Later, 40 villages were selected proportional to population size (PPS) from the four sub-counties.

During the baseline survey, 11–12 households were randomly selected from each selected village, resulting in a total of 460 households (Jordan et al., 2022).

The same small-holder farm households from HealthyLAND were followed up which became the baseline for EaTSANE (December 2018)

3.4 Sampling strategies

Objective 1

The villages in this study were beneficiaries of the preceding HealthyLAND project which was succeeded by EaTSANE. For the EaTSANE project baseline survey, eight out of the 40 HealthyLAND villages were selected purposively because they were closest to the anticipated EaTSANE demonstration plots for the agriculture work package. All villages that had not participated in the HealthyLAND project and were nearby the demarcated EaTSANE demonstration plots were listed to become potential control villages. Proportional to population size, sampling was done to select the respective villages for the final control group. The sampling frame was restricted by the four agro-ecological zones in Kapchorwa district.

In total, 180 households residing in the selected villages were targeted for the baseline data collection.

Inclusion

- a) Farming families with children below 8 years who had participated in any activity of the previous HealthyLAND project and lived in villages that had participated in the previous HealthyLAND project
- b) Farming families with children below 5 years, who had not participated in any activities of the previous HealthyLAND project and lived in the selected control villages.

The researchers informed the randomly selected participants to participate in the survey prior to the day of data collection with the help of a project social mobiliser, who had an agricultural background and the chairperson of the local council. The chairperson and the project social mobiliser supported the enumerators and supervisors to find the households on the day of the survey.

If the mother or the primary caregiver of the child was not around on the day of the survey, the survey team went back another day. If they did not manage to meet the primary caregiver at the second trial, the household was considered as drop out. The primary caregiver of the child, often the biological mother, was asked to respond to the questions concerning the food consumption of the child. Not all households were available for interviews due to the Christmas season coming up and circumcision events. In addition, some Healthy-LAND households had moved away from the research area. In total 156 households were finally included equally distributed across the agro-ecological zones. The various groups and distributions are shown in figure 4.

Objective 2 and 3: Four paired villages which were located close to the present EaTSANE demonstration plots were purposively selected representing the four agro-ecological zones resulting in eight villages to be visited. Fifty primary caregivers/mothers were further randomly chosen from the baseline participation list of the selected villages and asked to voluntarily participate in the TIPs and participatory cooking workshops.

3.5 Overall data collection procedures

Fehler! Verweisquelle konnte nicht gefunden werden. shows the different data collection steps taken by the nutrition group in the EaTSANE project Round 1. In this study, the baseline data (secondary data) together with results from FGDs were used to provide information for the TIPs (Refer to-Fehler! Verweisquelle konnte nicht gefunden werden.). The FGD is not presented in this study but was purposively conducted to establish a seasonal food availability calendar. The calendar was used by the project principal investigator to discuss with researchers from the other work packages on which crops could be used for the demonstration plots. At the same time, the information from the seasonal calendar on food availability was used to identify a list of legumes, vegetables and fruits which may possibly be available for the counselling rounds. In addition, the FGDs generated data on food related practices like methods of cooking, availability of legumes, vegetables and fruits, food likes, dislikes and food taboos. The information led to the development

of dietary recommendations by the project principal investigator. The derived recommendations were presented by the TIPs facilitators to the volunteers in a first counselling visit (referred to as the TIPs visit 1-3, Round 1) see Figure 5. Lastly, an evaluation workshop with the participatory cooking sessions was held at villages representing each agro-ecological zone whereby participants practically cooked and tasted improved recipes. Overall the steps started from February to June 2019), and these steps were repeated in round two from July to November 2019 with slightly different focus messages to be tested. In reference to Figure 4 lost to follow up meant the survey team could not meet the respective household during the survey period; absent: respondents did not participate in the workshop.

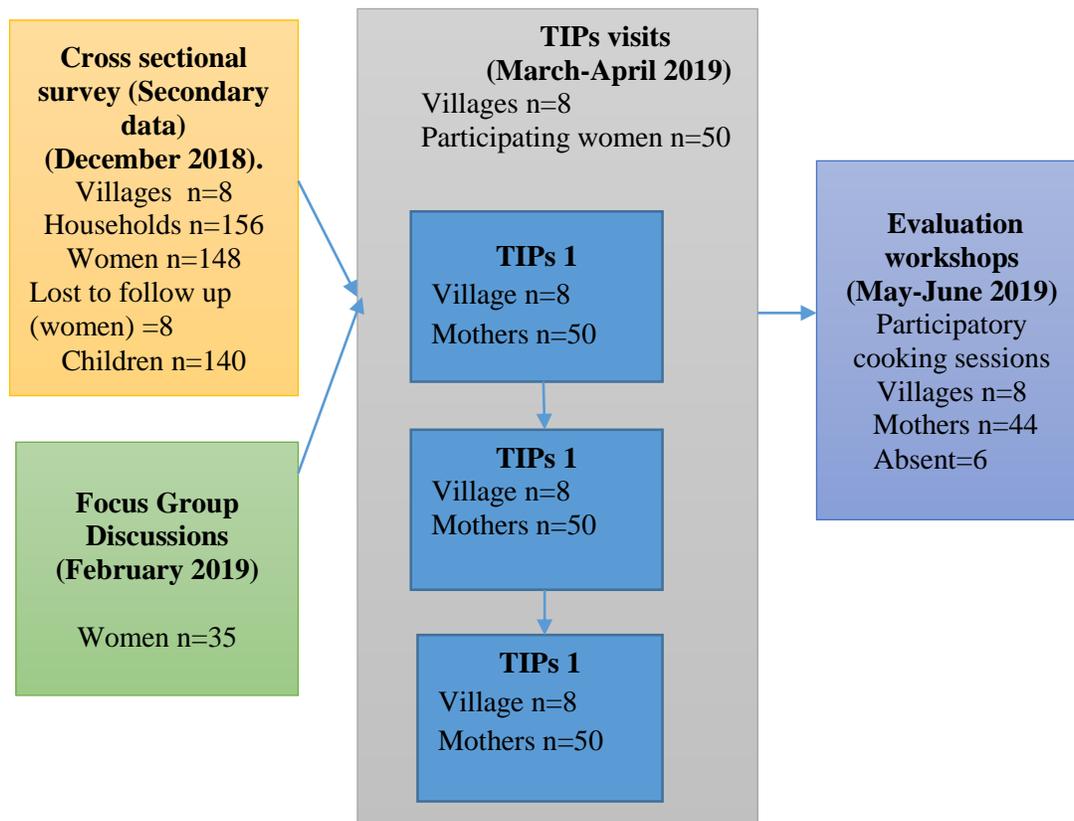


Figure 4: Overall data collection procedures

3.5.1 Procedures to determine the consumption pattern for legumes, vegetables and fruits

The qualitative open-list-based 24-hour questionnaire was used to investigate the foods and beverages the women, men and children ate the day and night prior to the baseline survey in December 2018. The timing of the 24-hour dietary recalls coincided with the last second annual harvest season. Only foods consumed at home, not those purchased and consumed outside of the home starting with the first food eaten in the morning were recorded (FAO & FHI 360, 2010). The main ingredients of the dishes were probed for and foods recorded according to predefined meal times. Each food was listed as a single variable and then coded into the ten food groups of the minimum dietary diversity score for women of reproductive age and seven food groups for children 6-23 months. To provide an overview for children older than 23 months MDD-W adult women was used (MDD-W) (FAO & FHI 360, 2010). The information was used to calculate the dietary diversity scores and food variety based on guidelines provided by FAO (FAO & FHI 360, 2010). Food variety in this study refers to a simple count of food items consumed. A special emphasis was put on fruits, legumes and vegetable groups as these were in the focus areas of the EaTSANE project.

3.5.2 Determining the barriers and facilitating factors to practice the dietary recommendations

3.5.2.1. Identifying commonly used recipes

Prior to each TIPs round, the availability of vegetables, legumes and fruits was assessed looking at the upcoming 5 months using Focus Group Discussions (FGDs) with men, women of the participating households and youth from the respective villages. In addition, food preparation methods, likes and tastes as well as food preferences were discussed during the FGDs. Commonly used recipes were documented and modified for the TIPs to make dietary diverse recipes from vegetables and legumes. The feedback from the various TIPs visits and the practical pre-tasting sessions by facilitators were also used to identify and document recipes that are generally culturally and seasonally acceptable, based on locally available nutritious ingredients and affordable for the households. These recipes were finally used for the cooking sessions.

3.5.2.2 Development of key messages or recommendations

The information from the 24-hour recall at baseline was used to estimate the Minimum Dietary Diversity for women and together with the findings on perceived food availability and food habits from focus group discussions (-not presented in this study). These provided a basis for the development of appropriate counselling messages.

Fifteen key messages were adopted under the following five themes;1) Increase legume consumption in household diet, 2) increase vegetable consumption in household diet, 3) increase legume and vegetable consumption in complementary feeding, 4) conserve essential nutrients and 5) improve food preservation and cooking methods. Details of the specific key message are shown in **Table 1**. The exact messages promoted among the individual households were chosen by each household during the counselling visits. These messages were generated from the analysis of data from FGDs and food variety and dietary diversity.

Table 1: A list of key messages applied in the different TIPs visits

<p>Increase legume consumption in household diet</p> <ol style="list-style-type: none">1. Increase the amount of legumes (pulses) served during meal times to 2-3 servings per day using an individual's hand-full estimate.2. Eat a variety of legumes and nuts at-least 4 times a week.3. Increase variety by cooking beans with paste or other vegetables. Enrich other household relishes with vegetables and legumes. <p>Increase vegetable consumption in household diet</p> <ol style="list-style-type: none">4. Increase the amount of vegetables served at meal times5. Increase variety and frequency of consumption of vegetables by “Eating a different vegetable every day for 7 days”6. Reduce the taste of bitter vegetables by use of groundnut paste or other available vegetables. <p>Increase legume and vegetable consumption in complementary feeding</p> <ol style="list-style-type: none">7. Incorporate legumes, vegetables and fruits in complementary foods to increase the child's dietary diversity of legumes, vegetables and fruits.8. Shred vegetables into smaller pieces mash legumes so that the child is able to swallow without choking. <p>Conservation of essential nutrients</p> <ol style="list-style-type: none">9. Avoid consuming tea at the same time with food, give tea one hour before meals or one hour after meals to enhance absorption of iron.10. Eat a variety of vitamin C rich foods, for example, citrus fruits, leafy vegetables to improve absorption of iron.11. Wash vegetables before cutting to avoid leaching of water-soluble vitamins and nutrients12. Avoid over-cooking of vegetables to avoid loss of nutrients.13. Reduce the use of soda ash in the preparation of vegetables and legumes to avoid loss of water-soluble vitamins. <p>Improved food preservation and cooking methods</p> <ol style="list-style-type: none">14. Soak beans before cooking for 3-4 hours or overnight to reduce on cooking time15. Dry and store vegetables and legumes to increase availability during the lean season
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3.5.2.3 Procedures for Trials of Improved Practices Round 1

Trials of improved practices of consisted of 3 sub-steps, that is, three visits as visualized in **Figure 5: Overview of the procedures for Trials of Improved Practices Round 1** . TIPs individual counselling Round 1 was done in the months of February to June. Consent was sought and signed before any counselling started. The counselling tools including IYCF counselling cards adopted from UNICEF is attached as reference (Bhandari & Chowdhury, 2016). A food availability calendar derived from the FGDs and counselling guides. Each TIPs facilitator was trained on how

to use the provided materials and was given a guide that included key messages and a structured form providing household characteristics such as the age of the youngest child and semi-structured interview guide. The counselling outcomes of each visit were noted by the interviewer using open-ended semi structured interviewer and recording guidelines (see Appendix A1.2, A1.3 and A1.4).

After each visit, the meeting date for the following visit was scheduled which was supposed to be not later than 14 days to enable caregivers to recall the practices. The information on the outcome of each visit was used to update question guides by recording previously selected trials. The guides were then redistributed to the TIPs facilitators to follow up on each previously chosen trial. Prior to each visit round, the TIPs facilitators underwent refresher training on the counselling process and shared experiences with the researcher to discuss solutions for any challenges that occurred during the visits.

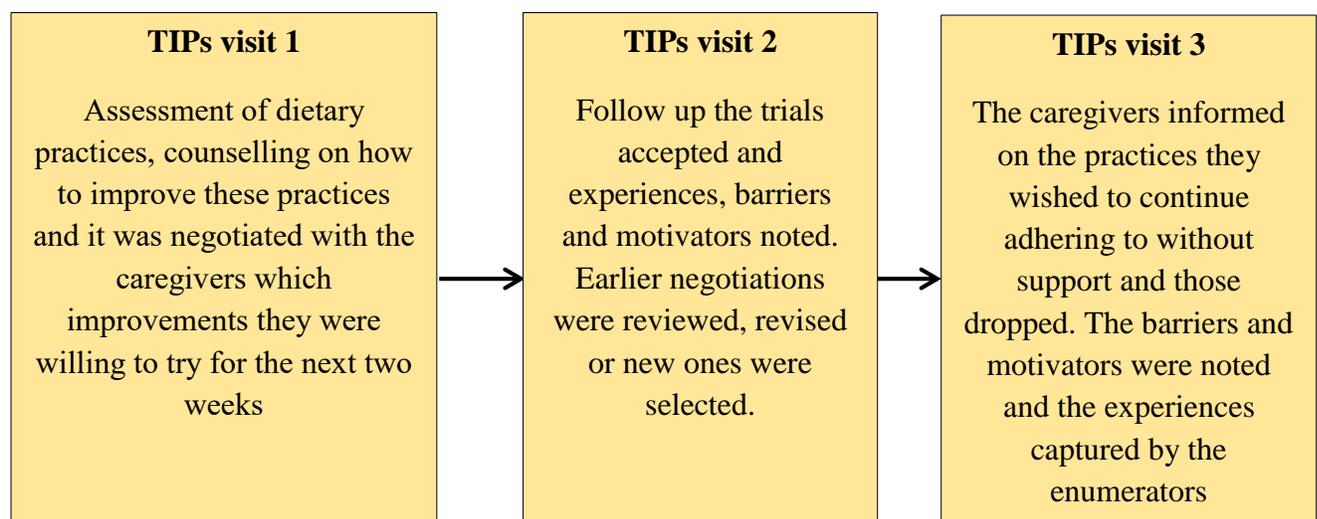


Figure 5: Overview of the procedures for Trials of Improved Practices Round 1

Household visit 1: The interviewers discussed with the mothers about the dietary behaviours of the household members emphasising on the consumption of vegetables, legumes and fruits. The mothers mentioned challenges they had with the consumption of legumes, vegetables and fruits. The enumerators then discussed all the various options that could be adopted. The mothers were able to choose one, two or three recommendations as action points to try out for 14 days.

Household visit 2: Two weeks after the first household visit, the enumerators went back to the households to discuss if practices were tried and if not asked the respondents what happened? If

the participants had managed to try out the recommendations they were asked about their experiences and if they were still interested in continuing with any action points. Challenges that were faced by the participants while practicing new behaviours were discussed and solutions were then negotiated for the different options. If possible new recommendations to follow up were selected and agreed upon to be tried (action points) by the household members. The outcome of these trials was followed up at the third visit.

Household visit 3: Again two weeks later (past the second visit) to the TIPs facilitators went back to the households to determine the challenges and facilitating factors faced by trying out the practices that were agreed upon in household visits one and two above. Actions that individuals wished to continue practicing with or without support were recorded.

3.5.2.4 Profile of the TIPs facilitators

Six female facilitators were recruited. Each facilitator had at least a university education and basic nutrition knowledge. They were also fluent in English and “Kupsabiny” a local dialect. The team underwent 5-days training on the counselling procedures, the key recommendations and the recording templates (see Appendix 2 for training activities). The training also included skills of individual counselling to enhance ethical conduct of the TIPs. Likewise, prior to the cooking demonstrations the enumerators had a one-day practical cooking session, tasted the recipes and reported their opinions.

3.5.3 Determining acceptability seasonally available of local recipes

Harvest-Plus Food Composition for Western Uganda was used as a reference for determining the macro and micronutrient quality and quantity of legumes, vegetables and fruits that were used for recipe modification. The objective of modifying recipes was to develop diversified recipes using available legumes, vegetables and fruits. The commonly used methods of cooking legumes and vegetables were used that is stewing and boiling. Improved cooking skills that save fuel and time like the soaking of pulses was emphasised. Skills of improving texture, appearance and flavour were considered. In addition, skills for conservation of nutrients such as reduction of the use of soda ash in vegetable preparations, washing vegetables before cutting and avoid over-cooking of vegetables were emphasised. Two major recipe combinations were developed; one with legumes

common beans (*Phaseolus vulgaris*) a major ingredient and another with vegetables *Vigna unguiculata* (cowpea leaves) with amaranths leaves or malabar spinach.

The common beans (*P. vulgaris*) was selected because it's a cheap source of protein and fat. It was also the most commonly consumed as an accompaniment to staples, locally available or easy to access and locally produced legume. Groundnuts was chosen as a spice for vegetables only because it is not produced in most of the areas in Kapchorwa and was only usually bought in insufficient amounts. However, it was possible to purchase it in small quantities and reported to be affordable at the nearby shops, markets or neighbourhood.

The cowpea leaves (*V. unguiculata*), amaranths and malabar spinach (*B. alba*) were selected because they were identified in the FGDs as underutilised indigenous leafy vegetables. Amaranths was perceived to have negative health consequences like diarrhoea. Improved vegetable recipes were cooked without soda ash because research shows that soda ash decreases the in-vitro bio-availability of micronutrients such as iron and zinc (Mamiro et al., 2011). Cowpea leaves and malabar spinach (*B. alba*) were promoted so as to improve the preparation methods because the participants believed that these vegetables could only be cooked with soda ash to enhance a deep green colour, savoury taste and soft texture. These crops were also being promoted and had been planted in the EaTSANE project demonstration gardens. These crops included climbing beans, groundnuts, cowpea leaves and grain amaranths among others. The overall purpose was to link agriculture interventions that were on-going in the study area to household food and nutrition.

3.5.3.1 Technique for recipe development

The technique involved the skill of double mixing or triple mixing of major nutrients from legumes, vegetables and where possible fruits.

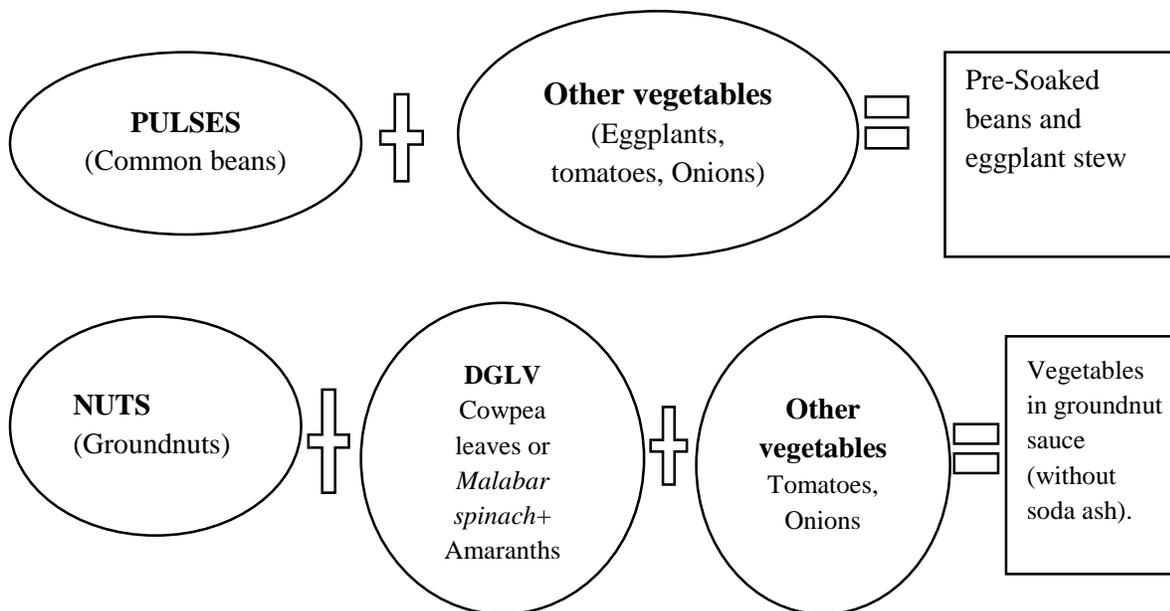


Figure 6: Adapted from FAO recipes for complementary feeding (FAO, 2011). Different combinations of food recipes developed to improve diversity of legumes and vegetables

The additional aim of the improved recipes was to modify the local methods and diversify the dishes. Normally legumes were neither cooked using pre-soaking nor eggplants added. Cowpea leaves was rarely consumed however whenever prepared it would be cooked using soda ash to ensure tenderness, maintain colour and taste. No other additional vegetables would be added to the cowpea leaves. Therefore, modification/improvement included pre-soaking legumes before cooking and adding eggplants, tomatoes and onions. Cowpea leaves was improved by addition of amaranths, groundnuts, tomatoes and onions. The principle adapted from FAO recipes for complementary feeding combinations of recipes guidelines were finally utilised to make a pre-soaked bean stew with eggplants and vegetables in groundnut sauce attached in **Table 2** (FAO, 2011). Pre-testing involved a one day training, tasting of improved recipes and practical cooking sessions by the TIPs facilitators who were natives and still residents of Kapchorwa. During the sessions, photos were compiled and printed to make a guideline in form of a recipe album.

Table 2: Modified recipes for the participatory cooking demonstrations

<p><u>Pre- soaked bean(<i>Phaseolus vulgaris</i>) stew with eggplants (<i>Solanum macrocarpon</i>)</u></p> <p><i>Ingredients</i></p> <p><i>1 cup of dried beans</i></p> <p><i>1 onion</i></p> <p><i>2 tomatoes</i></p> <p><i>2 table spoons of cooking oil</i></p> <p><i>5 medium sized eggplants (or amaranths)</i></p> <p><i>A pinch of salt</i></p>	<p>Preparation Method or cooking instructions</p> <p>Pre-soaked bean stew with eggplants</p> <ol style="list-style-type: none"> 1. Measure one cup of dried beans. 2. Sort the beans and wash. 3. In a dish or saucepan half full of water, soak the beans for 3-4 hours. 4. Bring the soaked beans and the soaking water to boil. 5. Add additional water if needed to cover the beans. 6. Cook until tender for 1 and half hour. 7. Add the salt to taste. 8. In a dry saucepan, add the oil, add the onions and eggplants stir until cooked. 9. Add the tomatoes and cook till tender. 10. Drain the beans from the stock/soup and add the beans to the cooked ingredients. 11. Using a wooden spoon stir continuously. 12. Gradually add the stock/soup to the beans to make a stew. 13. Simmer for 5 minutes. 14. Serve with <i>matooke</i> or <i>posho</i> <p>Modifications from the common method: Pre-soaking of dry beans, addition of eggplants or amaranths. Extra tomatoes, onions</p>
<p><u>Cowpea (<i>Vigna unguiculata</i>) leaves with amaranth or Malabar spinach (<i>Basella alba</i>) and groundnut (<i>Arachis hypogaea</i>) paste</u></p> <p><i>Ingredients</i></p> <p><i>2 bundles cowpea leaves</i></p> <p><i>2 bundles of dodo/amaranths</i></p> <p><i>8 heaped table spoonful of groundnut paste</i></p> <p><i>A pinch of salt</i></p> <p><i>Onions and tomatoes</i></p>	<p>Cowpea leaves with amaranth/malabar spinach and groundnut paste</p> <ol style="list-style-type: none"> 1. Wash the vegetables in running water do not soak. 2. Cut the mixed vegetables into tiny pieces. 3. Put the vegetables in a saucepan and add 1/2 cup of water. 4. Bring to boil until tender for 15-20 minutes. 5. using the green liquid water from the vegetables, dissolve the groundnut paste. 6. Add groundnut mixture to the cooked vegetables. 7. Add salt to taste. 8. Simmer for 5 minutes. 9. Serve with Plantain <i>matooke</i> or Maize meal <i>posho</i> <p>Modification from common method: Without soda ash, addition of amaranths, tomatoes, onions, extra amount of groundnut paste.</p>

3.5.3.2 Procedure for participatory cooking demonstrations

A one-day cooking demonstration was conducted in each four paired villages that represent an agro-ecological zone. A total of 8 villages participated in four different sites close to the EaTSANE demonstration plots. Out of the 50 households, 44 mothers attended the cooking session in Round 1. Reasons for absence were the long distance from their homes to the cooking demonstration site, lack of interest and engagement with other commitments. The mothers were accompanied by their husbands and young children. Most mothers arrived in the morning before their spouses. The facilitators prepared the fireplaces, fetched water and sorted the legumes while the women were involved in sorting and cutting the vegetables. Two paired fireplaces were organised for the food recipe categories: 1) improved and 2) the common legume and vegetable recipe. Refer to picture 7 below.



Picture 7: Practical food preparation sessions

The women contributed cooking utensils like saucepans, ladles and wooden spoons while the project provided the cups, plates, jugs, basins and food ingredients. The women cooked the improved recipes following guidelines from the *recipe album* while the unimproved recipes were prepared using the usual/ common skills and knowledge that the mothers practiced.

Major ingredients such as pulses, groundnuts, cowpea leaves, were provided equally to make the ingredients as similar as possible. All the paired combinations were set for cooking at the same time to ensure approximation of cooking time. Personal, kitchen and food hygiene such as hand washing, use of clean equipment and covering food were considered. Soon after cooking, the foods were served by the researchers to provide a blinding effect for the choice tests. The recipe pairs

were then named (A) and (B) for each pair of legumes and vegetables for “traditional” and “modified” recipe respectively.

3.5.3.3. Procedure for the food tasting sessions

Guided group discussions were conducted with separate groups for men and women. Out of the four paired villages, three had each one group for male and two groups for females and one paired village that had one to one group for female to male respectively.

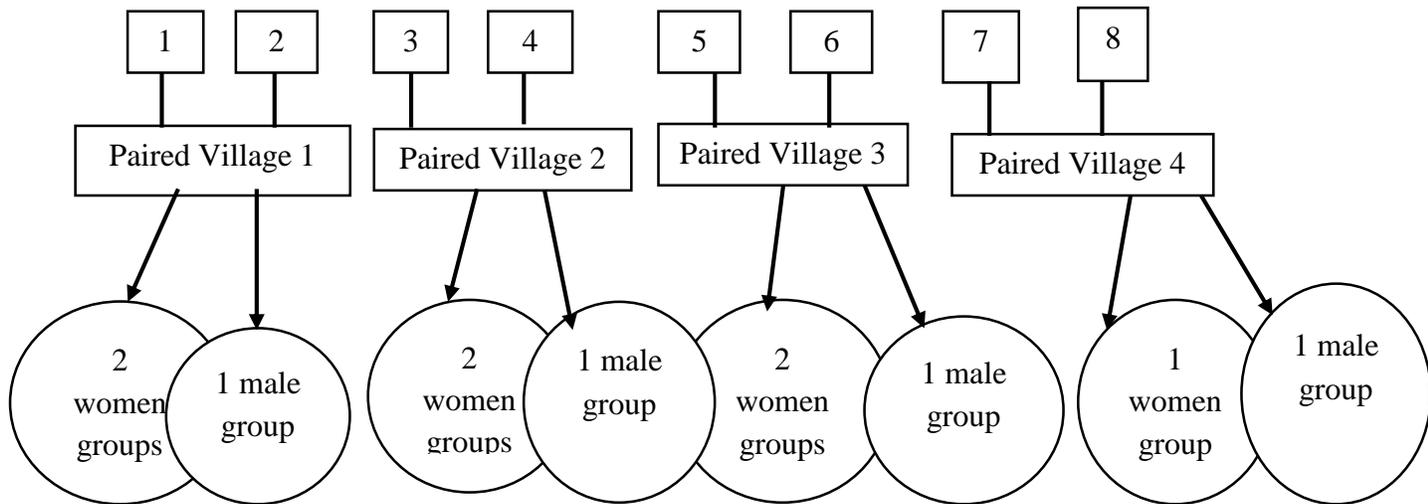


Figure 8: Organisation for group discussions

The mothers were provided with blinded recipes of common (A) and modified (B) for legumes and vegetables.



Picture 9: Food tasting sessions

Spoons and small tasting plates were provided. TIPs facilitators and note takers fluent in *Kupsabiny* (native language) guided the discussions. The mothers tasted the foods step by step and reported on the perceived nutritional value, attitudes towards cost, food preparation method, sensory characteristics, cooking time and fuel economy. At the end of each group discussion session, counts for the general likes for the recipes were conducted to provide quantitative opinion. Extra information included what the mothers perceived would be the reaction towards the improved recipes by their spouses, children, neighbours and in-laws. Voice recordings and photos were taken.

3.6 Data processing and analysis

3.6.1 Assessing the consumption patterns of fruits, legumes and vegetables

Secondary data from a cross-sectional survey conducted as a baseline for EaTSANE project was used and an end line for HealthLAND project. Data from the 24-hour recall of 148 women and 140 children over the age of 6 months to 8 years were used. Using qualitative questionnaires that were scanned into electronic copies. Each household defined by an identification number was recorded for the different individuals; mother, child and (father excluded in the study). All foods mentioned as consumed in the 24hr recall data assessment during the baseline were entered into IBM Statistical Package for Social Scientists (SPSS) statistics 20 for analysis and each food was coded within its food group. **Note:** Unquantified data meant a mere mention of any food was considered. Therefore, tomatoes and onions were not neglected despite being known as spices. The foods were coded according to mealtimes such as breakfast, mid-morning snack, lunch, mid-afternoon snack, evening snack, supper and night snack. Both meal time and food variety were related to describe food consumption patterns.

3.6.1.1 Assessing Minimum Dietary Diversity of women of reproductive (MDD-W)

The various foods were grouped into the ten food groups of the indicator on the Minimum Dietary Diversity of Women (MDD-W) (FAO & FHI 360, 2010). The 10 food groups are 1) grains, white roots, tubers and plantains, 2) pulses, 3) nuts and seeds, 4) dairy, 5) meat, poultry and fish, 6) eggs, 7) dark green leafy vegetables (DGLV), 8) other vitamin A rich vegetables and fruits, 9) other vegetables and 10) other fruits. The Minimum Dietary Diversity for women (MDD-W) of reproductive age is the proportion of women who consumed food items from at least 5 out of 10 different food groups during the previous day or night. During analysis, a woman who consumed

5 food groups and above out of ten received a score of one while those who did not consume food groups greater than 5 out of 10 scored 0. The minimum dietary diversity score is therefore met as long as a woman consume foods from 5 out of the 10 food groups described above. Finally, the proportion of women who consumed ≥ 5 food groups and those who consumed < 5 were then assessed (MDD-W). Further descriptive analysis was done to find standard deviations, means, the minimum and maximum number of food groups consumed.

Minimum dietary diversity for children 6 months up to 8 years

The proportion of children two to eight years meeting the minimum dietary diversity score (MDDS) was calculated based on the tool of the MDD-W reproductive age. The tool was used just to give an overview of the diet of older children in the target households. MDDS for children 2-8 years was calculated based on the proportion of children who ate ≥ 5 food groups out of 10 food groups based on the MDD-W score for adult women (FAO & FHI 360, 2010). The proportion meeting the minimum dietary diversity of children 6-23 months ≥ 4 out of 7 food groups was calculated based on the WHO indicator for infants and young children, (WHO, 2008).

3.6.1.2 Assessing variety consumption pattern for legumes, vegetables and fruits at different meal times of the day

To determine the variety consumption for legumes, vegetables and fruits amongst women in farming households, foods were categorised into six out of the ten food groups adapted from the standardized indicator on dietary diversity for women described previously. Assessment excluded non-legume, non-vegetables and non-fruits groups. These included; 1. Pulses (legumes), 2. Nuts and seeds, 3. Dark Green Leafy Vegetables (DGLV) 4. Other vitamin A rich vegetables and fruits, 5. Other vegetables, 6. Other fruits. The different food types consumed within each of the six food groups were counted. In addition, foods were assessed according to meal times such as breakfast, mid-morning snack, lunch, mid-afternoon snack, evening snack, supper and night snack. Information on meal time and food variety were related to describe food consumption patterns.

Table 3: Locally available food items in the legume, vegetable and fruits food groups

Food Groups	Possible legumes, vegetables and fruits used for analysis	Count
LEGUMES		
1. Pulses	Beans, soya beans, field peas, cowpeas, pigeon peas.	5
2. Nuts and Seeds	Groundnuts, sesame, pumpkin seeds, watermelon seeds	4
VEGETABLES AND FRUITS		
3. Dark green leafy vegetables	Collard greens (<i>Kale</i>), Amaranths (<i>dodo</i>), bean leaves, pumpkin leaves (<i>Kapkyekiky</i>), cowpea leaves, spider plant (<i>Gynandropsis gynandra</i>), black night shade (<i>Solanum nigrum</i>), malabar spinach (<i>Basella alba</i>), fresh field peas	9
4. Other vitamin A rich vegetables and fruits	Carrots, orange-fleshed sweet potatoes, mangoes, ripe pawpaw	4
5. Other vegetables	Cabbage white or purple, eggplants, avocado, tomatoes, onions	5
6. Other fruits.	Ripe yellow bananas, apples, oranges, jackfruit, custard apple, passion fruits, pineapple, lemon, lime, berries.	10
Total		37

Adopted from FAO food groups for MDD-W (FAO, 2016)

3.6.2 Analysis of determinants to practice the recommendations provided in the TIPs process

3.6.2.1 Data coding

Information of the semi-structured questions were recorded on interview guides by the TIPs facilitators. Data was typed to make electronic copies and these transcripts were read and reread. Inductively the sample data was then summarized with a focus on barriers and facilitating factors to practice the consumption pattern of diverse legumes, vegetables and fruits in household and complementary feeding to generate *meaning units* that express key results for the research questions. Additional information on exclusive breast-feeding and kitchen gardening were excluded. The meaning units are summaries of key results that maintain the core meanings of the study. The units were all summarized to make the *condensed meaning* units. The condensed meanings were then developed into a code tree. The code tree was later used for coding the entire

data with an open-source qualitative analysis software QDA miner lite version; 1.4.1 (2004-2014). Sample is attached in appendix as A5. The data results were sorted, clustered and categorized according to merging themes for presentation. Each code was given a category and an example code was randomly selected from various code examples presented in as results. Any merging code example was treated equally and used for discussions.

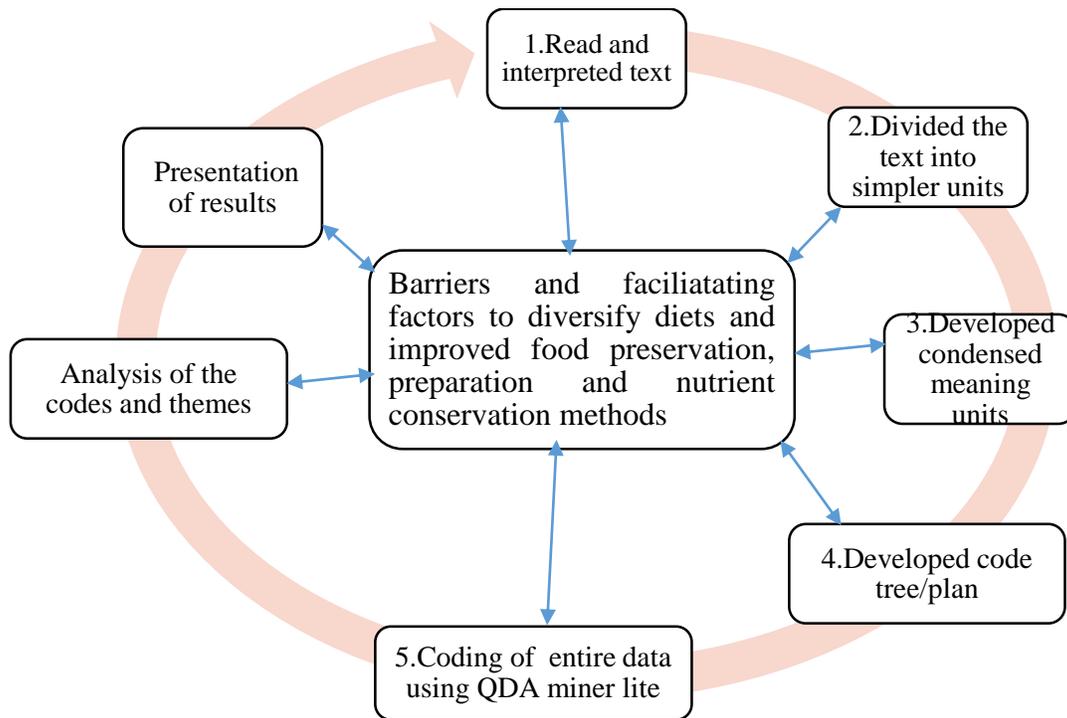


Figure 10: The procedure for qualitative data analysis (Source: Erlingsson & Brysiewicz, 2017)

3.6.3 Analysis of the acceptability of nutritionally diversified improved local recipes.

3.6.3.1 Assessment of feedback from the cooking and tasting sessions

The notes of the enumerators from the discussions held at the cooking sessions were supplemented with the transcribed recordings. The notes were then digitalised and a code tree was developed thereafter data analysed following the above procedures in **Figure 10**. Data analysis focused on emerging themes related to perceived nutritional value, sensory characteristics, cooking time, fuel economy, cost and food preparation methods used for the modified recipes. The proportion of mothers who generally preferred a modified recipe was analysed quantitatively to conclude the general acceptability of the improved recipe.

3.7 Ethical considerations

Confidentiality by the anonymity of participant's names, place of residence, age, religion, the occupation was taken care of during all data analysis (Saunders, Kitzinger & Kitzinger, 2015). Consent was read and interpreted by enumerators before signing by participants. This was done before any data collection procedures such as discussions, voice recording, photography or video recordings were started. Before each counselling session or face to face interactions, informed consent was sought and hard copies of consent forms signed by every mother. The permission to conduct research with human subjects was sought from the School of Health Sciences Institutional Review Board and Ethics committee (MAK-SHS-IRB) Makerere, Kampala, Uganda and Uganda National Council for Science and Technology (UNCST).

3.8 Limitations of the study

The first round of TIPs started in the dry/post-harvest season with the hope of proceeding through the rainy season but unfortunately, there was an un-expected delay in the onset of rain. This affected the availability of some vegetable varieties. However, this was also a post-harvest season for legumes which were usually kept as household stock.

The 24-hour recall depended on the memory of the respondent, therefore errors could have resulted from recalling food types. The Dietary diversity scores are entirely a qualitative measure thus mere mention of food type was considered without reflection of the quantities consumed (Nguyen et al., 2020). Nevertheless, the Minimum dietary diversity score for women of reproductive age has been confirmed as a simple tool and efficient in determining overall diet and micronutrient adequacy (Hanley-Cook et al., 2020).

The prevalence of the children 6-23 months old was assessed as ≥ 4 out of 7 food groups based on the WHO indicator (MDD-IYCF) for infants and young children as of 2010. However, WHO has developed a new Minimum dietary diversity (MDD) assessment tool that adds breast milk to the previous seven food groups. Therefore, a breast fed child should consume at least five food groups out of eight to meet the MDD (WHO, 2017).

CHAPTER FOUR

PRESENTATION AND INTERPRETATION OF RESULTS

4.0 Introduction

This chapter presents the research findings of the study based on the analysis of the data collected in accordance with the study objectives. The chapter is divided into four sub-sections, the first looks at the demographic information, the second section is results for dietary patterns and are summarized as bar charts, histograms and tables as proportions and counts. The third section is the results for barriers and facilitating factors to practice diverse diets presented as themes and proportions. The fourth section is the results for the acceptability of locally improved recipes also presented as themes and proportions.

4.1 Demographic characteristics of respondents

This was based on the secondary data derived from the baseline survey which was conducted in December 2018. Data presented show the frequencies and descriptive statistics for the dietary survey. The mean number of household members was eight. The oldest child included in the survey was 94 months. The minimum and maximum age of the mothers were 19 and 50 respectively. About ten percent 9.8% of the households were headed by a female. The percentage of women who were currently married and monogamous was 86%, 5.5% were currently married-polygamous, 3.7% were widowed, 1.2% were divorced and 3% were single.

4.2 The consumption pattern for legumes, vegetables and fruits amongst women in farming households in Kapchorwa district

Generally, the consumption pattern of various foods from the food groups in the MDD-W of women of reproductive age in Kapchorwa district is shown in Figure 11. Figure 11 shows that all women consumed at least grains, white roots and tubers. Almost all women consumed other vegetables and 74% consumed pulses. About 13% of the women had eaten nuts or seeds and 64% had dark green leafy vegetables. The consumption of animal sourced foods was generally low. The women's dairy consumption was 66% with less than half of the women consuming poultry, meat or fish the day prior to the baseline survey. Only one woman had eaten eggs. Vitamin A-rich fruits and vegetables and other fruits were consumed by 4% to 19% of the women respectively. Check figure 11.

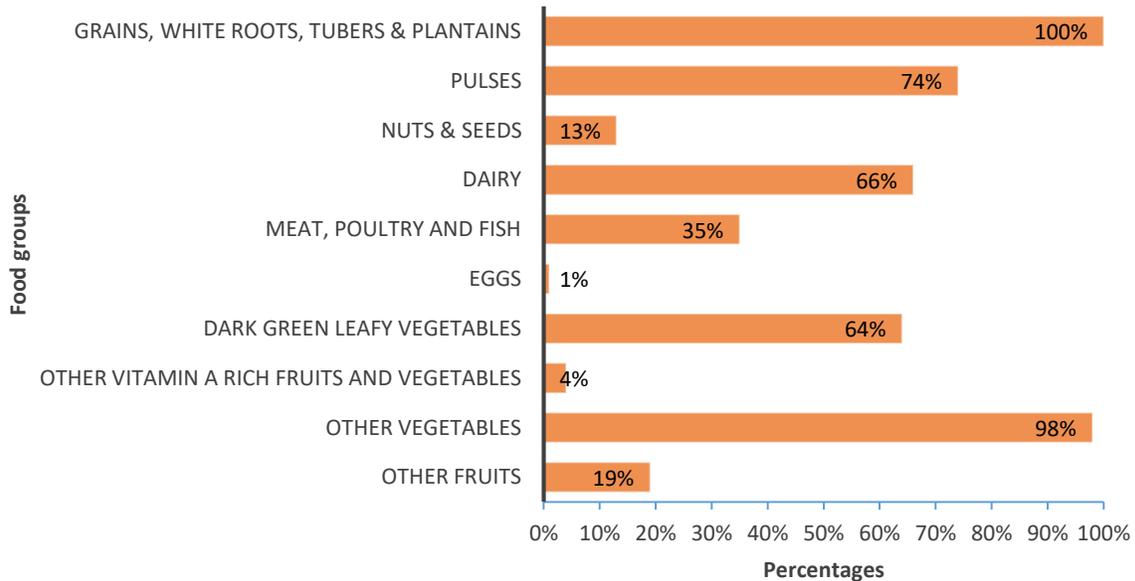


Figure 11: Consumption pattern for all the ten food groups in MDD-W n=148

4.2.1 Minimum Dietary Diversity of women of reproductive age

Results show that 61% of the participants had consumed a diet covering five or more food groups at baseline. The minimum number of food groups consumed was three and the highest eight out of a maximum of ten. The mean frequency of food groups consumption was 4.73 and SD ± 1.00 .

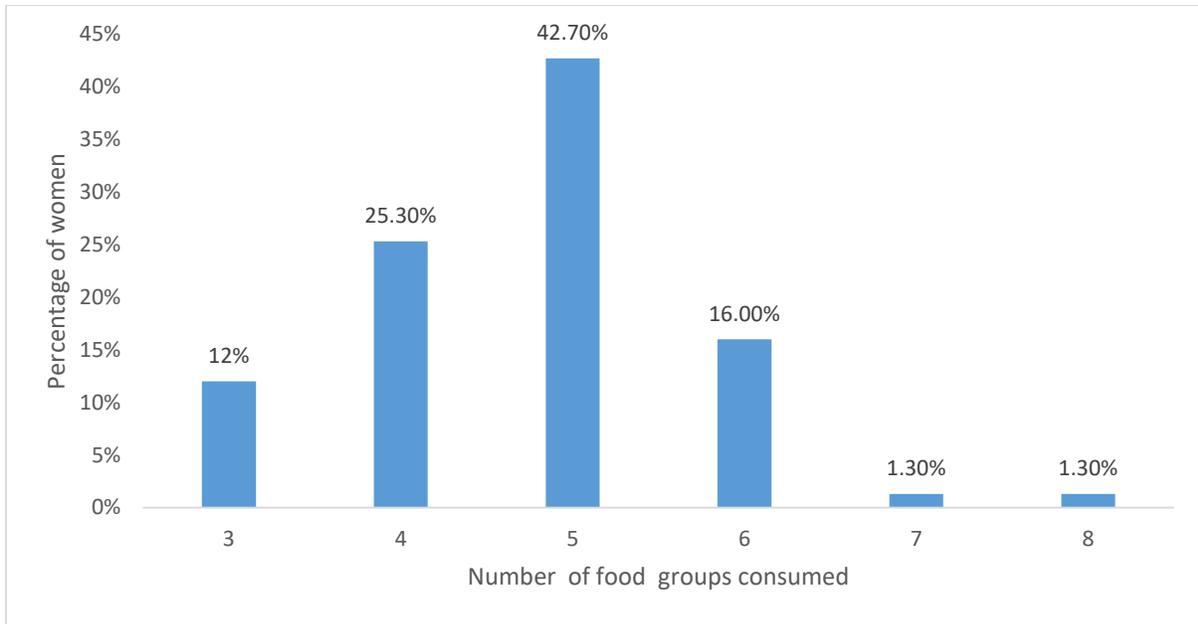


Figure 12: Proportion of women and number of food groups consumed from the MDD-W; n=148, EaTSANE baseline survey, 2018

Further analysis was conducted on the two groups of women categorised as; women who consumed greater than five food groups and those who consumed less than 5 food groups (Refer to figure 11). Results showed that women who consumed less than five food groups were less likely to consume pulses (54%) versus (86%) in the greater than five food group. Likewise, they rarely consumed nuts and seeds, dairy, meat, poultry and fish. Noticeably, none of the women had eaten eggs from the former group probably because those who consume fewer food items are also likely to be the poorest group (**Figure 11**)

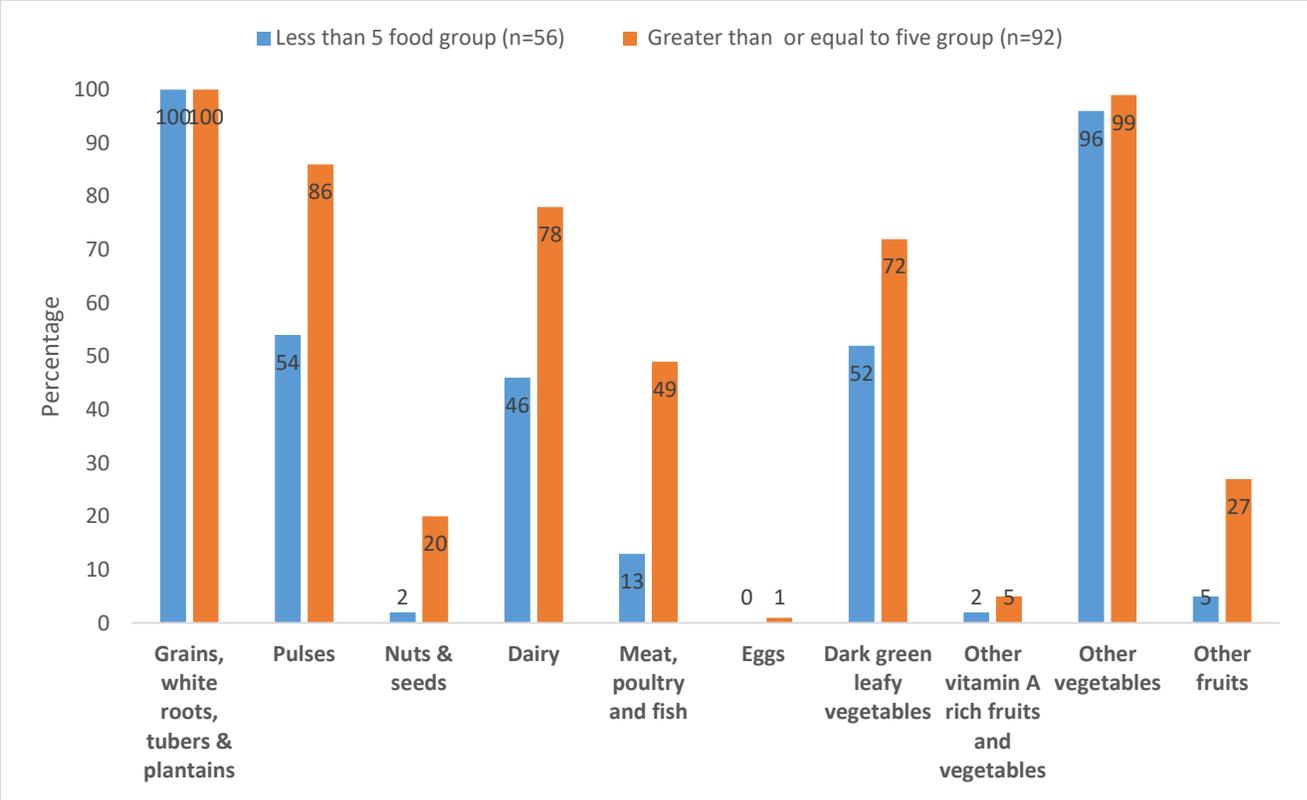


Figure 13: Percentage consumption of food groups by women within 24 hours in categories of above or below the cut off score for MDD-W (EaTSANE baseline, 2018; n=148)

4.2.2 Consumption patterns for children 6 months to 8 years using MDD-IYCF

Among children 6 months up to 8 years the diet was composed mainly of starchy staples and pulses. The consumption of flesh meat, eggs and vitamin A rich fruits and vegetables was lower among the younger compared to the older children (**Table 4**). The proportion of children meeting the minimum dietary diversity score was 63.5% for children 2-8 years, assessed as ≥ 5 out of 10 food groups based on the MDD-W score for adult women (FAO & FHI 360, 2010). Furthermore, a prevalence of 92.3% for the children 6-23 months old, assessed as ≥ 4 out of 7 food groups based on the WHO indicator (MDD-IYCF) for infants and young children 6-23 months was observed (WHO, 2010).

Table 4: Food groups consumed by children 24-hours at baseline in 2018

No	Children			%
	2-8 years, n=137*	%	6-23 months, n=13#	
1	Grains, white roots, tubers and plantains	98.5	Grains, roots and tubers	100
2	Pulses	65.7	Pulses, nuts and seeds	85
3	Nuts and seeds	8.0		
4	Dairy	73.7	Dairy products	77
5	Meat, poultry and fish	33.6	Meat, poultry and fish	31
6	Eggs	5.1	Eggs	15
7	Dark green leafy vegetables	52.6	Vitamin A rich fruits and vegetables	46
8	Other vitamin A rich fruits and vegetables	15.3		
9	Other vegetables	89.8	Other fruits and vegetables	100
10	Other fruits	21.2	Breast milk	-----

*Food groups based on MDD-W score (FAO & FHI 360, 2010).

#Food groups based on CDDS (WHO 2017)

4.2.3 Food variety and meal pattern for the legume, vegetable and fruit groups.

In this study, only 15 foods were consumed from the 37 possible food items in the legume, vegetable and fruit groups (**refer to Table 3**) used in the analysis for legumes and categorised under the six food groups in the MDD-W. From **Table 5**, the most dominant “legumes” which were consumed belonged to the “pulses” group (beans) or “nuts and seeds” (groundnuts). The different dark green leafy vegetables that were consumed included; collard greens (*Kale*), malabar spinach (*B. alba*), black night shade (*S. nigrum*) and pumpkin leaves. The highest consumption pattern of vegetables was found for the group “other vegetables” which included tomatoes, onions, avocado, eggplants and cabbage. (See **Figure 14**).

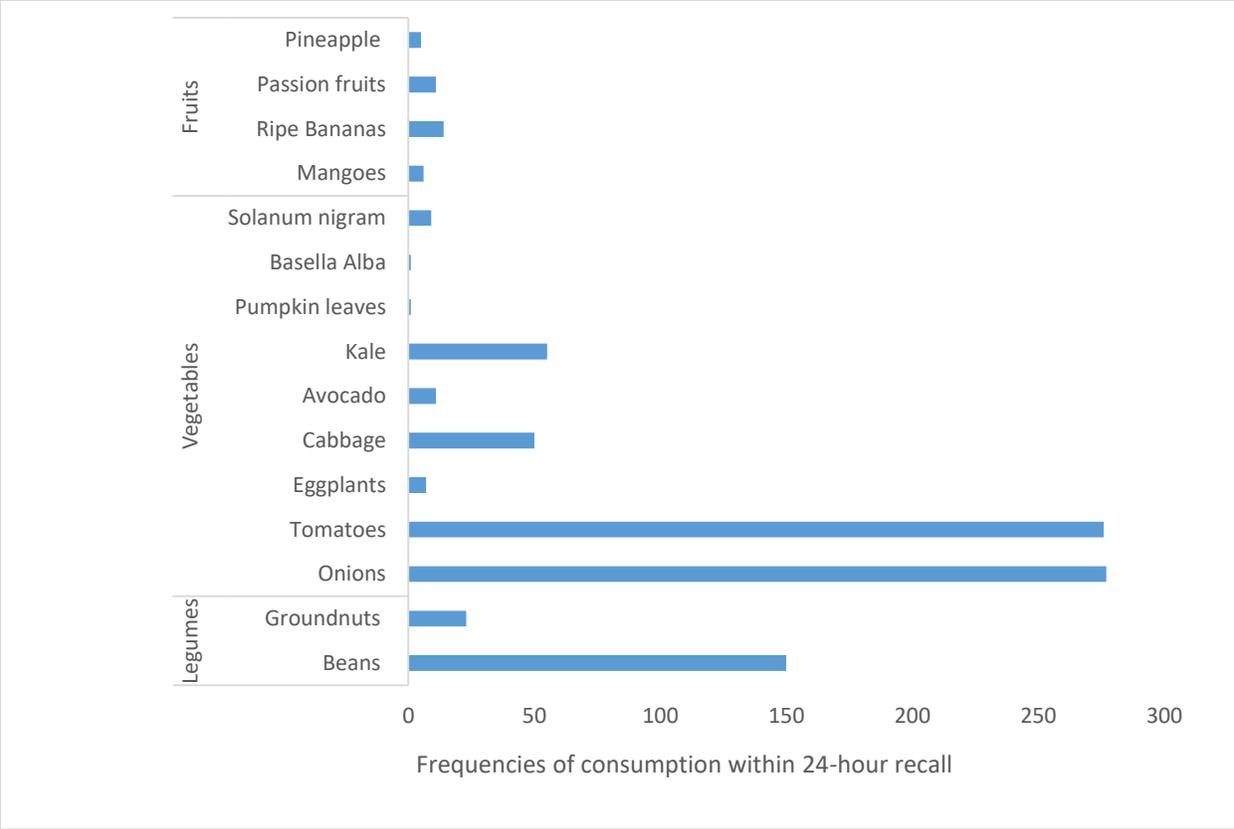


Figure 14: Food variety and frequency of consumption by women within 24-hours prior to the baseline in December 2018 (n=148)

Mealtime was categorised depending on the individual participant’s definition such as breakfast, lunch and supper because these were mentioned as the main meal times of the day.

Breakfast: Vegetables, pulses, nuts, seeds and fruits were rarely eaten as breakfast. The high consumption of tomatoes and onions resulted from the common cooking methods whereby these foods are used as spices or appetisers for plantains, potatoes and stews usually eaten as breakfast. The plantain or potato stews are eaten alone or used as an accompaniment to English tea or African tea (a mixture of milk, tea leaves and sugar) that also accounts for the high consumption pattern for dairy. Groundnuts are also occasionally mixed in plantains (*Matooke*), starchy staples and tubers to make a sauce for breakfast.

Lunch: Legumes especially beans were consumed as lunch commonly mixed with tomatoes and onions which contributed to the high consumption of tomatoes and onion as seen in the **Table 5**

below. Sometimes beans were mixed with cabbage or collard greens (*Kale*). Nuts (groundnuts) were rarely added to the beans.

Supper: Supper was majorly characterised by the consumption of beans, tomatoes, onions and cabbage. During supper beans that were leftover from lunch are mixed with other vegetables to increase the quantity.

Snacks: It was uncommon for legumes and vegetables to be eaten in between main meals as snacks. Tomatoes and onions were observed to be eaten at snack times, which was either as a result of a late breakfast and lunch or early supper. Snacks are mainly composed of left-over foods from the main meals.

Fruits: Fruits were rarely but recognizably consumed as breakfast and snacks throughout the day. Fruits that were consumed simply included ripe mangoes, ripe yellow bananas, passion fruits and pineapple. Precisely vitamin A rich fruits eaten being ripe mangoes and passion fruits.

Table 5: Frequency of consumption for legumes, vegetables and fruits at different meal times, (n=148).

Meal time	Pulses	Nuts and seeds	Other vegetables					Dark green leafy vegetables				Vitamin A rich fruits		Other fruits	
	Beans	Ground-nuts	Onions	Tomatoes	Egg plants	Cabbage	Avocado	Kale	Pumpkin leaves	Malabar spinach	Black night shade	Ripe mangoes	Passion fruits	Ripe yellow banana	Pineapple
Breakfast (7am-10am)	3	6	36	34	1	2	1	2	0	0	1	1	3	8	1
Mid-morning snack (10:00-12:59pm)	8	0	12	15	0	2	2	5	0	0	0	3	1	1	2
Lunch (1pm-3pm)	69	9	97	93	0	2	1	38	1	0	2	0	2	1	0
Mid-afternoon snack (3-4:30pm)	8	1	18	18	0	1	1	4	0	0	0	2	5	0	1
Evening snack (4:30-6:59pm)	5	1	7	8	0	2	1	0	0	0	1	0	0	4	0
Supper (7-9:50pm)	56	6	105	108	6	23	5	6	0	1	5	0	0	0	0
Night snack (10pm-6:59am)	1	0	2	0	0	0	0	0	0	0	0	0	0	0	1

4.3 Barriers and facilitating factors to diversify legumes, vegetables and fruits consumption in household diet and complementary feeding using TIPs

In visit 1 mothers voluntarily selected one, two or three recommendations that they were interested in trying out. Recommendations selected by the mother were followed up to find out if she tried the action (√) or she failed to try (X). These were checked for at the second and third visits. The mother voluntarily selected other recommendations or continued with the same recommendations with or without modification. These are observed in the table in **Appendix A3**. The recommendation “*Eat a different vegetable every day*” was the most selected, it had the highest number of trials, failures and willingness to continue the practice. “*Incorporating legumes, vegetables and fruits in complementary feeding*” was almost tried by all those who selected the practice. “*Increase the amount of legumes served to other household members*” was moderately selected but the failure to implement was common. “*Increasing the amount of vegetables served at mealtimes*” also was noted as difficult to implement with half of the people who selected failing to try. Barriers and facilitating factors are mentioned in the subsequent sections. (Refer to **Figure 15**).

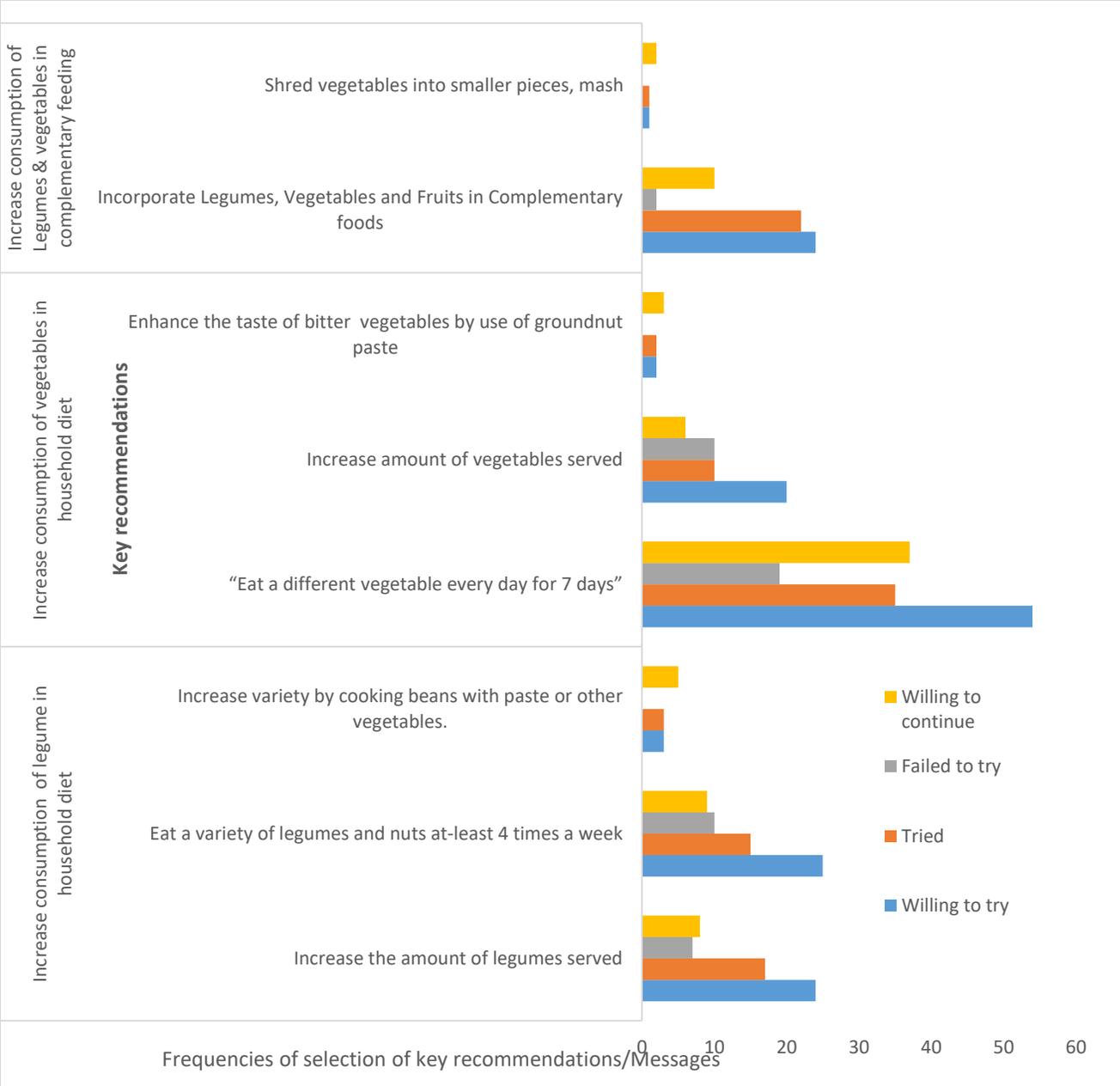


Figure 15: Cumulative frequencies of trial of key recommendations that improve consumption of legumes and vegetables in household diet and complementary feeding during TIPs Round 1 (Visit 1, 2, 3)

NOTE: The overall frequency of selection is stated as “willing to try” group in the figure above and from the prior group individuals either tried or failed to try the actions. Willing to continue was evaluated at the final visit reporting the recommendations that participants suggested that would continue practicing even without the support of the researchers.

4.3.1 Factors facilitating uptake of key recommendations on legume and vegetable consumption in the household diet

The main facilitating factors to practice the recommendations were; usual dietary practice, access and availability, perceived health benefits and reduced monotony.

Usual dietary practice: The women confirmed that beans and vegetables were familiar foods; hence consumption of these foods was a common dietary practice. This also means higher acceptance by household members.

“Vegetables are eaten almost every day and are either cooked alone or pasted or mixed with beans.” (10400110)

Access and availability: The women said it was easy for them to eat some vegetables even in the dry season. They promised that if the rains started then they would try to eat a different vegetable every day. Soon after the third visit in April, the women were motivated to increase the frequency of consumption of vegetables because they reported the availability of most of the fast-growing vegetables that had already sprouted either in the gardens or forests like collard greens (*Kale*), amaranths, malabar spinach (*B. alba*) and pumpkin leaves.

“Collard greens, amaranth are now available due to the rains.” (10300704)

“Picks malabar spinach from the forests:” (10301005)

In addition, the availability of legumes and vegetables in the market, shops and locality was a great motivation. For that reason, the mothers always chose to cook beans and common vegetables such as “collard greens (*kale*)” and white cabbage commonly sold at the roadside or neighbourhood.

“Collard greens and cabbage are mainly consumed now because it is available in the market” (10400202). “Pumpkin and pumpkin leaves are got from neighbours.” (10301005)

“I buy groundnuts because it's available in the local market /shops.” (10400110)

The women who had stored legumes as household stock said they had no difficulty increasing the serving and frequencies of consumption.

“Beans are stored in the house and are the main sauce cooked daily.” (10200805)

Improved appetite-less monotonous: The mothers reported that eating different vegetables every day improved appetite and reduced monotony.

“Eating a variety of vegetables daily makes you not to get tired of them.” (10200805)

Perceived health benefit: They also acknowledged that consuming variety could lead to nutritional benefits among others weight reduction and improvement of sight.

“Eating much vegetables and legumes than starchy or grain foods will help my weight reduce” (10400102). “My eyes will see for long due to nutrients in vegetables.” (10200803)

4.3.2 Barriers to practice key recommendations related to legume and vegetable consumption in the household diet

The main barriers to incorporating legumes, vegetables and fruits in the household diet; were seasonality, long cooking time for legumes, cost and lack of income, distance to the market, lack of variety in the market.

Distance to the market: The women said the markets where they could purchase a variety of vegetables were very far from their catchment. The markets were also only accessible on particular days of the week.

“Other vegetables are not available anymore only when brought from the far Kamus market.” (10400205)

Limited variety: The limitation in the variety of legumes and vegetables both at home and in the market was the reason why the women said they consumed mainly beans and collard greens (*kale*).

“Limited variety of vegetables at home.” (10300306)

“Other legume varieties are not found in our area” (10200602)

Cost: It was mentioned that legumes and vegetables that are not locally produced at home were expensive. The women stated that they lacked the income to purchase legumes and vegetables that were still expected to be available in the markets

“This is because the prices of beans have increased.” (10400202)

“Vegetables that are bought are expensive.”(10400210)

Seasonality: The women reported that the beans they had previously produced were either running out of stock or already out of stock. The gradual reduction of beans as household stock was common for the households who reported that they had produced only a little amount. Likewise, the women said they could hardly get a variety of vegetables both at home and in the market because of the dry season.

“My beans in the house got done and I just buy it now.” (10200601)

“Dry season limits availability variety of vegetables.” (10300303)

Long cooking time for legumes: Long cooking time was the most documented factor hindering the consumption of legumes. The women said the legumes/beans equally take many hours to cook therefore consuming a lot of fuel. They said cooking legumes/ beans cheats the time and effort required for other responsibilities.

“Beans consume a lot of time to cook” (10400102) and “Beans require a lot of firewood.” (10200602)

Lack of knowledge and skills: This was related to the knowledge of the need to consume a variety of legumes. Another difficulty stated was the lack of skills required to prepare certain legumes for use in household diet. Statements also showed negative attitudes towards certain legumes.

“I have never seen seeds for cowpeas and I don’t think I will eat them.” (10400105)

“Ever since I was young I had never known that green grams could be used for making sauce.” (10300310)

“I never thought of buying other legumes varieties since she is comfortable eating beans alone.” (10300310)

4.3.3 Factors determining the consumption of diverse legumes, vegetables and fruit in complementary feeding

The following section describes the dominant barriers and facilitating factors to practice the recommendations provided during the TIPs in complementary feeding. Overall acceptability, perceived outcomes were the major determinants.

4.3.3.1 Barriers to incorporating legumes and vegetables in complementary feeding

Vegetable consumption was limited by factors such as bitter taste, hard texture, and unattractive appearance. In addition, lack of skills for preparing complementary foods was only documented for the vegetables. These statements were mentioned by participating mothers during TIPs.

Dislike by child: The mothers complained that some children disliked vegetables. Dislike was more related to bitter tastes, hard texture, perceived unattractive appearance related to incorporating vegetables in children's meals.

"I tried making porridge mixed with greens but the baby refused because she is used to taking milk. "The young child does not like cabbage since it is hard." (10300104) "Children dislike malabar spinach because it is slippery." (10300702) "Children dislike nightshade because it's bitter." (10300702) "I think mixing vegetables with porridge makes it look bad." (10200602)

Parenting practices related to perceived negative health outcomes: Parenting practices could be associated with either culture or lack of knowledge. The mothers reported among others only basically introducing semi-solid or solid foods at the age of one instead of the recommended time that is six months.

"Infants are given vegetables and bean soup only until one year." (10200801)

They also said that if children ate more legumes and vegetables then they would probably eat less carbohydrate (*posho*) which is perceived as a better option for satisfaction. Additionally, they perceived that vegetables lacked nutrients and were not appropriate for feeding younger children.

"Giving children much vegetables make them not to eat posho." (1030010)

Also commonly documented was the practice of feeding children soup for the reason that they were going to get chocked, suffer from indigestion, bloating and diarrhoea in case of being fed vegetables or beans. These practices may be attributed to a lack of skills for preparing complementary foods.

"Only soup is given from legumes and vegetables to children because it chocks." (10200805)

"Amaranths/dodo and beans makes children suffer from diarrhoea." (10200604)

"Stomach makes sound (bloat) when children eat beans." (10200805)

4.3.3.2 Facilitating factors to incorporating legumes and vegetables in complementary foods

In this section, the key factors that facilitated the incorporation of legumes and vegetables were related to women's perceptions were acceptability by the child and perceived health benefits. These facilitators were mentioned after the women tried and received the dietary recommendations.

Acceptability by child: The women who tried the complementary feeding recommendations finally reported that when they added groundnut paste to bitter vegetables their children finally enjoyed its taste. Likewise, those who added groundnut paste to children's porridge reported that it truly did not look as unattractive as they had imagined. Refer to the statement attached below.

"She mixes groundnuts to bitter black nightshade and now the children eat them." (10300112)

"I managed to add some oddi (groundnut paste) in the child's porridge and it was looking good." (10301009)

Perceived positive outcomes: The most documented motivation was the perceived positive outcome to the children; women cited children getting satisfied and sleeping longer which gave them time to do other household chores.

"I increased and gave one ladle of beans the child ate and got satisfied he eats and puts the plate aside, unlike before where he could throw away the plate and cries because I think I used to give less." (10300762)

Perceived health benefits: Women mentioned that they previously did not know that vegetables would be fed to young children. After receiving the nutrition messages they were able to acknowledge that children would grow better and remain healthy because of consuming a variety of legumes and vegetables.

"I used to think that vegetables were not supposed to be eaten by young children but she has learned that it has no bad effect on them and so she will continue giving her children different varieties of vegetables." (10300310)

“I will continue serving increased amounts of legumes to the child as he grows because I want my grandchild to grow well.” (1030076)

“It is easy and I want him to get all nutrients.” (10301007)

4.3.4 Barriers and facilitating factors to practice recommended improved food preparation and nutrient conservation methods

The majority of the mothers were willing to “*avoid the use of soda ash in food preparation*” although less than half of them were unable to implement the recommendation not to use it. This was different from the recommendation “*soaking beans before cooking*”. This recommendation was selected by many mothers and almost all of them were able to try the practice. The same is valid for the recommendation “*give tea an hour before or after mealtimes*” which was almost managed by all those who chose it. “*Wash vegetables before cooking*” and “*avoid overcooking of vegetables*” were selected by only a few mothers. “*Drying vegetables*” was selected by a few mothers however they all failed to try it. “*Eat a variety of vitamin C rich fruits and vegetables*” was neglected by all mothers with none choosing the recommendation.

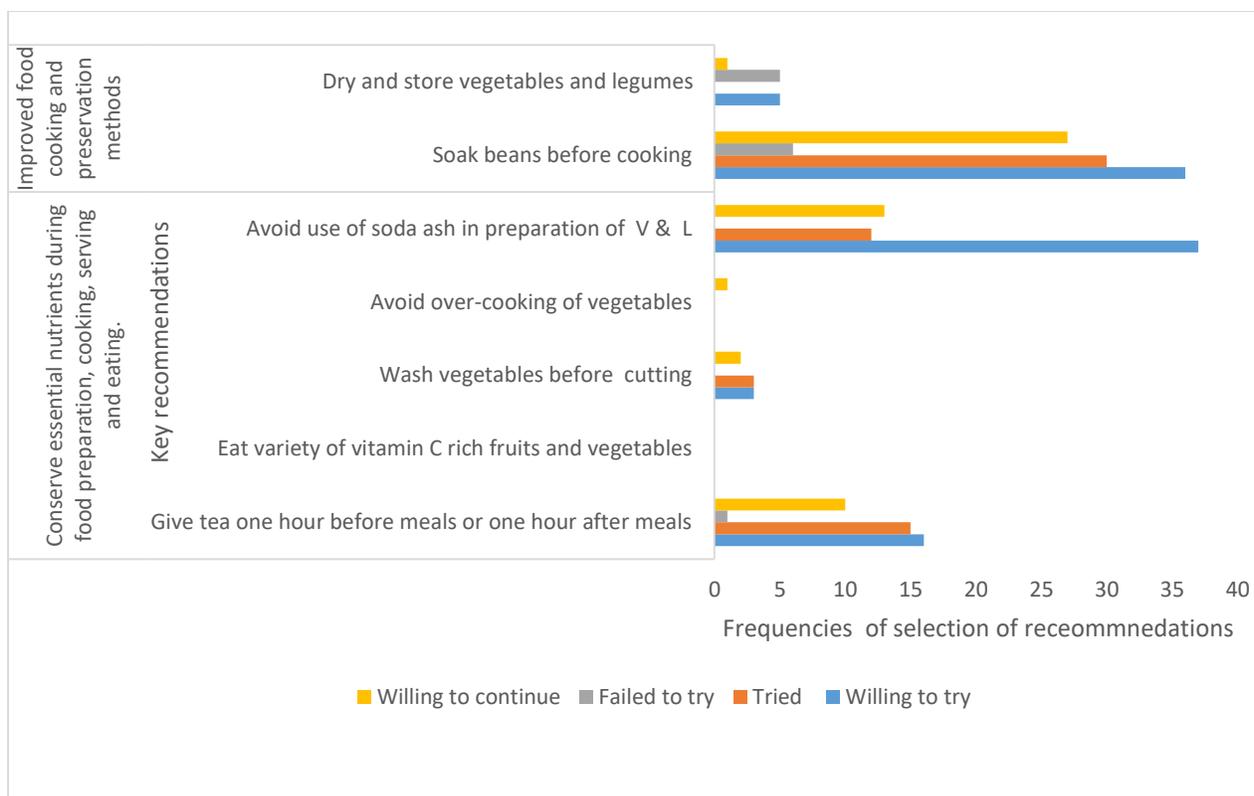


Figure 16: Cumulative frequencies for trials of recommendations during TIPs visit 1, 2, 3 Round 1 for improved food preparation and nutrient conservation

4.3.4.1 Facilitating factors to practice the recommended methods of food preparation and nutrient conservation

Practices surrounding food preparation and consumption determine the quality of nutrients in cooked foods. For this reason, improved methods that conserve nutrients are essential to change negative traditional practices. This study identified the following facilitating factors.

Perceived positive health benefit: Generally, the mothers who accepted the practices acknowledged that improved practices conserve nutrients in food such as washing vegetables before cutting.

“I now wash vegetables before cutting, it is good now since I know the vegetables remain with the value.” (10301005)

Perceived negative health consequences: Soda ash was also mentioned as a risk to negative health consequences and undesirable tastes.

“Stopped use of soda ash because when I cooked with it my stomach burns a lot like heart burn.” (10300762) “Children say with soda ash the vegetables are sour and not sweet” (10400203)

Improved sensory attributes: A mother who tried to cook leafy vegetables without soda ash reported that surprisingly it had desirable sensory characteristics.

“Vegetables without soda ash was nice and the colour remained green as usual.” (10301002)

Reduced cost of fuel and cooking time: During the TIPs women who tried pre-soaking beans before cooking said the beans tasted delicious and cooked for a short time.

“The amount of firewood she uses has reduced and she now has no problem cooking daily.” (10200604)

4.3.4.2 Barriers to practice the recommended methods of food preparation and nutrient conservation

Practices surrounding food preparation and consumption determine the quality of nutrients in cooked foods. For this matter, improved methods that conserve nutrients are essential to change negative traditional practices.

Food culture: The mothers cited the reasons why they use soda ash in food preparation. They said the use of soda ash is a traditional method of cooking vegetables such as cowpea leaves, malabar spinach, pumpkin leaves, bamboo shoots and bean sauce (*magareik*). They also preferred the sensory effect of the soda ash on vegetables such as enhancing green colour, softening and enhancing taste. They perceived that soda ash was also good for weight reduction. They said if soda ash was added to legumes then it would cook faster, especially for those that are tough and probably have been in stock for a long time. This may be because of the seasonal difference in freshness and type or variety of legumes. **Table 6** shows the related quotes.

Table 6: Perceived reasons why women used soda ash in food preparation

Perceived reason	Example quotes
Usual cooking method	<i>“Beans are boiled with soda ash to make magareik”(10400208)</i> <i>“Malabar spinach, pumpkin leaves, kapchekikuyu, bamboo shoots are boiled with soda ash”(10300703)</i>
Reduce cooking time	<i>“Boils beans with soda ash sometimes to cook faster” (1030011)</i>
Perceived health benefits	<i>“She uses soda ash to cut weight” (10400207)</i>
Food preservation	<i>“Soda ash reduces spoilage and softens beans” (10200803)</i>
Improve taste	<i>“Malabar spinach does not taste without soda ash” (10301001)</i> <i>“Soda ash gives nice taste to mashed beans- magareik” (10300107)</i>
Enhance texture	<i>“Other greens are hard to cook without soda ash like malabar spinach” (10300302)</i>
Usual dietary practice	<i>“The mother said that she is so used to soda ash and she is not ready to leave it”(10200809)</i>

Perceived undesirable sensory attributes: This was attributed to pre-soaking beans before cooking. It was mentioned that the procedure leads to undesirable sensory attributes namely; watery soup, pale colour, slippery texture, reduced flavour and unpleasant smell.

Previous skills: It was stated by the majority of women that whenever they cooked vegetables, they would first cut the vegetables, wash and cook. This is a practice that increases the loss of water-soluble nutrients through leaching. Likewise, it was stated that typically beans were prepared without pre-soaking.

“Vegetables are cut before they are washed.” (10400110)

“I am to cooking beans direct and not willing to soak her beans.” (TIPs mother)

Lack of time: In addition, the mothers complained of a lack of time for pre-soaking and the unavailability of legumes at hand usually before cooking.

“I did not soak them as you had advised because I don't have time.” (10301009).

“I also don't have beans ready in the house for soaking.”(10200801).

4.4 Acceptability of nutritionally improved local recipes developed from seasonally available legumes and vegetables

The improved legume and vegetable recipes of the pre-soaked dry beans with eggplants stew and a vegetable one of cowpea leaves and amaranths/*dodo* in groundnut sauce without soda ash were the most selected compared to those cooked the common way. Group discussions to identify the proportion of participants who selected the modified recipes during a participatory cooking session were conducted. In addition, discussions also included topics on sensory attributes, preparation method, ingredients and materials, overall preparation time, perceived outcomes and health outcomes. The participating women were sampled from the age bracket of (19 -50). The minimum and maximum age were 19 and 50 respectively.

4.4.1 Rate of acceptability of the improved legume and vegetable recipes

Out of the fifty women expected, 88% turned up and 12% were absent. The overall proportion of women from the four pair villages who chose the improved (pre-soaked beans stew) and the unimproved bean/legume recipes during the sensory-testing session was 93% and 7% respectively. All the women from the three village pairs chose the improved type while 21% of the women from one village pair preferred the unimproved legume dish.

Figure 17 shows the proportion of women who chose the improved and the unimproved vegetable recipes during the sensory-testing session per paired village n=44 out of 50 expected. Overall, results show that 89% of the women preferred and chose the improved vegetable recipe. Distinctly, only one village pair had all the participants choosing the improved vegetable recipe (cowpea leaves and amaranths sauce without soda ash).

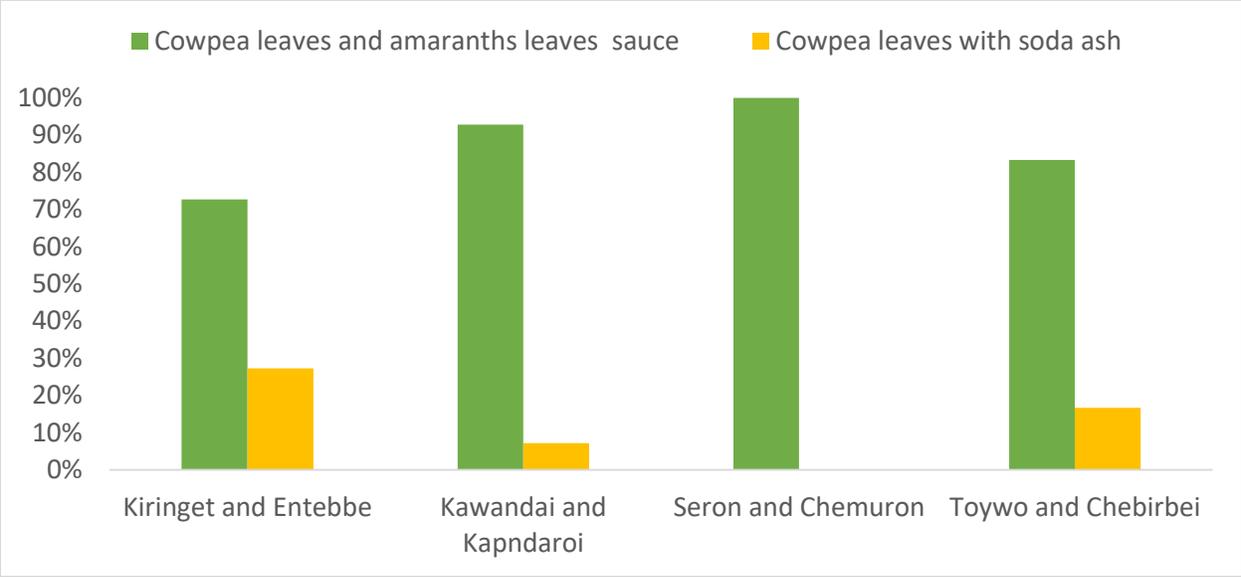


Figure 17: Proportion of women who chose the improved and the unimproved vegetable recipes during the tasting session per paired village (n=44)

4.4.2 Factors facilitating the selection of the improved legume and vegetable recipes

Suitability with local staples: In all recipes, acceptability was motivated by the reason that they were suitable accompaniments to local staples, namely plantain (*matooke*) and Maize meal (*posho*).

“Was tasty and can be eaten with posho and matooke” (Paired village 4: p.4.1.100)

Improved sensory attributes: The women applauded the improved tastes, smell, colour, texture of the modified recipes. They said the recipes were tasty, had a nice appearance, thick broth, less fibrous and tender. Refer to **Table 7** for sample quotes of perceptions on the sensory attributes.

Table 7: Feedback on the sensory attributes for the improved recipes

Sensory properties	Code	Example quotes for the vegetable recipe^a	Example quotes for the legume recipe^b
Smell	Good smell	<i>“Smells like dodo and it is nice” (Paired village 3: p.3.l.87)</i>	<i>“Onions, many tomatoes and eggplants made it smell well” (Paired village 1: p.10.l.297)</i>
Texture	Less fibrous/ Tender	<i>“Soft because of dodo” (Paired village 3: p.3)</i>	<i>“The beans got ready well” (Paired village 3: p.10.l.282)</i>
	Thick broth/Soup	<i>“It was nice since they put enough groundnut sauce making it thick” (Paired village 2: p.4.l.91)</i>	<i>“Soup from here is very thick and nice” (Paired village 4: p.10.l.292)</i>
Appearance	Nice appearance	<i>“Since it was cut, it appeared nice on the plate” (Paired village 1: p.4.l.93)</i>	<i>“They look like fresh beans” (Paired village 4: p.10.l.287)</i>
Taste	Substitute taste of meat	<i>“If I prepare vegetables in this way, I completely will not think of meat” (Paired village 2: p.3.l.82)</i>	na
	Tasty	<i>“This one is very nice and tasty and mixed with dodo, tomatoes, groundnut paste” (Paired village 3: p.4.95).</i>	<i>“The recipe had a mixture of things including eggplants, tomatoes and oils and making it taste nice (Paired village 2: p.11.l.313-314) “Tasted like fresh beans” (Paired village 4: p.10.l.293)</i>

^avegetable recipe refers to cowpea leaves and amaranths leaves sauce without soda ash;

^blegume recipe refers to pre-soaked dry beans with eggplants stew; na: Not applicable/not available

Perceived positive health benefits: Women were able to mention various health benefits perceived to be associated with consumption of the improved recipes. They perceived that the recipes were rich in proteins, vitamins, energy and therefore could cure illnesses, boost immunity, support growth, prevent kwashiorkor and malaria. Refer to Table 8 for details.

Table 8: Perceived health benefits associated with the improved recipes

Perceived health benefits	Example quotes for the vegetable recipe^a	Example quotes for the legume recipe^b
Rich in proteins	<i>“Better in value since the cowpea leaves were mixed with dodo, onions tomatoes plus groundnut paste thus has more protein” (Paired village 1: p.3.1.66).</i>	<i>“Protein is more here found in tomatoes, beans and eggplants” (Paired village 1: p.9.1.258)</i>
Energy giving	<i>“Has much energy, fit for children, Its energy is not destroyed by soda ash” (Paired village 3: p.3.1.73)</i>	na
Increase blood volume	<i>“Dodo also increases blood in the body” (Paired village 3: p.3.1.77)</i>	na
Rich in vitamins	<i>Tomatoes and eggplants have vitamins which is good for the body” (Paired village 4: p.9.1.257)</i>	
Weight gain	<i>“These recipes improve the body, adds the weight and you feel better” (Paired village 2: p.11.1.322)</i>	
Child’s growth	<i>“When you cook these recipes often, the children will not get kwashiorkor and will grow healthy” (Paired village 1: p.3.1.64)</i>	
Cognitive development	<i>“The children will be happy to eat and learn at school well” (Paired village 1: p.3.1.65)</i>	
Treats illnesses	<i>“Eggplants are medicinal it treats malaria and heals the body” (Paired village 2: p.9.1.262)</i>	
Improves skin health	<i>“These ingredients make the body healthy and soft” (Paired village 2: p.3.1.75-76)</i>	
Boost immunity	<i>“The body will get more nutrients and not get sick easily” (Paired village 3: p.9.1.254)</i>	

^avegetable recipe refers to cowpea leaves and amaranths leaves sauce without soda ash;

^blegume recipe refers to pre-soaked dry beans with eggplants stew; na: Not applicable/not available

Affordability: The women mentioned that some ingredients such as amaranths were available in the wild at no cost. They cited that the recipe was affordable because it was cooked without the addition of cooking oil.

“Dodo is also just fetched from the wild” (Paired village 4: p.2.1.58)

Fuel and time saving: The women stated that the bean recipe was affordable and fuel saving since it cooked for a shorter time.

“Has taken less firewood since it cooked for a short time” (Paired village 1: P.8.1.216).

“It also gets ready faster” (Paired village 3: p.2.1.57).

Labour saving: The modified bean recipe was stated to be time and labour saving.

“This can enable us to do other work because it does not tie one around to monitor the water and firewood” (Paired village 4: p.8.1.210-211).

4.4.3 Barriers to the acceptability of the improved legume and vegetable recipes

Neither perceived negative health outcomes nor dislike for recipes were mentioned. Throughout data analysis, none of the women said the cooking method was new. Likewise, unfamiliarity with the tastes and difficulty in following the skills and steps for preparation were not cited.

Cost of specific ingredients: The women said they only use a limited number of ingredients in the traditional recipes. For example, they prepare bean stew with onions and sometimes tomatoes only. The additional ingredients that were used in the improved recipes such as cooking oil, tomatoes, onions, groundnut, cowpea leaves were said to be quite expensive. Eggplants were also meant to be bought whenever it was out of season. They cited that some vegetables were commonly available only in urban centres for example cowpea leaves.

Distance to the market: Mothers reported that even with the availability of income, the markets were far from their homes. This means additional cost of transport, time and energy.

“Some ingredients are bought far from the market in town” (Paired village 4: p.9.1.241)

Time and labour for preparation of vegetable recipe: The women cited that the vegetable recipe cooked longer than in the common method because it had no soda ash which is commonly used to reduce cooking time. In reference to the above reactions, the participants, therefore, explained that the improved vegetable recipe consumed extra wood fuel, they also stated that the additional ingredients required more time to cook.

“Since it took longer time to cook as onions, tomatoes were added with no soda ash, it used more firewood” (Paired village 1: p.2.45)

The women said the vegetable recipe is more labour demanding because of the need to search, sort and cut vegetables.

“Had more work since dodo was first sorted, the cowpeas also sorted and cut and cooked” (Paired village 1: p.2.1.36)

Before the TIPs and still confirmed in TIPs visit one, the mothers mentioned a lot of barriers to the consumption of legumes, vegetables and fruits. However, as the TIPs visits continued, they were able to acknowledge several motivators. Above all the practical cooking sessions enabled them to have hands-on chance to review barriers, especially related to the improved cooking skills. This resulted in successful procedures and outcomes.

CHAPTER FIVE

DISCUSSION OF RESULTS

Dietary diversity and food variety of the diets of women in Kapchorwa

The prevalence of women achieving Minimum Dietary Diversity was 61.3%, this may be attributed to the season that the survey was done in December which corresponds to the second post-harvest season for beans. In this season, the rains are also still favourably available for some vegetables to grow. In Uganda, rural household consumption of legumes, vegetables and fruits is highly dependent on seasons and own household production entirely favoured by rain fed agriculture (MAAIF, 2016). The Kapchorwa, area receives rainfall in April, May, June, July, September, October, November and September. Rain is not received in January, February, March and August. Likewise, in Uganda the consumption of beans peak in November and continue to deteriorate monthly and peak again in July which is the harvest season (Larochelle et al., 2015). The beans are sometimes sold to the market (UNDP, 2012). Income can therefore be used for buying other essential needs or income. The income may be used to buy other foods in addition to legumes that may contribute to dietary diversity. Other farm produce can also be sold to provide income that may be used to buy nutritious foods (Koppmair et al., 2017). In the study area tomatoes and onions are used as spices and only added in negligible amounts but these foods could have significantly contributed to an increased number of food groups and led to the above consumption score in the MDD-W.

Altogether, women consumed a total count of only 15 food types out of the 37 possible food items from the legumes, vegetables and fruits groups showing a significant monotonous diet. Food variety (FV) is an indicator of a good diet because the various foods one eats increases the chances of receiving adequate nutrients (Sealey-Potts & Potts, 2014). Less varied foods are also monotonous and reduce overall nutrient intake. This increases the risk of under-nutrition and micronutrients.

In Uganda, a study amongst children showed a significant improvement in dietary diversity and nutritional status when children were fed a variety of foods (Kabahenda et al., 2014). On the other hand, low food variety is significantly related to micronutrient inadequacy (Meng et al., 2018).

Vegetables and legumes are rich sources of proteins, fats, carbohydrates, minerals, antioxidants, fibre, water and vitamins such as sources of beta-carotene, thiamine (B₁), riboflavin (B₂), niacin, pyridoxine (B₆), pantothenic acid, folic acid, ascorbic acid and vitamin E and K. Different plant foods contain also different bioactive plant compounds like phenolic acids that makes eating a variety of foods an important approach to consume a wide range of nutrients and minerals (Krawinkel, 2017). Fruits are an equally important source of various vitamins and minerals. Women of reproductive age are at high risk of micro-nutrient deficiency due to increased needs during menstruation, pregnancies and lactation. While the increased demand for growth during childhood leaves children vulnerable to malnutrition and micronutrient deficiency (FAO, 2016).

Applicability of the recommended Behaviour Change Messages (BCC) in improving food variety and diet diversity

TIPs is a useful strategy to test the feasibility of recommendations that facilitate general household and young children's consumption of diverse diets. This nutrition education approach is essential for sustainable behavior change communication (Talavera et al., 2020). The participants through individual counselling are offered a series of food related recommendations in which they can voluntarily select those that are easy for them. This process enabled the participants to discuss freely the barriers and facilitating factors for practicing improved dietary practices.

The majority of women following the dietary recommendations either tried or expressed willingness to eat a variety of legumes and vegetables. Women were motivated by the perceived positive health benefits specifically nutrition outcomes. According to the health belief theory of change, when individuals acknowledge health benefits then they are likely to take up promoted behaviours (Contento, 2011). Women were also motivated by the access and availability of legumes, vegetables and fruits in the market, shops, neighbourhood and forest and from their own production. Nevertheless, women also complained that for them to have a variety, they needed to access the markets which were too far and operated on limited days in the week. A study in Malawi explained that distance to the market is related to low dietary diversity (Koppmair et al., 2017; Madzorera et al., 2015). The cost associated with time and transport, therefore, made it unrealistic for them to go there regularly, a similar problem confirmed in a survey in Guatemala (FANTA, 2015).

Seasonality also affected the availability of legumes, vegetables and fruits. The first round of the trials was done in the lean season, hence when the dry season escalated, the price of vegetables and fruits increased. Similarly, market and farm diversity reduced leading to a reduction in diet diversity and food variety. At this time, vegetables were also hardly available on the farm and in the backyard gardens. Towards the planting seasons, legumes became scarce and expensive too because bean seeds had to be kept for planting. This impacted negatively the ability of the households to enhance their legume consumption. Food availability is also affected by other factors like low production, inadequate household stock and storage facilities or the need to sell legumes to get income required for other non-food essential household needs such as school fees. The likelihood that households eat diverse meals is high in the post-harvest season because of increased produce and income whereas during the lean season poorer households are likely to eat less diverse legumes, vegetables and fruits because of high costs and lack of own production stock (Ayenew et al., 2018; Jordan et al., 2022; Keding, Msuya, Maass & Krawinkel, 2012). The fact that most women did not have other sources of income and were generally subsistence farmers made it challenging to take up the recommendations because of the reduced bargaining power of the foods available in the market.

To achieve sustainable nutrition outcomes, practices related to food preparation should likewise be undertaken. As recommended by Bekele & Turyashemererwa (2019), pre-soaking of legumes before cooking leads to a substantial reduction in cooking time, saves fuel and improves sensory attributes. Pre-soaking of dry legumes before cooking increases absorption of nutrients preventing mal-absorption due to trypsin (Hotz & Gibson, 2007). Before the TIPs process, the soaking of beans was less known or rejected because of the perceived undesirable sensory attributes such as blunt taste, watery texture and pale colour of the product. However, during the trials, the recommendations and recipes which focused on soaking were gladly accepted by the women who tried pre-soaking of dry beans before cooking. Pre-soaking of dry legumes reduced some barriers that were mentioned such as “legumes preparation consumes a lot of fuel and time” hence pre-soaking of beans turned out to be the most acceptable solution. However, reported barriers were previous skills and food culture. The participating women said that they were conflicted with the perceived social attitudes attributed to deviating from cultural skills. Culture determines most of the skills and is transferred from one generation to another.

It was also noted that improved food-related practices were perceived to be time and labour consuming. For example, the women complained about the time required for pre-soaking of legumes, searching for ingredients, cutting vegetables and attending to food while it cooks. This is because women were always busy with other household chores, child caring and garden work. They therefore commonly chose to cook legumes without soaking.

Incorporating the legumes, vegetables and fruits in complementary feeding was determined by factors such as acceptability by the child, previous parenting practices, perceived health outcomes and mother's knowledge and skills of cooking. Women reported that they did not know the procedures for preparing complementary foods that included a mixture of legumes, vegetables and fruits. Also, they perceived that vegetables could not be used to feed children. A study in western Kenya also confirmed that lack of knowledge on how best to prepare and incorporate legumes, vegetables and fruits in infants and young children's meals is one of the reasons for the poor quality of complementary foods (Kretz & Jordan, 2020). Inadequate knowledge could also be a result of lack of exposure to nutrition education or low school education of the women (Ogbo et al., 2018).

Feasibility of modified recipes tested during the cooking demonstrations

The recipes tested in this study were modified using locally available ingredients such as groundnuts, common beans, eggplants, tomatoes, onions, amaranths and cowpea leaves. This was done because modified recipes are more likely to be acceptable when modified from familiar, locally and culturally acceptable ingredients and not based on novel foods. (Mbela et al., 2018). Acceptability was motivated by the taste, colour, aroma/smell and texture. Sensory characteristics should be modified with a target on preferences, cultural acceptance, familiarity and affordability of ingredients. Dislikes for vegetables and legumes originate from undesirable experiences with food tastes, for example, participants reported some vegetables were bitter, fibrous and tough indicating dislike. Handling perceived barriers to consumption by reducing bitterness, hardness and roughness, improving food colour, taste and aroma enhanced the acceptance of the modified recipes.

The recipes were cooked using common cooking methods in the area specifically stewing and boiling. Modification of recipes from local ingredients and cooking them by usual cooking and preparation methods motivated participants as confirmed in a study in Uganda (Bekele &

Turyashemererwa, 2019). This enhances faster learning of cooking procedures hence improving self-efficacy and confidence. Findings showed that women also wanted legume and vegetable recipes that were a suitable accompaniment to their local staples because they believed it enhanced the taste of the modified legume vegetable recipes. In addition, they also wanted the recipes whose preparation procedures saved their time and labour.

Furthermore, participatory cooking demonstrations enable participants to have practical food preparation enhancing the acquisition of their skills, knowledge and confidence (FAO, n.d.). According to Garcia et al., (2016), participatory cooking can improve cooking skills, self-confidence and eating behaviour. When participants are given the opportunity to prepare meals and chop ingredients, they get the knowledge of mixing diverse foods to enhance nutritional value and variety. In the same opportunity, they practice improved pre-preparation and preparation methods that conserve nutrients and save time and energy (Garcia et al., 2016). Other behaviours related to food, personal and environmental hygiene are also acquired. Tasting the food cooked by participants in actuality and evaluating acceptance of the taste, appearance, smell, texture, cooking time, nutritional value and cooking method. These enhance the choice of improved practices in complementary feeding and household diet. Feedback can be used to guide the improvement of the food environment to support the adoption of practices such as labour and energy-saving measures, modification of food taste and preference, cooking skills and nutrition knowledge.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1. Conclusion

Children above one year are usually fed from the family pot, therefore improving the dietary diversity of household meals can lead to considerable enhancement in complementary and general family meals. In this study, it was confirmed that the diets of the women and children were less diverse with a higher percentage composed of starchy staples and were low in cheap sources of proteins and micronutrients such as legumes, fruits and vegetables. This leaves children and women vulnerable to malnutrition and micronutrient deficiencies. Additionally, it was also confirmed that variety within food groups was low displaying a significantly monotonous diet. Efforts to improve dietary diversity using measures such as behaviour change communication complemented with modified recipes implemented during participatory cooking sessions embedded with sensory testing demonstrated that the women were finally willing to adopt the improved practices that aimed at achieving dietary diversity. This method of inquiry started with TIPs, the procedure enabled individuals to voluntarily select behaviours and practices that were affordable, easy and culturally acceptable. As quoted from Contento (2011), “participants are not only to be changed but they are the changers”. The tailored visits offered participants time to contemplate and they were motivated by the face-to-face individual discussions which gave confidentiality hence enabling support to modify the barriers faced. However most significantly, it was observed that prior to the cooking sessions, some participants were still hesitant to try the improved practices this confirms that nutrition knowledge alone may be mysterious, complex and difficult to understand.

Overall, testing of the improved recipes during participatory cooking sessions gave the participants confidence. During the sessions, the women had a chance to review the practices together at the same time change negative attitudes towards perceptions, especially on sensory attributes. Practical cooking sessions provided a hands-on chance for individuals to cut ingredients, cook, practice food hygiene and nutrient conservation and taste the food. This enhanced the acquisition of nutritional knowledge, attitude and skills hence allowing families to develop confidence for adopting improved dietary practices.

6.2. Recommendations

Nutrition education approaches should be a combination of well-planned strategies that enable participants to make voluntary decisions. This supports the adoption of dietary behaviors that are feasible culturally, socially and economically.

Advocates for dietary diversity should emphasize the consumption of a variety of foods within food groups. This improves the possibility of consuming a variety of food nutrients for better health.

Behavior change messages should focus on improving Knowledge; Attitude and Practices (KAP). This enables participants to overcome barriers to adopting improved practices.

Modified recipes should be developed from ingredients that are seasonally available thus improving availability and, physical and economic access. Procedures for the improved recipes should be modified in consideration to time for pre-preparation and preparation since women are usually engaged in other essential activities. Modified recipes should be easily prepared using common cooking methods and equipment. Additionally, considering the labor needed for preparation is essential that is to say; the procedure for preparation should be few and simple for better memorization. Recipe procedures should be organized using visual aids, this is important for easy interpretation by all people of different educational backgrounds. These visual aids when offered to participants after the cooking demonstration will enhance the recalling of the recipe procedures and therefore long-term memory.

In summary, to achieve satisfactory nutrition education outcomes, interventions should be intertwined with various environmental supports that promote food availability and access.

REFERENCES

- Abizari, A. R., Azupogo, F., Nagasu, M., Creemers, N., & Brouwer, I. D. (2017). Seasonality affects dietary diversity of school-age children in northern Ghana. *PLoS ONE*, *12*(8). <https://doi.org/10.1371/journal.pone.0183206>
- Adubra, L., Savy, M., Fortin, S., Kameli, Y., Kodjo, N. E., Fainke, K., & Martin-Prevel, Y. (2019). The 'Minimum Dietary Diversity for Women' (MDD-W) indicator is related to household food insecurity and farm production diversity: <https://pubmed.ncbi.nlm.nih.gov/30899899/>
- Arimond, M., Wiesmann, D., Becquey, E., Carriquiry, A., Daniels, M. C., Deitchler, M., ... & Torheim, L. E. (2010). Simple food group diversity indicators predict micronutrient adequacy of women's diets in 5 diverse, resource-poor settings. *The Journal of nutrition*, *140*(11), 2059S-2069S.
- Ashagidigbi, W. M., & Dahunsi, A. (2018). Poverty status of households and child malnutrition in rural population of Nigeria. *J. Environ. Agric. Sci*, *16*, 42-49. <https://www.academia.edu/43488816>
- Ayew, H. Y., Biadgilign, S., Schickramm, L., Abate-Kassa, G., & Sauer, J. (2018). Production diversification, dietary diversity and consumption seasonality: panel data evidence from Nigeria. *BMC Public Health*, *18*(1), 1-9. <https://europepmc.org/article/PMC/PMC6083632>
- Bekele, H., & Turyashemererwa, F. (2019). Feasibility and acceptability of food - based complementary feeding recommendations using Trials of Improved Practices among poor families in rural Eastern and Western Uganda. *Food science & nutrition*, *7*(4), 1311-1327. <https://doi.org/10.1002/fsn3.964>
- Breda Gavin-Smith, K. G. V. Z. (2018). Double burden of malnutrition. *Sight and Life*, *32*(2), 204. https://sightandlife.org/wp-content/uploads/2018/12/SALMZ_0218-1.pdf
- Bhandari, N., & Chowdhury, R. (2016). Infant and young child feeding. *Proceedings of the Indian National Science Academy*, *82*(5), 1507–1517. <https://doi.org/10.16943/ptinsa/2016/48883>
- Flattum, C., Friend, S., Story, M., & Neumark-Sztainer, D. (2011). Evaluation of an individualized counseling approach as part of a multicomponent school-based program to prevent weight-

- related problems among adolescent girls. *Journal of the American Dietetic Association*, 111(8), 1218-1223.111(8), 1218-1223. <https://doi.org/10.1016/j.jada.2011.05.008>
- Contento, I. R. (2011). *Nutrition Education: Linking Research, Theory and Practice* (2 Edition). Jones and Bartlett. <https://doi.org/10.1007/s13398-014-0173-7.2>
- Creswell, J. W. (2013). Steps in conducting a scholarly mixed methods study.
- Education and Training for Sustainable Agriculture and Nutrition in East Africa, EaTSANE (2018-2019). <https://www.eatsane.info/background>
- Ekesa, B., Ariong, R. M., Kennedy, G., Baganizi, M., & Dolan, I. (2020). Relationships between land tenure insecurity, agrobiodiversity, and dietary diversity of women of reproductive age: Evidence from Acholi and Teso subregions of Uganda. *Maternal and Child Nutrition*, 16(S3), 1–13. <https://doi.org/10.1111/mcn.12965>
- Ekesa, B., Nabuuma, D., Namukose, S., & Upenytho, G. (2020). *Nutrition Social Behavior Change and Communication (SBCC) guidance*. <https://hdl.handle.net/10568/107925>. [https://www.researchgate.net/publication/341179850 Nutrition_Social_Behavior_Change_and_Communication_SBCC_guidance.pdf](https://www.researchgate.net/publication/341179850_Nutrition_Social_Behavior_Change_and_Communication_SBCC_guidance.pdf)
- Erlingsson, C., & Brysiewicz, P. (2017). A hands-on guide to doing content analysis. *African Journal of Emergency Medicine*, 7(3), 93–99. <https://doi.org/10.1016/j.afjem.2017.08.001>. <https://www.sciencedirect.com/science/article/pii/S2211419X17300423>
- Food and Nutrition Technical Assistance (FANTA). (2015). Validation of food-based recommendations developed using optifood for groups at nutritional risk in the western highlands of guatemala. *Washington, DC: FHI 360/FANTA., August*, 1–4. https://www.fantaproject.org/sites/default/files/resources/FBRTrialsReport_July2016.pdf
- Food and Agricultural Organisation (FAO). (n.d.). *Participatory Cooking Demonstrations in Nutrition Education*. [http://www.fao.org/tempref/AG/agn/nutrition/Briefing_KIT/Espanol_not_complete/Notas de información - PDF/Briefing Note_Participatory Cooking Demonstrations.pdf](http://www.fao.org/tempref/AG/agn/nutrition/Briefing_KIT/Espanol_not_complete/Notas_de_información_PDF/Briefing_Note_Participatory_Cooking_Demonstrations.pdf)
- Food and Agricultural Organisation (FAO). (2010). *Knowledge sharing for improved food security*

and nutrition. Electronic publishing policy and support branch communication division.
<http://km.fao.org/fsn>. <https://www.fao.org/3/i0594e/i0594e00.pdf>

Food and Agricultural Organisation (FAO). (2011). “ *Improve the Food Security of Farming Families Affected by Volatile Food Prices* .” foodsecurity.mekonginstitute.org/project-379

Food and Agricultural Organisation (FAO). (2016). *Integrating agriculture and nutrition education for improved young child nutrition*. www.fao.org/publications.
<https://www.fao.org/publications/card/en/c/9445c00a-2369-45e7-95ad-6cbe33156e7e/>

Food and Agricultural Organisation (FAO) (2017). Guide in conducting participatory cooking sessions to improve complementary feeding practices.
<http://www.fao.org/3/i7265e/i7265e.pdf>

Food and Agricultural Organisation(FAO) & FHI 360. (2010). *Minimum Dietary Diversity for Women- A Guide to Measurement*.
<https://www.sciencedirect.com/science/article/abs/pii/S0306919217301902>

Garcia, A. L., Reardon, R., McDonald, M., & Vargas-Garcia, E. J. (2016). Community interventions to improve cooking skills and their effects on confidence and eating behaviour current nutrition reports, 5(4), 315–322. <https://doi.org/10.1007/s13668-016-0185-3>

Glas, M., Röhlig, A., Waswa, L., Krawinkel, M., & Nuppenau, E. A. (2018). Dietary diversity and consumption of foods from different food groups among small holder women farmers in Kenya, Malawi and Uganda. [https://www.uni-giessen.de/fbz/zentren/zeu/Ress/Glas_poster A4](https://www.uni-giessen.de/fbz/zentren/zeu/Ress/Glas_poster_A4).

Hanley-Cook, G. T., Tung, J. Y. A., Sattamini, I. F., Marinda, P. A., Thong, K., Zerfu, D., & Lachat, C. K. (2020). Minimum Dietary Diversity for Women of Reproductive Age (MDD-W) data collection: validity of the list-based and open recall methods as compared to weighed foodrecord. *Nutrients*, 12(7),2039.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7400839/>

Hollywood, L., Surgenor, D., Reicks, M., McGowan, L., Lavelle, F., Spence, M., & Dean, M. (2018). Critical review of behaviour change techniques applied in intervention studies to

- improve cooking skills and food skills among adults. *Critical reviews in food science and nutrition*, 58(17), 2882-2895. <https://pubmed.ncbi.nlm.nih.gov/28678613/>
- Hotz, C., & Gibson, R. S. (2007). Traditional food-processing and preparation practices to enhance the bioavailability of micronutrients in plant-based diets. *Journal of Nutrition*, 137(4), 1097–1100. <https://doi.org/10.1093/jn/137.4.1097>
- Ickes, S. B., Baguma, C., Brahe, C. A., Myhre, J. A., Adair, L. S., Bentley, M. E., & Ammerman, A. S. (2017). Maternal participation in a nutrition education program in Uganda is associated with improved infant and young child feeding practices and feeding knowledge: a post-program comparison study. *BMC nutrition*, 3(1), 1-10. <https://bmcnutr.biomedcentral.com/articles/10.1186/s40795-017-0140-8>
- Ickes, S. B., Jilcott, S. B., Myhre, J. A., Adair, L. S., Thirumurthy, H., Handa, S., & Ammerman, A. S. (2012). Examination of facilitators and barriers to home-based supplemental feeding with ready-to-use food for underweight children in western Uganda. *Maternal & child nutrition*, 8(1), 115-129. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3886188/>
- Integrated Food Security Phase Classification (IPC). (2017). Report of the integrated food security phase classification analysis for Uganda: *Technical Working Group by Uganda. January, 1–80*. <https://reliefweb.int/report/uganda/report-integrated-food-security-phase-classification-analysis-uganda-january-2017>
- Tidemann-Andersen, I., Acham, H., Maage, A., & Malade, K. M. (2011). Iron and zinc content of selected foods in the diet of schoolchildren in Kumi district, East of Uganda: A cross-sectional study. *Nutrition Journal*, 10(1), 81. <https://doi.org/10.1186/1475-2891-10-81>
- Jilcott, S. B., Ickes, S. B., Ammerman, A. S., & Myhre, J. A. (2010). Iterative design, implementation and evaluation of a supplemental feeding program for underweight children ages 6–59 months in Western Uganda. *Maternal and child health journal*, 14(2), 299-306. <https://pubmed.ncbi.nlm.nih.gov/19199014>
- Jordan, I., Röhlig, A., Glas, M. G., Waswa, L. M., Mugisha, J., Krawinkel, M. B., & Nuppenau, E.-A. (2022). Dietary diversity of women across agricultural seasons in the Kapchorwa

- district, Uganda: results from a cohort study. *Foods*, *11*(3), 344. <https://doi.org/10.3390/foods11030344>
- Kabahenda, M. K. Andress, E. L., Nickols, S. Y., Kabonesa, C., & Mullis, R. M. (2014). Promoting dietary diversity to improve child growth in less-resourced rural settings in Uganda. *Journal of Human Nutrition and Dietetics*, *27*(SUPPL2), 143–151. <https://doi.org/10.1111/jhn.12056>
- Keding, G. B., Msuya, J. M., Maass, B. L., & Krawinkel, M. B. (2012). Relating dietary diversity and food variety scores to vegetable production and socio-economic status of women in rural Tanzania. *Food Security*, *4*(1), 129–140. <https://doi.org/10.1007/s12571-011-0163-y>
- Kennedy, E., Stickland, J., Kershaw, M., & Biadgilign, S. (2018). *Journal of Human Nutrition*. *2*(1), 34–46. <https://doi.org/10.36959/487/280>
- Khamis, A. G., Mwanri, A. W., Ntwenya, J. E., & Kreppel, K. (2019). The influence of dietary diversity on the nutritional status of children between 6 and 23 months of age in Tanzania. *BMC Pediatrics*, *19*(1), 1–9. <https://doi.org/10.1186/s12887-019-1897-5>
- Krawinkel, M. (2017). *Dietary Diversity Score : A Measure of Nutritional Adequacy or an Indicator of Dietary Diversity Score : A Measure of Nutritional Adequacy or an Indicator of Healthy Diet ? August 2016*. <https://doi.org/10.15744/2393-9060.3.303>
- Kretz , E.C., & Jordan., I. (2020). Determinants of feeding practices for children aged 0-8 years in Teso South Sub-County, Kenya: An applied research study using Trials of Improved Practices (TIPs). Justus-Liebig-University Giessen, Germany. Unpublished Master thesis.
- Koppmair, S., Kassie, M., & Qaim, M. (2017). Farm production, market access and dietary diversity in Malawi. *Public health nutrition*, *20*(2), 325–335. <https://doi.org/10.1017/S1368980016002135>
- Kuchenbecker, J., Reinbott, A., Mtimuni, B., Krawinkel, M. B., & Jordan, I. (2017). Nutrition education improves dietary diversity of children 6-23 months at community-level: Results from a cluster randomized controlled trial in Malawi. *PloS one*, *12*(4), e0175216. <https://pubmed.ncbi.nlm.nih.gov/28426678/>
- Larochelle, C., Katungi, E., & Beebe, S. (2015). *Disaggregated Analysis of Bean Consumption*

Demand and Contribution To Household Food Security in Uganda. January, 1–29.
<https://doi.org/10.13140/RG.2.1.1279.6002>

Ministry of Agriculture Animal Industries and Fisheries (MAAIF). (2016). *Guidelines for integrating nutrition in agriculture enterprise mixes*. Ministry of Animal Industry and Fisheries guidelines. <https://www.fantaproject.org/sites/.../Uganda-Ag-Enterprise-Guidelines-Aug2016.pdf>

Madzorera, I., Blakstad, M. M., Bellows, A. L., Canavan, C. R., Mosha, D., Bromage, S., & Fawzi, W. W. (2021). Food crop diversity, women's income-earning activities, and distance to markets in relation to maternal dietary quality in Tanzania. *The Journal of Nutrition, 151*(1), 186-196. <https://academic.oup.com/jn/article/151/1/186/6007024>

Manoff Group. (2001). *Trials of Improved Practices (TIPs)*. <https://www.manoffgroup.com/wp-content/uploads/summarytips.pdf%0A>.

Mamiro, P., Nyagaya, M., Kimani, P., Mamiro, D., Jumbe, T., Macha, J., & Chove, B. (2011). Similarities in functional attributes and nutritional effects of magadi soda and bean debris-ash used in cooking African traditional dishes. *African Journal of Biotechnology, 10*(7), pp.1181–1185. <https://www.ajol.info/index.php/ajb/article/view/92836>

Matare, C. R., Craig, H. C., Martin, S. L., Kayanda, R. A., Chapleau, G. M., Kerr, R. B., & Dickin, K. L. (2019). Barriers and opportunities for improved exclusive breast-feeding practices in Tanzania: household trials with mothers and fathers. *Food and nutrition bulletin, 40*(3), 308-325. <https://pubmed.ncbi.nlm.nih.gov/31067996/>

Mbela, D. E. N., Kinabo, J., Mwanri, A. W., & Ekesa, B. (2018). Sensory evaluation of improved and local recipes for children aged 6 to 23 months in Bukoba, Tanzania. *African Journal of Food Science, 12*(11), 297–308. <https://doi.org/10.5897/ajfs2018.1738>.

Meng, L., Wang, Y., Li, T., Loo-Bouwman, C. A. V., Zhang, Y., & Man-Yau Szeto, I. (2018). Dietary diversity and food variety in Chinese children aged 3–17 years: Are they negatively associated with dietary micronutrient inadequacy?. *Nutrients, 10*(11), 1674. <https://pubmed.ncbi.nlm.nih.gov/30400573/>

- Muehlhoff, E., Wijesinha-Bettoni, R., Westaway, E., Jeremias, T., Nordin, S., & Garz, J. (2017). Linking agriculture and nutrition education to improve infant and young child feeding: Lessons for future programmes. *Maternal & child nutrition*, *13*, e12411. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6865961/>
- Nabuuma, D., Ekesa, B., & Kennedy, G. (2018). Dietary diversity among smallholder households in Bukoba District, Tanzania and Kiboga District, Uganda. *African Journal of Food, Agriculture, Nutrition and Development*, *18*(1), 13110–13128. <https://doi.org/10.18697/ajfand.81.17110>
- Najjumba, I. M., Bunjo, C. L., Kyaddondo, D., & Misinde, C. (2013). Improving learning in Uganda Vol. I: Community-led school feeding practices. In *Vasa*. <https://doi.org/10.1596/978-0-8213-9743-5>
- Nguyen, P. H., Martin-Prevel, Y., Moursi, M., Tran, L. M., Menon, P., Ruel, M. T., & Arimond, M. (2020). Assessing dietary diversity in pregnant women: relative validity of the list-based and open recall methods. *Current developments in nutrition*, *4*(1), nzz134. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7101484/>
- Oduol, J., Kimaiyo, J., Kegode, H., Isubikal, P., Jere, I., Buyinza, J., & Chemangei, A. (2017). Strategies for developing value chains in Manafwa , Kapchorwa and solwezi developing value chain innovation platforms to contributing authors. <http://apps.worldagroforestry.org/sites/default/files/outputs/Oduol%20et%20al.%202017.Value%20chain%20development%20strategies%20report.pdf>
- Ogbo, F. A., Ogeleka, P., & Awosemo, A. O. (2018). Trends and determinants of complementary feeding practices in Tanzania, 2004–2016. *Tropical medicine and health*, *46*(1), 1-13. <https://doi.org/10.1186/s41182-018-0121-x>.
- Petry, N., Olofin, I., Hurrell, R. F., Boy, E., Wirth, J. P., Moursi, M., Angel, M. D., & Rohner, F. (2016). The Proportion of Anemia Associated with Iron Deficiency in Low, Medium and High Human Development Index Countries : A Systematic Analysis of National Surveys. *Nutrients*, *8*(693), 1–17. <https://doi.org/10.3390/nu8110693>.
- Powell, B., Kerr, R. B., Young, S. L., & Johns, T. (2017). The determinants of dietary diversity

and nutrition: ethno-nutrition knowledge of local people in the East Usambara Mountains, Tanzania. *Journal of ethnobiology and ethnomedicine*, 13(1), 1-12.
<https://www.cifor.org/knowledge/publication/6474/>

Qualitative Data Analysis (QDA) miner lite an open-source qualitative data analysis software; QDA Miner (free version) download for PC (freedownloadmanager.org).
https://en.freedownloadmanager.org/users-choice/Qda_Miner_4.1_Download.htm

Rah, J. H., Akhter, N., Semba, R. D., Pee, S. De, Bloem, M. W., Campbell, A. A., Sun, K., Badham, J., & Kraemer, K. (2010). “ Low Dietary Diversity Is a Predictor of Child Stunting in Rural Bangladesh Low dietary diversity is a predictor of child stunting in rural Bangladesh. *European Journal of Clinical Nutrition*, 64(12), 1393–1398.
<https://doi.org/10.1038/ejcn.2010.171>

Reinbott, A., Schelling, A., Kuchenbecker, J., Jeremias, T., Russell, I., Kevanna, O., Krawinkel, M. B., & Jordan, I. (2016). Nutrition education linked to agricultural interventions improved child dietary diversity in rural Cambodia. *British Journal of Nutrition*, 116(8), 1457–1468.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5082286/>

Ruel, M. T., Deitchler, M., & Arimond, M. (2010). Developing simple measures of women's diet quality in developing countries: overview. *The Journal of nutrition*, 140(11), 2048S-20

Saunders, B., Kitzinger, J., & Kitzinger, C. (2015). Anonymising interview data: Challenges and compromise in practice. *Qualitative Research*, 15(5), 616-632.
<https://journals.sagepub.com/doi/full/10.1177/1468794114550439>

Savy, M., Martin-Prével, Y., Traissac, P., Eymard-Duvernay, S., & Delpeuch, F. (2006). Dietary diversity scores and nutritional status of women change during the seasonal food shortage in rural Burkina Faso. *Journal of Nutrition*, 136(10), 2625–2632.
<https://doi.org/10.1093/jn/136.10.2625>

Sealey-Potts, C., & Potts, A. (2014). An Assessment of Dietary Diversity and Nutritional Status of Preschool Children. *Austin Journal of Nutrition and Food Science*, 2(7), 1040.
<http://austinpublishinggroup.com/nutrition-food-sciences/fulltext/ajnfs-v2-id1040.php>

- Sié, A., Moe, C., Ouermi, L., Zabre, P., Dah, C., Arzika, A. M., Oldenburg, C. E., Tapsoba, C., Bärnighausen, T., Snyder, B. M., Keenan, J. D., & Lebas, E. (2018). Dietary diversity and nutritional status among children in rural Burkina Faso. *International Health*, *10*(3), 157–162. <https://doi.org/10.1093/inthealth/ihy016>.
- Somé, J. W., & Jones, A. D. (2018). The influence of crop production and socioeconomic factors on seasonal household dietary diversity in Burkina Faso. *PloS one*, *13*(5), e0195685. <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0195685>
- Talavera, M. T. M., Orillo, A. T. O., Domingo, D. G. C., & Abacan, S. F. (2020). Participatory cooking demonstration to enhance capacity of community nutrition workers in promoting optimal complementary feeding practices. *3*(2), 2017–2022. <http://socialhealthjournal.org/wp-content/uploads/2020/08/8-18-Article-2-JOSHV312.pdf>
- Tamale, D., & Kagoro-Rugunda, G. (2019). Dietary diversity among women of reproductive age (15-49 years): implication for folate deficiency in Mbarara district, Uganda. *International Journal Of Community Medicine And Public Health*, *6*(7), 2745. <https://doi.org/10.18203/2394-6040.ijcmph20192802>
- Teddlie, C., & Tashakkori, A. (2009). Foundations of mixed methods research: Integrating quantitative and qualitative approaches in the social and behavioural sciences: SAGE publications, Inc
- Sanghvi, T., Haque, R., Roy, S., Afsana, K., Seidel, R., Islam, S., & Baker, J. (2016). Achieving behaviour change at scale: Alive & Thrive's infant and young child feeding programme in Bangladesh. *Maternal & child nutrition*, *12*, 141-154. <https://pubmed.ncbi.nlm.nih.gov/27187912/>
- Uganda Bureau of Statistics (UBOS) and ICF. 2017. Uganda Demographic and Health Survey 2016: Key Indicators Report. Kampala, Uganda: UBOS, and Rockville, Maryland, USA: UBOS and ICF.
- United Nations. (2017). *The Sustainable Development Goals Report 2017*. <https://unstats.un.org/sdgs/files/report/2017/thesustainabledevelopmentgoalsreport2017.pdf>

- United Nations International Childrens Emmergency Fund (UNICEF) (1998). *The State of the World's Children 1998*. New York, USA: Oxford University Press
- World Health Organisation (2010). *Indicator for assessing Infant and Young Child feeding Practices; Part 2 measurement*. Geneva Switzerland. 9789241599290 eng.pdf;sequence=1 (who.int).
- World Health Organisation WHO (2008). *Indicators for assessing infant and young child feeding practices. Part I, Definitions, conclusions of a consensus meeting held 6–8 November 2007 in Washington, DC, USA*.
- World Health Organisation (WHO) (2017). *Global Nutrition Monitoring Framework Operational Guidance for tracking progress in meeting targets for 2025*. <https://apps.who.int/iris/bitstream/handle/10665/259904/9789241513609-eng.pdf?sequence=1>
- Waswa, L. (2016). *Improving dietary diversity and nutritional health of women and children under two years through increased utilization of local agrobiodiversity and enhanced nutrition knowledge in Kenya* (1 Edition). Justus-Liebig-University Giessen.

APPENDICES

A 1: Questionnaires

A1.1: Sample of 24 hr recall questionnaire for women translated to the local dialect (Kupsabiny)

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12.1 Mother: 24h-recall

<p>Asoomiinj kule pooru amiik (amiik ak snacks) ak kule tyaa :cēē kweeyaam ankeeyey amutun peet ak koomooy ak coomē kule kuceesat kule nee. Pooru paatee amiik cēē coomē am kaa, puryee ku coo coole arjaamee wulyaa ake nyēē puryee ku kaa. Cakēē amiik cēē yoomē kōrōrōn.</p> <p>Sil nyuny am yu pore wuloo yaataat amiik tōkōl cēē kaceemwoow. Yēē miitē kaceemwoow amiik cēē yoomootin, teep tukuuk cēē kicēeywēētyi. Kēērsyi amiik/snacks cēē munācēēmwoow. Yēē kawaany nalalateet kule, sil kurupuunakaap amiikaap kuruptooy keey ak coo kaceejaloolē..</p>		
Pooru amiik/Snack	Saaweeet (yooyeeec paatee yoo peet)	Sil amiik (/Kiceesat amiicu kule nee nto kweeyaam kule nee?)
Kukwaam nee leekweet yēē kurjeete kōrōrōn amutun? milk Tea, mandazi	9:00am	milk, Tea leaves, Sugar, mandazi, cooking oil
Kiy nee yeec ake nyēē kweeyaam :nyii? posho, sukumawiki, Beans,	Lunch	maize flour, sukuma wiki, Beans, cooking oil, Salt, Onions, tomatoes.
Kiy nee yeec ake nyēē kweeyaam :nyii? Matooke, Beans, Black Tea	super	Matooke, Beans, cooking oil, Onions, tomatoes, Salt.
Kiy nee yeec ake nyēē kweeyaam :nyii?		
Kiy nee yeec ake nyēē kweeyaam :nyii?		
Kiy nee yeec ake nyēē kweeyaam :nyii?		
Kiy nee yeec ake nyēē kweeyaam :nyii?		
Kiy nee yeec ake nyēē kweeyaam :nyii?		
Kweeyaam :nyii kiito ake (amiik nto snack) amutun am WULYAA AKE nyēē puryee ku kaa?	1 = Yunyooto 2 = puryo 88= mākēt	2

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A 1.2: Questionnaire for Trials of Improved Practices visit one

	Key Activity/behavioural change message	Comments take brief notes
	<p>GREET.</p> <p>Include small talk on weather, agricultural activities and general household chores in relation to what you found the mother doing when you get to household.</p>	
1.1	<p>Seek primary female caregiver's consent to participate in the study.</p>	
1.2	<p>Thank mother for her consent and continued engagement in HealthyLAND/EaTSANE activities</p>	
2	<p>ASK & ANALYZE</p>	
2.1	<p>Get caregiver engaged by Asking about her own health as part of greeting i.e. casually.</p>	
2.2	<p>Ask about healthyLAND project child to gain attention of the mother.</p>	
2.3	<p>Ask if there are other children younger than project child.</p>	
2.4	<p>Ask caregiver to explain how/what she feeds her children.</p> <p>Note: Probe to see if child that is:</p> <p>0-6 months</p> <p>Is exclusively breastfeeding and mother is eating adequate food including legumes and vegetables to produce enough milk</p>	
	<p>6-9 months</p> <p>Is breastfeeding getting 2-3 complementary feeds with age appropriate consistency/texture. Getting a diversified diet. mother is</p>	

	eating adequate food(including legumes and vegetables) to produce enough milk	
	9-11 months - Is breast feeding getting 3-4 complementary feeds. Feeds with age appropriate consistency/texture. Getting a diversified diet. Mother is eating adequate food including legumes and vegetables to produce enough milk.	
	12-23 months Is breastfeeding 3-4 meals but with increased amounts. Feeds with age appropriate consistency /texture. Getting diversified diet. Mother is eating adequate food including legumes and vegetables to produce enough milk	
2.5	Ask if children are given Legumes, vegetables and fruits	
	Legumes – varieties, amounts, how prepared etc.	
	Vegetables - varieties, amounts, how prepared etc.	
2.6	Ask mother if she experiences any challenges in ensuring that children get adequate legumes and vegetables in children’s complementary foods.	
2.7	Ask mother to explain what legumes and vegetables are eaten by other members of her household: who eats what, when, how acquired/processed/prepared, apportioned etc.	
	Legumes – varieties, amounts, frequency, preferences, dislikes, etc.	
	Vegetables – varieties, amounts, frequency, preferences, dislikes, etc.	
2.8	ANALYZE the mother’s behaviours (appropriate and inappropriate) in regard to complementary feeding (FATVAH), legumes and vegetables	
3	TELL Remind caregiver of the purpose of your visit	
3.1	Why am I here? To support you (caregiver) to incorporate legumes and vegetables in complementary foods and household meals to enhance nutrition and the use of the available food resources (including crops being promoted in demo plots).	

	It is important to incorporate diverse and adequate amounts of legumes and vegetables in complementary foods and household meals to improve nutrition of all household members.				
3.2	Praise for appropriate behaviors in section 2 above e.g. If:				
	Introduced or plans to introduce complementary feeding at 6 month				
	Continues to breast feed child for at least up to 2 years				
	Is incorporating legumes and vegetables in complementary feeds				
	Is incorporating legumes and vegetables in household diets				
3.3	Showing empathy, reflect on challenges identified in areas of:				
	Complementary feeding				
	Legumes				
	Vegetables				
4	HELP and SUPPORT				
4.1	Work with caregiver to identify critical areas for intervention. Start by listing AREAS that need IMPROVEMENT →				Complementary feeding: introduction of complementary feeds including legumes and vegetables Use of legumes and Legumes
4.2	Prioritize 2-3 behaviours the caregiver wants to focus on changing to enhance complementary feeds and household diets. Also identify possible barriers and supports to engaging in appropriate behaviour Focus on: Complementary feeding or specific food handling, processing, preparation Legume consumption among young children Vegetable consumption among young children General household diets Legume consumption among other household members Vegetable consumption among other household members	Barriers to change	Suggest possible solutions to the barriers	Accepted solutions to the barriers	Rejected solutions and why?

Section 5 and 6 for the TIPs visit one

5	EXPLAIN the importance and benefits of making the PRIORITIZED behaviour change (what she has prioritized)	
	Behaviour 1 -	
	Making posho mixed with vegetables and legumes	
6	Behaviour 2 -	
	Introducing complementary feeds such as porridge and bananas, avocado Buying milk	
6	Behaviour 3 -	
	Buy vegetables to eat different vegetable per week Kitchen garden to plant variety of vegetables	
6	REFLECT/ REFER /RETURN	
	Summary the key action points	
	Schedule next appointment	
	Refer for other services	
	Comments on special incident or observations or reaction from participant	

A1.3: Questionnaire for the Trials of improved practices visit two

HHNO	Name of TIPS facilitator:	Household Characteristics	Action point 1	Action Point 2	Action Point 3
	Name of Respondent				
	Name of project child		Was the action achieved? Yes/ no?		
	Age in months (Dec 18)				
	Birthdate of the child		If not, what happened? If yes, how did it work? Which experience was made? Would you like to continue the action point?		
	Participated in Healthy LAND intervention?				
	Child stunted				
	Child wasted				
	Child overweight				
	Father BMI Category				
	Mother BMI Category				
	If youngest child is not project child above:				
	Name of youngest Child				
	Birthdate of youngest child				
	Date of proposed next Visit	New action points:			

A1.4: Questionnaire for the Trials of improved practices visit three

HHNO			Action point 1	Action Point 2	Action Point 3
Facilitator Name of Respondent	V2				
Name of youngest child	Was the action achieved? Yes/ no?				
Birthdate of the child		If not, what happened? If yes, how did it work? Which experience was made?			
Would you like to continue with any of above action points without our support?	If yes which one and why.				
	If no which ones and why.				

A 1.5: Questionnaire for the cooking demonstrations

Recipe 2: Vegetables		
1-Discuss with participants what were the difference between the two recipes		
First let the participants discuss freely, then ask for the categories if not mentioned		
	Option A: Common recipe “Vegetables with soda ash”	Option B: Improved recipe “Cowpea leaves in groundnut sauce”
Cooking time		
Preparation method		
Taste		
Fuel		
Cost		
Nutritional value		
Others		
1. Ask the participants which one they would choose to replicate at home		
2. Record how many participants would choose which option		
Option A: Common recipe “Vegetables with soda ash” How many : _____	Option B: Improved recipe “Cowpea leaves in groundnut sauce” How many: _____	
Record why the participants choose the option		
WHY Option A? Common recipe “Vegetables with soda ash”	WHY Option B? Improved recipe “Cowpea leaves in groundnut sauce”	
Some of these recipes require more ingredients (i.e. Tomatoes, eggplants)? Will you be willing to buy these ingredients?		

If yes WHY?		If no WHY?	
ONLY FOR WOMEN: What do you think the rest of your family members will think about the improved recipes?			
Your spouse?	Your children?	Other family members? Indicate which family members	
ONLY FOR MEN: Would you appreciate if your wife will cook these improved recipes at home?			
If yes WHY?		If no WHY?	
Is there anything you could change about the improved recipes? – What would make them better?-			
Legumes recipe		Vegetables recipe	

**A 2: Schedule for the training of TIPs facilitators for EaTSANE Project Noah’s Arch
Hotel, Kapchorwa, March 14-18, 2019**

Day 1: Enhancing facilitators knowledge of TIPs methodology and appropriate for nutrition counselling skills

Time	Activity	Facilitator
8:30 – 9:30 am	Review critical nutrition issues in Kapchorwa (from previous surveys and FGDs) that need to be covered by TIPs	Senior researcher
9:30 – 10:30 am	Overview of what constitutes an adequate diet (emphasis dietary diversity and importance of legumes, fruits and vegetables)	Research assistant
	Review the role of TIPs facilitator in enhancing household diets (esp complementary feeding behaviour)	Senior researcher
10:45 – 11 :00 am	Tea break	
11:00 am – 1:00 pm	Appropriate feeding practices for young children (breastfeeding and complementary feeding using Ministry of Health IYCF counselling cards)- emphasizing identifying needs and appropriate counselling skills	Research assistant
1:00 – 2:00 pm	LUNCH BREAK	
2:00 – 3:30 pm	Practical: Prepare/evaluate appropriate complementary feeds for children (using FATVAH principle) focusing on adequate legumes, fruits and vegetables	Research assistant
3:30 – 5:30 pm	Role play – counselling on appropriate breastfeeding and complementary feeding practices	Senior researcher assistant

Day 2: Enhancing the consumption of legumes by all household members

Time	Activity	Facilitator
8:30 – 9:00 am	Importance of legumes in household diets (food security, supplementing ASF, & complementing cereals)	Senior researcher
9:00 -9:30 am	Review consumption of legumes, from survey results	One of facilitators Research assistant
9:30 -10:00 am	Review knowledge, perceptions and practices regarding legume consumption in Kapchorwa FGDs	One of Facilitators+ Senior researcher
10:00 -10:45 am	Brainstorm on ways to improve consumption of legumes across the agro-ecological zones <i>Key message – consume at least 4 servings of legumes each week</i>	Senior researcher
10:30 – 11 :00 am	TEA BREAK	
11:00 am – 1:00 pm	How to incorporate legumes in household diets – Theory and practical cooking of beans	Research assistant
1:00 – 2:00 pm	LUNCH BREAK	
2:00 – 3:30 pm	Prepare/evaluate appropriate legume dishes – emphasize appropriate complementary feeds for children (using FATVAH principle)	Research assistant /Facilitator
3:30 – 5:30 pm	Role play – counselling on legume consumption	Research assistant & Senior researcher

Day 3: Enhancing the consumption of Vegetable by all household members

Time	Activity	Facilitator
8:30 – 9:00 am	Importance of vegetables in household diets (food security, relish/sauce, nutrient-density of meals, & good source of fibre)	
9:00 -9:30 am	Review consumption of vegetables, from survey results	One of facilitators + Research assistant
9:30 -10:00 am	Review knowledge, perceptions and practices regarding vegetable consumption in Kapchorwa FGDs	One of Facilitators+ Senior researcher
10:00 -10:45 am	Brainstorm on ways to improve consumption of vegetables across the agro-ecological zones: <i>Key message – one different vegetable a day</i>	Senior researcher
10:30 – 11 :00 am	TEA BREAK	
11:00 am – 1:00 pm	How to incorporate vegetables in household diets – Theory and practical cooking different vegetables especially those promoted in farming component	Research assistant
1:00 – 2:00 pm	LUNCH BREAK	
2:00 – 5:00 pm	Principles of counselling/individualized nutrition education	Research assistant /Facilitators
3:30 – 5:30 pm	Role play – counselling on incorporating vegetables in complementary feeds and household diets	Research assistant & Senior researcher

Day 4: Field work (1st TIPs counselling session in selected village)

<i>Time</i>	<i>Activity</i>	<i>Facilitator</i>
8:00 – 5:00 PM	Individualized household counselling sessions	All facilitators

Day 5: Review of Fieldwork

<i>Time</i>	<i>Activity</i>	<i>Facilitator</i>
8:00 – 9:30 am	Review of individual TIPs facilitator notes/records	Research assistant & Senior researcher with individual facilitators
9:30 – 10:45 am	Experience sharing by facilitators	All
10:45 – 11 :00 am	Tea break	
11:00 am – 1:00 pm	Review counselling skills in relation to problems identified in morning (how to improve counselling approach) - group	Research assistant & Senior researcher
1:00 – 2:00 pm	LUNCH BREAK	
2:00 – 5:30 pm	Role playing – responsiveness to client needs etc Individualized sessions	Research assistant & Senior researcher

A3: Timeline for the TIPs and participatory cooking demonstrations in Kapchorwa

TIPs 2019	14 th -16 th March 2019	17 th -22 nd /March/ 2019	5 th -12 th / April / 2019	23 rd -30 th April 2019	27 th -5 th June / 2019
Training of TIPs facilitators					
TIPs visit one					
TIPs visit two					
TIPs visit three					
Cooking demonstrations					

A4: The implementation pattern for the recommended key messages by individual mothers in the TIPs

HHNO	Increase consumption of legumes in household diet						Increase consumption of vegetables in household diet						Increase consumption of legumes & vegetables in complementary feeding						Practice responsive feeding								Conserve essential nutrients during food preparation, cooking, serving and eating.								Improved food cooking and preservation methods					
	Increase the amount of legumes served		Eat a variety of legumes and nuts at-least 4 times a week		Cook beans with paste or other vegetables.		"Eat a different vegetable every day for 7 days"		Increase amount of vegetables served		Enhance the taste of vegetables by use of groundnut paste		Incorporate legumes, vegetables and fruits in complementary foods		Shred vegetables into smaller pieces, mash		Support children who are unable eat by themselves		Eat together with your child		Minimize destructions while your child is feeding		Give children their own plate		Give tea one hour before meals or one hour after meals		Eat variety of vitamin C rich fruits and vegetables		Wash vegetables before cutting		Avoid over-cooking of vegetables		Avoid use of soda ash in preparation of V & L		Soak beans before cooking		Dry and store vegetables and legumes			
VISIT	V2	V3	V2	V3	V2	V3	V2	V3	V2	V3	V2	V3	V2	V3	V2	V3	V2	V3	V2	V3	V2	V3	V2	V3	V2	V3	V2	V3	V2	V3	V2	V3	V2	V3	V2	V3				
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P13								√																												X	X		X	
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P25	√			√						X																											√		X	
P26																																						√	X	

A:5 Sample of a code tree used for analysis of TIPS

Research question: What are the hindering and facilitating factors to practice improved food preparation skills and increase

Consumption of Legumes, Vegetables and Fruits in Complementary and household diet.

CATEGORY	Code	Sub-code	Description	Examples
Barriers to consumption of Legumes <u>BL</u>	Availability <u>BL</u> Availability is the amount of food present in an area through all forms e. g household food production, food Stock, food aid	Seasonal differences	This is used when caregiver says legumes are not available in some months	"Beans got finished two months ago in January" 10300762
		Lack of production	This is used when caregiver says they do not grow a particular legume	"groundnuts are not grown here" 10300762
		Lack of household stock	This is applied when caregiver says legumes are no-longer in stock at home	"She has no stored legumes" 10200605
	Preference <u>BL</u> This is the meaning developed from personal experience with food & sensory attributes	Dietary pattern	This is used when caregiver says legumes are eaten rarely in a month	"Field peas are cooked but rarely like once in a month" 10301001
		Preference for staples	This is used when caregiver says they are used to eating bigger portions of staples than legumes	"She is used to eating much <u>posho</u> which prevents her from increasing serving of legumes"
		Preference for animal source foods	This is used when caregiver says a household member prefers animal source foods more.	"Husband like meat and fish more than beans" 10300760