Cost of the Diet analysis in two districts:

Sesheke District, Western Province

and

Namwala District, Southern Province,

Zambia

Livelihood Zones:

Sesheke: Cereal, Livestock and Timber Zone

Namwala: Maize, Livestock and Fishery Zone

Data collected: May 2017

Date of report: June 2017

Lead agency: **Concern Worldwide**

In consortium with: **Save the Children International**

In partnership with: **The Government of the Republic of Zambia**

Funded by: **Department for International Development (UK)**

This project is funded with UK aid from the British people

Acknowledgements

The Cost of Diet analysis was led by Claire Duffy, consultant to Concern Worldwide. This report was written by Claire Duffy with contributions from Marie Rongeard, Jonnathan Mtonga and Regine Kopplow.

The analysis was funded by the Department for International Development (UK).

Thanks are due to Concern Worldwide staff in Lusaka and at regional offices in Mongu and Choma, including Felix Masalakufa, Nangana Simwinji and Concilia Muhau for their warm welcome and for making the practical arrangements for the analysis to take place. Thanks are also due to the assessment team driver, Moffat Nkausu.

This analysis would not have been possible without the willing help of the market traders of Sesheke and Namwala and of the women who participated in the focus group discussions. Their time, hospitality and insights are greatly appreciated.

Special thanks are also due to Amy Lane at Save the Children UK, and software developer, James Seddon, for their advice and support. The author is also grateful to the Disaster Mitigation and Management Unit of the Zambian government for providing contextual information that informs the report.

June 2017

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Acronyms

CoD	Cost of the Diet
DiRECT	Direct Response Through Emergency Cash Transfers
DMMU	Disaster Mitigation and Management Unit
EO	'Energy-only' diet (a diet that meets average energy requirements)
FAO	Food and Agriculture Organisation of the United Nations
FHAB	'Food habits' diet (a culturally appropriate diet that meets average requirements for intake of energy, fat, protein and micronutrients)
HFIAS	Household Food Insecurity Access Scale
JCTR	Jesuit Center for Theological Reflection
MCDSS	Ministry of Community Development and Social Services
MDD	Minimum dietary diversity
MNUT	Micronutrient diet (a nutritious diet that meets average requirements for energy, fat, protein and micronutrients)
RAIN	Realigning Agriculture to Improve Nutrition project
WHO	World Health Organization
ZMW	Zambian Kwacha (unit of currency)

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1. Introduction

1.1. Introduction to Concern Worldwide in Zambia and the DiRECT initiative

Concern Worldwide is an international humanitarian organisation dedicated to ending extreme hunger and transforming the lives of the world's poorest people. Concern has been working in Zambia since 2002; engaging in long term development work, responding to emergency situations and seeking to address the root causes of poverty through advocacy work.

DiRECT – Direct Response through Emergency Cash Transfers – is an emergency intervention to provide a cash transfer to 21,329 food insecure households in five drought-affected areas across Southern and Western Provinces. It also provides support to local retailers, together with information and training, to alleviate the impact of the crisis through consumption support while stimulating local markets. The programme was implemented between September 2016 and June 2017 by a consortium comprised of Concern Worldwide and Save the Children International and in coordination with the Ministry of Community Development and Social Services (MCDSS) and the Disaster Mitigation and Management Unit (DMMU) in the office of the Vice President of the Republic of Zambia.

International evidence shows that the size of a social cash transfer has a major impact on nutrition outcomes. To have a positive impact on nutrition the transfer size should take into account the cost of a nutritious (not caloric) diet, while not being so high as to provide disincentives to work. In 2010 the food basket for Zambia cost 96 ZMW for a family of six to meet minimum nutritional requirements. It is likely that the value of the food basket has increased since then and it is also likely to be higher during the peak of the lean season and times of stress.

The value of the Government's social cash transfers targeting chronic poverty has recently been raised to 90 ZMW, and the DiRECT Emergency Cash Transfers are of the same amount. It is envisaged that any subsequent emergency responses should be undertaken through a shock responsive social cash transfer system. To be able to better advocate for a shock responsive cash transfer value an assessment on the current cost of a nutritious diet *adjusted for times of stress* would allow insight to set a more responsive amount.

DiRECT is implemented in two districts of Western Province (Limulunga and Sesheke) and in three districts of Southern Province (Sinazongwe, Pemba and Namwala). The Cost of the Diet study will be conducted in one district in each province: Sesheke in Western Province and Namwala in Southern Province.

1.2. Nutrition status

In Zambia, chronic food insecurity is prevalent among low income groups such as the urban poor and rural, small-scale farmers, and impedes the country's potential to

reduce poverty. Chronic malnutrition in children, also known as stunting, is observed when a child's height is below that expected for his or her age. In Zambia, 45 percent of children under five years of age are chronically malnourished, higher than the African average of 42[1] percent. Of these children, 21 percent are severely stunted[2]. Stunting is recognised to have irreversible effects on a child's development, such as impaired cognitive development, poorer health outcomes, and limited work productivity as an adult.[3] The prevalence of underweight children nationally is 15 percent. In Zambia, 5 percent of children under five years are wasted (insufficient weight for height), compared to an average of 15 percent of children across the developing world[4] . Micronutrient deficiencies, particularly deficiency in iron and vitamin A, are prevalent among infants, young children and pregnant and lactating women and remain a major public health concern.

1.3. Introduction to Western Province and Southern Province

1.3.1. Western Province

Zambia's Western Province is bordered internally to the north and east by Northwestern, Central and Southern Provinces. It is bordered by Angola to the west and by Namibia to the south. Mongu is the provincial capital of the province, which is subdivided into sixteen districts. Sesheke District is in the far south of the province on the border with Namibia and is comprised of nine wards.

The 2010 census puts the population of Western Province at 902,974, an increase of 18 percent on the census undertaken in 2000. Sesheke District recorded a population of 99,384 in 2010 (11 percent of the province's population), having experienced population growth of 2.4 percent per annum during the inter-censal period (2000-2010). In 2011 some districts in Western Province, including Sesheke, were split. The current population is therefore uncertain and a reliable estimate will not be available until the 2020 census has been carried out.

As part of the DiRECT baseline assessment, the Household Food Insecurity Access Scale (HFIAS) was used to calculate levels of household food insecurity across the target areas. The analysis indicated widespread food insecurity across the assessment zone, with Sesheke emerging as the most food insecure district[5]. The report also revealed that 92 percent of women in Sesheke District did not achieve minimum dietary diversity (compared to 87 percent in Limulunga, the second target district in

[1] National Food and Nutrition Commission of Zambia (2011) National Food and Nutrition Strategic Plan for Zambia 2011-2015

[2] Central Statistics Office, Zambia (2007) Zambia Demographic and Health Survey 2007

[3] Concern Worldwide and International Food Policy Institute (2011) Rain Project Brief No. 1

[4] National Food and Nutrition Commission of Zambia (2011) National Food and Nutrition Strategic Plan for Zambia 2011-2015

[5] Concern Worldwide (2017), Direct Response through Emergency Cash Transfers – DiRECT Baseline Report. Lusaka, Zambia.

Western Province). In a measure of minimum child dietary diversity, it was found that only 12 percent of children in Sesheke achieved minimum dietary diversity. Further, the baseline survey showed that 99 percent of children aged 6-23 months did not attain the minimum acceptable diet, i.e. meal frequency and dietary diversity. The government of Zambia estimates that 36 percent of children under five years in Western Province are stunted owing to chronic malnutrition.[6]

1.3.2. Southern Province

Southern Province is bordered internally by Western Province to the west, by Central Province to the north, and by Lusaka Province to the northeast. It shares much of its southern and eastern border with Zimbabwe, but is also bordered by Botswana and Namibia to the southwest. Choma is the provincial capital of Southern Province, which is comprised of eleven districts. Namwala District is in the northwest of the province and is comprised of fifteen wards.

The 2010 census recorded a population of 1,589,926 in Southern Province – an annual increase of 2.8 percent since the previous census in 2010, or an increase of 31 percent (from 1,212,124) over ten years. Namwala had a population of 102,886 in 2010 (6.5 percent of the province's population), having experienced population growth of 2.2 percent per annum during the inter-censal period (2000-2010).

The HFIAS score also indicates a high level of household food insecurity in target districts in Southern Province. The DiRECT baseline assessment showed that the diet of 74 percent of the participants in Namwala was below the minimum recommended dietary diversity. The survey found that only 16 percent of children achieved minimum dietary diversity, and that up to 99 percent of children aged 6-23 months did not attain the minimum acceptable diet (meal frequency and dietary diversity). The government of Zambia puts the rate of stunting among children under five years in Southern Province at 37 percent.[7]

1.4. Aims of the study

This Cost of the Diet (COD) analysis has three main aims:

1. To estimate the amount and combination of local foods in each district that are needed to provide a family of five with a diet that meets their average needs for energy and recommended intakes of protein, fats and micronutrients
2. To calculate the annual and monthly cost in Zambian Kwacha (ZMW) of such a diet for a family of five in each of the selected districts
3. To determine if the value of the current cash transfer provision is sufficient to allow the poorest households in these districts to access a nutritious diet.

[6] Central Statistics Office, Zambia (2013-14) Zambia Demographic and Health Survey
[7] Ibid.

2. Methodology

The Cost of the Diet is a method and software that calculates the minimum cost of a diet that provides a household's recommended intakes of energy, protein, fat and micronutrients using locally available foods. For a detailed description of the Cost of the Diet tool, the diets it can analyse, its uses and limitations refer to Annex 1.

2.1. Study location

The Cost of Diet survey was carried out in two districts in which DiRECT is being implemented: Sesheke in Western Province and Namwala in Southern Province.

In Western Province, the DiRECT project has been implemented in two districts, Limulunga and Sesheke. As Limulunga has better availability of food and benefits from easier access to the markets in Mongu (the provincial capital), it was felt that Sesheke is representative of more districts in Western Province, and should be prioritised for the survey. Additionally, a relationship had already been established with traders in Sesheke who have benefited from support through the project, including a two-day training on basic business skills in December 2016 and a one-off grant of ZMW 500 in January 2017. It was felt that important insights might be gained from speaking to the Sesheke traders.

In Southern Province, DiRECT has been implemented in three districts, Sinazongwe, Pemba and Namwala. Some traders in Namwala were also beneficiaries of the emergency project support. Similarly, it was felt that important insights could be gained from speaking to traders with whom a relationship has already been established. Further, Namwala was felt to be more representative of the region as a whole because, in common with the majority of districts in the province, livelihoods are characterised by farming, pastoralism and fishing.

Each of the districts was identified as belonging to a distinct livelihood zone - a geographical area within which people share broadly the same patterns of access to food – as previously identified by in a livelihood zoning exercise carried out by the World Food Programme. Cost of Diet assessments are often conducted in a livelihood zone because the foods that are available and consumed are homogenous. The livelihood zones are described as follows:

1. Sesheke (Western Province) – Cereal, Livestock and Timber Zone
2. Namwala (Southern Province): Maize, Livestock and Fishery Zone

These are the dominant means of livelihood, however, many households in both districts also undertake small-scale farming. Additionally, many households in Namwala are engaged in pastoralism and fishing. Although these activities may contribute comparatively little to income generation across the districts, they potentially have a significant impact on nutrition, food consumption and dietary

diversity. DiRECT supports communities in all nine wards in Sesheke, and six of the fifteen wards in Namwala.

A map of the two districts and the villages and markets surveyed is provided in Annex 2. The following section describes how data was collected for the analysis.

2.2. Market Surveys

2.2.1. Overview

A list of the foods consumed in each region was compiled at the outset of the study. Prior to beginning the fieldwork, the enumerators practised data collection methods at a trial market survey in Sesheke Town. The food list was subsequently updated to include any new foods that had been found during the trial. The final food list for Sesheke comprised 79 foods, while the list for Namwala included 84 foods. The food lists for each district can be seen in Annex 3. Note: the foods that are highlighted were not included in the final analysis as a suitable substitute could not be found in the COD food database, or because the nutritional composition of these foods could not be found. The substitutes selected for foods that were not found in the COD have also been indicated.

The markets selected for data collection in each district are listed in Annex 4. These markets were selected to be representative of where poor households in the districts purchase their food.

The Sesheke survey, which began on 2nd May 2017, recorded the price and weight of foods found in 7 markets or shops across the district over the course of 5 days. The survey in Namwala began on 9th May 2017 and six markets or shops were surveyed over four-day period. It soon became clear that barely any fresh food (namely fruit and vegetables) was available outside of the main towns in both districts. The implications of the non-availability of fresh food for the CoD analysis is discussed further in Section 3.1. The market data collection in Sesheke Town was intended as a trial, however, given the difficulty obtaining price data outside of the town – and in view of the fact that the data was of high quality – it was included in the analysis.

For the purpose of the assessment, retrospective data on prices were collected so that a baseline analysis of the last year could be produced[8]. The retrospective reference year selected for data collection was from 16th August 2016 – 15th August 2017. The assessment team established that the name and length of each season was as follows:

[8] The aim of retrospective data collection, i.e. obtaining food prices for previous seasons, is to establish a baseline, but this only allows for the collection of information on foods available in the season in which the survey is carried out. It cannot account for foods that can be found at other times of the year but not available in the current season.

Cold season: 15 April 2017 – 15 August 2017 (active season at time of survey)
Rainy season: 1 November 2016 – 14 April 2017
Dry season: 16 August 2016 – 31 October 2016

As poor people typically buy food in small amounts (they often cannot afford bulk purchases), market traders were asked the price of the smallest unit of each food item that they sold during each season. Three samples of each food were weighed using electronic scales. The CoD method guidelines recommend collecting weight and price data from four traders at each market to give four prices and 12 weights for each food item. However, this was difficult in practice as most rural markets consisted of only one or two traders with neither selling the same foods, if fresh or staple foods were found at all. Market traders were asked questions about trends in prices, seasonality and changes in the demand and supply of commodities. This qualitative data was noted down by the enumerators and typed up after each market survey. These informal interviews provided important contextual information that was used to inform the results. A sample of the form used to record market data can be seen in Annex 5.

2.2.2. Market data processing

Upon returning from the field, all market data recorded on the paper forms was entered into the CoD software. To do this, a food list first had to be created within the software to mirror the food list used for the market data collection. Many of the foods on the list were selected directly from the food composition database embedded in the Cost of the Diet software. However, a nutrition profile was added for a small number of foods not listed in the CoD database. Where a food was not listed in the CoD database and nutritional information for the food could not be found from an alternative source (as was the case for many species of fish) a substitute was chosen from the foods already listed in the CoD database. The foods for which substitutes were chosen are indicated on the food list in Annex 3. Where foods are produced in a variety of forms (i.e. wholegrain, milled, degermed, polished, etc.) the form or forms typically consumed in the areas surveyed was chosen.

Once the food list was replicated within the CoD software the price and weight data collected at the markets was manually entered into the programme. The software automatically calculates the average price per 100g for each food across every market. A summary of the foods found at the markets and the price per 100g can be seen in Annex 6.

The Cost of Diet methodology is designed to calculate the minimum cost of a diet that provides adequate nutrition for a specified family in each defined season, as well as an average cost for the year. During market surveys, traders are asked for the current price, and for the price in previous seasons within the last year. It is accepted that retrospective price information is not always reliable, but several factors in the Sesheke/Namwala context render the retrospective price information highly unreliable. It was found that the price of most food items remains constant

throughout the year but that the quantity offered varies depending on supply and demand. However, enumerators were unable to obtain a weight estimate for foods sold during other seasons for the stated price. In any case, even during the present data collection large weight variations were noted among samples of the same foods. In grouping or bundling fresh fruit and vegetables, traders are primarily concerned with the appearance of volume (i.e. that each bunch, bundle or pile appears to be of similar quantity). To illustrate how quantities differ between seasons, one trader explained that a bunch of rape in the current season might be comprised of fifteen leaves, but that the bunch would be reduced to ten leaves in the dry season.

The 'cost of the diet' that has been calculated for the current season (the 'cold' season) will be the most accurate as it is based on actual weights and prices, but it will also be the cheapest, given that prices are lowest at harvest time when stocks are plentiful. To avoid underestimating the cost of the diet during the dry and rainy season – and in the absence of accurate weight data – the weight of fresh foods whose price remains constant throughout the year was entered into the software at 60 percent of those recorded in the current season. This figure is based on the feedback from traders that bundles of tomatoes and onions, which are comprised of five units in the cold season, are typically reduced to three units when supply decreases. Where a trader stated there were price variations across the seasons, the weight recorded for the current season was assumed for the dry and rainy seasons. In the case that a trader could state the exact quantity by which a bundle would be reduced in the next season (i.e. 4 to 2), the weight for other seasons was entered at the ratio indicated. Although this method is not ideal, it is a reasonable approximation.

2.3. Interviews and focus group discussions

2.3.1. Overview

In order to better understand local dietary patterns and how food and dietary constraints should be set, one-to-one interviews were conducted with eight women in each of the sites visited. The women selected were those responsible for preparing food in the home, and represented a range of wealth groups. The villages selected for the interviews and focus group discussions and a breakdown by wealth group for each village can be seen in Annex 7.

Interviewees were read out the list of foods that had been compiled by the assessment team at the outset of the project and asked to state if they consume these foods 'never', 'rarely', 'often' or 'usually'. The responses were noted into a custom form (see Annex 8) by an enumerator. The wealth ranking of each individual was provided by the community liaison representative at the end of the session and was recorded as 'poor', 'middle' or 'better off'.

The responses were tallied when all the interviews were completed, revealing the foods that are least and most often consumed. The women were brought together for a focus group discussion led by one team member while another took notes. These

discussions provided an insight into local dietary habits, consumption patterns and food taboos. In particular, information was collected on the foods eaten or not eaten by infants and young children and pregnant and lactating women. Household production of food; key staples; foods bartered, bought and sold; foods commonly preserved; and the consumption of wild foods were also discussed. If the tally revealed anything unusual, the session leader had the opportunity to probe further.

2.3.2. Focus group data processing

Notes taken during the focus group discussions were jointly transcribed by the focus group discussion leader, note taker and practitioner.

The information on consumption frequency recorded during the interviews was then entered into the CoD software. The software assigns a numerical score to each food, which, when tallied for all respondents, gives the maximum and minimum food frequency constraints. The responses are scored as follows:

'never'/rarely = 0 points
'often' = 1 point
'usually' = 2 points

If a group of 8 women is surveyed, each food item could receive a minimum total score of 0 and maximum of 16. A total score of 0-1 points translates into a maximum constraint of 0, 1- 8 points translates to a maximum constraint of 7 (a food eaten once a day) and a total score of 9-16 points translates to a maximum constraint of 14 (a food eaten two times a day). The software calculates these constraints based on the individual interview data that has been inputted. Maximum and minimum constraints are discussed in more detail in Section 2.8.

2.4. Excluded data

Following the market surveys and focus group discussions, a number of foods were excluded from the Cost of Diet analysis. These foods and the reason for their exclusion are summarised in Table 1 below.

Table 1: **Foods excluded from the CoD analysis for each district.**

Category	Food	Reason excluded from analysis
SESHEKE		
Fruit	Munzinzila	No nutritional information available and no suitable substitute found
Fruit	Mizauli	No nutritional information available and no suitable substitute found
Fish	Imilonge fresh	Not found at the market
Fish	Liminga dry	Not found at the market
Fish	Liminga fresh	Not found at the market
Fish	Linembele dry	No nutritional information available and no suitable substitute found
Fish	Linembele fresh	Not found at the market
Fish	Lingongi fresh	Not found at the market
Fish	Tiger fish fresh	Not found at the market
Fish	Tunyengele dry	No nutritional information available and no suitable substitute found
NAMWALA		
Fruit	Munzinzila	No nutritional information available and no suitable substitute found
Fruit	Mizauli	No nutritional information available and no suitable substitute found
Cereals	Ceele	No nutritional information available and no suitable substitute found
Cereals	Chibwantu	No nutritional information available and no suitable substitute found
Fish	Bottle fish dry	No nutritional information available and no suitable substitute found
Fish	Bottle fish fresh	No nutritional information available and no suitable substitute found
Fish	Imilonge fresh	No nutritional information available and no suitable substitute found
Fish	Liminga dry	No nutritional information available and no suitable substitute found
Fish	Liminga fresh	No nutritional information available and no suitable substitute found
Fish	Liminga smoked	No nutritional information available and no suitable substitute found
Fish	Lingongi dry	No nutritional information available and no suitable substitute found
Fish	Mabango fresh	No nutritional information available and no suitable substitute found
Fish	Tiger fish dry	Excluded as not found in Namwala markets
Fish	Tiger fish fresh	No nutritional information available and no suitable substitute found

In Sesheke, munzinzila and mizauli (fruit) were found to be commonly consumed, but were excluded from the analysis because (1) they were not found at the market meaning that price data could not be obtained, and (2) nutrient composition information could not be found. Although dried linembele (fish) was found in Sesheke markets it is not frequently consumed (only 34 percent of respondents reported eating it regularly) and no suitable substitute could be found in the food database. 'Lingongi fresh' and 'tiger fish fresh' are consumed regularly by 53 and 63 percent of respondents respectively, but were excluded from the database as no price information could be obtained. It is not ideal to exclude from the analysis foods that are important to the local diet, but the absence of price data is problematic. The issue is somewhat mitigated by the software's ability to select from other species/varieties of fish for which price data has been obtained.

In Namwala, munzinzila and mizuali (fruit) were excluded as they are almost never consumed and were not found on the market. Ceele (a food made with nshima and sour milk) and chibwantu (drink made from maize and milk) are frequently consumed. However, neither was found at the market, and as no suitable substitute could be found in the CoD software they were excluded from the analysis. Most of the fish listed in the table have a low consumption rate among the respondents, and as none of them were found at the market they were excluded.

2.5. The diets calculated by the Cost of the Diet software

Using the market and food consumption data the Cost of Diet software can estimate the cost of four theoretical diets (see Table 2 below).

Table 2: A summary of the diets analysed using the Cost of the Diet software.

Diet name	Definition	Energy needs met	Fat at 30% of energy	Protein needs met	Micronutrient needs met	Reflects a typical diet
Energy only (EO)	A lowest cost diet that only meets the average energy requirements of the members of the household	X				
Energy, fat and protein only diet	A lowest cost diet that only meets the average energy and the recommended protein and fat requirements of the members of the household	X	X	X		
Micro-nutrient RNI (MNUT)	A lowest cost nutritious diet	X	X	X	X	
Food Habits (FHAB)	A lowest cost nutritious diet that reflects cultural consumption patterns	X	X	X	X	X

This report focuses on three of four theoretical diets: (1) an energy-only diet; (2) a nutritious diet with all the required micronutrients, and (3) a nutritious diet based on local foods habits.

An *energy-only diet* is one which meets only the average energy requirements of the family. The software calculates the cost of this diet based on the family specification (see Section 2.6), and price data entered for the energy foods found at the market.

In creating a model of a *nutritious diet*, the software selects from foods found at the market and combines them (food type and quantity) in a way that produces the lowest cost diet that meets the average energy requirements and the recommended micronutrient intake of the typical family. The diet does not necessarily reflect people's typical dietary patterns; it simply draws on the foods that are available.

The *food habits diet* is, in theory, a nutritious diet that takes into account the typical dietary habits of households in each of the districts as revealed by the individual interviews and focus group discussions. Typical dietary habits are incorporated through applying minimum and maximum constraints to the number of times a food can be consumed in a day or over the course of week (see Section 2.8). However, some of the most commonly eaten foods in Sesheke and Namwala (as revealed by the focus group discussions and individual interviews) were not found at the markets. As no price data could be found for these foods, they could not be included in the hypothetical diet. This means that the food habits diet presented in this analysis omits some of the foods one would expect to see in a representation of a typical diet in each of the districts. This is discussed further in Section 3.6.

For a more detailed description of each of the diets analysed by the CoD software, please refer to Annex 1.

When all the market and food consumption data has been entered, the software calculates the average cost of each diet for Sesheke and Namwala, rounded to the nearest Zambian Kwacha (ZMW). At the time of writing (June 2017), 1 Euro equals 10.46 ZMW.

2.6. Specification of a typical family

A 5-person household has been selected as the standard family size for both Sesheke and Namwala districts. In the 2007 Zambian Demographic and Health Survey, the average household size is 4.9 persons, compared with 5.2 persons in the 2001-2002 survey[9]. The CoD software can only generate a cost based on a specified number of persons, so a 5-person household size has been selected.

The 'standard family' is comprised of family members chosen from the WHO database of average energy requirements based on a daily energy requirement of 5 x 2,100

[9] Central Statistics Office, Zambia (2007) Zambia Demographic and Health Survey

kcals, or 10,500 kcal in total (see Annex 9). The typical Cost of the Diet family for a 5-person household consists of:

- An adult man, aged 30-59y, weighing 50 kg and moderately active (2,750 kcal/d)
- An adult woman, aged 30-59y, 45 kg, moderately active (2,300 kcal/d) and lactating (418 kcal/d)
- A child (either sex) aged 11-12 years (2,250 kcal/d)
- A child (either sex) aged 9-10 years (1,913 kcal/d)
- A baby (either sex) aged 12-23 months (894 kcal/d)

The total energy requirement of this family is 10,525 kilocalories per day.

The Cost of the Diet is dependent on arbitrary factors such as the numbers, age, sex and degree of physical activity and of the individuals comprising this 'typical' family. To illustrate the possible range in the cost of the diet, a CoD family was specified in the same way for five, seven, eight, nine and ten members. In addition, for each of these household sizes a minimum ('low energy') family was selected by choosing the youngest, smallest family for each number of individuals between five and ten members, and a maximum ('high-energy') family was selected by choosing the oldest, largest family between four and ten members. The specification of minimum and maximum energy families of between five and ten members is also shown in Annex 9. These are recommended as standard families for all Cost of the Diet analyses. This ensures that a possible range in energy needs can be covered.

Each month the Jesuit Center for Theological Reflection (JCTR) in Zambia produces a 'basic needs basket' – document tracking the cost of food and non-food essentials – for families in fifteen towns and cities across the country[10]. The locations covered include Mongu in Western Province and Choma in Southern Province, and the costs are calculated based on a 5-person household. Although the cost estimates are not specific to rural areas, it is useful to compare the Cost of the Diet for Sesheke and Namwala to the cost of a basic food basket as determined by JCTR in the regional capitals of the respective provinces. The cost of the diet determined by this analysis is compared to the JCTR estimates in Section 5.

2.7. Recommended intakes for energy and micronutrients

The needs of individuals for **energy** are taken from a database embedded in the Cost of the Diet software that specifies the estimated average requirement recommended by the WHO and FAO[11] for individuals by age, sex and activity level. As this intake is based on the estimated average requirement, the probability that any given individual's requirement is met is 0.5 or 50 percent.

[10] www.jctr.org.zm/basic-needs-basket

[11] WHO/FAO (2001) Human Energy Requirements / WHO/FAO (2007) Protein and Amino Acid Requirements in Human Nutrition

The needs of individuals for **protein** are taken from a database embedded in the software which specifies the safe individual intake recommended by the WHO and FAO[12] for individuals by age and sex. This intake is defined as the 97.5th percentile of the distribution of individual requirements, so the probability that any given individual's protein requirement is met is 0.975 or 97.5 percent.

The needs of individuals for **micronutrients** are taken from a database embedded in the software which specifies the recommended nutrient intake proposed by the WHO and FAO[13] for individuals by age and sex. This intake is defined as the 97.5th percentile of the distribution of individual requirements, so the probability that any given individual's requirement is met is 0.975 or 97.5 percent. The recommended intake of vitamin A is specified as the recommended safe intake, as there are no adequate data to derive mean and standard deviations of intake.
The needs of individuals for **fat** are specified as 30 percent of total energy intake. A diet selected by the Cost of Diet software that meets all of the requirements described above is called a 'nutritious' diet.

2.8. Determining maximum and minimum food frequency constraints

The number of times per week a food can be included in a diet is limited by applying minimum and maximum values. For the energy-only diet and the nutritious diet – and for all foods – the minimum constraint is set to zero (meaning that the software has the option to include or exclude foods from the diet) and the maximum constraint is set to 21 (meaning that a food cannot be included more than 21 times a week, i.e. three times per day).

In the case of the food habits nutritious diet, the software applies minimum and maximum constraints that reflect the consumption frequency indicated in the individual interviews. As explained in Section 2.3.2, the software assigns a numerical score to each food, which, when tallied for all respondents, gives the maximum and minimum food frequency constraints. This is intended to enable the software to create a diet that captures typical dietary habits. For example, a food that is typically eaten at every meal will have a maximum constraint of 21 (3 meals per day x 7 days per week). Similarly, a food that is usually eaten twice a day will have a maximum constraint of 14. Manual adjustments can been made to the 'food habits' diet minimum and maximum constraints in light of information on local dietary habits obtained from focus group discussions.

Constraints can also be used to reflect seasonal variations in food availability. For example, if a market trader advised that a food is not available in a particular season and no price is entered for that season, the software will automatically set a zero minimum and maximum constraint for that food so that it will not be included in the diet simulated for that season. In the case of 'free' foods, i.e. wild or home produced

[12] WHO/FAO (2004) Vitamin and Mineral Requirements for Human Nutrition
[13] FAO/WHO (2008) Fats and Fatty Acids in Human Nutrition

foods (see Section 2.9), constraints can be manually adjusted to reflect seasonal availability.

2.9. Inclusion of 'free' foods

In the case that households subsist on their own produce at any point during the year the COD guidelines recommend that the value of home production be added to household income, and that home produce be entered into the software at zero cost for the seasons in which it is available. The focus group discussions in Sesheke and Namwala (see Section 3.3) revealed that many of the most commonly eaten foods are home-produced, and that these foods are only purchased from the market when own produce runs out. 'Free' or home-produced foods are of critical importance to the families in both districts; however, the inclusion of these foods at zero cost can skew the results of the CoD analysis because the software does not have a facility to specify the number of days a family will be able to sustain itself with its own produce before having to purchase from the market. Including home-grown foods at zero cost also means that the costs of production (i.e. inputs) are not taken into consideration. Furthermore, given that maize production has been severely affected by drought over the past two years, it would be inappropriate to include household maize production as 'income' in this instance.

Notwithstanding the reasons outlined above for avoiding the inclusion of 'free' maize, the inclusion in this assessment of a small number of fruits and vegetables without price data would result in a more realistic food habits diet, and a more realistic cost for the diet in each season. Vegetables – and leafy green vegetables in particular – are an important source of vitamins and minerals and are frequently consumed in both districts. However, if the commonly eaten vegetables are not found on sale at the markets and no price data can be recorded, they will not be included in the hypothetical diet generated by the CoD software. As explained above, it is generally preferable not to include home-produced foods at zero cost, but given that price data could only be found for six vegetables in Namwala, the software will struggle to generate a diet that provides adequate nutrition, and the cost will likely be unrealistic as the software may be forced to source certain nutrients from more expensive sources. Taking these factors into account, it was decided that two green leafy vegetables with a high consumption rate – okra and sweet potato leaves – would be included at zero cost for the rainy season in the Namwala assessment. In order to allow the software to include at least one home-produced (i.e. 'free') vegetable in the rainy season in the Sesheke assessment, amaranth leaves were included at zero cost. In each case, this entailed setting a minimum constraint of 0 (to allow the software the option to include the vegetable(s) or not) and a maximum constraint of 14 (to limit their inclusion to two meals per day).

A large variety of wild fruit is consumed in both districts, but given the uncertainty around their seasonality and the absence of nutrient composition data, they were excluded from the analysis. Nevertheless, wild fruit is an important source of vitamins and it is important that its consumption is represented in the analysis. For this reason,

mango and a generic 'bush fruit' have been selected from the CoD food database and entered for the rainy season for both districts, and 'bush fruit' has been included as a free fruit for the cold season. Constraints for each fruit have been set at 0 and 7.

2.10. Supplementary market data

Unprocessed maize grain was found at only one trading post throughout the entire assessment period, but it is uncertain if the weight data obtained is representative of maize prices in rural areas. JCTR quotes a price for mealie meal (25kg) of K91.83 in Choma, Southern Province (April 2017) and K98.78 in Mongu, Western Province (March 2017)[14]. However, since mealie meal has a low consumption rate among the communities surveyed, it is preferable to source a price for unprocessed maize grain (roller meal). The WFP estimate the price of maize at K2.30/kg in Sesheke and K2.00/kg in Choma as at February 2017[15]. Prices are likely to have fallen in the interim due to an early harvest[16], which provides some assurance that entering the February prices into the software will not underestimate the cost of the diet in May 2017. Supplementary market data has been entered for both districts using the WFP price estimates.

More than half of the focus group participants (56 percent in Sesheke and 63 percent in Namwala) reported eating chicken regularly. Chicken was not found at the markets, however, since most of the villages in which focus groups were conducted are not within easy reach of a market, and given that background chickens were observed roaming freely in each of the villages, it is likely that chickens are purchased from neighbours. As chicken is an important source of protein in the diet of the communities surveyed in both Sesheke and Namwala it is important to assign a cost so that the software has the option to factor it into a hypothetical diet. The price was estimated by field staff at K40 per 1.8kg in Sesheke and K35 per 1.5kg in Namwala, and these prices were entered into the software as 'supplementary market data'.

2.11. Accounting for seasonality

Information on the seasonality of all the foods on the food list was compiled by the country team. A fishing ban is instated in Zambia throughout the rainy season each year, and as result there is a substantial decline in the number of type of fish on offer in local and rural markets (during this time fish is mainly only available in supermarkets). Some traders stated a price for various types of fish during the rainy season, but given the unreliability of retrospective data collection, a decision was taken to not to enter price data for all species of fish (with the exception of kapenta and chisense) into the software for the rainy season.

[14] http://www.jctr.org.zm/basic-needs-basket

[15] http://documents.wfp.org/stellent/groups/public/documents/ena/wfp291463.pdf?_ga=2.217854608.72519170.1496522571-1130126811.1496522571

[16] http://www.fao.org/giews/food-prices/regional-roundups/detail/en/c/885070/

2.12. Estimating the affordability of diets

The cost of a nutritious diet becomes a more meaningful figure when compared with the income of the poorest members of the community. To assess the affordability of the diet household income and non-food expenditure (NFE) per wealth group must be known. The CoD software uses this information to highlight the proportion of income spent on food and the non-food items needed to achieve a minimum acceptable standard of living.

It is understood that data on household income and NFE had been gathered in a HEA survey undertaken by the World Food Programme in each of the districts, but regrettably – and for reasons beyond its control – the assessment team was unable to obtain this information.

3. Results

3.1. Availability of food at the market

A total of 55 foods were found at the markets in Sesheke District, and 39 foods in Namwala District. In Sesheke, 13 of the 39 most commonly eaten foods[17] were not found at the market, while in Namwala 18 of the 40 most frequently consumed foods[18] were not found at the market. These include Bambara nuts, chicken and various vegetables. Of note in Namwala, fresh and sour milk were not found despite being commonly consumed.

Table 3 shows the number of foods per food group found at the markets. Cooking oil, sugar and salt were also commonly found. Soya pieces were found to be widely available and as it is a protein product, it has been included in the legumes category.

Table 3: Number of foods per food group found at markets in Sesheke and Namwala.

Food Group	Sesheke	Namwala
Cereals/grains	5	5
Tubers	4	3
Legumes/pulses/nuts	9	7
Vegetables	11	6
Fruit	5	7
Fish	13	7
Meat	1	1
Eggs	1	1
Dairy	2	0

Maize is the staple crop throughout the country, and although the respondents unanimously reported daily consumption of roller meal (unrefined ground maize meal), only mealie meal (refined maize meal) was found at the market in Sesheke District. In Namwala, a sack of unprocessed maize grain was found in only one shop. Traders reported that there is less demand for maize during the harvest time as most rural families depend on their own produce at this time of year. Millet and sorghum are widely consumed in Sesheke District but were not found at the markets. This can be attributed to the fact that these grains are grown for home consumption only (i.e. not for trade or barter). Rice and wheat flour were found at markets in both districts, but based on the interviews with focus group participants, they are rarely consumed in the rural communities.

Some fresh fruit and vegetables which are understood to be commonly eaten when available were not in season at the time of the survey and therefore were not found at the market. These include amaranths, mushrooms and mangoes.

[17] Foods 'usually' or 'often' consumed by 50 percent or more of focus group respondents

[18] Foods 'usually' or 'often' consumed by 50 percent or more of focus group respondents

Cassava leaves and Bambara nuts are typically available year-round but were not found in any markets. Only larger variety of perennially available vegetables were found in Sesheke than in Namwala. Even vegetables that respondents reported as being commonly consumed – such as okra, pumpkin leaves, hibiscus leaves and sweet potato leaves – were not found at Namwala markets.

An array of food (fruit, vegetables, legumes, cereals, fish and meat) was available in Sesheke Town and Namwala Central; however, outside of the towns or roadside villages, fresh produce was not found. Rural trading posts stocked only non-perishable food items, primarily cooking oil, sugar, salt, bicarbonate of soda, confectionary and soft drinks. There are three main reasons for the non-availability of fresh produce at rural trading posts:

1. All rural communities are engaged in gardening and maize production, and as they are sustained by their own produce at harvest time (the current season), there is no demand for fresh produce at local trading posts at present. Further, where there is demand for fresh produce outside of the cold season, supply can be sporadic. One rural roadside trader in rural Sesheke reported that she buys vegetables and tomatoes to re-sell only twice a month. Supplying perishable food items more frequently was regarded as too great a financial risk.

2. Traders in rural areas reported that people are not willing to pay the mark-up for the convenience of purchasing locally. Typically, those living in remote areas will task a family member or friend with buying food on their behalf from the town (despite the often considerable travel distance). It was reported that women seldom go to the town but that men make the journey more often.

3. The strength and prevalence of the barter system in rural areas effectively negates demand for fresh produce from rural cash trading posts.

A cash economy exists in both districts – each village visited had least one trading post and focus group participants reported engaging in cash trade – but it is weak. The focus group discussions held in villages across Sesheke and Namwala revealed that for people in these communities, maize is essentially another form of currency: it is bartered to access a range of goods, including clothes, soap and vegetables, both within and outside the community. This is discussed in more detail in Section 3.3. The extent of the barter system and effective removal of fresh food from the cash economy presents a challenge to the Cost of Diet method, which requires commodity price data in order to determine the minimum cost of a nutritious diet.

It also emerged during the data collection that different foods are available at the market at different times of the day. For example, although dried fish was plentiful, very little fresh fish was found at Sesheke Town market during the initial survey (at approximately midday). However, it was observed that an abundance of fresh fish was available in the evening (from 18hr). No fresh produce was found at a rural trading post (Sabelo, Silumbo ward) surveyed two days later, although the trader reported that tomatoes and other vegetables are sometimes available early in the morning

when traders from the other side of the Zambezi River (where the land is more productive and not prone to flooding) come across to trade. At another trading post a few kilometers further along the road (Salumano, Kalobolelwa ward), the trader explained that she buys fresh fruit and vegetables from Namibia for resale at her trading post once or twice a month. She does not make the trip any more frequently because of financial risk involved in selling fresh produce in a location where demand is limited. In Shivawambwe (Namwala) focus group participants explained that local markets only stock vegetables in July and August. Again, the sporadic nature of the market offering makes it difficult to acquire price data for produce outside of the main district market.

3.2. Individual interview findings

The individual interviews revealed that dietary diversity is limited in both districts. In both Sesheke and Namwala, only 39 foods (including salt, sugar and cooking oil) were described as being 'usually' or 'often' eaten.

Maize in the form of roller meal (whole grain ground maize) is regularly and universally consumed in the districts surveyed. Half of all respondents in Sesheke reported consuming sorghum and millet often or usually, but the rate was much lower in Namwala with only 13 percent of respondents claiming to regularly consume sorghum, and only 9 percent consuming millet.

The consumption frequency of the foods on the food list is broadly similar in both provinces. Most vegetables on the list are often or usually consumed in both districts, with some notable differences. For example, 66 percent of respondents in Sesheke reported eating cassava leaves 'usually' or 'often', compared with only 22 percent in Namwala. However, 81 percent of respondents in Namwala reported regular consumption of sweet potato leaves, compared with only 25 percent of participants in Sesheke. Half of the respondents in Namwala reported frequent consumption of small eggplants (impwa), compared to only 19 percent in Sesheke.

Based on the individual interviews, the consumption of fruit appears to be low in both districts, however, it was revealed during the focus groups that a wide range of wild fruit is consumed. A list of the wild fruits named by focus group participants is provided in Annex 10.

The consumption of pulses is generally low, with the exception of cowpeas, which were reported to have a high rate of consumption in both districts despite not being found at any markets in Namwala. Solwezi beans, Lusaka beans and white beans were found on sale at markets in both Sesheke and Namwala, but are reported as being rarely consumed. Half of the respondents in Namwala reported eating kabulangeti beans regularly, compared to only 28 percent of respondents in Sesheke. Although more than half of all respondents reported the frequent consumption of Bambara nuts, these were not found at the markets in either district. Groundnuts are the most

widely consumed legume in both districts ('usually' or 'often' consumed by 84 percent of respondents in Sesheke and by 97 percent of respondents in Namwala), surpassed only by groundnuts in pounded form, with respondents almost unanimously reporting regular consumption. Interestingly, soya pieces – commonly found at the markets in both districts – have a high rate of consumption: 75 percent in Sesheke and 88 percent in Namwala based the findings of the individual interviews.

3.3. Focus group findings – typical dietary habits

Food consumption habits are similar in both districts. Meals are eaten up to three times a day during harvest time, but meal frequency reduces to two meals and then one meal per day as the availability of food decreases. For four to six months of the year the communities surveyed do not have enough food and rationing becomes necessary. Respondents also report skipping meals. In Namwala, ceele and chibwantu (drinks made from milk or sour milk and maize) which are popular and frequently consumed during times of plenty are not consumed during the lean season.

Infants and young children

The foods given to children are uniform across both districts. A child is fed plain porridge at six months, and nshima and water are introduced at one year. Children are given plain maize porridge with milk and bananas. Several groups reported that young children are not given leftover nshima as it is believed to cause a child to grow a large stomach. Some myths persist, and it is common for children not to be given Bambara nuts (thought to delay a child's speech or the growth of their teeth), imilonge (delayed development of a child's teeth) and pumpkin (believed to cause diarrhoea). Some groups expressed a belief that the consumption of eggs leads to delayed hair growth among children, while other groups do not have this superstition and reported giving children eggs for protein and to promote growth. Some participants reported a belief that sour milk causes weak joints in children, and others stated that children are not given okra it is believed to be devoid of nutritional value. Most groups stated that children's nutritional needs are prioritised when food is scarce, although one group reported rationing children's meals in favour of allocating more to the man of the house.

Pregnant and lactating women

In the communities surveyed, pregnant women eat fish, meat, ground nuts, milk, nshima, beans, vegetables and wild fruits, but avoid eating eggs, chicken, wild animals and leftovers. Some superstitious beliefs were revealed during the focus group discussions, for example, several groups explained that pregnant women are forbidden from eating the meat of a cow that died while pregnant.

Lactating mothers avoid eating imilonge (fish), okra, pumpkin and pumpkin leaves as it is believed that consumption of these foods by the mother will cause stomach pains for the baby consuming breast milk.

Sick people

Sick people are given foods that are believed to boost the immune system: vegetables, fruit, fresh milk, fish and eggs. In one village in Sesheke District it was reported that sick people are given caterpillars, although caterpillars are rarely consumed otherwise.

Changes in availability of certain foods

Respondents in one village in Sesheke reported that the consumption of goat meat has declined and attributed this to the prevalence of diseases in goat herds. Villages in both Sesheke and Namwala reported that certain species of fish that had been commonly eaten are no longer available due to overfishing. Deforestation is believed to have resulted in the declining availability of some wild fruits. In several areas animals including rabbits, duiker, mbaambi, rabbits, hares, buffalo and warthogs are no longer found due to overhunting. The declining population of these animals and of impala, porcupines, wild guinea fowl and gazelles is also believed to be due to the depletion of the forest and increased settlement. In Namwala, the disappearance of a wild tuber known as chipama was also attributed to land being cleared for settlement. Some wild vegetables, including muzaeo and namukulongu, are still available but no longer considered edible, whereas wild vegetables such as hahipa, bunkululu, mukamba, bbuyu and nahwa are reported to be depleted.

Wealth status and meal preparation

In the focus group discussions in both districts it was commonly agreed that everyone prepares food to the level that their income allows. For example, those who are better off can afford to buy cooking oil and will use onions and tomatoes. Those with less purchasing power are more restricted in their cooking.

3.4. Focus groups: observations

The groups in both districts reported similar coping strategies during times of food insecurity: undertaking casual labour in exchange for food, gathering wild foods (predominantly fruit and nuts) for consumption, selling vegetables produced in home gardens, and selling fish. Notably, one group in Sesheke also reported selling home brewed beer in order to buy food. A group in Namwala described a potentially negative coping strategy whereby a bag of maize could be borrowed on the promise that two bags would be repaid at the next harvest. This effectively amounts to a loan with an interest rate of 100 percent.

The preservation of food is common in all villages surveyed. Maize is typically stored in sacks or granaries and treated with chemicals. One group explained that if they cannot afford chemicals the maize is stored unprocessed so that the weevils feed on the chaff and not on the grain. Groups in two villages reported adding ash to maize, which is said to act as a preservation agent. Another group preserve maize with dried cow dung and tobacco leaves. A variety of vegetables is preserved by sun-drying, though one group reported a reduction in the amount of vegetables dried in the past year owing to excessive rains. Although some groups reported selling dried vegetables for cash, most is reserved for home consumption. Preserved vegetable stocks for home consumption usually last for one to three months. Two groups in Sesheke District reported drying beef, which is stored and consumed when needed. Wild fruits are also commonly preserved across both districts. Fruits such as munzinzila, mubilo, muchingachinga and mundundo are sun-dried and only sold if there is a surplus. One group in Sesheke reported extracting oil from mongongo nuts to sell at the market.

The focus groups revealed that barter is prevalent throughout both districts; indeed, maize is considered a form of currency. Focus group participants reported exchanging home-grown vegetables and busala for maize, and bartering maize for fish, salt, clothes, kitchenware and utensils. Vegetables are also reported to be bartered for fish, while groundnuts are bartered for cabbage. Barter happens predominantly within the community, but for certain items barter will take place outside of the community.

Maize is the main staple in both districts, is generally eaten at every meal, and is available in a variety of forms: fresh maize, samp, roller meal (ground wholegrain, local process) and mealie meal (degermed, industrial production). Roller meal is most widely consumed, both as nshima and porridge. During harvest time maize is mixed with milk to make a popular drink known as chibwantu. Maize is grown in all communities and is purchased from the market when the home supply runs out. Sorghum and millet are also commonly consumed in communities throughout Seskehe, but are rarely grown or consumed in Namwala. Rice is only consumed on special occasions.

The cultivation of ground nuts and Bambara nuts is widespread, and ground nuts may also be purchased from within the community if home stocks deplete. Ground nuts are pounded and added to porridge or relish. Beans are typically eaten twice a week. Local beans and cowpeas are cultivated and kept for home consumption. Pulses such as Kabulangeti beans, Lusaka beans and white beans are bought from the market.

Every community is engaged in gardening and produces a range of vegetables including rape, okra, cabbage, tomatoes, Chinese cabbage, hibiscus leaf, amaranths and pumpkin leaves. Vegetables are eaten at every meal primarily between May and September. Vegetables are purchased from the market when own produce declines (usually from September).

Though considered a staple in other parts of Zambia, cassava is not commonly cultivated in either Sesheke or Namwala. Sweet potatoes are commonly eaten but

are often purchased from the market. Busala, a wild tuber, was not found at the markets in Sesheke but is particularly popular in Namwala.

3.5. Cost of the diets

Using price and weight data collected at the markets, the cost of an energy-only diet, a nutritious diet, and a nutritious diet based on typical dietary habits was calculated for a family of five in each district. It should be noted that breast milk appears in each diet summary but is specifically intended for the child aged 12-23 months, who is automatically included in any standard household composition. There is no monetary cost attached to breast milk; it is costed within the average extra energy and nutrients required by the mother each day (418kcal per day).

3.5.1. Energy-only diet

When estimating an energy only diet, the software calculates a lowest cost diet that meets only the average energy requirements of the family. The analysis is not used to promote an energy-only diet because it is very unlikely to meet all micronutrient requirements, however, it is useful to illustrate:

- The potential for micronutrient deficiencies in a diet that provides energy
- The additional cost of meeting all nutrient requirements, including micronutrients, in addition to energy (see Annex 1 for more information)

Table 4 shows the analysis of the daily and annual cost of the diet for a standard CoD family of 5 persons. The minimum cost of a diet that meets a household's energy needs has been estimated at 7.18 ZMW per day in Sesheke and between 7.68 ZMW and 7.98 ZMW in Namwala depending on the season. The average monthly cost of the energy-only diet for a 5-person household is estimated to be 218 ZMW in Sesheke and 238 ZMW in Namwala District. The annual cost of the EO diet is 2,620 ZMW in Sesheke District and 2,851 ZMW in Namwala District.

Table 4: The daily, monthly and annual cost in Zambian Kwacha of an energy-only diet for a 5-person household in two districts.

Energy-only Diet			
District	**Daily Cost (ZMW)**	**Average Monthly Cost (ZMW)**	**Annual Cost (ZMW)**
Sesheke	7.18	218	2,620
Namwala	7.68-7.98	238	2,851

Given that the supplementary price data entered for maize puts the cost at 2.00 ZMW/kg in Namwala and 2.30 ZMW/kg in Sesheke, it might be expected that the energy cost would be lower in Namwala, however, Namwala's price advantage has been offset by the higher cost of mealie meal found at the market. It is also worth noting that although some of the household energy requirement in Sesheke will be met by home-grown sorghum and millet, this is not reflected in the cost of the energy-

only diet as no price data for was found for these crops. In any case, maize is the dominant staple depended on by all communities surveyed.

Figures 1 and 2 show how the monthly cost of the energy-only diet in Sesheke and Namwala varies according to the number of individuals in the household and for families with minimum, average and maximum energy requirements. (Refer to Section 2.6 and Annex 9 for more information on families of 'high' and 'low' energy requirements.)

Figure 1: Monthly cost of an energy-only diet for households of 5, 6, 7, 8, 9 and 10 persons in Sesheke.

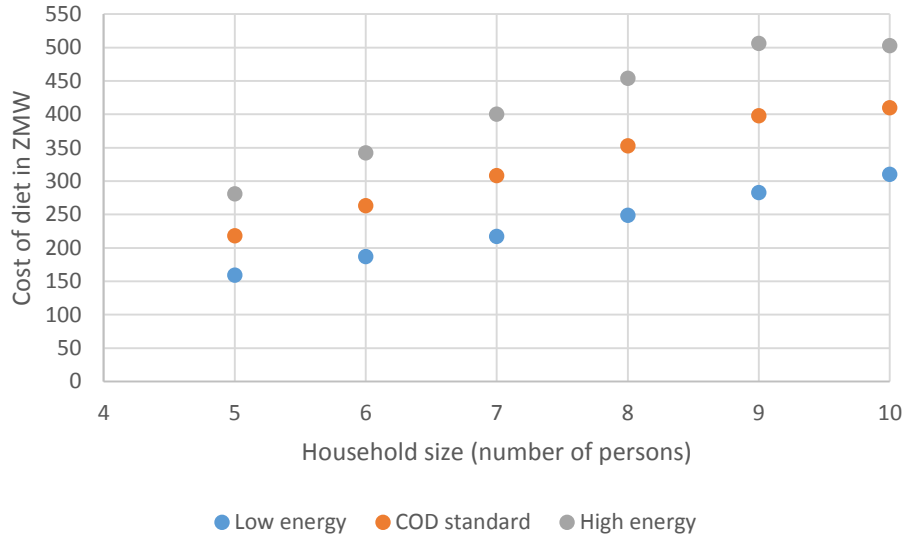
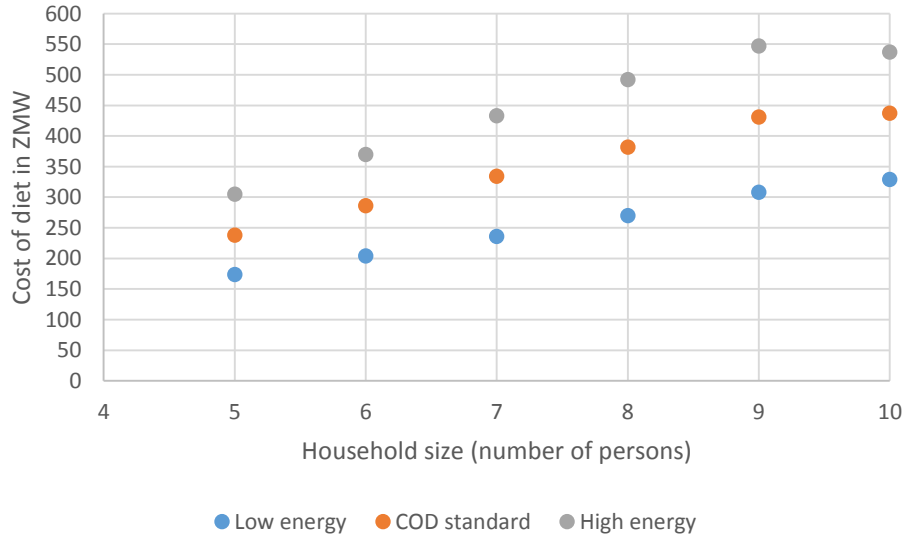


Figure 2: Monthly cost of an energy-only diet for households of 5, 6, 7, 8, 9 and 10 persons in Namwala.



The cost of an energy-only diet for a 5-person household in Sesheke ranges between 159 ZMW and 281 ZMW per month. In Namwala the cost for the same sized household ranges between 174 ZMW and 305 ZMW per month.

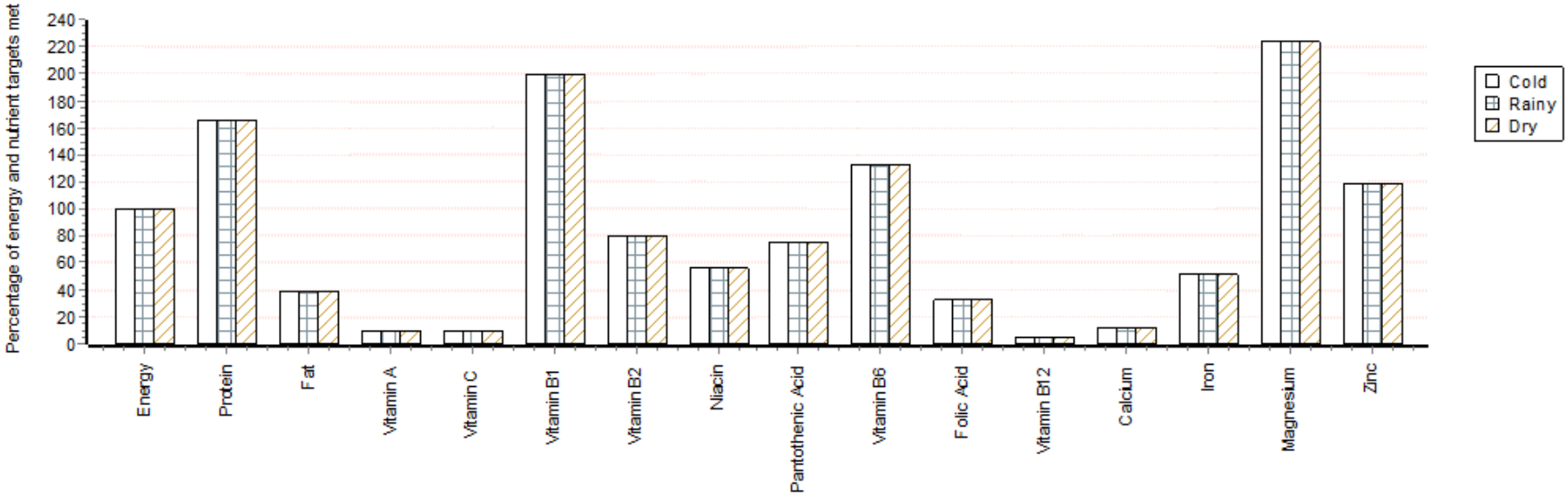
Figures 3 and 4 show the percentage of recommended requirements met for the essential macro and micronutrients by an energy only diet, averaged across a 5-person household for both districts. Annex 11 shows the absolute weight and cost of the foods selected for an energy-only diet for the family in each district for a year, with the percentage contributed by each food in terms of weight, cost, energy, protein and fat, the percentage contribution of each food for eight vitamins and four minerals, and the percentage of the total requirements for each nutrient.

The software incorporates both unprocessed maize grain and mealie meal into the analysis for both districts (and in the same proportions for each district). Interestingly, roller meal (unprocessed maize grain) accounts for 61 percent of the cost of the EO diet in Sesheke and only 39 percent of the cost in Namwala. This can be attributed to the difference in the cost of maize grain in each district (K2.30/kg in Sesheke and K2.00/kg in Namwala).

The analysis highlights the crucial importance of maize in the diet of the target communities. Not only does maize fulfil the bulk of the family's energy requirement, it also meets the family's need for vitamin B1, vitamin B6, magnesium and zinc, as illustrated in Annex 11. The energy-only diet also meets the family's protein requirement, but it is important to note that as maize is not a complete protein additional sources of protein are necessary to provide all the essential amino acids. The importance of maize in the diet in both districts cannot be overstated.

Figure 3: The percentage of energy and target nutrient intakes met in an energy-only diet for the family, by season in Sesheke.

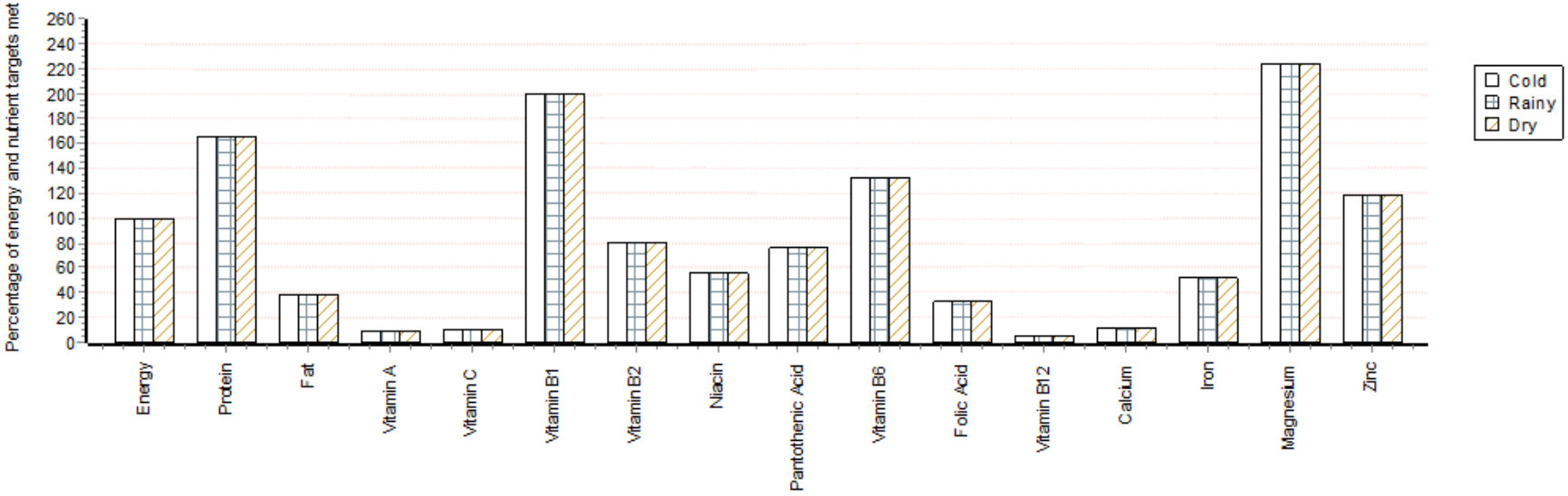
Energy-only Diet – Sesheke District / Cereal, Livestock and Timber Zone



Season	Energy	Protein	Fat	Vitamin A	Vitamin C	Vitamin B1	Vitamin B2	Niacin	Pantothenic Acid	Vitamin B6	Folic Acid	Vitamin B12	Calcium	Iron	Magnesium	Zinc
Cold	100.0	165.2	38.2	9.1	9.7	199.4	80.3	55.4	75.4	133.1	32.5	5.0	11.6	51.2	223.9	118.5
Rainy	100.0	165.2	38.2	9.1	9.7	199.4	80.3	55.4	75.4	133.1	32.5	5.0	11.6	51.2	223.9	118.5
Dry	100.0	165.2	38.2	9.1	9.7	199.4	80.3	55.4	75.4	133.1	32.5	5.0	11.6	51.2	223.9	118.5

Figure 4: The percentage of energy and target nutrient intakes met in an energy-only diet for the family, by season in Namwala.

Energy-only Diet – Namwala District / Maize, Livestock and Fishery Zone



Season	Energy	Protein	Fat	Vitamin A	Vitamin C	Vitamin B1	Vitamin B2	Niacin	Pantothenic Acid	Vitamin B6	Folic Acid	Vitamin B12	Calcium	Iron	Magnesium	Zinc
Cold	100.0	165.2	38.2	9.1	9.7	199.4	80.3	55.4	75.4	133.1	32.5	5.0	11.6	51.2	223.9	118.5
Rainy	100.0	165.2	38.2	9.1	9.7	199.4	80.3	55.4	75.4	133.1	32.5	5.0	11.6	51.2	223.9	118.5
Dry	100.0	165.2	38.2	9.1	9.7	199.4	80.3	55.4	75.4	133.1	32.5	5.0	11.6	51.2	223.9	118.5

3.5.2. Micronutrient/nutritious (MNUT) diet

When estimating a nutritious diet, the software calculates the lowest cost combination of foods which meets the average energy requirements and the recommended micronutrient intake of the typical family. This diet does not reflect people's typical dietary patterns but it is useful to illustrate:

- The differences in diet composition and its cost when compared with a diet that takes into account typical dietary patterns.
- The extra cost of micronutrients when compared with the energy only diet
- The relatively small number of foods that can provide a nutritious diet but often in unrealistic quantities

Table 5 shows the minimum cost of a nutritionally adequate diet that meets the average recommended requirements for energy, protein, fat and micronutrients. It is estimated to cost between 19.51 ZMW and 21.57 ZMW per day in Sesheke and between 25.04 ZMW and 30.66 ZMW in Namwala. The monthly cost of the MNUT diet for a typical 5-person family is estimated to be in is 615 ZMW in Sesheke and 821 ZMW in Namwala. The annual cost is 7,377 ZMW and 9,857 ZMW in Sesheke and Namwala respectively.

Table 5: The daily, monthly and annual cost in Zambian Kwacha of a nutritious diet for a 5-person household in two districts.

Nutritious Diet			
District	**Daily Cost (ZMW)**	**Monthly Cost (ZMW)**	**Annual Cost (ZMW)**
Sesheke	19.51-21.57	615	7,377
Namwala	25.04-30.66	821	9,857

Table 6 shows the cost of the MNUT diet for a typical 5-person family by season. In both districts the MNUT diet is most expensive during the dry season. The cost of the diet in the rainy and cold season is similar within each district, but overall, the cost of the diet is significantly higher in Namwala than in Sesheke. As the cost of maize is lower in Namwala than in Sesheke (see section 3.5.1.), the higher overall cost of the diet in Namwala can be attributed to the smaller number of nutrient-rich vegetables found at the markets in the district. As indicated in Section 3.1, only 13 of the 39 foods reported to be commonly eaten in Namwala were found at the market. Since the diet can only be costed using price information for food items found at the market, the software may not have the option to choose the cheapest source of each nutrient. This will result in a higher cost for a nutritious diet.

Table 6: The seasonal cost in Zambian Kwacha (ZMW) of a nutritious diet for a 5-person household in two districts.

Based on a 5-person household	**Average daily cost (Zambian Kwacha)**		
	Cold	**Rainy**	**Dry**
Sesheke	19.51	20.10	21.57
Namwala	27.36	25.04	30.66

Figures 5 and 6 show how the monthly cost of the MNUT (nutritious) diet in Sesheke and Namwala varies according to the number of individuals in the household and for families with minimum, average and maximum energy requirements. (Refer to Section 2.6 and Annex 9 for more information on families of 'high' and 'low' energy requirements.)

Figure 5: Monthly cost of an MNUT (nutritious) diet for households of 5, 6, 7, 8, 9 and 10 persons in Sesheke.

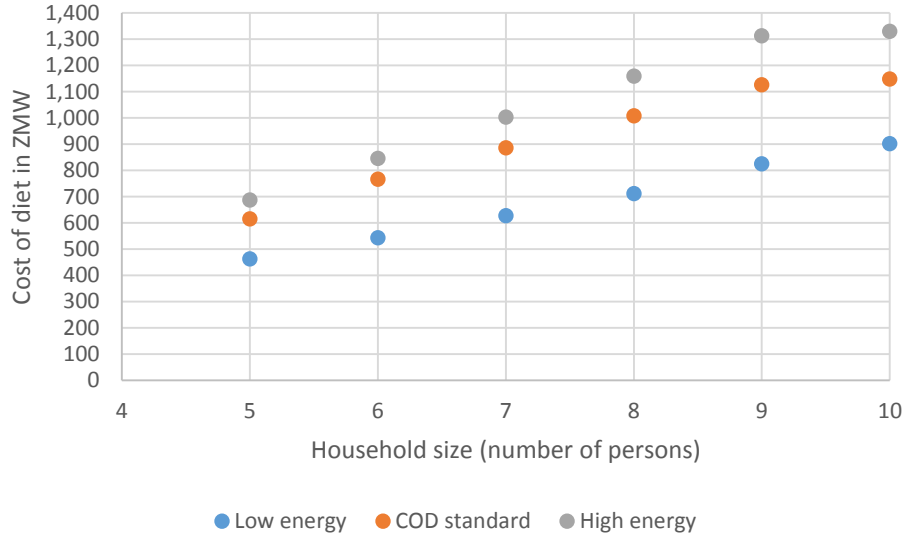
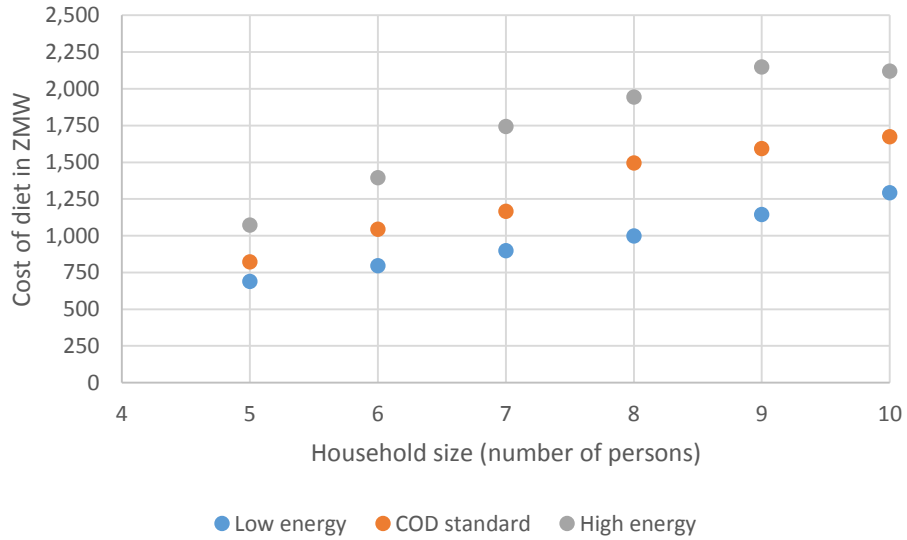


Figure 6: Monthly cost of an MNUT (nutritious) diet for households of 5, 6, 7, 8, 9 and 10 persons in Namwala.



The cost of a nutritious (MNUT) diet for a 5-person household in Sesheke ranges between 462 ZMW and 687 ZMW per month. In Namwala the cost for the same sized household ranges between 688 ZMW and 1,071 ZMW per month.

Annex 12 shows the absolute yearly weight and cost of the foods selected for a nutritious diet in each district with the percentage contributed by each food in terms of weight, cost, energy, protein and fat, the percentage contribution of each food for eight vitamins and four minerals and the percentage of the total requirements met by each nutrient.

In Sesheke, the nutritious diet comprises 17 foods. Wholegrain maize accounts for 20 percent of the cost of the nutritious diet, but satisfies 60 percent of the family's total energy requirement and 52 percent of protein needs. In the context of the hypothesized diet, maize provides essential nutrients in the following proportions:

Vitamin B1 – 78%
Vitamin B2 – 25%
Vitamin B3 (niacin) – 34%
Vitamin B6 – 55%
Folic acid – 22%
Iron – 34%
Zinc – 65%

This breakdown highlights the importance of the staple crop as part of a nutritious diet in the district.

As a food group, fish also makes an important contribution to the nutritious diet, with three species included. Overall, fish contributes 40 percent to the cost of the diet and provides 19 percent of the protein intake. In addition, it provides 38 percent and 11 percent of the intake of calcium and iron respectively, and is the only source of vitamin B12 (excluding that contained in breastmilk fed to the child aged 12-23 months).

Two vegetables – pumpkin and sweet potato leaves – contribute 9 percent to the overall cost of the diet, but along with amaranth leaves (included in the analysis at zero cost) provide almost 73 percent of the family's vitamin A requirement and 29 percent of the yearly recommended intake of vitamin C. The vegetables also provide 54 percent of both vitamin B2 and folic acid.

Oil accounts for 17 percent of the overall cost and provides just over half of the fat in the diet.

Caterpillars account for almost 16 percent of the iron in the nutritious diet, with a further 26 percent of iron provided by the 'free' amaranth leaves.

The fruits that have been included at zero cost in the cold and rainy season (mango and non-specific bush fruit) provide 70 percent of the yearly intake of vitamin C. Together, the three 'free' foods make up 46 percent of vitamin A and 93 percent of the vitamin C intake across the year.

The nutrients that contribute most to the cost of the diet are those for which the target of 100 percent has only just been reached[19]. Vitamin B12 emerges as the most expensive nutrient, in this instance derived only from fish, which accounts for 40 percent of the overall cost of the diet.

In Namwala District, the nutritious diet comprises 23 foods. Wholegrain maize provides 54 percent of the energy and 40 percent of protein in the diet, and accounts for 10 percent of the overall cost of the nutritious diet. As in the hypothetical diet generated for Sesheke, maize also provides a high proportion of the recommended intake of vitamin B1 (64 percent), vitamin B2 (23 percent), vitamin B3/niacin (27 percent) and vitamin B6 (47 percent), as well as iron (38 percent) and zinc (49 percent).

Other protein sources include beans (providing 16 percent of protein) and fish (providing 19 percent of protein), with each food group accounting for 15 percent and 33 percent of the annual cost of the diet respectively. The greatest cost contributor, fish also provides 25 percent of vitamin B3/niacin, 37 percent of calcium and all of the vitamin B12 (excluding that contained in the breastmilk fed to the child aged 12-23 months). Beans account for 31 percent of the folic acid in the diet, and also contribute to the intake of calcium (12 percent), zinc (16 percent) and iron (16 percent).

The four costed vegetables included in the hypothetical diet account for 19 percent of yearly cost, and when combined with the two 'free' vegetables (sweet potato leaves and okra) provide a significant proportion of the diet's vitamin A (93 percent), vitamin C (48 percent), vitamin B2 (57 percent), vitamin B3/niacin (33 percent), vitamin B6 (34 percent), folic acid (52 percent), calcium (39 percent), iron (31 percent) and zinc (21 percent). Wild fruit – represented in the analysis as 'fruit, bush, nonspecific' provides 48 percent of the vitamin C in the diet.

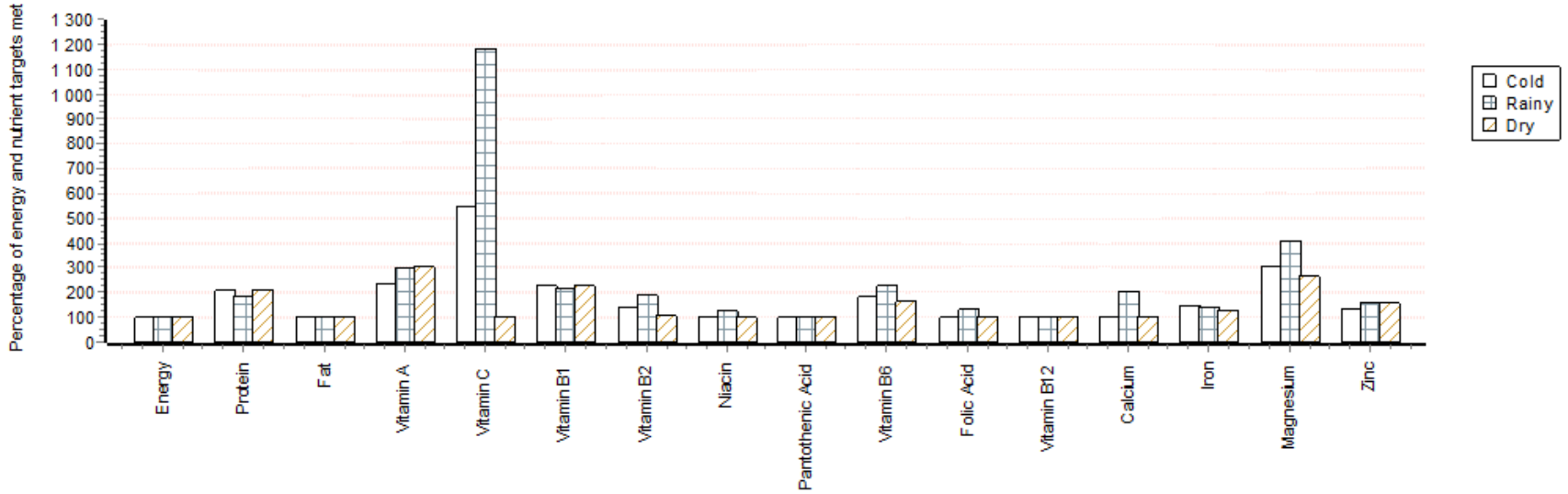
Figures 7 and 8 show the percentage of energy and target nutrient intakes for the family by season. The percentage of nutrient intakes met in a nutritious diet are broadly similar in each season, with the exception of vitamin C, with levels spiking during the cold and rainy season in both districts owing to the inclusion of 'free' foods, such as bush fruit, mango, okra, amaranth leaves and sweet potato leaves. Although the software has been able to meet the recommended intakes of each micronutrient using local foods, the micronutrients for which the target of 100 percent has only just been met are revealed as being those most difficult to obtain in a diet that is not constrained by typical dietary patterns. These nutrients drive up the cost of the MNUT diet because the software has to include more expensive foods that provide these nutrients. Interestingly, vitamin B12 is the micronutrient that adds most to the cost of the diet in Sesheke, whereas the most costly micronutrients in the diet created for Namwala are calcium and iron.

[19] It can be observed that most nutrients included in the model of a nutritious diet far exceed the target intake of 100%. The software is designed to create a diet that achieves a minimum of 100% of the target intake for each nutrient. When a target is reached by 100% and no more it implies that the nutrient is not abundant. The software may therefore have to include foods that are more expensive in order to meet the requirement.

The analysis indicates that in Namwala the nutritious diet is cheaper in the rainy season than in the cold season. However, the reality is likely to be different: the harvest occurs in the cold season meaning more people are consuming their own food stocks, and with more plentiful food stocks market prices are likely to be lower. The cost determined for the rainy season is cheaper mainly because of the inclusion of wild fruit at zero cost, which means that the software does not have to draw on priced foods to fulfil the requirement for vitamin C. Various foods that are home-produced could have been included at zero cost during the cold season, which would have resulted in a lower cost of the diet in this season. But as explained in Section 2.9, it is not possible to specify the number of days in a season that 'free' foods last, which may cause the cost of the diet to be underestimated. Furthermore, it is important to use market prices as far as possible so that – in the case that all food must be sourced from the market – the cost of a nutritious diet is known.

Figure 7: The percentage of energy and target nutrient intakes met in a nutritious diet for the family, by season in Sesheke.

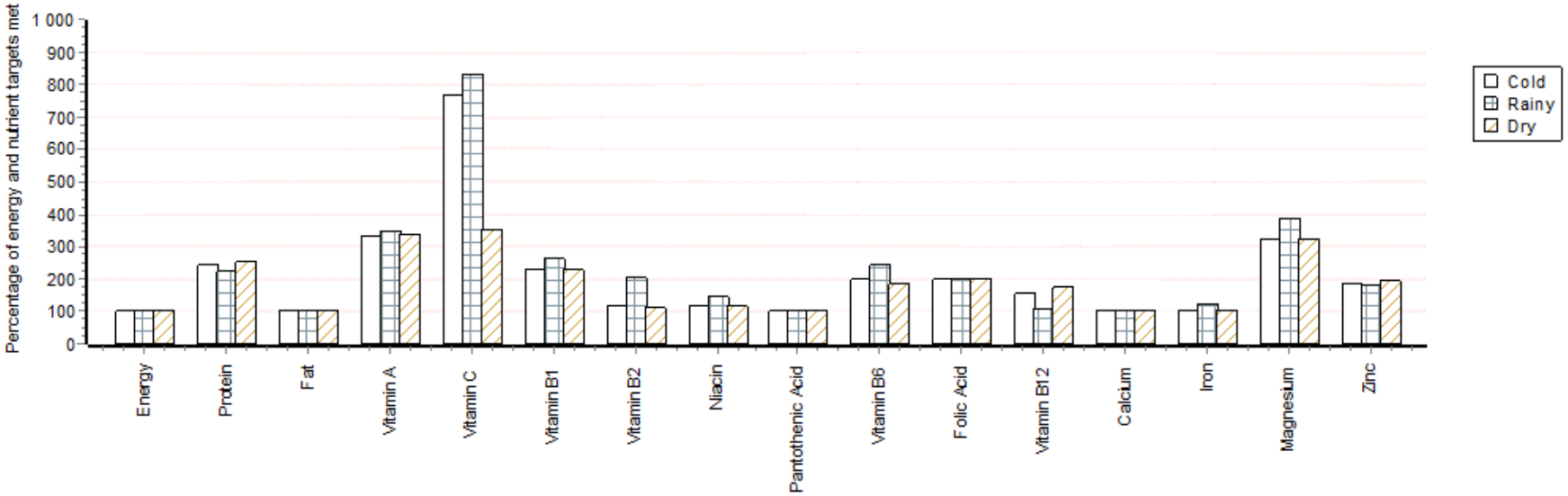
Nutritious Diet – Sesheke District / Cereal, Livestock and Timber Zone



Season	Energy	Protein	Fat	Vitamin A	Vitamin C	Vitamin B1	Vitamin B2	Niacin	Pantothenic Acid	Vitamin B6	Folic Acid	Vitamin B12	Calcium	Iron	Magnesium	Zinc
Cold	100.0	210.4	100.0	230.4	551.1	225.7	140.9	101.0	100.0	183.5	100.0	100.0	100.0	146.1	301.2	135.3
Rainy	100.0	186.1	100.0	298.5	1,180.8	212.9	191.9	125.8	101.3	229.3	134.4	100.0	205.0	136.2	408.9	160.4
Dry	100.0	205.5	100.0	299.8	100.0	225.3	105.4	100.0	103.0	162.3	100.0	100.0	100.0	129.2	262.6	157.2

Figure 8: The percentage of energy and target nutrient intakes met in a nutritious diet for the family, by season in Namwala.

Nutritious Diet – Namwala District / Maize, Livestock and Fishery Zone



Season	Energy	Protein	Fat	Vitamin A	Vitamin C	Vitamin B1	Vitamin B2	Niacin	Pantothenic Acid	Vitamin B6	Folic Acid	Vitamin B12	Calcium	Iron	Magnesium	Zinc
Cold	100.0	242.8	100.0	334.2	768.3	230.1	116.3	117.2	101.6	199.1	197.4	153.1	100.0	103.3	326.7	186.6
Rainy	100.0	221.9	100.0	351.3	830.3	260.8	205.3	144.5	100.5	240.4	197.4	108.5	100.0	122.0	386.9	177.9
Dry	100.0	251.7	100.0	341.6	354.9	229.4	112.7	115.3	101.1	183.2	198.1	174.1	100.0	104.0	326.2	193.2

3.5.3. The food habits nutritious diet

As described in Annex 1, the food habits diet is, in theory, a nutritious diet that takes into account the typical dietary habits of households in each of the districts as revealed by the individual interviews and focus group discussions. Typical dietary habits are incorporated through applying minimum and maximum constraints to the number of times a food can be consumed in a day or over the course of week. (See Section 2.8 for a more detailed explanation.)

Table 7 shows that the minimum cost of a nutritionally adequate diet based *on local dietary habits* that meets the average recommended requirements for energy, protein, fat and micronutrients. The FHAB diet is estimated to cost between 22.48 ZMW and 25.65 ZMW per day in Sesheke and between 29.51 ZMW and 39.12 ZMW in Namwala. The average monthly cost of the FHAB diet for a typical 5-person family is 718 ZMW in Sesheke and 1,103 ZMW in Namwala. The annual cost of the diet is estimated to be 8,617 ZMW in Sesheke and 12,159 in Namwala.

Table 7: The daily, monthly and annual cost in Zambian Kwacha of a food habits nutritious diet for a 5-person household in two districts.

Food Habits Nutritious Diet			
District	**Daily Cost (ZMW)**	**Average monthly cost (ZMW)**	**Annual Cost (ZMW)**
Sesheke	22.48-25.65	718	8,617
Namwala	29.51-39.12	1,013	12,159

Table 8 shows the cost of the FHAB diet for a typical 5-person family by season. In both districts the FHAB diet is most expensive during the dry season. In Sesheke, the average daily cost is slightly higher in the rainy season than in the cold season, but in Namwala the cost appears to be higher in the cold season than in the rainy season. The cost in the rainy season has been reduced by the inclusion of mango, bush fruit and two vegetables (sweet potato leaves and okra) at zero cost. In reality, the cost of the diet is likely to be cheapest during the cold season when market supply is high. However, in order to generate the most accurate cost possible across the year it is important to factor into the diet the foods that are most commonly relied upon for sustenance and nutrition, whether they are purchased at the market or not.

Table 8: The seasonal cost in Zambian Kwacha (ZMW) of a food habits nutritious diet for a 5-person household in two districts.

Based on a 5-person household	**Average daily cost (Zambian Kwacha)**		
	Cold	**Rainy**	**Dry**
Sesheke	23.84	22.48	25.65
Namwala	34.78	29.51	39.12

Figures 9 and 10 show how the monthly cost of the MNUT (nutritious) diet in Sesheke and Namwala varies according to the number of individuals in the

household and for families with minimum, average and maximum energy requirements. (Refer to Section 2.6 and Annex 9 for more information on families of 'high' and 'low' energy requirements.)

Figure 9: Monthly cost of a food habits nutritious diet for households of 5, 6, 7, 8, 9 and 10 persons in Sesheke.

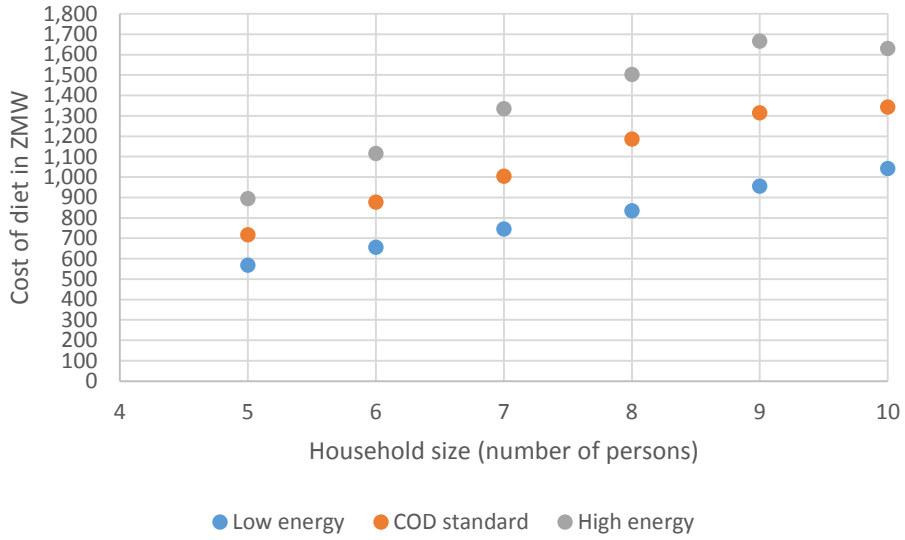
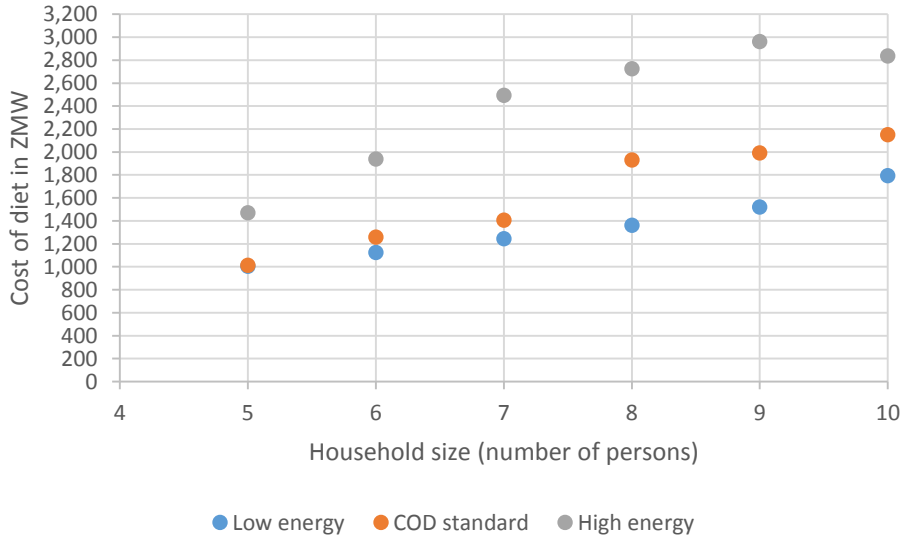


Figure 10: Monthly cost of a food habits nutritious diet for households of 5, 6, 7, 8, 9 and 10 persons in Namwala.



The cost of a food habits nutritious diet for a 5-person household in Sesheke ranges between 569 ZMW and 895 ZMW per month. In Namwala the cost for the same sized household ranges between 1,005 ZMW and 1,470 ZMW per month.

Annex 13 shows the absolute yearly weight and cost of the foods selected for a food habits nutritious diet in each district with the percentage contributed by each food in terms of weight, cost, energy, protein and fat, the percentage contribution of each food for eight vitamins and four minerals and the percentage of the total requirements met by each nutrient.

In Sesheke, the food habits nutritious diet comprises 23 foods, including three varieties of maize, five varieties of fish, five legumes and four vegetables. Wholegrain maize accounts for 12 percent of the cost of the food habits diet but satisfies 42 percent of the family's total energy requirement and 34 percent of protein needs. The FHAB diet also incorporates fresh maize and mealie meal. Overall, maize products account for 22 percent of the annual cost of the food habits diet and contribute 65 percent of the diet's energy and 50 percent of protein needs. Combined, the three forms of maize provide essential micronutrients in the following proportions:

Vitamin B1 – 74%
Vitamin B2 – 29%
Vitamin B3 (niacin) – 33%
Vitamin B6 – 52%
Folic acid – 16%
Iron – 28%
Zinc – 57%

As with the nutritious (MNUT) diet, the food habits (FHAB) diet is similarly dependent on the contribution of maize to the intake of four 'B' vitamins, folic acid, iron and zinc.

Fish accounts for 40 percent of the cost of the food habits diet (in line with the MNUT diet) and provides 23 percent of the diet's protein (compared to 19 percent in the MNUT model). Fish is an important source of several micronutrients in the diet, including calcium (43 percent) and iron (21 percent), and it provides the family's full complement of vitamin B12 (excluding that contained in breastmilk fed to the child aged 12-23 months). Three costed vegetables (pumpkin, mushrooms and sweet potato leaves), along with one 'free' vegetable (amaranth leaves) and two 'free' fruits (mango and 'bush fruit') provide the bulk of the remaining micronutrients. The breakdown of the contribution by costed vegetables and 'free' fruit and vegetables can be seen in Table 9.

Table 9: Percentage of micronutrients in the FHAB diet in Sesheke provided by costed and 'free' fruit and vegetables.

Micronutrient	% provided by costed veg (pumpkin, dried mushrooms, sweet potato leaves)	% provided by 'free' fruit and vegetables (amaranth leaves, mango, 'bush fruit')	% micronutrients provided by fee and costed fruit and vegetables
Vitamin A	61%	37%	98%
Vitamin C	12%	86%	98%
Vitamin B2	26%	39%	65%
Vitamin B3/niacin	16%	19%	35%
Vitamin B6	14%	25%	39%
Folic Acid	24%	40%	64%
Calcium	4%	48%	52%
Iron	13%	36%	49%
Zinc	11%	18%	29%

As can be seen from Table 9 above, the 'free' foods are an important source of micronutrients in the diet, contributing as much as 86 percent of family's annual vitamin C intake and 48 percent of calcium. Combined with the costed items in the table, fresh fruit and vegetables provide the family's entire intake of vitamin A and vitamin C (the remaining intake is from breastmilk).

The four pulses incorporated into the diet contribute relatively little to the protein intake (3 percent), but they constitute 15 percent of the folic acid in the diet.

Oil accounts for 15 percent of the cost of the diet and constitutes 55 percent of the fat intake.

As with the MNUT diet, vitamin B12 is the nutrient that contributes most to the cost of the FHAB diet in Sesheke. However, the target of 100 percent is far exceeded for all other micronutrients.

In Namwala District, the nutritious diet comprises 27 foods. Wholegrain maize accounts for 6 percent of the cost of the food habits diet but satisfies 42 percent of the family's total energy requirement and 27 percent of protein needs. The FHAB diet also incorporates mealie meal. Combined, maize products account for 9 percent of the annual cost of the food habits diet and contribute 49 percent of the diet's energy and 31 percent of protein needs. Together, the wholegrain maize and mealie meal provide essential micronutrients in the following proportions:

Vitamin B1 – 57%
Vitamin B2 – 22%
Vitamin B3 (niacin) – 18%
Vitamin B6 – 39%
Folic acid – 10%
Iron – 30%
Zinc – 40%

As with the MNUT diet and the FHAB diet for Sesheke, maize contributes significantly to the micronutrient content of the Namwala FHAB diet.

The FHAB diet in Namwala incorporates six varieties of fish, which together provide a further 31 percent of the protein intake. Fish accounts for 40 percent of the cost of the diet, but provides a high quantity of some essential micronutrients, including vitamin B3/niacin (41 percent), calcium (50 percent), iron (17 percent) and zinc (16 percent). Fish is the most important source of vitamin B12 in the diet, contributing 92 percent of the intake (the remainder is sourced from eggs (5 percent) and breastmilk).

Four pulses are included in the diet. They account for 14 percent of the overall cost of the diet, 14 percent of the protein intake and also contribute to the intake of folic acid (36 percent), calcium (11 percent), zinc (16 percent) and iron (17 percent).

The three costed vegetables (cabbage, rape (substituted by kale), and pumpkin) and one fruit (watermelon) are included in the hypothetical diet and account for 11 percent of yearly cost. When combined, the two 'free' vegetables (sweet potato leaves and okra) and two 'free' fruits (mango and 'non-specified bush fruit') provide a significant proportion of the diet's vitamin A (95 percent), vitamin C (94 percent), vitamin B2 (62 percent), vitamin B3/niacin (24 percent), vitamin B6 (34 percent), folic acid (48 percent), calcium (29 percent), iron (31 percent) and zinc (19 percent). The breakdown of the contribution by costed vegetables and 'free' fruit and vegetables can be seen in Table 10.

Table 10: Percentage of micronutrients in the FHAB diet in Namwala provided by costed and 'free' fruit and vegetables.

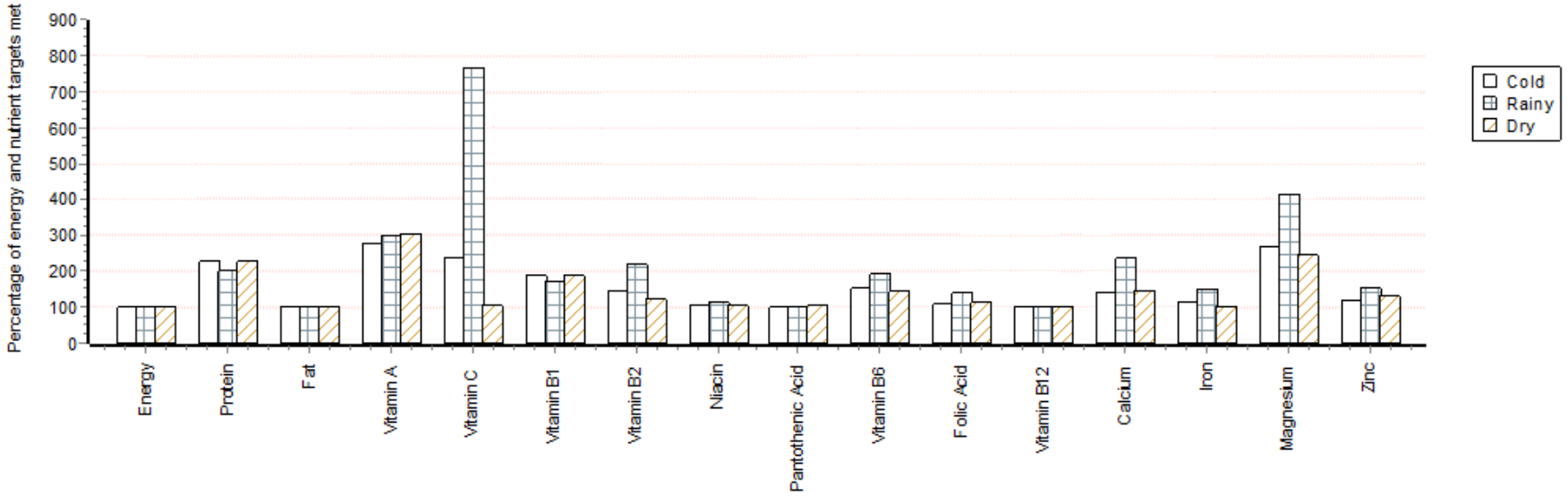
Micronutrient	% provided by costed fruit and veg (cabbage, rape, pumpkin, watermelon)	% provided by 'free' fruit and vegetables (mango, bush fruit, okra, sweet potato leaves)	% micronutrients provided by fee and costed fruit and vegetables
Vitamin A	52%	43%	95%
Vitamin C	49%	44%	93%
Vitamin B2	16%	37%	53%
Vitamin B3/niacin	8%	17%	25%
Vitamin B6	15%	20%	35%
Folic Acid	22%	26%	46%
Calcium	16%	13%	29%
Iron	8%	23%	31%
Zinc	9%	10%	19%

As can be seen from Table 10 above, 'free' foods are an important source of micronutrients in the diet, although it is interesting to note that they contribute less vitamin C and calcium to the diet than the free foods in the Sesheke FHAB diet. However, in common with the Sesheke model, the combination of costed and free fruit and vegetables provides almost all of the family's intake of vitamin A and vitamin C.

Figures 11 and 12 show the percentage of energy and target nutrient intakes for the family by season. Interestingly, the target for vitamin B12 is exceeded in each season, indicating that the additional fish species incorporated into the Namwala FHAB diet help to avoid vitamin B12 deficiency. In two seasons the target for iron is met by exactly 100 percent, indicating that sources of iron are more limited and expensive. There are some variations in the amount by which the target for each micronutrient is met across each season, but for the most part the targets are exceeded by a substantial margin.

Figure 11: The percentage of energy and target nutrient intakes met in a food habits nutritious diet for the family, by season in Sesheke.

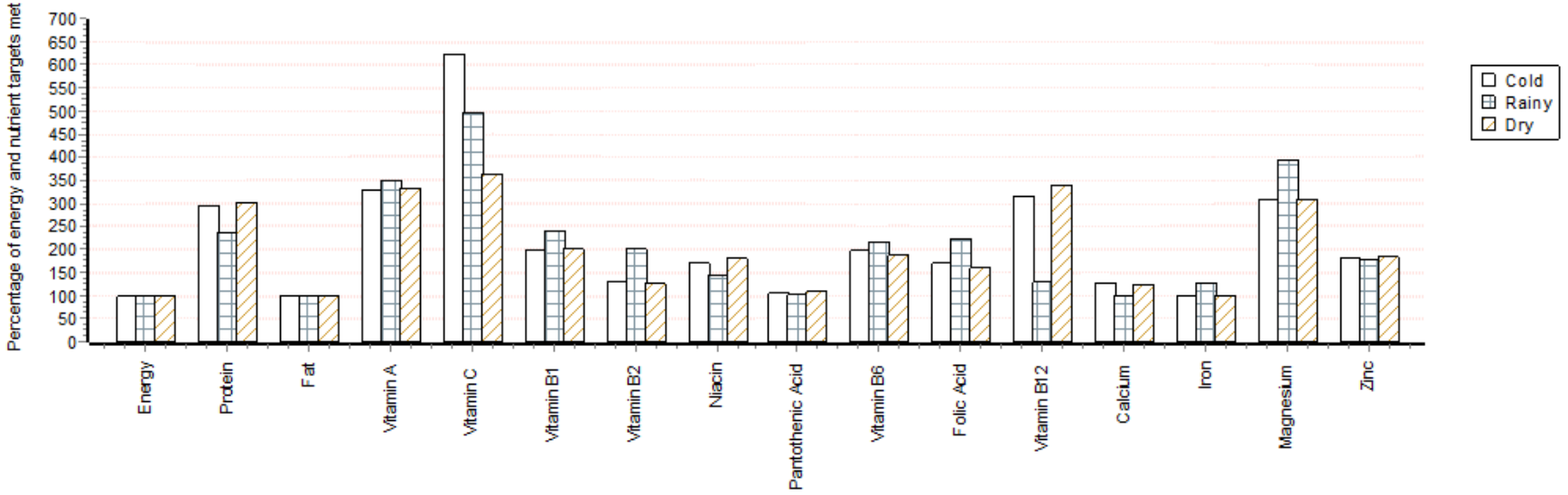
Food Habits Nutritious Diet – Sesheke District / Cereal, Livestock and Timber Zone



Season	Energy	Protein	Fat	Vitamin A	Vitamin C	Vitamin B1	Vitamin B2	Niacin	Pantothenic Acid	Vitamin B6	Folic Acid	Vitamin B12	Calcium	Iron	Magnesium	Zinc
Cold	100.0	229.3	100.0	278.3	233.8	188.1	146.3	103.9	100.7	153.4	109.1	100.0	140.6	112.8	270.5	117.7
Rainy	100.0	199.9	100.0	301.1	763.3	169.2	217.3	112.8	100.4	193.1	138.9	100.0	237.4	147.1	413.5	154.7
Dry	100.0	225.4	100.0	303.8	103.3	189.5	122.2	104.2	103.8	143.4	113.7	100.0	143.4	101.7	244.2	131.6

Figure 12: The percentage of energy and target nutrient intakes met in a food habits nutritious diet for the family, by season in Namwala.

Food Habits Nutritious Diet – Namwala District / Maize, Livestock and Fishery Zone



Season	Energy	Protein	Fat	Vitamin A	Vitamin C	Vitamin B1	Vitamin B2	Niacin	Pantothenic Acid	Vitamin B6	Folic Acid	Vitamin B12	Calcium	Iron	Magnesium	Zinc
Cold	100.0	296.2	100.0	330.3	620.2	196.5	127.6	170.2	106.9	195.4	169.3	316.0	125.1	100.0	309.5	178.6
Rainy	100.0	239.3	100.0	351.3	496.1	239.7	201.9	144.2	100.3	218.5	226.0	129.2	100.0	125.5	395.4	176.0
Dry	100.0	300.8	100.0	332.2	363.3	199.4	126.1	179.8	108.9	185.9	161.1	339.7	121.1	100.0	309.7	184.0

3.6. Cost comparison between the MNUT and FHAB diets

As explained in Section 3.1, the individual interviews and focus group discussions revealed a striking disparity between the foods that are most commonly consumed, and the foods that are available at the market. In Sesheke, 13 of the 39 most commonly eaten foods[20] were not found at the markets, while 29 of the foods found at the market were reported as being 'rarely' or 'never' consumed by 50 percent or more of respondents. In Namwala, 18 of the 40 most frequently consumed foods[21] were not found at the market, while 17 of the 40 foods found at the market were reported as being 'rarely' or 'never' consumed by 50 percent or more of respondents.

As shown in Table 11, the cost of the FHAB diet is 17 percent more expensive than the MNUT diet in Sesheke, and 23 percent more expensive in Namwala. However, it is important to remember that the cost of each diet is based on foods for which market data was available (with the exception of the small number of fruit and vegetables that were included at zero cost for reasons explained in Section 2.9). If markets reliably stocked the foods that people routinely consume the cost of the 'food habits' diet would likely be much lower. When the software is limited to selecting from priced foods – and so many of the foods favoured by the communities were not available at the markets – it has a much narrower scope for generating a food habits diet. The resulting hypothetical diet will inevitably be more expensive.

Table 11: Daily, monthly and annual cost of MNUT diet and FHAB diet for each district, with difference in cost between the two diets highlighted.

Diet	Rainy season (166 days)	Cold season (123 days)	Dry season (77 days)	Monthly cost	Annual cost
SESHEKE DISTRICT					
MNUT cost	19.51	20.10	21.57	615	7,377
FHAB cost	23.84	22.48	25.65	718	8,617
DIFFERENCE	**4.33**	**2.38**	**4.08**	**103**	**1,240**
% difference				**17%**	**17%**
NAMWALA DISTRICT					
MNUT cost	27.36	25.04	30.66	821	9,857
FHAB cost	34.78	29.51	39.12	1,013	12,159
DIFFERENCE	**7.42**	**4.47**	**8.46**	**192**	**2,302**
% difference				**23%**	**23%**

Another point to consider is that the 'food habits' diet – which is intended to be a culturally appropriate diet – is not necessarily a reflection of local food preferences, but of food availability. As noted above, respondents reported rarely or never consuming a large proportion of the foods found at the market – but lack of access to markets (economic and physical) is a key reason for poor dietary diversity. Given that the food habits diet comprises only a small number of the foods that are most frequently consumed, it is recommended that cost of the food habits diet be viewed with caution.

[20] Foods 'usually' or 'often' consumed by 50 percent or more of focus group respondents
[21] Foods 'usually' or 'often' consumed by 50 percent or more of focus group respondents

4. Key Findings

The key findings of the Cost of the Diet survey are summarized below.

The cost of a nutritious diet beyond the means of the poor

The average monthly cost of a nutritious diet for a family of five is ZMW 615 in Sesheke and ZMW 821 in Namwala. This is clearly well beyond the means of the poor and shows that the monthly social cash transfer of ZMW 90 is grossly inadequate.

Underdeveloped market system

The market surveys undertaken as part of the Cost of the Diet study offer a snapshot of the foods on offer at the market during harvest time, typically the time of greatest abundance. A relatively small number of foods was found at the main markets in both districts (55 in Sesheke; 39 in Namwala), and discussions with traders revealed that supply is often erratic, varying by season, day of the week and even time of day. This is – at least in part – a function of the high level of domestic production in the districts, with many families only purchasing from the market when their own stocks have run out.

Dearth of markets in rural areas

In the main, the Cost of Diet analysis relied on market data obtained from the main markets in each district, i.e. Sesheke market and Katima market in Sesheke District, and Namwala Central and Moobola market in Namwala District. Most (but not all) of the villages in which the focus group discussions were held had a trading post offering non-perishable items including cooking oil, salt, confectionary and soft drinks, but fresh food was never found. These communities are wholly reliant on their own produce during the cold season, but it is unclear if rural trading posts supply vegetables, pulses and cereals at other times of the year when home stocks are depleted. The ability of rural trading posts to supply fresh food is likely compromised by the well-established barter system evident in these areas.

Prevalence of barter system

The focus group discussions and conversations with market traders reveal that barter is the dominant form of trade in rural areas. As described in Section 3.4, maize is regarded as a form of currency and is exchanged for food and non-food items (such as kitchenware) both locally and outside the community. This suppresses the development of the cash economy and the market system.

Impact of poor road infrastructure in rural areas

The sites of the main markets in both districts are on the national road network and are therefore accessible to the urban population. However, the state of the unpaved roads into rural areas make transportation of goods extremely difficult. Some traders explained that transporting food supplies to rural areas was not viable because the communities are not willing to pay or are unable to afford the mark-up on the goods necessary to make the venture feasible. The only trading posts in rural areas found to be offering fresh fruit and vegetables) were those along the main roads. Poor road infrastructure is a major impediment to the development of markets in both districts.

Disparity between foods sold at the market and main foods consumed in rural areas

As noted in the previous chapter (Section 3.6), many of the foods most frequently consumed in rural areas were not found at the markets, and many of the foods found at the markets are not commonly consumed in rural communities. While this compromises the CoD software's ability to calculate a food habits nutritious diet that is realistic in both cost and content, it also shows that access (physical and economic) and distribution (due to underdeveloped infrastructure) are major obstacles to achieving food security and a fully functioning market system.

Importance of domestic food production

Communities are heavily reliant on home-grown food and use several strategies (food preservation, reduction in number of meals, etc.) to make this supply last as long as possible. Most groups interviewed reported experiencing a food shortage of four to six months each year. Foods can be purchased from the markets when own stocks are depleted, but the expense is so great that households have to reduce portion sizes and the number of meals consumed in a day. This underscores the importance of home produce in the diet of rural communities, and highlights the extreme vulnerability of these communities should the harvest fail.

Main sources of protein

The main protein-rich foods that are consumed in each district are fish, chicken, soya pieces, pulses and milk. Chicken was not found at markets in either district, but as it is a commonly consumed food supplementary price data was included in the cost of diet analysis (see Section 2.10). Despite this, chicken was not included in either the MNUT diet or the FHAB diet for either district, indicating that a nutritious diet can be achieved using other, more affordable sources of protein, that potentially also contribute important micronutrients to the diet. The interviews revealed that the consumption of pulses is generally low, with the exception of cowpeas, which are regularly consumed in both districts. A variety of pulses, including Solwezi, Lusaka, kabulangeti and white beans, was found at the market, and up to three varieties of bean were included in the nutritious diet generated by the COD software. This indicates that pulses are a low-cost source protein that can make an important contribution to a nutritious diet.

Limited dietary diversity

The individual interviews and focus group discussions revealed that dietary diversity is limited in both districts. The bulk of each household's energy needs is provided by maize, and a small number of vegetables and fish is the main source of micronutrients in the diet.

Contribution of food preservation to household food security

As reported in Section 3.4 the preservation of food is common in all villages surveyed. The preservation of mushrooms, pumpkin and green vegetables by sun-drying has much potential for improving food security (both in extending the length of time that communities are self-sufficient each year, and for income generation), but the volume of food that can be preserved of often dictated by weather conditions.

Importance of wild foods in the diet

Wild fruits were reported to be commonly eaten, and, as evidenced by the MNUT and FHAB diet analysis, make a significant contribution to the intake of vitamin A and vitamin C in the local diet. Although the nutrient composition of the wild fruits is not known, fruit typically provides a range of essential micronutrients and its inclusion in the local diet helps to lower the cost of a nutritious diet.

Changes in availability of wild foods

The focus group discussions revealed that some wild foods are no longer as freely as available as they once were. Certain wild game has been hunted to the point of extinction, while the availability of some wild fruit and vegetables has declined due to deforestation and the clearing of land for farming and settlements. Participants also reported the declining stocks of certain fish species owing to overfishing.

Food taboos

A number of food-related myths and taboos were discussed during the focus group sessions. Breastfeeding mothers avoid eating okra, pumpkin and pumpkin leaves as they are thought to cause breastfed infants stomach pain. Certain foods such as Bambara nuts, eggs, sour milk, imilonge (fish) are believed to negatively affect a child's growth and/or cognitive development. Young children are not given pumpkin as it is thought to cause diarrhoea. It was also reported that pregnant women avoid eating meat from a cow that died while pregnant or giving birth as it is believed to bring bad luck.

5. Conclusions and Recommendations

This analysis set out estimate the amount and combination of local foods in each district that are needed to provide a family of five with a diet that meets their average needs for energy and recommended intakes of protein, fats and micronutrients. This information has been set out in Annex 12.

The second objective of the analysis was to calculate the annual and monthly cost of such a diet for a family of five in each of the selected districts. It was concluded that the annual cost of a nutritious diet for a family of five is **7,377 ZMW** in Sesheke and **9,857 ZMW** in Namwala.

The monthly cost of a nutritious diet for the family is **615 ZMW** in Sesheke and **821 ZMW** in Namwala. As noted in Section 2.6, JCTR Zambia produces a monthly 'basic needs basket' that tracks the cost of basic food items for a family of five across fifteen towns and cities across the country. The food basket is standardised for each location (in contrast to the CoD method which uses locally available foods) and is comprised of mealie meal, beans, kapenta, bream, beef, green vegetables, tomatoes, onions, cooking oil, bread, sugar, milk, tea, eggs and salt. JCTR puts the cost of a basic food basket at **1,538.52 ZMW** for a family of five in Mongu[22] (Western Province), and at **1,340.08 ZMW** in Choma[23] (Southern Province). These cost estimates are for the provincial capitals and are not specific to rural areas, but they provide a useful frame of reference.

The final aim of the Cost of the Diet analysis was to determine if the value of the current cash transfer provision is sufficient to allow the poorest households in Sesheke and Namwala districts to access a nutritious diet. While the cost of the basic food baskets estimated by JCTR far exceeds the cost of the diet estimated using the Cost of the Diet tool, the cost estimated by both methods far exceeds the value of the cash transfer, which is set at **90 ZMW** per household. By any measure, the amount of the cash transfer is insufficient to the aim of enabling a poor family of five to access a nutritious diet.

The monthly cost of purchasing enough maize grain and mealie meal to satisfy the energy requirements of a family of five is estimated at 218 ZMW in Sesheke and 238 ZMW in Namwala (see Section 3.5.1.). This shows that, if sourcing the staple foods from the markets, a cash provision of 90 ZMW is still inadequate. It is recommended that the value of the social cash transfer be increased to a level that at least ensures that households have access to sufficient food energy when their own staple crop production is jeopardised or when their self-sufficiency is otherwise compromised.

Although an increase in the value of the social cash transfer could in theory provide target communities with access to a greater range of foods, the lack of markets in rural areas and the inaccessibility of the districts' main markets due to distance and

[22] http://www.jctr.org.zm/images/BNBs/Mongu_March_2017.pdf
[23] http://www.jctr.org.zm/images/BNBs/Choma_April_BNB.pdf

poor road infrastructure means it is unlikely that an increased cash provision would automatically translate into a greater diversity of food purchases. However, home - produced vegetables, tubers and beans provide essential nutrition for rural households, and an increase in the value of the cash transfer would enable households to purchase better seed and agricultural inputs. This in turn may result in increased dietary diversity, improved food security and better nutrition outcomes.

The lack of dietary diversity and dependence of rural communities on household food production also highlights the importance of initiatives such as the RAIN project (Realigning Agriculture to Improve Nutrition), and it is recommended that resources continue to be directed at education with respect to nutrition and subsistence agriculture.

It was observed during the survey that barter trade is prevalent in Sesheke and Namwala. Further research is needed to understand the informal barter networks that operate in these communities and the value placed on various foods within this system. This could help paint a much clearer picture of how and when foods can be accessed, which would in turn inform any potential nutrition interventions.

The preservation of fruit and vegetables by sun-drying is common practice in the communities surveyed. The ability to preserve nutrient rich foods is of critical importance to food insecure communities, but they remain vulnerable to changing weather patterns which can undermine efforts to dry foods. In tandem with promoting nutrition and improved farming methods, resources ought to be directed at helping communities to develop efficient and effective methods of preserving food. This is also important to ensure that the micronutrient content of the preserved foods is not compromised in the process. It is recommended that a desk review be undertaken to assess research or investment being undertaken in this area by other organisations.

Wild fruits play an important role in the diet of local communities, as evidenced by the information provided in the focus group discussions, and the list of wild fruits named in Annex 10. These foods likely contribute micronutrients such as vitamin A and vitamin C, but uncertainty around consumption frequency and nutrient composition meant that their impact could not be properly captured in the CoD analysis. In order to fully understand the contribution of wild foods to the local diet it is recommended that nutritional analysis be carried out for those wild foods most commonly available and frequently consumed.

It is concerning that children do not benefit from the important nutrition provided by certain nutrient-rich foods (i.e. Bambara nuts, eggs, milk curds) due to myths that persist in some rural communities. Breast-feeding mothers are also missing out on important nutrition by avoiding okra, pumpkin and pumpkin leaves (some of the most commonly available foods in rural areas) because of myths that their breastmilk will cause their infants to become ill. It is recommended that any future initiatives aimed at nutrition education/sensitization address these taboos.

With regard to the Cost of the Diet method, the suitability of the tool should be carefully considered before undertaking a survey in a context which has a high level of reliance on home produced foods and barter trade. The CoD software can only compile a diet chosen from foods for which price data is available, so the inability to obtain price data for many foods in the Sesheke and Namwala surveys means that the food habits diet does not include some of the most commonly eaten foods. Therefore the food habits nutritious diet – and its cost – must be viewed with caution.

Similarly, the inability to obtain price data for certain foods means that the 'nutritious' (MNUT) diet is comprised of foods chosen from a smaller number of foods than is actually available. Therefore the cost of a nutritious diet, as estimated by the CoD software, ought to be viewed as the amount a nutritious diet would cost if food could only be obtained at the market. Notwithstanding these challenges, the CoD method highlights the ways in which the underdeveloped market system makes it difficult for rural communities to access a nutritious and adequately diverse diet.

A few general points in relation to the Cost of the Diet software application:

(1) The programme is cumbersome and involves time-consuming processes which ought to be more straightforward. Examples are given below.
   - The software compiles 'annual diet summary' and 'percentage nutrient requirements' reports for each diet (EO, MNUT and FHAB) which can be saved as an MS Excel file or a Rich Text File. However, each document requires extensive reformatting in Microsoft Word before it can be included in the CoD report. This is time consuming and eats into time that should be spent on the analysis. It would be helpful if the software could generate reports in a ready-to-use format.
   - The process of creating theoretical 'low' and 'high' energy households so that the cost of the three diets can be compared for households of different sizes with minimum and maximum energy requirements is laborious (they must be manually created by the assessment practitioner) and causes the software application to become so slow as to be barely usable. Given that 'HEA/CoD standard' families (families of average energy requirements) comprising 4, 5, 6, 7, 8, 9 and 10 members can be selected from a drop-down list in the 'edit family of individuals' page of the 'Standard Analysis summary' section, it is unclear why 'low' and 'high' energy families cannot be selected in the same way.

(2) The CoD food database, which is embedded in the software application, contains many duplicate food profiles. For example, a search for 'egg' will return a range of profiles input during previous CoD studies, but the stated nutrient values may vary between profiles, and it is difficult to know which is the most accurate. The nutritious diet is comprised of locally available foods, but the specific foods included are selected on the basis of their nutrient composition. In order to have confidence that the diet compiled meets the nutritional needs of the household there must be confidence that the nutrient values assigned to the selected foods is correct.

6. Annexes

Annex 1: A detailed description of the Cost of the Diet tool

The Cost of the Diet method and software

The Cost of the Diet is a method developed by Save the Children UK to calculate the minimum amount of money a typical household would need to purchase their recommended intakes of energy, protein, fat and micronutrients, using locally available foods. The cost of food grown and consumed at home is included in the calculation by applying market prices. Menu driven software developed that applies linear optimisation routines in Microsoft Excel 2010 is used to select locally available foods to meet these nutrient requirements at the lowest possible cost.

The Cost of the Diet software selects a mixture of foods that will enable a family to meet their energy and nutrient requirements as recommended by the WHO and the FAO (2004) at the lowest possible cost. As mentioned, this is defined as a 'nutritious' diet. As the software can select amounts of foods that are not realistic in terms of the frequency with which foods are eaten, for example by specifying that a particular food is eaten three times a day every day, the frequency with which each food is consumed can be adjusted to reflect typical dietary patterns.

Energy only diet

When estimating an energy only diet, the software calculates a lowest cost diet that meets only the average energy requirements of the family. The analysis is not used to promote an energy only diet because it is very unlikely to meet all micronutrient requirements, but it is useful to illustrate:

- The potential for micronutrient deficiencies in a diet that provides energy
- The additional cost of meeting all nutrient requirements, including
- micronutrients, in addition to energy
- Micronutrient RNI diet

Nutritious/micronutrient (MNUT) diet

When estimating a micronutrient RNI diet, the software calculates the lowest cost combination of foods which meets the average energy requirements and the recommended micronutrient intake of the typical family. This diet does not reflect people's typical dietary patterns but it is useful to illustrate:

- The differences in diet composition and its cost when compared with a diet that takes into account typical dietary patterns.
- The extra cost of micronutrients when compared with the energy only diet
- The relatively small number of foods that can provide a nutritious diet but often in unrealistic quantities

Food habits diet

When creating a food habits diet, the software calculates the lowest cost combination of foods which meet the average energy requirements and the recommended micronutrient requirements, whilst adhering to the minimum and maximum constraints which set the number of times a week specific food items can be included in the diet. This diet therefore does reflect people's typical dietary patterns and is useful to illustrate the extra cost of meeting average energy and recommended nutrient intakes when typical dietary habits such as the main staple, foods commonly consumed and food taboos are taken into account.

Table 2 on page 16 of the report summarises the characteristics of each diet.

The Cost of the Diet software can also be used:

- To estimate the minimum cost of a diet for specified households of multiple individuals;
- To take into account seasonal variations in food prices when costing the diet;
- To identify seasonal shortfalls in nutrient intake;
- To develop models of the impact of potential interventions that might enable households to meet their nutrient requirements.

A Cost of the Diet assessment is most useful when chronic malnutrition and micronutrient deficiencies have been identified as a nutritional problem and the availability or affordability of nutritious foods is likely to be among the underlying causes.

The limitations of the Cost of the Diet software and method

It is useful to understand the limitations of the cost of the diet method before applying any analysis.

The software can identify a 'diet' that provides the recommended amounts of energy and micronutrients from a relatively small number of foods, but they would need to be eaten every day at every meal, which is unrealistic.

Because the actual requirements for micronutrients of any given individual cannot be known, the RNIs are set at two standard deviations above the average, to minimise the risk of deficiency. This means that when the mixture of foods selected by the Cost of the Diet software meets the RNIs of a family by 100 percent, the nutritional needs of 97 percent of all individuals will be exceeded. The result is that greater quantities of food are selected and at a higher cost than is necessary to meet the actual nutritional requirements of most individuals.

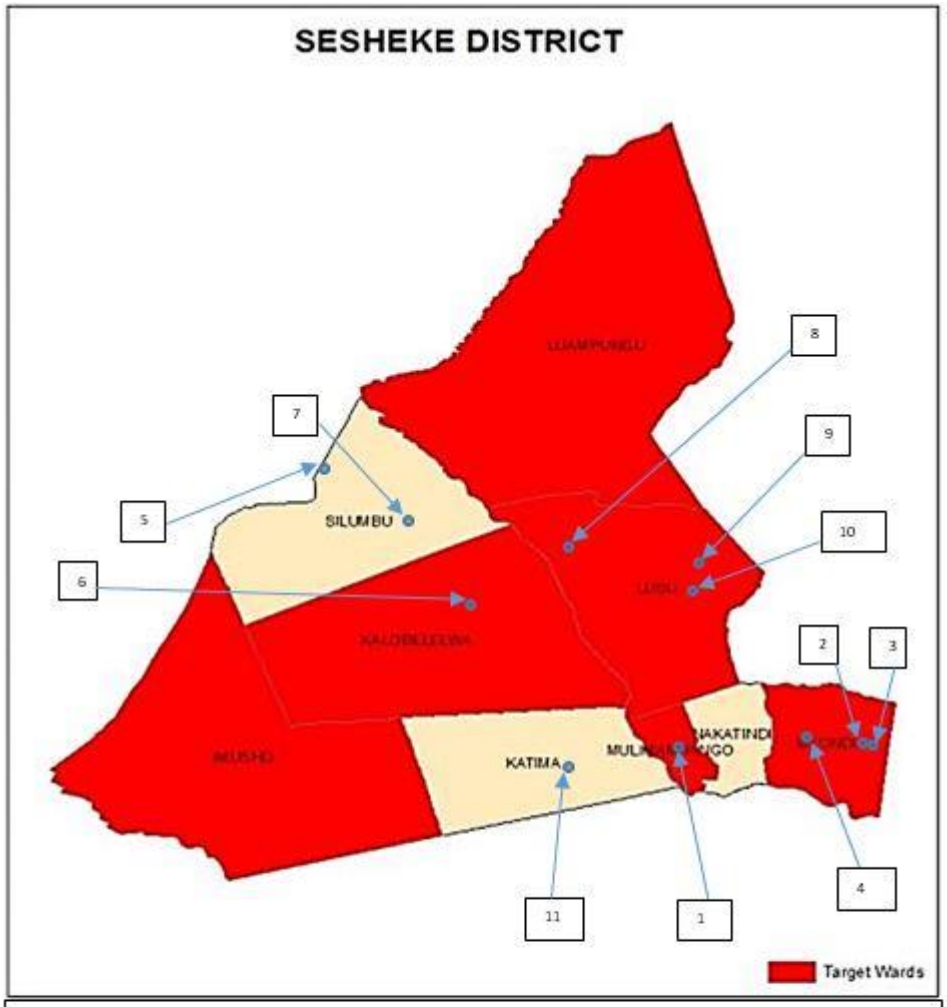
The needs for a number of nutrients are not taken into account by the software including iodine, vitamin D, essential amino acids and essential fatty acids. Iodine is not included because the amount in foods depends on the soil on which plants are grown or animals are reared, so no data are provided in food tables. Vitamin D is not included because requirements can be met by making vitamin D in skin exposed to

ultra-violet light. And most food tables do not provide data on essential amino acids or fatty acids.

The cost of the diet method calculates amounts of food for a family based on the sum of recommended nutrient intakes, but food may not be distributed within a household based on nutrient needs.

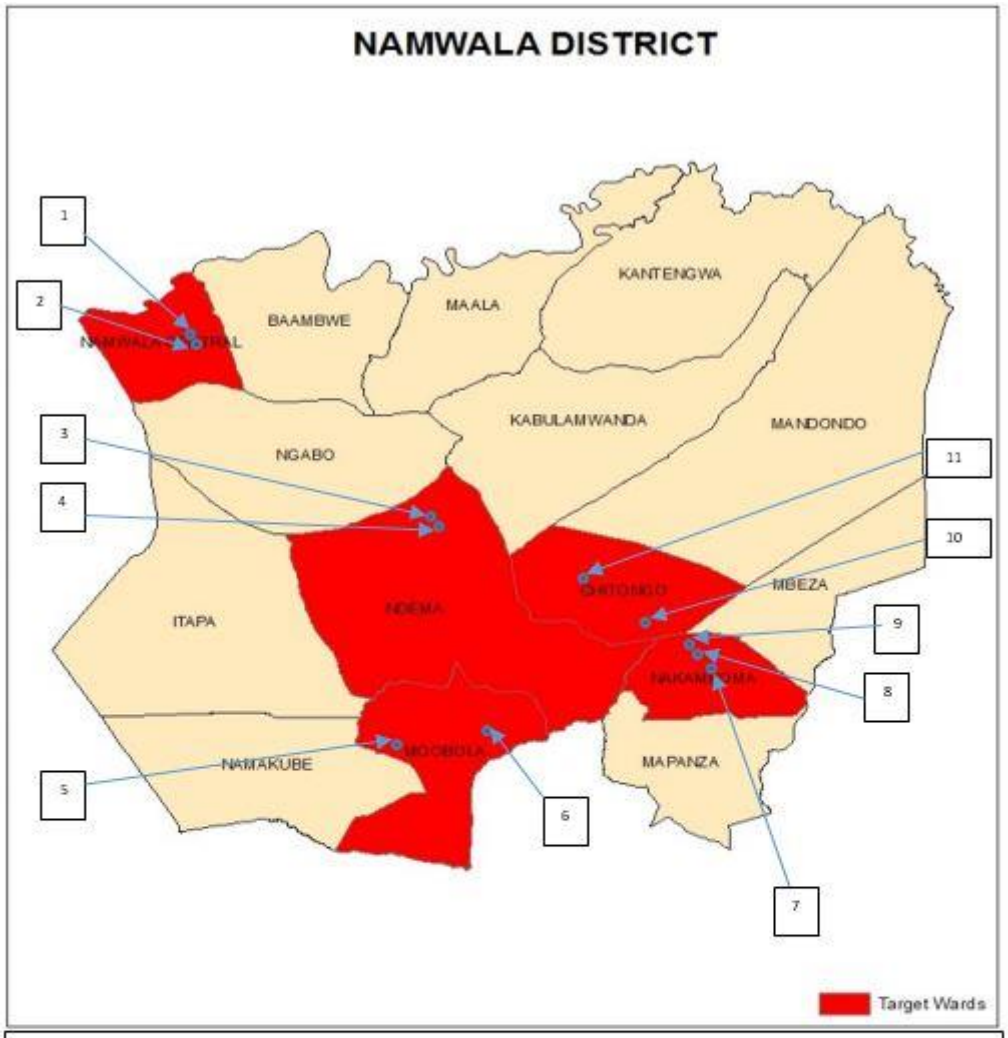
The method does not take into account the additional energy, protein and nutrients needed by someone who is sick or convalescing as there are insufficient data for the calculations.

Annex 2: **Maps of Sesheke District and Namwala District**



Legend

1. Sesheke Market
2. Mutunda Village
3. Mutunda trading post
4. Kabuyu trading post
5. Kaale Village
6. Sabelo trading post
7. Salumano trading post
8. Luso East
9. Zambwe Village
10. Kufutwa Village trading post
11. Katima Mulilo Market



Legend

1. Shapoopa Village, Namwala Central
2. Namwala Central Market
3. Shivawambwe Village, Ndema
4. Shivawambwe trading post, Ndema
5. Nkomba Village, Moobola
6. Moobola Market
7. Katowa Market, Nakamboma
8. Shalupumba Village, Nakamboma
9. Shalupumba Market, Nakamboma
10. Niko Market, Chitongo
11. Chitongo trading post

Annex 3: Food list for Sesheke and Namwala (includes food names as they appear in COD software, and names of substitutes chosen for foods not found in the database).

SESHEKE FOOD LIST	FOOD NAMES IN COD DATABASE	NAMWALA FOOD LIST
VEGETABLES		
Amaranths	Leaf, amaranth, raw	Amaranths
Cabbage	Cabbage, CotD	Cabbage
Cassava leaves	Leaf, cassava, raw	Cassava leaves
Chinese	Cabbage, chinese, pe tsai, raw	Chinese
Mushrooms	Mushroom, CotD	Mushrooms
Mushrooms, dried	Mushrooms, shitake, dried	Mushrooms, dried
Okra	Okra, raw	Okra
Onions	Onion, CotD	Onions
Pumpkin	Pumpkin, raw	Pumpkin
Pumpkin leaves	Leaf, pumpkin, raw	Pumpkin leaves
Rape	Kale, raw	Rape
Sindambe	Leaf, hibiscus	Mundambi
Small eggplant	Eggplant, raw	Impwa
Sweet potato leaves	Leaf, sweet potato, raw	Sweet potato leaves
FRUIT		
Apples	Apple, CotD	Apples
Avocado	Avocado	Avocado
Bananas	Banana, CotD	Bananas
Guavas	Guava, fruit	Guavas
Lemons	Lemon or lime, CotD	Lemons
Mango	Mango, ripe	Mango
Munzinzila	***suitable substitute not found***	Munzinzila
Muzauli	***suitable substitute not found***	Muzauli
Oranges	Orange, CotD	Oranges
Pawpaw	Papaya, fruit, ripe	Pawpaw
Tomato	Tomato, CotD	Tomato
	Watermelon	Watermelon
PULSES, LEGUMES, NUTS		
Bambara nuts	Bambara groundnut, raw	Bambara nuts
Groundnuts	Groundnut, shelled, dried, raw	Groundnuts
Groundnuts, pounded	Groundnut flour, without fat	Groundnuts, pounded
Cowpeas	Cowpea, dried, CotD	Cowpeas
Kabulangeti beans	Bean, adzuki, mature, raw	Kabulangeti beans
Lusaka beans	Bean, pinto, mature, raw	Lusaka beans

Lyambai/sugar beans	Bean, kidney, mature, raw	Lyambai beans
Mbereshi beans	Bean, navy, mature, raw	Mbereshi beans
Solwezi beans	Bean, pink, mature, raw	Solwezi beans
Soya pieces	Tempeh, soybean	Soya pieces
White beans	Bean, white, mature, raw	White beans
Yellow beans	Bean, yellow, mature, raw	Yellow beans
Cereals		
Maize - fresh	Maize, white, whole kernel, cooked	Maize - fresh
Roller meal (local process)	Maize, white, flour, wholegrain	Roller meal (local process)
Mealie meal (industrial)	Maize, white, grit, degermed	Mealie meal (industrial)
	Maize, white, dried	Samp
Orange maize grain	Fortified maize meal (WFP)	Orange maize grain
Millet	Millet, grain or flour, CotD	Millet
Rice	Rice, white, raw, CotD	Rice
Sorghum	Sorghum, grain or flour, CotD	Sorghum
Wheat flour	Wheat, grain or flour, CotD	Wheat flour
Wheat fritters	Wheat, fritter	Wheat fritters
	Beverage, barley, fermented	Chibwantu
	suitable substitute not found	Ceele
Tubers		
Cassava whole	Cassava, root, raw	Cassava whole
Cassava ground	Cassava, root, dried meal	Cassava ground
Irish potatoes	Potato, white, CotD	Irish potatoes
	Yam, raw	Busala
Sweet potatoes	Sweet potato, raw	Sweet potatoes
Fish		
	No suitable substitute found	Bottle fish dry
	No suitable substitute found	Bottle fish fresh
Bream dry	Fish, dried, CotD	Bream dry
Bream fresh	Fish, bream, pink gray	Bream fresh
Chisense dry	Fish, anchovy, gangetic hairfin, dried	Chisense dry
Imilonge dry	Fish, minnow, finescale razorbelly, dried (Sesheke) Fish, tiger, dried (Namwala)	Imilonge dry
Imilonge fresh	***No suitable substitute found***	Imilonge fresh
Kapenta dry	Fish, dried, fresh water	Kapenta dry
Liminga dry	***No suitable substitute found***	Liminga dry
Liminga fresh	***No suitable substitute found***	Liminga fresh
Liminga smoked	Fish, smoked, dried (Sesheke only); ***No substitute selected for Namwala***	Liminga smoked
Linembele dry	***No suitable substitute found***	

Linembele fresh	Fish, catfish and other fresh water fish (Namwala only); ***No suitable substitute found for Sesheke analysis***	Linembele fresh
Lingongi dry	Fish, tilapia, dried (Sesheke only) ***No suitable substitute found for Namwala analysis***	Lingongi dry
Lingongi fresh	***No suitable substitute found***	Lingongi fresh
Mabango dry	Fish, catfish, dried	Mabango dry
Mabango fresh	Fish, catfish and other fresh water fish (Sesheke only) ***No suitable substitute found for Namwala analysis***	Mabango fresh
Tiger fish dry	Fish, tiger, dried (Sesheke only) ***Excluded as not found in Namwala markets***	Tiger fish dry
Tiger fish fresh	***No substitute selected***	Tiger fish fresh
Tumbala dried	Fish, tilapia, dried	
Tumbala fresh	Fish, tliapia, raw (Sesheke only)	
Tunyengele dry	***No suitable substitute found***	
	Fish, tilapia, dried (Namwala only)	Tutaka dry
	Fish, tilapia, raw (Namwala only)	Tutaka fresh
Meat		
Beef	Beef, with bone	Beef
Goat meat	Goat, raw	Goat meat
Pork	Pork, raw	Pork
Chicken	Chicken, raw	Chicken
Eggs and Egg Products		
Eggs	Egg, chicken, CotD	Eggs
Dairy		
Cow's milk fresh	Milk, cow, whole, CotD	Cow's milk fresh
Sour milk	Milk, cow, curds	Sour milk
Other		
Sugar (refined)	Sugar, brown, CotD	Sugar (refined)
Sugar cane	Sugarcane	Sugar cane
Cooking oil	Oil, CotD	Cooking oil
Caterpillars	Caterpillars [*manual entry*]	Caterpillars

Annex 4: Markets surveyed in each district

SESHEKE DISTRICT, WESTERN PROVINCE		
Markets	**Ward**	**Date Visited**
Sesheke Town	Mulimambango	02-May-2017
Mutunda Village	Maondo	03-May-2017
Kabuyu Village	Maondo	03-May-2017
Sabelo Village	Silumbu	04-May-2017
Salumano	Kalobolelwa	04-May-2017
Katima Mulilo Town	Katima	06-May-2017
Sesheke Town	Mulimambango	06-May-2017
NAMWALA DISTRICT, SOUTHERN PROVINCE		
Namwala Central	Namwala Centra	09-May-2017
Shivawambwe Village	Ndema	10-May-2017
Moobola Market	Moobola	11-May-2017
Katowa Market	Nakamboma	12-May-2017
Niko Market	Chitongo	12-May-2017
Chitongo Market	Chitongo	12-May-2017

Annex 5: Sample market data collection form

COST OF THE DIET - MARKET SURVEY								
Date: **Village:**			**Trader Name:** **Ward:**			**Interviewer names:** **District:**		
		GRAMS			**PRICE**			**Comment**
Food Item	**Local Name**	**Weight 1**	**Weight 2**	**Weight 3**	**Cold**	**Dry**	**Rainy**	
Vegetables								
Amaranths	Libowa							
Cabbage	Cabbage							
Cassava leaves	Shombo							
Chinese	Chinese							
Mushrooms	Mbowa							
Okra	Delele							
Onions	Onions							
Pumpkin	Namundalangwe							
Pumpkin leaves	Mangambwa							
Rape	Rape							
Sindambe	Sindambi							
Small eggplant	Malembeka							
Sweet potato leaves	Kalembula							
Tomato	Tomato							
Fruit								
Apples	Apples							
Avocado	Kotapela							
Bananas	Makonde							

Guavas	Guava							
Lemons	Lemons							
Mango	Mango							
Munzinzila	Munzinzila							
Muzauli	Muzauli							
Oranges	Oranges							
Pawpaw	Pawpaw							
Pulses and nuts								
Bambara nuts	Lituu							
Ground nuts	Ndongo							
Cowpeas	Manawa							
Kabulangeti beans								
Lusaka beans								
Lyambai beans								
Mbereshi beans								
Solwezi beans								
Soya pieces								
White beans								
Yellow beans								
Cereals								
Maize - fresh	Monyi							
Roller meal (local process)	Bupi							
Mealie meal (industrial)	Bupi							
Orange maize grain								
Millet	Mauza							
Rice	Rice							
Sorghum	Mabele							
Wheat flour	Bupi bwa buloto							

Wheat fritters	Bitumbuwa							
Tubers								
Cassava whole	Mwanja							
Cassava ground	Bupi bwa mwanja							
Irish potatoes	Makwili							
Sweet potatoes	Ngulu							
Fish								
Bream dry								
Bream fresh								
Chisense dry								
Imilonge dry								
Imilonge fresh								
Kapenta dry								
Liminga dry								
Liminga fresh								
Liminga smoked								
Linembele dry								
Linembele fresh								
Lingongi dry								
Lingongi fresh								
Mabango dry								
Mabango fresh								
Tiger fish dry								
Tiger fish fresh								
Tumbala fresh								
Tunyengele dry								
Meat								
Beef	Nama ya komu							
Goat meat	Nama ya puli							

Pork	Nama ya kulube							
Chicken	Nama ya kuhu							
Eggs	Mayi							
Dairy								
Cow's milk fresh	Muzilili							
Sour milk	Mabisi atemile							
Other								
Sugar (refined)	Sugar							
Sugar cane	Mushwati							
Cooking oil	Salad							
Pounded ground nuts	Ndongo ya bupi							
OTHER								
Caterpillars	Maungu							
Mushrooms dry	Mbowa ye omile							
Mushrooms fresh	Mbowa ye mezi							

Annex 6: **Market report – Price per 100g of foods found in the markets in Sesheke District.**

SESHEKE DISTRICT: Price per 100g of all foods found at the market	SEASON			
	Cold	Rainy	Dry	All
	Price per 100g			
Grains and grain-based products				
Millet, grain or flour, CotD ()	0	0	0	0
Rice, white, raw, CotD ()	1.52	1.47	1.52	Multiple
Sorghum, grain or flour, CotD ()	0	0	0	0
Wheat, fritter ()	1.56	2.6	2.6	Multiple
Wheat, grain or flour, CotD ()	0.87	0.87	0.87	0.87
Maize, white, flour, whole grain	0.23	0.23	0.23	0.23
Maize, white, whole kernel, cooked	0.42	0.42	1.05	Multiple
Maize, white, grit, degermed	0.28	0.28	0.28	0.28
Roots and tubers				
Cassava, root, dried meal ()	1.4	1.4	1.4	1.4
Cassava, root, raw ()	1.06	1.06	1.06	1.06
Potato, white, CotD ()	1.49	0	0	Multiple
Sweet potato, raw ()	0.26	0.44	0	Multiple
Legumes, nuts and seeds				
Bambara groundnut, raw ()	0	0	0	0
Bean, adzuki, mature, raw ()	1.85	1.69	1.69	Multiple
Bean, kidney, mature, raw ()	0	0	0	0
Bean, navy, mature, raw ()	0	0	0	0
Bean, pink, mature, raw ()	1.92	1.92	1.92	1.92
Bean, pinto, mature, raw ()	2.27	0	0	Multiple
Bean, white, mature, raw ()	1.88	1.88	2.06	Multiple
Bean, yellow, mature, raw ()	1.71	1.71	1.71	1.71
Cowpea, dried, CotD ()	1.89	1.89	1.89	1.89
Tempeh, soybean ()	6.65	6.95	7.37	Multiple
Groundnut, shelled, dried, raw	2.16	0	0	Multiple
Meat and offal				
Beef, with bone ()	4	4	4	4
Chicken, raw ()	2.22	2.22	2.22	2.22
Goat, raw ()	0	0	0	0
Pork, raw ()	0	0	0	0
Fish, seafood, amphibians and invertebrates				
Fish, catfish, dried ()	4.47	0	4.47	Multiple
Fish, dried, CotD ()	8.4	0	4.2	Multiple
Fish, dried, fresh water ()	13.51	13.51	13.51	13.51
Fish, tilapia, dried ()	5.92	0	5.92	Multiple
Caterpillar Sesheke ()	2.15	2.15	2.15	2.15
Fish, bream, pink gray ()	1.9	0	1.9	Multiple

Fish, catfish and other freshwater fish ()	2.02	0	2.02	Multiple
Fish, smoked, dried ()	3.68	0	3.68	Multiple
Fish, tiger, dried ()	7.61	0	7.61	Multiple
Fish, minnow, finescale razorbelly, dried	3.74	0	3.74	Multiple
Fish, anchovy, gangetic hairfin, dried	10.64	10.64	10.64	10.64
Fish, tilapia, raw	2.42	0	2.42	Multiple
Eggs and egg products				
Egg, chicken, CotD ()	2.22	2.02	2.22	Multiple
Milk and milk products				
Milk, cow, curds ()	0.76	0.76	0.76	0.76
Milk, cow, whole, CotD ()	2.05	1.86	2.05	Multiple
Vegetables and vegetable products				
Cabbage, CotD ()	0.44	0.44	0.44	0.44
Cabbage, chinese, pe tsai, raw ()	0.75	1.02	1.02	Multiple
Kale, raw ()	1.27	2.09	2.09	Multiple
Leaf, hibiscus ()	0.64	1.06	0	Multiple
Leaf, pumpkin, raw ()	1.02	1.7	1.7	Multiple
Mushroom, CotD ()	0	0	0	0
Mushrooms, shiitake, dried ()	6.58	6.58	6.58	6.58
Okra, raw ()	1.26	1.89	1.26	Multiple
Onion, CotD ()	1.78	1.78	1.78	1.78
Pumpkin, raw ()	0.13	0.13	0.13	0.13
Leaf, amaranth, raw	0	0	0	0
Eggplant, raw	0.86	0.86	0.86	0.86
Leaf, cassava, raw	0	0	0	0
Leaf, sweet potato, raw	0.2	0.33	0.33	Multiple
Fruit and fruit products				
Apple, CotD ()	1.85	0	0	Multiple
Avocado ()	0	0	0	0
Banana, CotD ()	1.37	1.37	1.37	1.37
Mango, ripe ()	0	0	0	0
Orange, CotD ()	1.79	0	0	Multiple
Tomato, CotD ()	1.45	2.71	2.71	Multiple
Fruit, bush, nonspecific ()	0	0	0	0
Guava, fruit	0.43	0.43	0	Multiple
Papaya, fruit, ripe	0	0	0	0
Oils and fats				
Oil, CotD ()	2.43	2.4	2.37	Multiple
Sugars and confectionary				
Sugar, brown, CotD ()	1.4	1.34	1.4	Multiple
Sugarcane ()	0.35	0	0	Multiple
Herbs, spices and condiments				
Lemon or lime, CotD ()	0	0	0	0
Salt	0.4	0.4	0.4	0.4

NAMWALA DISTRICT: Price per 100g of all foods found at the market	SEASON			
	Cold	Rainy	Dry	All
	Price Per 100g			
Grains and grain-based products				
Maize, white, dried ()	0	0	0	0
Millet, grain or flour, CotD ()	0	0	0	0
Rice, white, raw, CotD ()	1.36	1.36	1.36	1.36
Sorghum, grain or flour, CotD ()	0	0	0	0
Wheat, fritter ()	17.63	8.82	17.63	Multiple
Wheat, grain or flour, CotD ()	0.92	0.92	0.92	0.92
Maize, white, flour, whole grain	0.12	0.12	0.12	0.12
Maize, white, whole kernel, cooked	0	0	0	0
Maize, white, grit, degermed	0.46	0.49	0.46	Multiple
Roots and tubers				
Cassava, root, dried meal ()	0	0	0	0
Cassava, root, raw ()	0	0	0	0
Potato, white, CotD ()	1.45	1.45	1.45	1.45
Sweet potato, raw ()	0.28	0.47	0	Multiple
Yam, raw ()	0.48	0.48	0.48	0.48
Legumes, nuts and seeds				
Bambara groundnut, raw ()	0	0	0	0
Bean, adzuki, mature, raw ()	1.75	1.75	1.75	1.75
Bean, kidney, mature, raw ()	1.32	1.32	1.32	1.32
Bean, navy, mature, raw ()	0	0	0	0
Bean, pink, mature, raw ()	1.48	1.48	1.48	1.48
Bean, pinto, mature, raw ()	1.58	1.58	1.58	1.58
Bean, white, mature, raw ()	1.62	1.62	1.62	1.62
Bean, yellow, mature, raw ()	0	0	0	0
Cowpea, dried, CotD ()	0	0	0	0
Tempeh, soybean ()	3.64	4.19	4.07	Multiple
Groundnut, shelled, dried, raw	2.91	2.91	2.91	2.91
Groundnut flour, without fat	6.04	6.04	6.04	6.04
Meat and offal				
Beef, with bone ()	3	3	3	3
Chicken, raw ()	2.33	2.33	2.33	2.33
Goat, raw ()	0	0	0	0
Pork, raw ()	0	0	0	0
Fish, seafood, amphibians and invertebrates				
Fish, catfish, dried ()	0.98	0	0.98	Multiple
Fish, dried, CotD ()	7.32	0	10.12	Multiple
Fish, tiger, dried ()	2.78	0	2.78	Multiple
Fish, tilapia, dried ()	4.57	0	6.19	Multiple
Caterpillar ()	0	0	0	0
Fish, bream, pink gray ()	1.81	0	1.81	Multiple
Fish, catfish and other freshwater fish ()	1.66	0	1.66	Multiple

Fish, dried, fresh water ()	8.18	10.31	10.31	Multiple
Fish, tiger ()	0	0	0	0
Fish, anchovy, gangetic hairfin, dried	0	0	0	0
Fish, tilapia, raw (Tilapia, cru)	1.44	0	1.44	Multiple
Eggs and egg products				
Egg, chicken, CotD ()	2.23	2.23	2.23	2.23
Milk and milk products				
Milk, cow, curds ()	0	0	0	0
Milk, cow, whole, CotD ()	0	0	0	0
Vegetables and vegetable products				
Cabbage, CotD ()	0.36	0.36	0.57	Multiple
Cabbage, chinese, pe tsai, raw ()	0.22	0.37	0.37	Multiple
Kale, raw ()	0.35	0.59	0.48	Multiple
Leaf, hibiscus ()	0	0	0	0
Leaf, pumpkin, raw ()	0	0	0	0
Mushroom, CotD ()	0	0	0	0
Mushrooms, shiitake, dried ()	0	0	0	0
Okra, raw ()	0	0	0	0
Onion, CotD ()	1.61	1.6	1.61	Multiple
Pumpkin, raw ()	0.11	0.15	0.11	Multiple
Leaf, amaranth, raw	0	0	0	0
Eggplant, raw (Aubergine, crue)	0.57	1.01	1.01	Multiple
Leaf, cassava, raw	0	0	0	0
Leaf, sweet potato, raw	0	0	0	0
Fruit and fruit products				
Apple, CotD ()	2.1	4.2	4.2	Multiple
Avocado ()	0	0	0	0
Banana, CotD ()	0.7	0.7	0.7	0.7
Mango, ripe ()	0	0	0	0
Orange, CotD ()	1.23	1.23	1.23	1.23
Tomato, CotD ()	0.64	1.43	1	Multiple
Watermelon ()	0.14	0.14	0.14	0.14
Guava, fruit	0.27	0.69	0.69	Multiple
Papaya, fruit, ripe	0	0	0	0
Oils and fats				
Oil, CotD ()	2.55	2.55	2.55	2.55
Sugars and confectionary				
Sugar, brown, CotD ()	1.5	1.5	1.5	1.5
Sugarcane ()	0	0	0	0
Herbs, spices and condiments				
Lemon or lime, CotD ()	0.16	0.22	0.16	Multiple
Salt (Lobon)	0.51	0.51	0.51	0.51

Annex 7: **Focus group discussion sites and wealth ranking breakdown**

SESHEKE DISTRICT, WESTERN PROVINCE			
Focus Group Location	**Ward**	**Date Visited**	**Wealth Group**
Mutunda Village	Maondo	03-May-2017	4 x middle 4 x poor
Kaale Village	Silumbu	04-May-2017	4 x middle 4 x poor
Luso East	Luso	05-May-2017	2 x middle 6 x poor
Zambwe	Luso	06-May-2017	4 x middle 4 x poor
NAMWALA DISTRICT, SOUTHERN PROVINCE			
Focus Group Location	**Ward**	**Date Visited**	**Wealth Group**
Shapopa Village	Namwala Central	09-May 2017	2 x better off 5 x middle 1 x poor
Shivawambwe Village	Ndema	10-May 2017	5 x middle 3 x poor
Nkomba Village	Moobola	11-May 2017	4 x middle 4 x poor
Shalupumba Village	Nakamboma	12-May 2017	4 x better off 3 x middle 1 x poor

Annex 8: Sample interview form

Individual Interviews - Food Consumption Habits
One-to-one interviews with those who prepare household food

Date:	**Informant:**
Village:	**Wealth Group:**
District:	**Interviewer:**

When available how many times a week does your HH eat the following foods?

This questionnaire asks about CONSUMPTION IN THE HOUSEHOLD ONLY, not purchase.

FOOD TYPE	LOCAL NAME	N/A	NEVER	RARELY	OFTEN	USUALLY
			Never	Special Occasions	(1-4 times per week)	(+5 times per week)
Vegetables						
Amaranths	Libowa					
Cabbage	Cabbage					
Cassava leaves	Shombo					
Chinese	Chinese					
Mushrooms	Mbowa					
Okra	Delele					
Onions	Onions					
Pumpkin	Namundalangwe					
Pumpkin leaves	Mangambwa					
Rape	Rape					
Sindambe	Sindambi					
Small eggplant	Malembeka					
Sweet potato leaves	Kalembula					
Tomato	Tomato					
Fruit						
Apples	Apples					
Avocado	Kotapela					
Bananas	Makonde					
Guavas	Guava					
Lemons	Lemons					
Mango	Mango					
Munzinzila	Munzinzila					
Muzauli	Muzauli					
Oranges	Oranges					
Pawpaw	Pawpaw					
Pulses and nuts						
Bambara nuts	Lituu					
Ground nuts	Ndongo					
Cowpeas	Manawa					
Kabulangeti beans						
Lusaka beans						
Lyambai beans						
Mbereshi beans						
Solwezi beans						
Soya pieces						
White beans						
Yellow beans						
Cereals						

Maize - fresh	Monyi					
Roller meal (local process)	Bupi					
Mealie meal (industrial)	Bupi					
Orange maize grain						
Millet	Mauza					
Rice	Rice					
Sorghum	Mabele					
Wheat flour	Bupi bwa buloto					
Wheat fritters	Bitumbuwa					
Tubers						
Cassava whole	Mwanja					
Cassava ground	Bupi bwa mwanja					
Irish potatoes	Makwili					
Sweet potatoes	Ngulu					
Fish						
Bream dry						
Bream fresh						
Chisense dry						
Imilonge dry						
Imilonge fresh						
Kapenta dry						
Liminga dry						
Liminga fresh						
Liminga smoked						
Linembele dry						
Linembele fresh						
Lingongi dry						
Lingongi fresh						
Mabango dry						
Mabango fresh						
Tiger fish dry						
Tiger fish fresh						
Tumbala fresh						
Tunyengele dry						
Meat						
Beef	Nama ya komu					
Goat meat	Nama ya puli					
Pork	Nama ya kulube					
Chicken	Nama ya kuhu					
Eggs	Mayi					
Dairy						
Cow's milk fresh	Muzilili					
Sour milk	Mabisi atemile					
Other						
Sugar (refined)	Sugar					
Sugar cane	Mushwati					
Cooking oil	Salad					
Pounded ground nuts	Ndongo ya bupi					
OTHER						
Caterpillars	Maungu					
Mushrooms dry	Mbowa ye omile					
Mushrooms fresh	Mbowa ye mezi					

Annex 9: Energy requirements for standard, high and low energy households (WHO)

Family size		5 individuals			6 individuals			7 individuals			8 individuals			9 individuals			10 individuals		
Household member	Kcal /day	Low	HEA /CoD	High	Low	HEA /CoD	High	Low	HEA /CoD	High	Low	HEA /CoD	High	Low	HEA /CoD	High	Low	HEA/C OD	High
Baby (either sex) 12-23 months	894	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Child (either sex) 2-3 years	1,088	X			X			X			X			X			X	X	X
Child (either sex) 3-4 years	1,200	X			X			X			X			X			X		
Child (either sex) 4-5 years	1,300				X			X			X			X			X		
Child (either sex) 5-6 years	1,400							X			X			X	X		X	X	
Child (either sex) 6-7 years	1,500										X	X		X			X		
Child (either sex) 7-8 years	1,625								X					X	X		X	X	
Child (either sex) 8-9 years	1,763					X						X					X		
Child (either sex) 9-10 years	1,913		X						X						X			X	
Child (either sex) 10-11 years	2,075					X						X							
Child (either sex) 11-12 years	2,250		X						X						X			X	X
Child (either sex) 12-13 years	2,413					X						X				X			X
Child (either sex) 13-14 years	2,575								X				X		X	X		X	X
Child (either sex) 14-15 years	2,725									X		X	X			X			X
Child (either sex) 15-16 years	2,838						X			X			X		X	X		X	X
Child (either sex) 16-17 years	2,913			X			X			X			X			X			X
Child (either sex) 17-18 years	2,950			X			X			X			X			X			
Man, 18-29y, 50 kg, light activity	2,300	X			X			X			X			X			X		
Man, 30-59y, 50 kg, mod activity	2,750		X			X			X			X			X			X	
Man, 30-59y, 60 kg, vig activity	3,450			X			X			X			X			X			X
Woman, 18-29y, 45 kg, light	1,850	X			X			X			X			X			X		
Woman, 30-59y, 45 kg, mod	2,300		X			X			X			X			X			X	
Woman, 30-59y, 55 kg, vig	2,850			X			X			X			X			X			X
Woman is lactating	418	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
Total average energy		7,749	10,524	13,474	9,049	12,612	16,312	10,449	14,724	19,037	11,949	16,837	21,612	13,574	18,962	24,024	15,337	21,037	26,274

Annex 10: Wild fruits commonly eaten, as reported by focus group participants

1. Lousala
2. Mahuluhulu
3. Mahuma (Coconuts)
4. Mahumu (not to be confused with mahuma!)
5. Manego (African Bubble Gum)
6. Mangomba
7. Mankomona
8. Manono
9. Masuk
10. Masumu
11. Matobo (African Bubble Gum – may be same as manego?)
12. Matuu
13. Mawii
14. Mbubu
15. Mbula (has a pleasing scent)
16. Mbwyu
17. Minzumbo
18. Mizauli
19. Mongongo
20. Msuzilila
21. Mubilo (unknown to team)
22. Mubuyu (from baobab tree)
23. Muchingachinga
24. Muhamani
25. Muhuluhulu
26. Muhwahwa
27. Mulutuluha
28. Mumbole
29. Mumbu (like strawberries – grow in the bush – red while not ripe, black when ripe)
30. Mundundo
31. Muninga
32. Muntente
33. Munzinzila
34. Muteme (fruit, unknown to team)
35. Mwawa
36. Namukuloungo (wild fruit that is picked from the bush and cooked.
37. Nchenje (green, and yellow when ripe).
38. Ntumbulwa
39. Ntungulwa
40. Tende cuulou

Annex 11: The edible weight and cost of the foods selected for the family for the whole year in Sesheke and Namwala for an energy-only diet with the percentage contributed by each food in terms of weight, cost, energy, protein and fat, the percentage contribution of each food for eight vitamins and four minerals and the percentage of the total target met for each nutrient, averaged across the seasons.

Energy-only Diet – Sesheke District / Cereal, Livestock and Timber Zone

Food List	Quantity (Kg)	% quantity	Cost (ZMW)	% cost	% energy	% protein	% fat	% vit A	% vit C	% vit B1	% vit B2	% niacin	% vit B6	% folic acid	% vit B12	% calcium	% iron	% zinc
Breast milk	194	15.5	0	0.0	3.3	2.0	20.3	99.4	100.0	1.1	4.3	6.2	0.6	8.0	100.0	28.6	0.0	1.7
(Maize, white, flour, whole grain)	690	55.0	1 586	60.5	62.7	65.9	73.8	0.6	0.0	90.2	51.8	71.2	86.8	83.1	0.0	63.6	95.9	86.8
(Maize, white, grit, degermed)	369	29.5	1 034	39.5	34.0	32.1	5.9	0.0	0.0	8.7	43.9	22.6	12.6	8.9	0.0	7.8	4.1	11.5
Total	1 253	100	2 620	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
% target met					100	165	38	9	10	199	80	55	133	32	5	12	51	118

Energy-only Diet – Namwala District / Maize, Livestock and Fishery Zone

Food List	Quantity (Kg)	% quantity	Cost (ZMW)	% cost	% energy	% protein	% fat	% vit A	% vit C	% vit B1	% vit B2	% niacin	% vit B6	% folic acid	% vit B12	% calcium	% iron	% zinc
Breast milk	194	15.5	0	0.0	3.3	2.0	20.3	99.4	100.0	1.1	4.3	6.2	0.6	8.0	100.0	28.6	0.0	1.7
(Maize, white, flour, whole grain)	690	55.0	1 103	38.7	62.7	65.9	73.8	0.6	0.0	90.2	51.8	71.2	86.8	83.1	0.0	63.6	95.9	86.8
(Maize, white, grit, degermed)	369	29.5	1 748	61.3	34.0	32.1	5.9	0.0	0.0	8.7	43.9	22.6	12.6	8.9	0.0	7.8	4.1	11.5
Total	1 253	100	2 851	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
% target met					100	165	38	9	10	199	80	55	133	32	5	12	51	118

The percentage of target met is an average of the % nutrient requirements met over the year.

Annex 12: The edible weight and cost of the foods selected for the family in Sesheke and Namwala for the whole year for a nutritious diet with the percentage contributed by each food in terms of weight, cost, energy, protein and fat, the percentage contribution of each food for eight vitamins and four minerals and the percentage of the total target met for each nutrient, averaged across the seasons.

Nutritious Diet – Sesheke District / Cereal, Livestock and Timber Zone

Food List	Quantity (Kg)	% quantity	Cost (ZMW)	% cost	% energy	% protein	% fat	% vit A	% vit C	% vit B1	% vit B2	% niacin	% vit B6	% folic acid	% vit B12	% calcium	% iron	% zinc
(Leaf, amaranth, raw)	307	13.4	0	0.0	3.1	9.6	0.9	24.9	23.3	2.9	32.6	10.6	13.4	32.9	0.0	48.2	26.2	12.6
(Groundnut, shelled, dried, raw)	7	0.3	148	2.0	1.0	1.3	3.2	0.0	0.0	1.4	0.3	3.9	0.9	1.0	0.0	0.1	0.4	1.0
(Bean, adzuki, mature, raw)	11	0.5	195	2.6	0.9	1.7	0.1	0.0	0.0	1.1	0.7	1.0	0.8	8.9	0.0	0.3	0.7	3.0
Breast milk	194	8.5	0	0.0	3.3	1.7	7.7	3.3	1.3	1.0	2.2	3.1	0.4	2.2	5.0	2.2	0.0	1.3
(Cassava, root, dried meal)	2	0.1	26	0.3	0.1	0.0	0.0	0.0	0.2	0.1	0.0	0.1	0.3	0.1	0.0	0.0	0.0	0.1
(Caterpillar Sesheke)	2	0.1	39	0.5	0.2	0.8	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	15.5	1.4
(Fish, minnow, finescale razorbelly, dried)	19	0.8	708	9.6	2.0	10.1	3.3	0.0	0.0	0.0	0.0	4.0	0.0	0.0	17.2	28.0	8.7	0.0
(Fish, catfish and other freshwater fish)	15	0.6	424	5.7	0.6	2.0	1.6	0.1	0.0	0.0	0.7	3.4	1.6	0.2	34.9	0.2	0.8	0.3
(Fish, dried, fresh water)	13	0.6	1 817	24.6	1.2	6.5	1.3	0.0	0.0	0.3	1.2	9.4	1.3	0.5	42.9	9.4	2.3	4.0
(Fruit, bush, nonspecific)	328	14.3	0	0.0	2.2	1.1	1.0	2.2	50.8	2.3	3.2	8.0	5.2	3.1	0.0	1.4	0.9	1.9
(Mango, ripe)	316	13.8	0	0.0	5.3	1.3	1.0	21.3	19.1	4.5	6.1	8.5	9.3	6.0	0.0	1.3	0.4	0.0
(Maize, white, flour, whole grain)	655	28.5	1 506	20.4	59.5	52.1	26.8	0.0	0.0	77.8	25.3	33.5	54.9	22.2	0.0	4.7	33.8	64.5
(Maize, white, grit, degermed)	56	2.4	157	2.1	5.2	4.0	0.3	0.0	0.0	1.2	3.4	1.7	1.3	0.4	0.0	0.1	0.2	1.4
(Mushrooms, shiitake, dried)	7	0.3	454	6.2	0.5	0.5	0.1	0.0	0.0	0.5	2.8	3.6	1.5	1.5	0.0	0.0	0.2	3.0
(Oil, CotD)	51	2.2	1 225	16.6	11.6	0.0	52.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Leaf, sweet potato, raw)	164	7.2	421	5.7	2.2	6.0	0.3	27.1	3.0	5.1	16.4	6.1	7.1	17.8	0.0	2.5	8.1	2.7
(Pumpkin, raw)	147	6.4	255	3.5	1.0	1.2	0.2	21.1	2.2	1.7	5.2	3.2	2.0	3.2	0.0	1.3	1.6	2.7
Total	2 294	100	7 377	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
% target met					100	198	100	276	741	220	156	112	200	116	100	147	138	151

The percentage of target met is an average of the % nutrient requirements met over the year.

Nutritious Diet – Namwala District / Maize, Livestock and Fishery Zone

Food List	Quantity (Kg)	% quantity	Cost (ZMW)	% cost	% energy	% protein	% fat	% vit A	% vit C	% vit B1	% vit B2	% niacin	% vit B6	% folic acid	% vit B12	% calcium	% iron	% zinc
(Bean, adzuki, mature, raw)	5	0.2	79	0.8	0.4	0.6	0.0	0.0	0.0	0.4	0.3	0.4	0.3	2.2	0.0	0.2	0.4	1.1
(Bean, kidney, mature, raw)	35	1.2	462	4.7	3.0	5.7	0.3	0.0	0.3	4.0	2.5	2.3	2.9	10.9	0.0	3.0	4.9	4.6
(Bean, white, mature, raw)	58	2.1	943	9.6	5.0	9.4	0.5	0.0	0.0	5.4	2.7	0.9	3.9	17.9	0.0	8.5	10.3	10.0
Breast milk	194	6.9	0	0.0	3.3	1.4	7.7	2.6	1.4	0.9	2.2	2.7	0.4	1.3	3.6	3.3	0.0	1.1
(Cabbage, chinese, pe tsai, raw)	164	5.8	681	6.9	0.7	1.4	0.3	0.7	7.8	1.4	2.6	2.1	8.0	10.3	0.0	7.7	0.9	1.8
(Egg, chicken, CotD)	22	0.8	556	5.6	0.9	1.9	2.4	1.1	0.0	0.3	3.6	1.8	0.6	0.8	4.7	0.7	2.2	1.1
(Fish, catfish, dried)	< 1	0.0	8	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.0	0.3	0.0	0.1	0.0
(Fish, dried, fresh water)	13	0.4	1 304	13.2	1.1	5.1	1.2	0.0	0.0	0.3	1.1	7.7	1.1	0.3	29.4	13.1	2.7	3.1
(Fish, tilapia, dried)	22	0.8	1 172	11.9	1.9	9.1	2.1	0.0	0.0	0.5	1.9	13.5	1.9	0.5	51.8	23.1	4.7	5.4
(Fruit, bush, nonspecific)	296	10.5	0	0.0	2.0	0.8	0.9	1.6	47.9	1.9	2.9	6.3	4.4	1.6	0.0	1.8	1.0	1.4
(Kale, raw)	103	3.6	411	4.2	1.3	3.0	1.0	13.9	21.6	2.4	4.3	3.2	5.9	11.5	0.0	9.4	2.6	2.7
(Lemon or lime, CotD)	1	0.0	3	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Salt)	< 1	0.0	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Mango, ripe)	1	0.0	0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Maize, white, flour, whole grain)	599	21.2	958	9.7	54.4	40.2	24.5	0.0	0.0	64.1	23.2	26.5	46.8	11.9	0.0	6.4	38.1	48.5
(Maize, white, grit, degermed)	17	0.6	79	0.8	1.6	1.1	0.1	0.0	0.0	0.3	1.1	0.5	0.4	0.1	0.0	0.0	0.1	0.3
(Oil, CotD)	54	1.9	1 389	14.1	12.4	0.0	55.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Okra, raw)	408	14.4	0	0.0	3.7	5.4	1.2	3.7	7.2	6.1	13.1	12.0	5.2	10.7	0.0	11.4	9.0	7.6
(Leaf, sweet potato, raw)	213	7.5	0	0.0	2.8	6.5	0.4	28.2	4.1	5.9	21.3	6.9	8.5	13.5	0.0	4.8	13.0	2.9
(Pumpkin, raw)	406	14.4	638	6.5	2.7	2.8	0.4	46.8	6.4	4.3	14.4	7.7	5.2	5.2	0.0	5.2	5.5	6.1
(Sweet potato, raw)	36	1.3	135	1.4	0.7	0.3	0.0	0.0	1.1	0.4	1.1	0.7	1.3	0.5	0.0	0.4	0.2	0.3
(Fish, tilapia, raw)	33	1.2	736	7.5	0.9	4.3	0.9	0.2	0.0	0.3	0.6	3.7	1.7	0.6	10.2	0.3	3.7	1.3
(Watermelon)	143	5.1	300	3.0	1.1	0.6	0.2	1.1	2.0	1.0	1.0	0.8	1.4	0.3	0.0	0.6	0.6	0.7
Total	2 826	100	9 857	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
% target met					100	235	100	344	709	244	156	129	214	198	137	100	112	184

Annex 13: The edible weight and cost of the foods selected for the family in Sesheke and Namwala for the whole year for a food habits nutritious diet with the percentage contributed by each food in terms of weight, cost, energy, protein and fat, the percentage contribution of each food for eight vitamins and four minerals and the percentage of the total target met for each nutrient, averaged across the seasons.

Food Habits Nutritious Diet – Sesheke District / Cereal, Livestock and Timber Zone

Food List	Quantity (Kg)	% quantity	Cost (ZMW)	% cost	% energy	% protein	% fat	% vit A	% vit C	% vit B1	% vit B2	% niacin	% vit B6	% folic acid	% vit B12	% calcium	% iron	% zinc
(Leaf, amaranth, raw)	375	17.9	0	0.0	3.8	10.8	1.0	28.5	47.1	4.3	35.9	13.3	19.2	37.5	0.0	46.9	35.0	16.9
(Groundnut, shelled, dried, raw)	13	0.6	289	3.3	2.0	2.3	6.3	0.0	0.0	3.4	0.5	7.8	2.1	1.9	0.0	0.2	0.8	2.1
(Bean, adzuki, mature, raw)	13	0.6	241	2.8	1.1	2.0	0.1	0.0	0.0	1.7	0.8	1.3	1.2	10.3	0.0	0.3	1.0	4.1
(Bean, white, mature, raw)	3	0.2	62	0.7	0.3	0.6	0.0	0.0	0.0	0.4	0.1	0.1	0.3	1.6	0.0	0.3	0.5	0.8
(Bean, yellow, mature, raw)	4	0.2	75	0.9	0.4	0.7	0.1	0.0	0.0	0.9	0.4	0.4	0.5	2.2	0.0	0.2	0.5	0.8
Breast milk	194	9.3	0	0.0	3.3	1.5	7.7	3.1	2.2	1.2	2.0	3.2	0.5	2.1	5.0	1.8	0.0	1.5
(Cassava, root, dried meal)	2	0.1	30	0.3	0.2	0.0	0.0	0.0	0.4	0.2	0.0	0.2	0.4	0.1	0.0	0.0	0.1	0.1
(Fish, minnow, finescale razorbelly, dried)	28	1.4	1 063	12.3	3.0	14.0	4.9	0.0	0.0	0.0	0.0	6.2	0.0	0.0	25.8	33.6	14.3	0.0
(Cowpea, dried, CotD)	< 1	0.0	11	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.4	0.0	0.0	0.1	0.1
(Fish, anchovy, gangetic hairfin, dried)	3	0.1	302	3.5	0.2	1.5	0.1	0.0	0.0	0.2	0.7	1.4	0.4	0.1	2.6	1.6	3.9	0.0
(Fish, catfish and other freshwater fish)	10	0.5	293	3.4	0.4	1.3	1.1	0.1	0.0	0.0	0.4	2.5	1.3	0.1	24.1	0.1	0.6	0.3
(Fish, dried, fresh water)	13	0.6	1 777	20.6	1.1	5.9	1.3	0.0	0.0	0.4	1.0	9.5	1.4	0.5	42.0	7.4	2.5	4.3
(Fish, tilapia, dried)	< 1	0.0	9	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.5	0.1	0.0	0.0
(Fruit, bush, nonspecific)	105	5.0	0	0.0	0.7	0.3	0.3	0.7	27.1	0.9	0.9	2.7	2.0	0.9	0.0	0.3	0.3	0.7
(Salt)	2	0.1	9	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Mango, ripe)	115	5.5	0	0.0	1.9	0.4	0.4	7.3	11.6	2.0	2.0	3.2	4.0	2.0	0.0	0.4	0.2	0.0
(Maize, white, flour, whole grain)	459	21.9	1 055	12.2	41.7	33.7	18.7	0.0	0.0	66.5	16.0	24.3	45.4	14.5	0.0	2.6	25.9	49.8
(Maize, white, whole kernel, cooked)	34	1.6	143	1.7	1.2	0.9	0.6	0.0	0.0	0.9	0.3	0.8	0.5	0.3	0.0	0.1	0.6	1.2
(Maize, white, grit, degermed)	236	11.3	662	7.7	21.8	15.8	1.4	0.0	0.0	6.2	13.0	7.4	6.3	1.5	0.0	0.3	1.1	6.4
(Mushrooms, shiitake, dried)	6	0.3	385	4.5	0.4	0.4	0.1	0.0	0.1	0.5	2.2	3.1	1.5	1.2	0.0	0.0	0.2	2.8
(Oil, CotD)	54	2.6	1 299	15.1	12.3	0.0	55.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

(Leaf, sweet potato, raw)	175	8.4	482	5.6	2.3	5.8	0.4	27.1	5.4	6.6	15.7	6.8	8.9	17.8	0.0	2.1	9.5	3.2
(Pumpkin, raw)	248	11.8	430	5.0	1.7	1.9	0.3	33.4	6.2	3.6	7.9	5.6	4.0	5.0	0.0	1.7	3.0	5.0
Total	2 095	100	8 617	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
% target met					100	215	100	294	446	180	173	108	169	124	100	185	126	137

The percentage of target met is an average of the % nutrient requirements met over the year.

Food Habits Nutritious Diet – Namwala District / Maize, Livestock and Fishery Zone

Food List	Quantity (Kg)	% quantity	Cost (ZMW)	% cost	% energy	% protein	% fat	% vit A	% vit C	% vit B1	% vit B2	% niacin	% vit B6	% folic acid	% vit B12	% calcium	% iron	% zinc
(Bean, adzuki, mature, raw)	6	0.3	108	0.9	0.5	0.7	0.0	0.0	0.0	0.7	0.4	0.4	0.5	3.1	0.0	0.2	0.5	1.5
(Bean, pink, mature, raw)	24	1.0	358	2.9	2.1	3.0	0.3	0.0	0.0	4.5	1.5	1.2	2.8	9.1	0.0	1.7	2.8	3.0
(Bean, pinto, mature, raw)	3	0.1	51	0.4	0.3	0.4	0.0	0.0	0.0	0.6	0.2	0.1	0.3	1.4	0.0	0.2	0.3	0.4
(Bean, white, mature, raw)	70	2.9	1 127	9.3	6.0	9.8	0.6	0.0	0.0	7.3	3.2	0.8	4.9	21.9	0.0	9.0	12.4	12.3
Breast milk	194	8.0	0	0.0	3.3	1.2	7.7	2.7	1.9	1.0	2.1	2.1	0.4	1.3	2.1	2.9	0.0	1.1
(Cabbage, chinese, pe tsai, raw)	44	1.8	192	1.6	0.2	0.3	0.1	0.2	2.9	0.4	0.7	0.4	2.3	2.8	0.0	1.8	0.2	0.5
(Egg, chicken, CotD)	45	1.8	1 104	9.1	1.7	3.3	4.7	2.2	0.0	0.7	6.9	2.9	1.2	1.5	5.4	1.2	4.5	2.3
(Fish, catfish and other freshwater fish)	9	0.4	218	1.8	0.4	0.9	1.0	0.1	0.0	0.0	0.4	1.5	1.0	0.1	9.2	0.1	0.6	0.2
(Fish, catfish, dried)	14	0.6	141	1.2	0.7	3.3	0.2	0.0	0.0	0.2	0.3	4.2	1.5	0.2	2.9	0.2	1.0	0.7
(Fish, dried, fresh water)	16	0.7	1 653	13.6	1.4	5.7	1.5	0.0	0.0	0.4	1.4	7.8	1.5	0.4	21.6	14.7	3.4	4.0
(Fish, tiger, dried)	14	0.6	400	3.3	1.1	5.8	0.4	0.0	0.0	0.3	0.5	7.2	2.6	0.4	4.9	0.3	1.7	1.2
(Fish, tilapia, dried)	37	1.5	1 942	16.0	3.2	13.1	3.6	0.0	0.0	0.9	3.1	18.2	3.4	0.8	50.2	34.1	7.9	9.3
(Fruit, bush, nonspecific)	105	4.3	0	0.0	0.7	0.3	0.3	0.6	23.6	0.8	1.0	1.8	1.6	0.6	0.0	0.6	0.4	0.5
(Kale, raw)	131	5.4	519	4.3	1.7	3.4	1.2	17.9	38.5	3.5	5.3	3.3	7.9	15.0	0.0	10.6	3.3	3.6
(Lemon or lime, CotD)	< 1	0.0	1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Salt)	2	0.1	12	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Mango, ripe)	79	3.2	0	0.0	1.3	0.2	0.2	4.3	6.9	1.1	1.5	1.5	2.3	0.9	0.0	0.4	0.1	0.0
(Maize, white, flour, whole grain)	457	18.8	731	6.0	41.5	26.6	18.7	0.0	0.0	55.0	17.1	16.3	37.6	9.3	0.0	4.3	29.2	38.1
(Maize, white, grit, degermed)	83	3.4	387	3.2	7.7	4.4	0.5	0.0	0.0	1.8	4.9	1.8	1.8	0.3	0.0	0.2	0.4	1.7
(Oil, CotD)	55	2.2	1 395	11.5	12.5	0.0	55.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Okra, raw)	272	11.2	0	0.0	2.5	3.1	0.8	2.5	6.6	4.6	8.5	6.5	3.6	7.3	0.0	6.7	6.0	5.2
(Leaf, sweet potato, raw)	263	10.8	0	0.0	3.5	7.0	0.5	35.1	7.1	8.2	25.5	6.8	11.1	17.1	0.0	5.2	16.1	3.7
(Pumpkin, raw)	291	12.0	433	3.6	2.0	1.7	0.3	33.8	6.4	3.5	10.0	4.4	3.9	3.8	0.0	3.3	4.0	4.5
(Sweet potato, raw)	110	4.5	548	4.5	2.1	0.8	0.1	0.1	4.9	1.3	3.1	1.8	4.2	1.5	0.0	1.2	0.8	1.1
(Fish, tilapia, raw)	20	0.8	445	3.7	0.5	2.3	0.6	0.1	0.0	0.2	0.4	1.8	1.1	0.4	3.6	0.2	2.2	0.8

(Watermelon)	55	2.3	116	1.0	0.4	0.2	0.1	0.4	1.1	0.4	0.4	0.3	0.6	0.1	0.0	0.2	0.2	0.3
(Wheat, grain or flour, CotD)	30	1.3	280	2.3	2.7	2.5	0.6	0.0	0.0	2.5	1.7	6.8	2.0	0.7	0.0	0.5	1.9	4.0
Total	2 432	100	12 159	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
% target met					100	271	100	340	510	217	161	160	204	193	237	113	112	179

The percentage of target met is an average of the % nutrient requirements met over the year.

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