

A Cost of the Diet analysis in Bari District of Somalia

Location: East Golis livelihood zone, Puntland

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Save the Children

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Executive Summary

Background

The federal republic of Somalia has faced political upheaval over many years leading to the ongoing conflict and population displacement that has impacted the population in a number of ways. The protracted complex humanitarian and livelihoods crisis has resulted in increasing socio-economic vulnerability and poverty. According to the United Nations (UN), Somalia represents one of the worst humanitarian crises in the world with almost 50% of its people in need of external assistance and close to 1.5 million internally displaced people (IDPs).

The study was undertaken in Bari region, northeast of the autonomous state of Puntland in Somalia. The zone is bordered by Sool region to the southwest, Nugaal region to the south, the Indian Ocean to the east, the Gulf of Aden to the north and the disputed border with Sanaag on the northwestern side. The population in the Bari region is estimated at 367,368 (UNDP 2005) with an almost even divide between rural/urban, 188,005 and 179,633 respectively. Approximately 55 per cent of the population in Qardho, Bender Beilla, Iskushuban, Kandala and Alula are pastoralists. The region's economic activities include livestock, fishing and frankincense with part of the urban population depending on casual labour at the port.

According to the post Gu 2012 nutrition survey report, the underlying causes of malnutrition in this pastoral zone include high morbidity coupled with limited access to health services, poor water and sanitation, rapid food price rises and poor child care and feeding practices. The negative impact of these factors are often exacerbated by the frequent seasons of poor rainfall that does not only affect the livestock body conditions and production, but also lead to out-migration of livestock therefore reducing milk access for household members left behind. Pastoral populations mainly rely on the consumption and sale of animals and animal products such as milk for subsistence and commercial purposes. Animal milk is the predominant food among the pastoral population and is a good source of high quality protein and micronutrients and an important contributor to the total energy intake of individuals. Acute malnutrition levels have been seen to increase when access to animal milk is reduced.

Objective

The aim of this analysis was to assess the degree to which economic constraints might prevent households in the East Golis livelihood zone from having access to a nutritious diet. The data collection and analysis set out to answer the following questions:

- What is the cost of a nutritionally adequate diet for a typical household in the East Golis livelihood zone of Bari region, Puntland?
- What nutrients have the greatest influence on the cost of a nutritious diet?
- Are there any neglected or underutilised foods that could decrease the cost of a nutritious diet?
- How affordable is the diet for a typical household in different wealth groups?

Methods

A market and dietary pattern survey and focus group discussions were conducted in four markets and four villages in the livelihood zone. The market price, seasonal availability and consumption patterns of local foods was collected. With these data, three theoretical diets were created using the Cost of the Diet software: a lowest cost diet that only meets recommended average energy requirements; a lowest cost diet that meets recommended intakes for energy and nutrients (MNUT); and a lowest cost diet that meets recommended intakes for energy and nutrients based upon typical dietary habit of households in East Golis livelihood zone of Puntland. These were compared with income data from the 2012 livelihood assessment, to estimate the affordability of a nutritious diet at the household level by wealth group.

Results

The results from the cost of the diet analysis show that the Energy only and MNUT diets were more or less of the same cost meaning that it costs almost the same to meet an energy only and a protein, fat and micronutrient rich diet. The LACON diet was 18 times more expensive meaning that the constraints in the software made it much harder for the software to meet recommended nutrient intakes that reflect typical dietary habits. Hence the software selected more expensive food sources to meet nutrient requirements.

There were 35 foods available in the markets visited in East Golis even though the team had listed a total of 77 foods that are available in the main market in Bosasso. The livelihood zone is mainly pastoral hence the consumption of milk is high but the consumption of meat products is not high due to the prices for the very poor who have limited livestock.

The hot climate and long distances make it difficult to transport fresh foods like vegetables and fruits from Bosasso market hence these were found to be in limited supply. Most of the fruits that are consumed are those that are canned and the most common fruit was pineapple and bananas.

The diets selected by the software were not diverse for both the energy only and MNUT diets both of which identified five food items. Although the MNUT diet is calculated to meet the requirements for energy, proteins, fats and micronutrients, the diet did not meet requirements for Vitamin A, Vitamin C, Vitamin B2, Vitamin B6, Folic Acid, B12, Pantothenic acid, Calcium and Iron for children 12-23 months and the rest of the family. The LACON diet met most of the nutrient requirements except for Vitamin B1, Folic acid and Iron, indicating that there is a likely deficiency of these nutrients in the livelihood zone. To meet the requirements for Vitamin B12 for example, the LACON diet only selected liver products while for Folic Acid, 63% of the requirements were met by Cowpeas and Fasulia (canned broad beans).

Rice, pasta and wheat flour were the main staples providing a source of starchy carbohydrates with cowpeas providing a good source of Vitamin B1, Folic acid and iron, whilst meat provides a source of protein and Vitamin B12. Fresh animal milk is often consumed and when this is not available it is replaced with milk powder and this provides a good source of proteins, fat, Vitamin A and B group vitamins and

calcium. Dates, lime and Tamarind were the most common fruits found. Chili is a common ingredient in most homes and provides a good source of Vitamin C.

The cost of diet analysis indicates the importance of the foods households are currently consuming while emphasizing the need for more meat, vegetables and fruit in the diet. For example, the software has shown that cowpeas provide an inexpensive source of Vitamin B1, Folic acid and Copper. Their role in providing Folic acid is important for the prevention of neural tube defects in the foetus and to make red blood corpuscles.

An issue with the nutritious diets (MNUT and LACON) is that foods have to be eaten in large quantities to meet the recommended nutrient intakes, which may be expensive and unrealistic for poor households. For example, the LACON diet includes 13.7Kg a year of red chillis which contribute 53.3% of the vitamin C requirements and 57.7 kg a year of dates, which do not contribute significantly to meeting any nutrient requirements. The LACON diet also included 1029 kg of dairy products which contribute 55% of requirements for Vitamin B2 and 90% of the requirements for calcium.

The results show that the daily cost of the LACON diet fluctuates by season, with the Jilaal (main dry season) being the most expensive season. Seasonal price data was collected retrospectively and one inherent disadvantage of this is that recall by traders may not be accurate. The price list of food items in appendix 2 indicates that all the food items were available throughout the year, and that may not be the case for fresh animal milk which is seasonal. All wealth groups rely on food from the market with the poor only accessing 7% of their food from food aid. Hence, these seasonal fluctuations do have an effect on the poor wealth group's ability to access a nutritious diet

The results from the cost of the diet show that the middle and better off wealth groups can afford a nutritious diet (MNUT). However, the households in the poor wealth group cannot afford both an energy only and nutritious diet (MNUT or LACON) that meets their recommended energy, fat, protein and micronutrient intakes. The gap in the affordability of the LACON diet, expressed in cash (34,404 USD a year for the poor), is very large indicating a huge unmet need for this wealth group.

Breastfeeding remains critical for children up to 2 years of age. According to the COD analysis for children aged 12-23 months, breastfeeding met over half of the nutrient requirements for Fat and vitamin C while contributing significantly to the requirements for calcium and folic acid.

The most nutritious foods for the minimum cost were identified as Sorghum, Cowpeas, lime, oranges, goat meat, liver, sheep meat, and camel milk. However, from the data collected, sorghum is not a staple food and may need to be promoted.

Recommendations

The results from the Cost of the Diet analysis show that for the households in the poor wealth group, it is not possible for them to obtain their recommended intakes of energy, fat, protein and micronutrients from foods found in the local markets. The very poor household's access to the nutritious foods selected by the software is restricted mainly by poverty and the poor road infrastructure which contributes to the high cost of food as well as limiting availability of fresh foods into the markets further away from Bossaso.

Hence, the following recommendations are made:

- There is need to consider a social protection programme for households in the poor wealth group to enable them meet their minimum nutrient requirements
- There is need to invest in improving the road and market infrastructure in this livelihood zone in order to reduce the transaction costs that contribute to higher food prices as well as to make all food types accessible in remote areas. It is unlikely that fresh foods (fruits and vegetables) will be available in remote areas until the road infrastructure improves.
- The Cost of the Diet analysis indicates that animal milk is a good source of protein and calcium and also some of the B vitamins. However, milk is not available throughout the seasons and there is need to invest in projects that would support all year round milk availability and especially for poor households.
- Consider promoting Cowpea and sorghum consumption given their contribution to meeting a nutritious diet.
- From the analysis, the requirements for iron, Folic acid, Vitamin B12 and Vitamin B1 were the hardest to meet for the LACON diet hence there is need for further investigation of the micronutrient status of the population and appropriate interventions to address any deficiencies.
- There is need to continue promotion of appropriate Infant and Young Child feeding practices with emphasis on timely initiation and exclusive breastfeeding, as well as continued breastfeeding up to 2 years given the important of breastfeeding in contributing to meeting nutrient needs of children.

1 Introduction

1.1 Somalia

The federal republic of Somalia has faced political upheaval over many years leading to the ongoing conflict and population displacement that has impacted the population in a number of ways. The protracted complex humanitarian and livelihoods crisis has resulted in increasing socio-economic vulnerability and poverty. According to the United Nations (UN), Somalia represents one of the worst humanitarian crises in the world with almost 50% of its people in need of external assistance and close to 1.5 million internally displaced people (IDPs).

In addition to the ongoing conflict and displacement, the country is also prone to frequent droughts

1.2 Aim of the analysis

The aim of this analysis was to assess the degree to which economic constraints might prevent households in the East Golis Livelihood Zone from having access to a nutritious diet. The data collection and analysis set out to answer the following questions:

- What is the cost of a nutritionally adequate diet for a typical household in the East Golis livelihood zone of Bari region, Puntland?
- What nutrients have the greatest influence on the cost of a nutritious diet?
- Are there any neglected or underutilised foods that could decrease the cost of a nutritious diet?
- How affordable is the diet for a typical household in different wealth groups?

2 Overview of the Study Area

2.1 Introduction to Puntland and the East Golis livelihood Zone

Bari region is situated in the northeast of the autonomous state of Puntland in Somalia. It is bordered by Sool region to the southwest, Nugaal region to the south, the Indian Ocean to the east, the Gulf of Aden to the north and the disputed border with Sanaag on the northwestern side. The population in the Bari region is estimated at 367,368 (UNDP 2005) with an almost even divide between rural/urban, 188,005 and 179,633 respectively. Approximately 55 per cent of the population in Qardho, Bender Beilla, Iskushuban, Kandala and Alula are pastoralists. The region's economic activities include livestock, fishing and frankincense with part of the urban population depending on casual labour at the port.

The East Golis pastoral livelihood zone is located in Bari region, and is spread in Alula, Bandar Beyla, and Iskushuban districts. The main sources of income in East

Golis livelihood are frankincense production and pastoralism; however, fish harvesting is also practiced on a smaller scale.

2.2 The nutrition situation

Somalia is among the countries with the highest neonatal, infant and under five mortality rates at 52, 109 and 180 deaths per 1,000 live births respectively¹. Mortality rates in Puntland follow similar trends with neonatal, infant and under five mortality at 35, 80 and 122 deaths per 1,000 live births per day. The results of the 2009 National micronutrient and anthropometric Nutrition survey² show malnutrition to be an alarming problem with global acute malnutrition and severe acute malnutrition rates reported at 10.7% and 1.3% respectively, while underweight and stunting rates were 12.8% and 16.5% respectively. Seasonal fluctuations and livelihood zone variations are common for acute malnutrition in Puntland. According to the Post Gu 2012 nutrition surveys, the nutrition situation of the population in the East Golis/Karkaar/Dharoor livelihood zones of Bari region was depicted as serious (GAM rate of 13.9% and SAM rate of 4.1%). In Sool Plateau of Bari the nutrition situation remained in the serious phase since Deyr 2011/12 (GAM rate of 11.3% and a SAM rate of 1.7%). Despite the improvement in nutrition situation from very critical to critical levels in IDPs settlements in Bossaso with GAM rates at 18.7% (15.7-22.1 95% CI) and SAM at 3.9% (2.8-5.4 95% CI), the nutrition situation remained at sustained phase in Qardo as in Post Deyr 2011/12 with malnutrition rates at GAM 21.7% (16.8-27.6 95% CI) and SAM 5.6% (3.3-9.2 95% CI). Concerning micronutrient deficiency, the study notes that anemia is quite high at 56.4% and vitamin A deficiency at 24.1 %, both indicative, of a severe public health concern. Prevalence of Iron deficiency in children under five was estimated in the same study at 59.6%.

Causes of malnutrition

According to the post Gu 2012 nutrition survey report, the underlying causes of malnutrition in this pastoral zone include high morbidity coupled with limited access to health services, poor water and sanitation, rapid food price rises and poor child care and feeding practices. The negative impact of these factors are often exacerbated by the frequent seasons of poor rainfall that does not only affect the livestock body conditions and production, but also lead to out-migration of livestock therefore reducing milk access for household members left behind. Pastoral populations mainly rely on the consumption and sale of animals and animal products such as milk for subsistence and commercial purposes. Animal milk is the predominant food among the pastoral population and is a good source of high quality protein and micronutrients and an important contributor to the total energy intake of individuals. Acute malnutrition levels have been seen to increase when access to animal milk is reduced.

2.3 Household profiles and key economic characteristics

The food security and livelihoods assessment completed in 2012 divided the population of East Golis livelihood zone into three wealth groups: poor, middle, better

¹ UN Somalia 2010

² FSNAU 2009:National Micronutrient and Nutritional Anthropometric Survey

off. As shown in table 1, the assessment estimated that 30% of the households were classified as poor, 50% as middle and 20% as better off. The typical household size differed substantially between the wealth groups: 7 members for the poor, 8 for the middle and 10 for the better off.

Table 1: The characteristics of households in East Golis Livelihood Zone by wealth group

Wealth group	% of households	Typical household Size
Poor	30	7
Middle	50	8
Better Off	20	10

2.4 Food Sources

According to the livelihood assessment, the main sources of food were purchases, food aid and livestock products, with purchases accounting for 83% of the income for the poor, 91% of the middle wealth group and 106% for the better off wealth group. The poor get an additional 7% of their food from food aid and 6% from livestock products. The main staple foods purchased were rice, wheat flour and pasta. Pastoralism is the main livelihood activity in the zone.

3 Methods

3.1 Location

A livelihood zone is defined as an area within which people share broadly the same patterns of access to food (FEG, 2012). Cost of the Diet assessments are often conducted in a livelihood zone because the foods that are available and people consume are homogenous. The Cost of the Diet assessment took place in the East Golis livelihood zone of Bari Region, Puntland. The data were collected in the villages of Iskushuban, Humbabays, Harira, Dharor, Ammaan and Timirshe.

The assessment took place in between 2nd – 9th December 2012 during the Deyr rainy season.

Figure 1: East Golis Livelihood Zone



3.2 Data collection and sources

3.2.1 Market survey to collect price data

Surveys were conducted in the following markets of the district: Iskushuban, Humbabays, Harira, Dharor, Ammaan and Timirshe.

Prior to collecting price data, a comprehensive list of all food items available in the livelihood zone was developed using the Save the Children teams as they have local knowledge of the area. This was followed by a field trial in Bosasso market (data not included) where survey participants practiced data collection methods whilst adding items to the food list. The resulting comprehensive food list was then used to collect data on price and weight in the remaining markets.

To collect the information needed to estimate the cost of the diet, market traders were asked the price of the smallest unit of each food item that they sold, assuming that the poor were likely to be able to afford this amount. Generally, the poor typically buy foods in small amounts as they cannot afford bulk purchases.

Three samples of each food were weighed using electronic scales that had a precision of 1 g (Tanita KD-400, Tanita Corporation, Japan). Where possible in each market, weight and price data were collected from 4 traders giving a total of four prices and 12 weights for each food item on the food list. Market traders were then asked questions about annual trends in prices, seasonality and changes in the demand and supply of commodities. These responses were then entered into an excel spreadsheet to estimate the average price and weights of foods in all seasons.

Each food item identified in the market survey was then selected from the food composition database in the CoD software, choosing the countries closest to where Somalia imports its food from. All price data were converted to cost per 100g and then entered for each season into the Cost of the Diet programme.

3.2.2 Specification of a typical family

A typical household was determined from the HEA and from discussions with the survey team as to what constitutes a typical family. The typical household size was judged to contain 6 individuals: a man, a woman and 4 children. As the estimates of household income for this typical family are based on an energy requirement of 6 x 2,100 kJ, or 12,600 kJ in total, the Cost of the Diet method identifies a family of the same individuals that require as close to 12,600 kJ as possible. This typical household economy analysis/Cost of the Diet (HEA/CoD) family consists of:

- An adult man, aged 30-59y, weighing 60 kg and moderately active (3,450 kcal/d)
- An adult woman, aged 30-59y, 45 kg, moderately active (2,300 kcal/d)
- A child of either sex aged 13-14 years (2,575 kcal/d);
- A child of either sex aged 6-7 years (1,500 kcal/d);
- A child of either sex aged 12-23 months (894 kcal/d).
- A child of either sex aged 6-8 months (615 kcal/day)
- The total energy requirement of this family is 11,334 kcal/d.

Because the Cost of the Diet is dependent on the numbers, age and degree of physical activity of the individuals selected for this 'typical' family, which is arbitrary, and to illustrate the possible range in the cost of the diet, a CoD/HEA family was

specified in the same way for 5, 6, 7, 8, 9 and 10 members and two other families were specified to cover the highest and lowest energy needs for families of between 5 and 10 members.

A minimum or low energy family was selected by choosing the youngest, smallest family for each number of individuals between 5 and 10; and a maximum or high energy family was selected by choosing the oldest, largest family between 5 and 10.

3.2.3 Requirements 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 (EAR) recommended by the WHO and FAO (2004) 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 requirements are met is 0.5 or 50%.

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 (2007) 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%.

The needs of individuals for vitamins and minerals (collectively called micronutrients) are taken from a database embedded in the software which specifies the recommended nutrient intake (RNI) proposed by the WHO and FAO (2004) 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%. 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 (WHO/FAO, 2004).

The needs of individuals for fat are specified as 30% of total energy intake.

3.3 The Cost of the Diet 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 needs for energy, protein, fat and micronutrients, with the probabilities specified above, using locally available foods. The cost of food grown at home and consumed at home is included in the calculation by applying market prices. Menu driven software developed that applies linear programming routines in Microsoft Excel 2003³⁴ is used to minimize the cost of locally available foods to meet these nutrient requirements. The Cost of the Diet software generates a hypothetical diet using a combination of foods that will enable a family to meet their energy and nutrient requirements as recommended by the World Health Organization and the Food and Agriculture Organization (2004) at the lowest possible cost. As the software can identify a diet that is 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.

The Cost of the Diet software can be used:

³ Louise Mwirigi and Joesph Waweru, Seasonal Trends in pastoral Malnutrition, FSNAU, August 2011

⁴ Available from Save the Children, UK upon request

- To estimate the cost of a typical local diet;
- To estimate the minimum cost of a diet for any given individual and for specified households of multiple individuals;
- To take into account seasonal variations in food prices when costing the diet;
- To identify seasonal gaps 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 are likely to be among the underlying causes.

Using the data collected in East Golis Livelihood Zone, the cost of 3 types of diet were estimated:

- A diet that meets the specified needs for energy only (energy only diet)
- A diet that meets the specified needs for all nutrients at minimum cost nutritious diet (MNUT diet)
- A diet that meets the specified needs for all nutrients at lowest cost using a locally nutritious diet (LACON, locally appropriate, cost-optimized and nutritious, diet)

Table 2 below summarizes the characteristics of each diet. These diets are described in more detail below.

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

Diet name	Definition	Energy needs met	Fat at 30% of energy	Protein needs met	Micro-nutrient needs met	Reflects a typical diet
Energy only diet	A lowest cost diet that only meets the average energy requirements of the members of the household	X				
Minimum cost nutritious diet (MNUT)	A lowest cost diet that meets the average energy and the recommended nutrient requirements of the household	X	X	X	X	
Locally appropriate cost-optimised nutritious diet (LACON)	A lowest cost diet that meets the average energy and the recommended nutrient requirements of the household and reflects cultural consumption patterns	X	X	X	X	X

3.3.1 Energy only diet

When creating 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 several of the micronutrient requirements, but it is useful to illustrate:

- The potential for micronutrient deficiencies in a diet that only meets average energy needs
- The additional cost of meeting all nutrient requirements, including micronutrients, compared with meeting only average energy needs.

3.3.2 Creating the minimum cost nutritious diet (MNUT)

When creating a MNUT 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 the typical dietary patterns of people in the livelihood zone.

This diet is used to show the differences in diet composition and its cost when compared with a diet that takes into account typical dietary patterns.

3.3.3 Creating the locally appropriate cost-optimised nutritious diet (LACON)

When creating a LACON diet, the software calculates the lowest cost combination of foods which meet the average energy requirements and the recommended micronutrient requirements, whilst adhering to a set of minimum and maximum constraints which set the number of times a week specific food items can be included in the diet. For example if the minimum constraint for Irish potato is set at 5 and the maximum is set at 14 this means that the software must include potato in the diet no less than 5 times a week but no more than 14 times a week (twice a day).

To create these constraints, a one hour interview based upon a questionnaire and focus group discussion was carried out to understand local dietary patterns. The questionnaire was based upon the food list generated by the market survey and aimed to determine how often the foods were consumed. The questions asked during the focus group discussion were based on early observations from the market data, comments from traders, and responses to the questionnaire. In particular, information was collected on the wild foods consumed, on household production of food, and on cultural taboos, 'normal' consumption patterns, and key staples. The discussions were held in 5 villages; Iskushuban, Humbabays, Harira, Dharor and Timirshe and each group consisted of 8 women, 2 from each wealth group identified by the livelihood assessment, all of whom were responsible for preparing food for the household. The women were identified by Village elders.

During the interview the women were asked to state the frequency with which they ate each item of food on the list. The frequency options given were never, sometimes (1-4 times a week) or often (more than five times a week). The responses were given a numerical score: 'never' was awarded 0 points, 'sometimes' 1 point and 'usually' 2 points, then the total for each food item from all 8 respondents was calculated. This meant that each item could receive a minimum total score of 0 and maximum of 16. A total score of 0-1 points was translated into a maximum constraint of 0, 1-8 points was translated into a maximum constraint of 7 (a food eaten once a day) and a total score of 9-16 points was translated into a maximum constraint of 14 (a food eaten twice a day).

During the focus group discussions the women stated that Rice, Wheat flour, and Spaghetti (Pasta) were the staple foods of people in the livelihood zone. The results from the livelihood assessment (2012) found the same, with Rice and Wheat flour identified as the main staple. These foods were entered into the diet a minimum of 7 times per week and a maximum of 14 times per week.

It is important to note that the constraints applied are intended to reflect typical dietary patterns rather than reflect economic constraints, because the Cost of the Diet is a tool to illustrate a diet that could be achieved if economic limits were removed.

The list of all food found in the markets in East Golis Livelihood Zone, the portion sizes, minimum and maximum constraints entered into the Cost of the Diet Software can be found in Appendix 3.

The average cost of all diets were calculated in Somali Shillings (SoSh) and thereafter converted to US dollars. The prices in Sosh are given at the end of the report.

3.4 Estimating the affordability of diets

3.4.1 Estimating affordability according to annual income

The cost of a nutritious diet becomes a more meaningful figure when compared with the income and purchasing power of the poorest members of the community. A diet may be cheap in comparison to other contexts, but if it is beyond the means of the poor, then the risk of malnutrition remains.

Estimates of cash income were made during the livelihoods assessment (2012). For the purpose of the present analysis, in addition to the estimated cash income, the cash value of all food that is consumed but not purchased was estimated based on the market cost of the same foods. This included all food grown or produced by the household, food paid in kind in exchange for labour, or food provided as gifts. Table 3 shows these estimates for the four wealth groups.

Table 3: Total estimated income in USD of a typical 6 person household in three wealth groups rounded to the nearest thousand.

	Poor	Middle	Better-off
Annual Cash Income	1,942	2,809	3,648
Annual Own Produce	385	1,493	2,578
Total Annual Income	2,327	4,303	6,227

3.4.2 Estimating affordability after meeting the livelihood protection threshold

The income figures in Table 3 represent the total and potential income as food by households in different wealth groups. However, households have many needs in addition to food, some of which are critical for their survival. The 'livelihoods protection threshold', estimated by the Household Economy Analysis (2012) is defined as the annual cost of essential non-food items, specific to each wealth group. By subtracting the livelihood protection threshold from the total annual income figures presented above, a more realistic indication of what amount households may have available to spend on food can be estimated. Table 4 shows the total income of each wealth group after subtracting household's needs for essential non-food items.

Table 4: Total income and livelihood protection threshold by wealth group

	Poor	Middle	Better-off
Total annual income	2,327	4,303	6,227
Non-food expenditure (NFE)	531	1,181	1,363
Total annual income - NFE	1,796	3,121	4,863

The difference between the total estimated annual income plus the livelihood protection threshold and the annual cost of a nutritious diet was defined as the 'affordability' of the diet.

4 Results

The list of foods identified and used in the Cost of the Diet analysis with the price per 100g in all four seasons can be found in Appendix 2. The list of all foods found in the markets in East Golis livelihood zone, the portion sizes, minimum and maximum constraints entered into the Cost of the Diet Software can be found in Appendix 3.

The field team collected data on 36 foods found in the markets: 6 cereals, 2 pulse/legume, 5 vegetables, 6 fruits, 7 animal products, 6 dairy products, 1 tuber, 1 fats/oils, sugar and manufactured food. The results from the interviews and focus group discussion found that rice, wheat and pasta were the main staple foods in the livelihood zone while other foods like lime, pepper, meats, vegetable condiments and milk are usually consumed.

As mentioned, food purchases constitute 83% of the poor household's energy requirements. These purchases include Rice, Wheat, Pasta, Sugar, Meat, Vegetable oil, milk, and dates. Many of the women interviewed stated that milk, meat and fruits were consumed frequently.

Table 5 shows the energy density of the main staple foods eaten in East Golis with their cost in USD per 100 kcal of raw and cooked food and per 10g of protein.

Table 5: The energy density and cost of the main staple foods eaten by people in East Golis, ranked in terms of cost per 100 g from low to high

					Cost in USD		
	Energy/ 100 g (kcal)	Cost per 100 g	Protein g/100g	Energy in kcal per 100 g	Per 100 g cooked	Per 100 kcal	Per 10 g protein
Spaghetti	364.0	0.2	10.3	364.0	0.2	0.1	0.2
Wheat flour	339.0	0.2	13.7	339.0	0.2	0.1	0.2
Rice	260.0	0.2	4.8	260.0	0.2	0.1	0.4

4.1 The cost of the diet

The list of foods applied in the Cost of the Diet software and the price per 100g of the foods in all four seasons can be found in Appendix 2.

4.1.1 Energy only diet

Table 6 shows the analysis of the cost of the diet by family group and by season.

The minimum cost of a diet that meets only a household's energy need has been estimated at between 5.1-6.7 USD per day, depending on the season, and features only 5 of the 36 foods included in the software. The annual cost of the diet for the typical family is estimated to be USD 2,066.

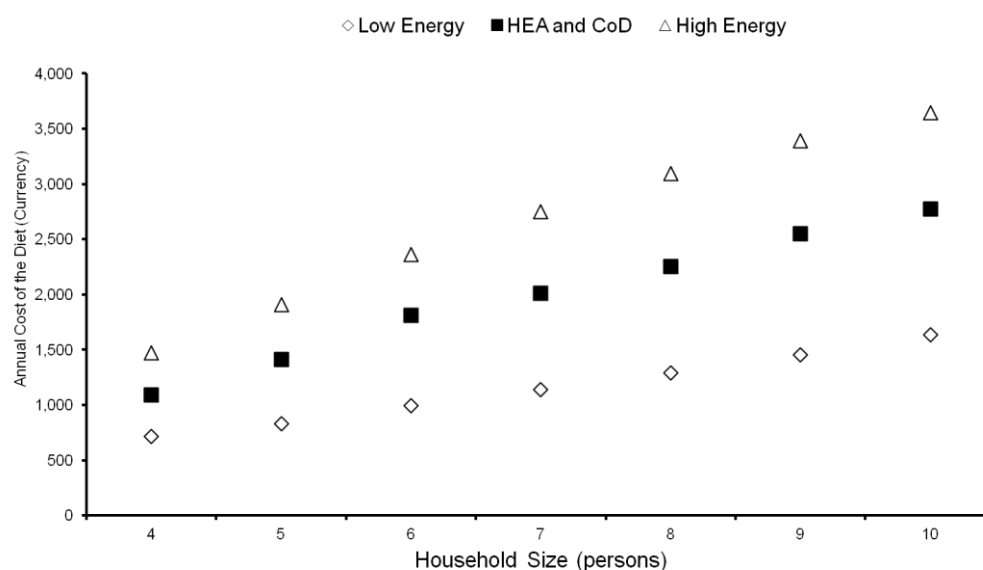
Table 6: The lowest cost diet for the HEA/COD family in East Golis that meets only their energy requirements. The annual costs have computed in USD

Age Group	Deer	Xagaa	Gu	Jilaal	Annual Cost
6-8 month old	0.1	0.1	0.1	0.1	31.7
12-23 month-old	0.2	0.3	0.2	0.3	96.7
Rest of Family	4.8	5.5	5.0	6.3	1,937.6
Overall	5.1	5.8	5.3	6.7	2,066.0

It should be noted that the cost of the diet of the child aged 6-8 months and 12-23 months only includes the cost of the solid complementary foods the child is given, it does not include the cost of breast milk which is costed within the average extra energy (568 kcal/d) and nutrients required by the mother each day.

The composition of the typical household selected for the Cost of the Diet analysis consists of a family of 2 adults and 4 children whose energy intake is aligned with the energy intake used in the HEA. Figure 2 shows how the annual cost of the energy only diet for the HEA/CoD family varies by the number of individuals in the household from 5 to 10 and for families with the minimum and maximum energy requirements. The cost for a family of 6 members could range from USD 994 – 2,364.

Figure 2: The annual cost of an energy only diet based upon mean energy values for household of between 5 and 10 members and low, HEA and Cost of the Diet and high average energy requirements.



The key foods in the energy only diet are Sorghum, Pasta, Camel milk, sugar and vegetable oil.

Table 7 shows the absolute weight and cost of the foods selected for the family for the whole year for the energy only diet with the percentage contributed by each food in terms of weight, cost, energy, protein and fat, and the percentage contribution of each food for eight vitamins and four minerals.

Table 7: The percentage of the average requirements for energy, protein and fat met each day by the **energy only diet** and the percentage of the recommended daily intake of vitamins and minerals provided by the diet for the HEA/CoD family.

Food List	Quantity (g)	% quantity	Cost	% cost	% energy	% protein	% fat	% vitamin A	% vitamin C	% vitamin B1	% vitamin B2	% niacin	% vitamin B6	% folic acid	% vitamin B12	% calcium	% iron	% zinc	% copper
SORGHUM, WHOLE GRAIN, RED	435	38	542	28.0	40.6	52.9	11.2	4.6	0.0	78.5	71.5	74.6	90.2	50.2	0.0	75.8	86.5	31.7	0.0
PASTAS	224	19	410	21.2	22.9	27.3	1.9	0.0	0.0	13.5	14.7	25.4	9.8	33.2	0.0	23.4	13.1	7.2	98.1
MILK, CAMEL	335	29	657	33.9	7.7	19.8	16.5	95.4	100.0	8.1	11.0	0.0	0.0	16.6	0.0	0.0	0.0	61.1	0.0
SUGAR	82	7	198	10.2	8.9	0.0	0.0	0.0	0.0	0.0	2.7	0.0	0.0	0.0	0.0	0.7	0.4	0.0	1.9
VEGETABLE OIL	82	7	129	6.7	19.8	0.0	70.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	1157	100	1,936	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0	100.0	100.0	100.0	100.0
% Requirements met					1.0	1.5	1.2	0.0	0.0	0.9	0.4	1.4	0.4	0.2	0.0	0.1	0.2	0.9	

Although the energy only diet meets the recommended requirements for energy and fat by design, it lacks several essential micronutrients. Figure 3 shows that for a child aged 12 – 23 months in all seasons RDIs for Vitamin A, Vitamin C, B1, B2, B6, Folic Acid, Calcium, B12, and Iron are not met. Some nutrients for example magnesium, zinc, and niacin, requirements are met in seasons 2, 3 and 4 but not season 1 (Deer). As shown in table 6 above, Deer season is the cheapest season but also the season when it is hardest to meet other nutrient requirements.

Figure 3: The percentage of energy and the recommended nutrient intakes for micronutrients met by an energy only diet for a 12-23 month old child.

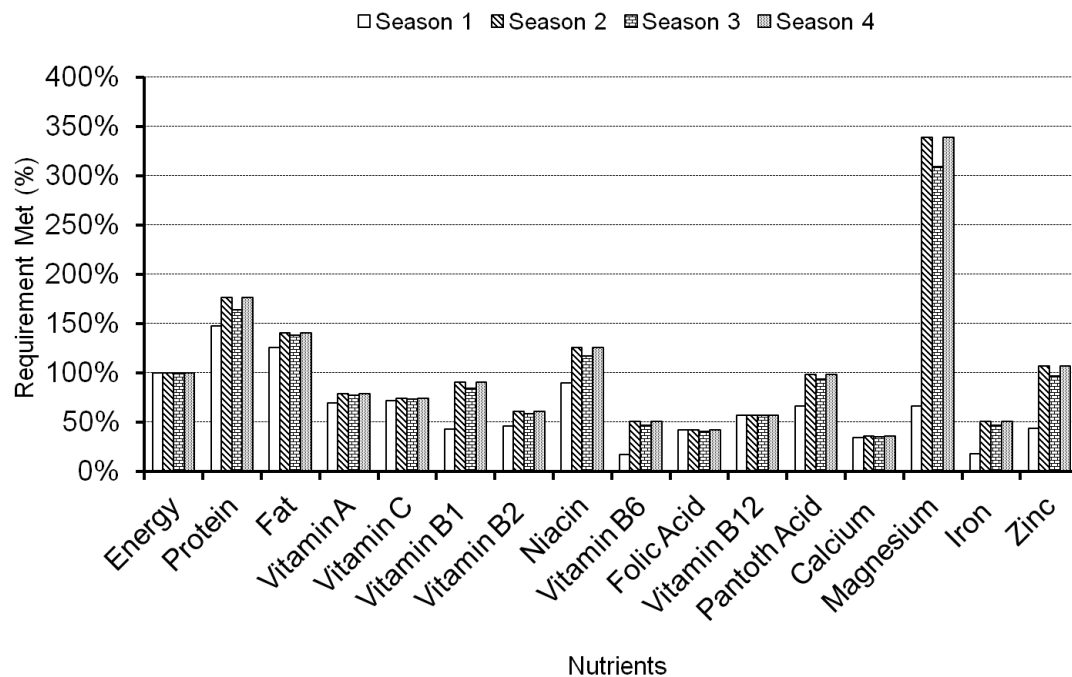
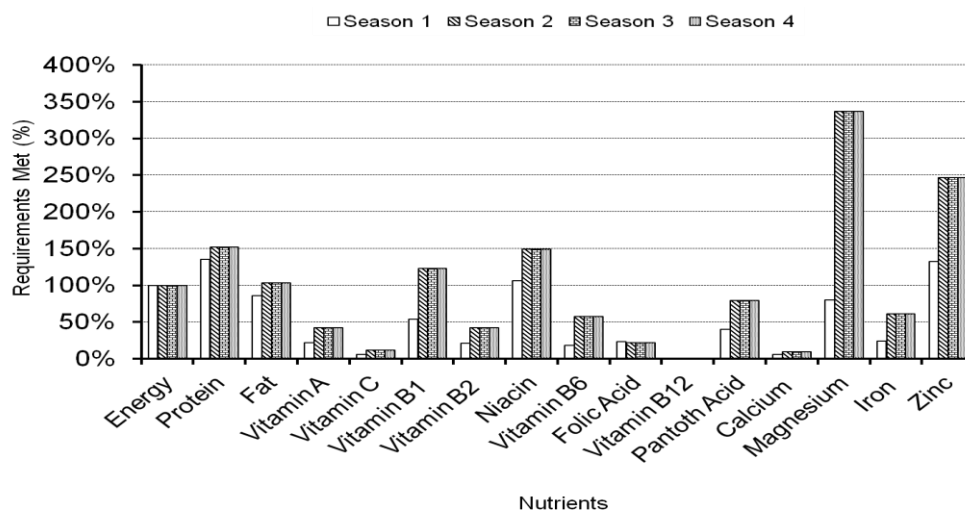


Figure 4 shows that for the rest of the family, a diet that only meets the need for energy, leads to a shortfall in requirements for Vitamin A, Vitamin C, B1, B2, B6, Folic Acid, Calcium and Iron, while the requirements for B12 are not met at all.

Figure 4: Percentage of energy and recommended nutrient intakes for micronutrient met for the rest of the family by an energy only diet.



When compared by season, it is harder to meet other nutrient requirements during the Deer season

4.1.2 Minimum cost nutritious diet (MNUT)

The minimum cost of a nutritionally adequate diet that meets the average energy requirements and the RNIs for micronutrients is estimated to cost between USD 5.1-6.7 per day, depending on the season. Although this is somewhat similar to the energy only diet, the annual cost is more by 4 USD. Table 8 shows the costs by family members and by season. However this diet includes only 5 of the 29 foods known to be eaten by people in East Golis and this is worrying given that food groups like meats and vegetables have not been selected by the software.

Table 8: The lowest cost diet for the HEA/CoD family in East Golis that meets needs for energy and micronutrients but does not take into account the typical diet.

Age Group	Season 1 (Deer)	Season 2 (Xagaar)	Season 3 (Gu)	Season 4 (Jilaal)	Annual Cost
6-8 month old	0.1	0.1	0.1	0.1	31.7
12-23 month-old	0.2	0.3	0.2	0.3	96.7
Rest of Family	4.8	5.5	5.0	6.3	1,941.6
Overall	5.1	5.8	5.3	6.7	2,070.1

The key components of the diet selected by the Cost of the Diet software are camel milk, Sorghum, Pasta, Sugar and vegetable oil for the 12-23 month olds and the rest of the family, with a majority of the nutrients being provided by sorghum and camel milk. For children 12-23 months, breast milk provides the main source for Vitamin A (87.4%), Vitamin C (96.6%), Vitamin B2 (66.3%), Folic Acid (71.9%), Calcium (89.3%), Vitamin B12 (100%) indicating the importance of breast milk for this age group..

Table 9 shows the absolute weight and cost of the foods selected for the family for the whole year with the percentage contributed by each food in terms of weight, cost, energy, protein and fat, and the percentage contribution of each food for eight vitamins and four minerals.

Table 9: The percentage of the average requirements for energy, protein and fat met each day by the **MNUT diet** and the percentage of the recommended intake of vitamins and minerals provided by the diet for the HEA/CoD family.

Food List	Quantity (g)	% quantity	Cost	% cost	% energy	% protein	% fat	% vitamin A	% vitamin C	% vitamin B1	% vitamin B2	% niacin	% vitamin B6	% folic acid	% vitamin B12	% calcium	% iron	% zinc	% copper
SORGHUM, WHOLE GRAIN, RED	561.0	55.7	693	43.8	54.9	74.9	15.3	10.2	0.0	90.7	85.8	89.5	96.4	73.1	0.0	89.8	94.8	52.7	0.0
PASTAS	99.3	9.9	193	12.2	10.6	13.3	0.9	0.0	0.0	5.4	6.1	10.5	3.6	16.6	0.0	9.5	4.9	4.1	95.7
MILK, CAMEL	224.6	22.3	469	29.6	9.1	11.9	9.5	89.8	100.0	4.0	6.9	0.0	0.0	10.3	0.0	0.3	0.2	43.2	2.1
SUGAR	81.7	8.1	165	10.4	15.0	0.0	37.2	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.3	0.2	0.0	2.1
VEGETABLE OIL	40.8	4.0	62	3.9	10.3	0.0	37.1	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				
Total	1007.3	100.0	1,582	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0	100.0	100.0	100.0	100.0
% Requirements met																			

4.1.3 Locally appropriate cost-optimised nutritious diet (LACON)

The MNUT diet specified in section 4.1.2 above was not chosen to be typical of the foods eaten by people in East Golis; the diet reflects the least expensive way for the typical family to meet the specified amounts of energy and micronutrients using all foods available in the market, but in unconstrained amounts.

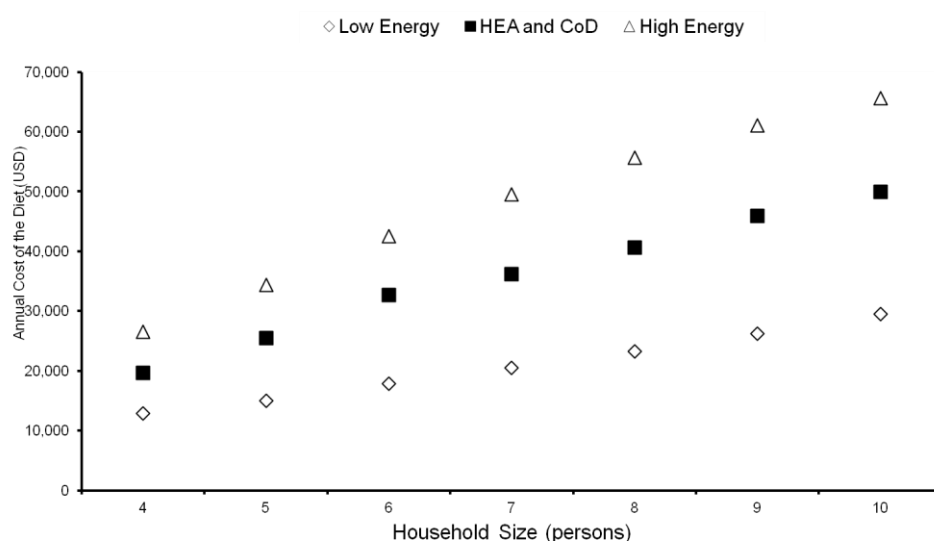
Table 10 shows the breakdown of costs by family members and by season for a culturally acceptable diet (LACON). The estimated minimum amount of cash that a family of 6, including a child aged 12-23 months, would need to be able to purchase this diet from the market is between 89.59-122.21 USD/day and includes 25 of the 36 foods known to be eaten by people in East Golis. This diet is 18 times more expensive than the energy only diet and MNUT diets which is very expensive.

Table 10: The lowest cost diet for the HEA/CoD family in East Golis that meets needs for energy and micronutrients and is adjusted to account for usual dietary habits.

Age Group	Season 1 (Deer)	Season 2 (Xagaar)	Season 3 (Gu)	Season 4 (Jilaal)	Annual Cost
6-8 month old	1.28	1.54	1.31	1.74	527.91
12-23 month-old	4.86	5.84	5.00	6.65	2,010.49
Rest of Family	83.46	100.34	85.28	113.81	34,456.78
Overall	89.59	107.71	91.58	122.21	36,995.18

Figure 5 shows the annual cost of a LACON diet for the household size and the three compositions. This indicates that the annual cost presented for a 6 person family could range from 17,896 – 42,549 USD

Figure 5: Annual cost of a LACON diet for the low, HEA/COD and high energy families



The cost of the diet of the child aged 12 to 23 months represents the additional foods needed to meet the recommended energy and nutrient requirements in addition to breast milk, the cost of which is included in the cost of the mother's diet. It is important to note the essential contribution of breast milk in this diet for children aged 12-23 months. Although breast feeding should be partial at this age and only contributes 39% of the average energy requirements, it makes the greatest

contribution to a child's intake of Energy (37.2%), Fat (63.0%), Vitamin C (64.3%), Calcium (34.6%) and Folic Acid (30.1%). Breast milk contains little iron however, so it is important that iron-rich complementary foods are given to the child.

For the rest of the family, goat and camel milk, liver, rice and wheat contribute the most to meeting essential nutrients. Rice and wheat are part of the staple diet and easily accessible however, meat (especially liver) is expensive and is not consumed often. Fresh animal milk on the other hand is seasonal and when it is not available communities switch to powdered milk which is likely to provide some of the nutrients found in fresh animal milk.

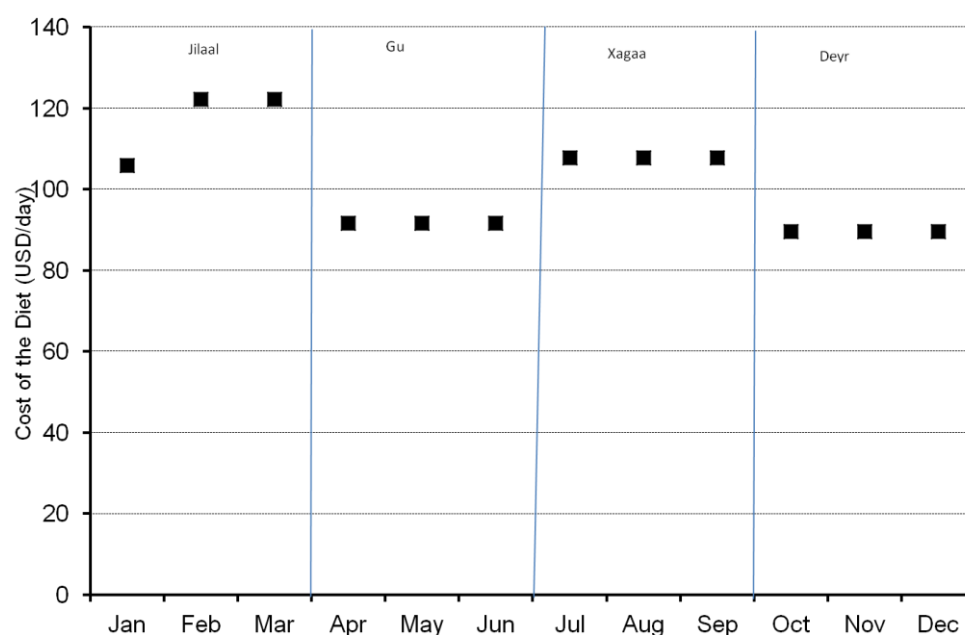
Table 11 shows the absolute weight and cost of the foods for the whole year with the percentage contributed by each food in terms of weight, cost, energy, protein and fat, and the percentage contribution of each food for eight vitamins and four minerals for the family. The table also shows a diet that meets average energy requirements and meets or exceeds the RNIs for micronutrients at lowest possible cost, based on market prices in December 2012. Some micronutrients are provided in the diet in excess of the recommended daily intake (RDI) and this happens because some nutrients are present in foods at a low concentration or are poorly absorbed, so relatively large amounts of food need to be consumed to meet the RDIs.

The RDI is exactly 100% for energy, fat and Vitamin B6 while requirements for Vitamin B1, Folic acid and Iron are not met.

Table 11: The percentage of the average requirements for energy, protein and fat met each day by the LACON or most nutritious diet and the percentage of the recommended daily intake of vitamins and minerals provided by the diet for the HEA/CoD family.

Food List	Quantity (kg)	% quantity	Cost	% cost	% energy	% protein	% fat	% vitamin A	% vitamin C	% vitamin B1	% vitamin B2	% niacin	% vitamin B6	% folic acid	% vitamin B12	% calcium	% iron	% zinc	% copper
CAMEL	18.1	0.9	118	2.8	0.9	2.6	1.9	0.0	0.0	0.6	0.7	2.5	2.2	0.2	1.0	0.0	2.4	3.7	0.3
CAMEL LIVER	12.1	0.6	94	2.2	0.3	1.6	0.3	35.8	1.8	0.9	10.4	3.2	2.1	4.9	35.7	0.0	5.8	3.3	9.8
CHILI, RED	13.7	0.7	104	2.5	0.2	0.2	0.1	1.3	53.3	0.7	0.3	0.7	2.9	0.8	0.0	0.0	0.6	0.2	2.8
COWPEA, UNCOOKED	37.0	1.8	109	2.6	2.7	5.4	0.3	0.0	0.0	11.7	1.9	4.5	4.5	38.1	0.0	1.0	12.9	7.7	6.4
DATE	57.7	2.8	110	2.6	3.8	1.2	0.2	0.0	2.3	5.2	1.5	1.2	6.2	0.3	0.0	2.1	6.1	1.1	4.1
FASULIA, CANNED	41.2	2.0	124	2.9	3.3	6.8	0.4	0.0	1.6	10.3	2.1	5.6	6.1	26.5	0.0	1.4	16.7	7.3	6.3
GABARAALE	27.5	1.3	44	1.0	0.6	3.6	0.5	0.2	0.0	2.0	0.6	4.3	2.6	0.5	1.7	0.4	1.6	0.7	0.3
GOAT, LIVER	14.6	0.7	226	5.4	0.4	1.7	0.3	38.1	1.9	1.0	11.1	3.4	2.3	5.2	38.1	0.0	6.2	3.6	10.5
GOAT, RAW	41.2	2.0	302	7.2	1.8	5.1	3.7	0.0	0.0	1.5	1.5	5.0	4.4	0.3	2.0	0.1	4.8	7.3	0.6
LIME	13.7	0.7	95	2.3	0.1	0.1	0.0	0.0	6.2	0.2	0.0	0.1	0.3	0.2	0.0	0.2	0.3	0.1	0.1
MILK, CAMEL, FERMENTED	279.6	13.3	331	7.8	7.5	10.8	13.6	3.4	7.4	10.0	20.0	9.1	7.8	4.2	6.2	31.7	0.0	10.3	1.4
MILK, COW, POWDERED, WHOLE	2.5	0.1	22	0.5	0.3	0.5	0.5	0.1	0.3	0.3	1.0	0.4	0.2	0.1	0.1	1.4	0.2	0.5	0.0
MILK, GOAT	373.5	17.8	589	13.9	6.1	9.6	10.9	4.1	5.0	11.1	17.0	8.5	8.7	0.7	1.0	28.7	3.6	6.9	4.6
MILK, GOAT, FERMENTED	373.5	17.8	510	12.1	6.1	9.6	10.9	4.1	5.0	11.1	17.0	8.5	8.7	0.7	1.0	28.7	3.6	6.9	4.6
ONION TUBER	27.5	1.3	66	1.6	0.3	0.3	0.0	0.0	1.8	0.7	0.2	0.3	1.7	0.8	0.0	0.1	0.3	0.3	0.5
POTATO, ENGLISH, RAW	68.7	3.3	119	2.8	1.5	1.0	0.0	0.0	11.9	4.5	0.4	2.9	9.6	1.2	0.0	0.2	1.4	1.3	3.4
RICE, GRAIN OR FLOUR, HYV	230.7	11.0	424	10.0	19.9	11.1	1.0	0.0	0.0	8.3	4.5	12.2	15.0	2.6	0.0	0.8	7.3	15.6	12.4
SHEEP HEAD AND FEET	9.2	0.4	8	0.2	0.8	1.3	2.0	0.0	0.2	4.0	0.7	1.4	1.4	0.1	0.6	0.2	1.2	1.4	0.3
SHEEP, LIVER	3.2	0.2	49	1.2	0.1	0.6	0.1	12.9	0.6	0.3	3.8	1.1	0.8	1.7	12.9	0.0	2.1	1.2	3.5
SPAGHETTI	230.7	11.0	393	9.3	17.8	15.9	10.5	0.0	0.0	5.5	3.0	14.4	8.6	6.0	0.0	1.4	12.2	14.2	10.7
TAMARIND, RIPE	13.7	0.7	40	0.9	0.8	0.3	0.0	0.0	0.5	1.1	0.4	0.3	1.3	0.1	0.0	0.5	1.3	0.3	0.9
VEGETABLE OIL	58.1	2.8	94	2.2	11.9	0.0	41.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WHEAT, FLOUR, ALL-PURPOSE, 72% EXTRACT.	147.4	7.0	252	6.0	12.7	10.9	1.1	0.0	0.0	8.8	1.9	10.4	2.7	5.0	0.0	1.0	9.3	6.3	16.6
Total	2095.25	100.00	4,226	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
% Requirements met					100.0%	203.7%	100.0%	526.6%	108.2%	93.2%	160.2%	194.8%	104.6%	93.5%	754.4%	115.9%	42.7%	145.3%	

4.1.4 Seasonal fluctuations in the LACON diet



The most expensive season is Jilaal (season 4) with the daily cost of food going up to 122.21 USD per day. Jilaal is the main dry season when the hunger gap peaks, there is no livestock production, milk availability is low and cereal prices tend to be high. The other dry season is Xagaa (considered a minor dry season) which is the second most expensive season and though the season also witnesses livestock migration and increased cereal prices, there could be a respite due to the calving of camels which may reduce the cost of milk due to increased availability. Jilaal is the season when malnutrition rates are likely to be higher due to the high cost of food and poor water availability.

4.1.5 Contribution of food groups to the cost of the LACON diet

Figure 6 shows that for the LACON diet, dairy, cereals and meats are the most costly elements of the diet for a child aged 12 to 23 months. This is because they are required in larger quantities to meet the minimum nutrient requirements. They are also the food items that are most expensive.

The same data for the rest of the family shown in Figure 7 reveals that the same food groups as those for children 12-23 months contribute the most to the cost of the LACON diet.

Figure 6. The weekly cost of foods each week selected by the Cost of the Diet software for the LACON diet which meets needs for energy and micronutrients in a culturally acceptable diet for a 12-23 month old child.

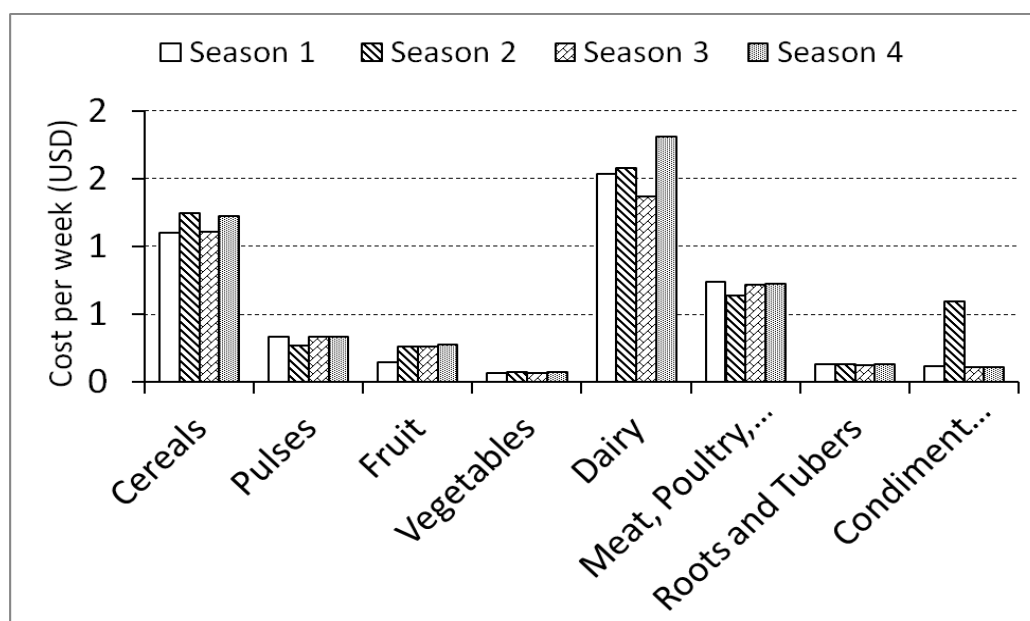
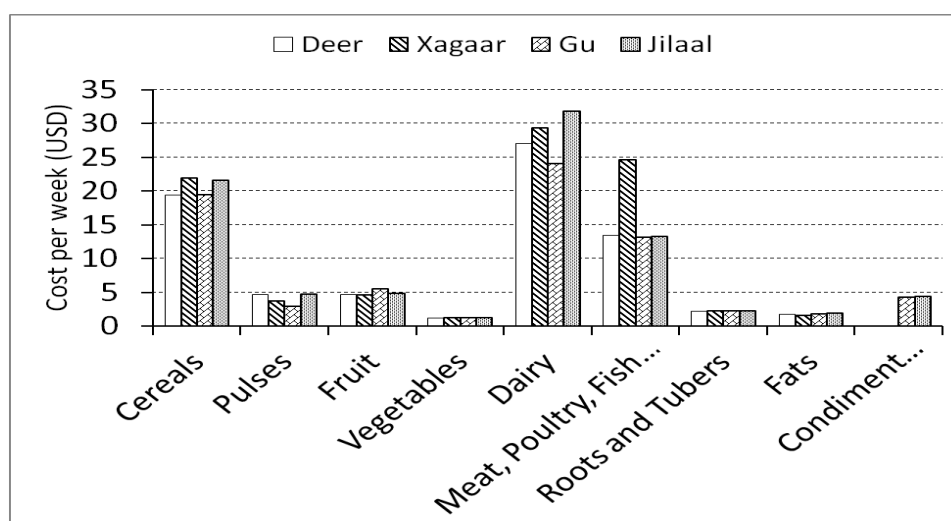


Figure 7: The weekly cost of foods each week selected by the Cost of the Diet software for the LACON diet which meets needs for energy and micronutrients in a culturally acceptable diet for the rest of the family



4.2 Affordability of the diets

In order to calculate affordability, the cost of the diet plus the livelihood protection threshold is subtracted from the total income, all of which are estimates based on multiple assumptions and variable parameters. Table 12 shows the estimated

affordability of the diet per year if the livelihood protection thresholds specific to each wealth group are applied to the cost of the three diets calculated in this analysis.

The results indicate that an energy only diet plus household expenditure on non-food items accounts for 86% of the poorest wealth group's total income whilst for the MNUT diet it costs 17% more than the current available income. This shows that for the poor, their current income levels may not enable them to access a nutritious diet. The results indicate that all the wealth groups are not able to afford the LACON diet even though this represents typical diets.

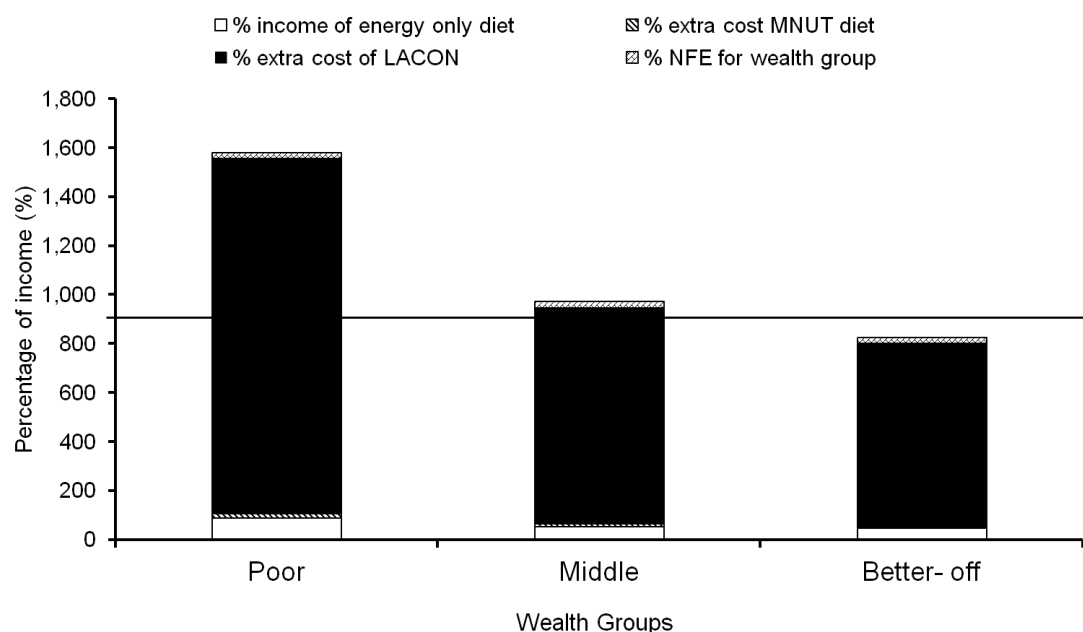
Table 12: The estimated incomes by wealth group, livelihood protection thresholds (LPT) and the costs of three diets estimated by the Cost of the Diet software for households in East Golis Livelihood Zone in December 2012.

Wealth Group	Poor	Middle	Better- off
Annual income	2,327	4,303	6,227
Wealth group NFE	531	1,181	1,363
Total income - NFE	(a) 1,796	3,122	4,864
Cost of energy only diet	(b) 2,011	2,257	2,773
Excess or shortfall	(a)-(b) 215	865	2,091
Cost of MNUT diet	(c) 2,407	2,695	3,231
Excess or shortfall	(a)-(c) -611	427	1,633
Cost of LACON diet	(d) 36,200	40,628	49,920
Excess or shortfall	(a)-(d) -34,404	-37,506	-45,056
Spending on food			
Cost of energy only diet	2,011	2,257	2,773
% income of energy only diet	86	52	45
Extra cost of MNUT diet	396	438	458
% extra cost MNUT diet	17	10	7
Extra cost of LACON	33,793	37,933	46,689
% extra cost of LACON	1,452	882	750
Non-food expenditure	531	1,181	1,363
% NFE for wealth group	23	27	22
	1,578	972	824

The livelihood protection thresholds are estimated specifically for each wealth group and take into account the cost of preserving the assets and services that they currently enjoy. This means that for poor people who have fewer assets than people who are better off, it costs them less to preserve their assets. However it could be argued that there should be an essential set of assets and services that all households should have in order to survive, to include preserving a house and paying for expenses related to education and health.

Table 12 shows that the gap in affordability increases so that the cost of the most nutritious diet are currently estimated to be about 1,452% of current income for the poor, 882% of income for the middle and 750% of income for the better off wealth groups.

Figure 8: The affordability of an energy only and LACON diet based on the numbers presented in Table 14.



4.2.1 The application of average prices of food groups

The aim of this analysis was to see what foods were chosen by the Cost of the Diet software in each of the main food groups when the price of each food group was standardized by taking the average. The rationale being that the most nutritious foods from the food groups may be identified. Table 13 shows the average cost of the food groups. When the prices are averaged, the cheapest food group is sugar at 0.17 USD per 100g and the most expensive is fat at 1.26 USD per 100g. This process roughly maintains the ratio in the price between the different food groups but serves to minimize the inclusion of expensive foods.

Table 13: The average cost of the food groups, entered into the software to identify which foods are the most nutritious regardless of their price.

Food Groups	Code of Staple	Cost (USD/100g)	Ratio Roots = 1
Roots	Roo	0.17	1
Fruit	Fru	0.34	1.97
Cereals	Cer	0.21	1.23
Sugar	Sug	0.17	0.98
Vegetables	Veg	1.19	6.88
Pulses	Pul	1.15	6.62
Fat	Fat	1.26	7.26
Dairy	Dai	0.40	2.29
Animal	Ani	0.83	4.79
Manufactured	Man	0.94	5.46

To ensure that food items were selected based upon nutrient content, the minimum constraints, which specify how many times a food item should be included in the diet were removed.

Table 14 shows that when the average food group prices are entered into the software, the minimum cost of a diet that meets a household's energy and nutrient need is estimated at 29.66 USD per day for all seasons and features only 8 of the 25 foods included in the software. The annual cost of the diet for the typical family is estimated to be 10,824.64 USD.

Table 14: The cost of a diet that meets the average energy and recommended nutrient requirements when the average food group prices are applied to the software

Age Group	Season 1 Deyr	Season 2 Xagaa	Season 3 Gu	Season 4 Jilaal	Annual Cost
6-8 month-old	1.19	1.19	1.19	1.19	435.81
12-23 month-old	2.98	2.98	2.98	2.98	1,088.94
Rest of Family	25.48	25.48	25.48	25.48	9,299.89
Overall	29.66	29.66	29.66	29.66	10,824.64

Table 15 shows the absolute weight and cost of the foods for the whole year for a nutritious diet with the prices averaged by food group, with the percentage contributed by each food in terms of weight, cost, energy, protein and fat, and the percentage contribution of each food for eight vitamins and four minerals and the percentage of the total requirements met for each nutrient, averaged over the four seasons.

Table 15: the absolute weight and cost of the 8 foods selected for the family for the whole year for a nutritious diet with the prices averaged by food group over the 4 seasons

Food List	Quantity (kg)	% quantity	Cost (USD)	% cost	% energy	% protein	% fat	% vitamin A	% vitamin C	% vitamin B1	% vitamin B2	% niacin	% vitamin B6	% folic acid	% vitamin B12	% calcium	% iron	% zinc	% copper
SORGHUM, WHOLE GRAIN, RED	426.7	24.5	896	9.6	39.9	23.6	10.8	0.4	0.0	43.9	14.0	32.4	30.1	4.9	0.0	6.3	42.7	23.5	0.0
COWPEA, WHOLE DRIED	185.8	10.7	2,137	23.0	16.0	20.3	2.0	0.1	0.0	33.8	9.7	15.9	17.9	84.2	0.0	6.9	29.9	21.8	51.9
LIME	97.3	5.6	331	3.6	0.5	0.4	0.2	0.0	49.0	1.0	0.3	0.3	1.8	0.6	0.0	1.7	0.9	0.3	1.1
ORANGE	54.2	3.1	184	2.0	0.5	0.2	0.0	0.0	30.5	1.1	0.5	0.3	0.8	1.0	0.0	1.7	0.1	0.2	0.9
GOAT, RAW	244.9	14.0	2,032	21.9	13.0	22.9	26.1	0.0	0.0	5.0	8.8	20.9	20.9	0.8	11.2	0.6	13.2	24.5	5.8
LIVER	24.6	1.4	204	2.2	0.8	2.4	0.7	91.0	4.0	1.1	21.5	4.6	3.5	4.4	70.1	0.1	5.5	3.8	32.3
SHEEP, RAW-EP	154.9	8.9	1,285	13.8	11.6	14.1	28.2	0.0	0.0	2.7	5.1	12.9	12.6	0.5	6.8	0.3	7.6	14.4	3.7
MILK, SHEEP, CURDS, WHOLE	555.6	31.9	2,222	23.9	17.7	16.1	31.9	8.5	16.5	11.4	40.1	12.8	12.4	3.7	11.9	82.5	0.0	11.5	4.4
Total	1743.88	100.00	9,292	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
% Requirements met					100.0%	203.7%	100.0%	526.6%	108.2%	93.2%	160.2%	194.8%	104.6%	93.5%	754.4%	115.9%	42.7%	145.3%	

5 Key Findings

The results from the cost of the diet analysis show that the Energy only and MNUT diets were more or less of the same cost meaning that it costs almost the same to meet an energy only and a protein, fat and micronutrient rich diet. The LACON diet was 18 times more expensive meaning that the constraints in the software made it much harder for the software to meet recommended nutrient intakes that reflect typical dietary habits. Hence the software selected more expensive food sources to meet nutrient requirements.

There were 35 foods available in the markets visited in East Golis even though the team had listed a total of 77 foods that are available in the main market in Bosasso. The livelihood zone is mainly pastoral hence the consumption of milk is high but the consumption of meat products is not high due to the prices for the very poor who have limited livestock.

The hot climate and long distances make it difficult to transport fresh foods like vegetables and fruits from Bosasso market hence these were found to be in limited supply. Most of the fruits that are consumed are those that are canned and the most common fruit was pineapple and bananas.

The diets selected by the software were not diverse for both the energy only and MNUT diets both of which identified five food items. Although the MNUT diet is calculated to meet the requirements for energy, proteins, fats and micronutrients, the diet did not meet requirements for Vitamin A, Vitamin C, Vitamin B2, Vitamin B6, Folic Acid, B12, Pantothenic acid, Calcium and Iron for children 12-23 months and the rest of the family. The LACON diet met most of the nutrient requirements except for Vitamin B1, Folic acid and Iron, indicating that there is a likely deficiency of these nutrients in the livelihood zone. To meet the requirements for Vitamin B12 for example, the LACON diet only selected liver products while for Folic Acid, 63% of the requirements were met by Cowpeas and Fasulia (canned broad beans).

Rice, pasta and wheat flour were the main staples providing a source of starchy carbohydrates with cowpeas providing a good source of Vitamin B1, Folic acid and iron, whilst meat provides a source of protein and Vitamin B12. Fresh animal milk is often consumed and when this is not available it is replaced with milk powder and this provides a good source of proteins, fat, Vitamin A and B group vitamins and calcium. Dates, lime and Tamarind were the most common fruits found. Chili is a common ingredient in most homes and provides a good source of Vitamin C.

The cost of diet analysis indicates the importance of the foods households are currently consuming while emphasizing the need for more meat, vegetables and fruit in the diet. For example, the software has shown that cowpeas provide an inexpensive source of Vitamin B1, Folic acid and Copper. Their role in providing Folic acid is important for the prevention of neural tube defects in the foetus and to make red blood corpuscles.

An issue with the nutritious diets (MNUT and LACON) is that foods have to be eaten in large quantities to meet the recommended nutrient intakes, which may be

expensive and unrealistic for poor households. For example, the LACON diet includes 13.7Kg a year of red chillis which contribute 53.3% of the vitamin C requirements and 57.7 kg a year of dates, which do not contribute significantly to meeting any nutrient requirements. The LACON diet also included 1029 kg of dairy products which contribute 55% of requirements for Vitamin B2 and 90% of the requirements for calcium.

The results show that the daily cost of the LACON diet fluctuates by season, with the Jilaal (main dry season) being the most expensive season. Seasonal price data was collected retrospectively and one inherent disadvantage of this is that recall by traders may not be accurate. The price list of food items in appendix 2 indicates that all the food items were available throughout the year, and that may not be the case for fresh animal milk which is seasonal. All wealth groups rely on food from the market with the poor only accessing 7% of their food from food aid. Hence, these seasonal fluctuations do have an effect on the poor wealth group's ability to access a nutritious diet

The results from the cost of the diet show that the middle and better off wealth groups can afford a nutritious diet (MNUT). However, the households in the poor wealth group cannot afford both an energy only and nutritious diet (MNUT or LACON) that meets their recommended energy, fat, protein and micronutrient intakes. The gap in the affordability of the LACON diet, expressed in cash (34,404 USD a year for the poor), is very large indicating a huge unmet need for this wealth group.

Breastfeeding remains critical for children up to 2 years of age. According to the COD analysis for children aged 12-23 months, breastfeeding met over half of the nutrient requirements for Fat and vitamin C while contributing significantly to the requirements for calcium and folic acid.

The most nutritious foods for the minimum cost were identified as Sorghum, Cowpeas, lime, oranges, goat meat, liver, sheep meat, and camel milk. However, from the data collected, sorghum is not a staple food and may need to be promoted.

6 Recommendations

The results from the Cost of the Diet analysis show that for the households in the poor wealth group, it is not possible for them to obtain their recommended intakes of energy, fat, protein and micronutrients from foods found in the local markets. The very poor household's access to the nutritious foods selected by the software is restricted mainly by poverty and the poor road infrastructure which contributes to the high cost of food as well as limiting availability of fresh foods into the markets further away from Bossaso.

Hence, the following recommendations are made:

- There is need to consider a social protection programme for households in the poor wealth group to enable them meet their minimum nutrient requirements
- There is need to invest in improving the road and market infrastructure in this livelihood zone in order to reduce the transaction costs that contribute to higher food prices as well as to make all food types accessible in remote areas. It is unlikely that fresh foods (fruits and vegetables) will be available in remote areas until the road infrastructure improves.
- The Cost of the Diet analysis indicates that animal milk is a good source of protein and calcium and also some of the B vitamins. However, milk is not available throughout the seasons and there is need to invest in projects that would support all year round milk availability and especially for poor households.
- Consider promoting Cowpea and sorghum consumption given their contribution to meeting a nutritious diet.
- From the analysis, the requirements for iron, Folic acid, Vitamin B12 and Vitamin B1 were the hardest to meet for the LACON diet hence there is need for further investigation of the micronutrient status of the population and appropriate interventions to address any deficiencies.
- There is need to continue promotion of appropriate Infant and Young Child feeding practices with emphasis on timely initiation and exclusive breastfeeding, as well as continued breastfeeding up to 2 years given the important of breastfeeding in contributing to meeting nutrient needs of children.

Appendix 1. Family members chosen from the WHO database of average energy requirement used to create households with low and high average energy requirements plus a household with an energy requirement closest to the number of people x 2,100 kcal (HEA/CoD family).

Family size		5 individuals			6 individuals			7 individuals			8 individuals			9 individuals			10 individuals		
Household member	Kcal/day	HEA & Cost of the Diet			HEA & Cost of the Diet			HEA & Cost of the Diet			HEA & Cost of the Diet			HEA & Cost of the Diet			HEA & Cost of the Diet		
		Low	Diet	High	Low	Diet	High	Low	Diet	High	Low	Diet	High	Low	Diet	High	Low	Diet	High
Woman is lactating	418	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
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		
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	X	
Child (either sex) 5-6 years	1,400							X			X			X	X		X		
Child (either sex) 6-7 years	1,500										X	X		X			X	X	
Child (either sex) 7-8 years	1,625								X					X	X		X		
Child (either sex) 8-9 years	1,763					X						X					X	X	
Child (either sex) 9-10 years	1,913		X						X						X				
Child (either sex) 10-11 years	2,075					X						X						X	
Child (either sex) 11-12 years	2,250		X						X						X				X
Child (either sex) 12-13 years	2,413					X						X				X		X	X
Child (either sex) 13-14 years	2,575								X				X		X	X			X
Child (either sex) 14-15 years	2,725									X		X	X			X		X	X

Child (either sex) 15-16 years	2,838					X			X			X		X	X				X
Child (either sex) 16-17 years	2,913			X		X			X			X			X		X		X
Child (either sex) 17-18 years	2,950			X		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 active	2,750		X			X			X			X			X			X	
Man, 30-59y, 60 kg, vig active	3,450			X		X			X			X				X			X
Woman, 18-29y, 45 kg, light activity	1,850	X			X			X			X			X			X		
Woman, 30-59y, 45 kg, mod active	2,300		X			X			X			X			X			X	
Woman, 30-59y, 55 kg, vig active	2,850			X		X			X			X				X			X
Total average energy requirement		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
HEA energy specification			10,500			12,600			14,700			16,800			18,900			21,100	

Appendix 2. All the foods that are consumed by the inhabitants of East Golis Livelihood Zone and the costs per 100g reported by market traders

Table 16

Add the foods available in the country using the Food List (maximum of 200 entries)	Enter the price of each food here per 100g of eaten food - If Food is not available for a season leave it blank					
	Season 1	Season 2	Season 3	Season 4	Season 5	
Foods available						Food Group
BREAST MILK (GENERIC)	0.00	0.00	0.00	0.00	0.00	Breast Milk
RICE, RAW (KENYA)	4025.30	5311.50	4422.30	6073.70		Cereals
SORGHUM, GRAIN OR FLOUR, LOCAL (INDIA)	5,526.30	6,473.70	4,736.80	6,078.90		Cereals
SORGHUM, WHOLE GRAIN, RED (SENEGAL)	2752.30	2752.30	2752.30	3145.50		Cereals
WHEAT, FLOUR, ALL-PURPOSE, 72% EXTRACT.	4549.80	6283.00	5308.10	6801.50		Cereals
PASTAS (MEXICO)	3,995.90	4,946.10	4,413.30	5,372.30		Cereals
MACARONI (EGYPT)	4,678.30	5,694.10	5,148.20	6,437.00		Cereals
COWPEA, WHOLE DRIED (SENEGAL)	41,099.50	43,979.10	43,193.70	57,417.10		Pulses
BEAN, KIDNEY, DRIED, RAW (KENYA)	5706.10	6442.70	5802.70	6780.90		Pulses
BANANA (EGYPT)	7029.80	8139.80	7893.10	9465.60		Fruit
LIME (EGYPT)	14235.90	15339.90	14177.80	16502.00		Fruit
ORANGE (EGYPT)	3024.20	7258.10	3024.20	3024.20		Fruit
TOMATO (EGYPT)	4,775.60	6,070.40	5,397.10	7,054.60		Vegetables
DATE (INDONESIA)	5,140.10	5,686.20	5,274.80	6,050.30		Fruit
TAMARIND (INDIA)	7,148.60	7,953.10	7,042.40	8,438.70		Fruit
PEPPER, RED OR HOT, FRESH (SENEGAL)	30844.60	32864.10	31578.90	37637.70		Vegetables
ONION (EGYPT)	3425.10	4711.60	3978.90	5734.00		Vegetables
GARLIC (EGYPT)	20456.80	27905.00	22244.30	27209.50		Vegetables
CORIANDER (MEXICO)	69194.30	82464.50	84360.20	107109.00		Vegetables
GOAT, RAW (KENYA)	45492.80	54479.10	41786.00	67593.40		Meat, Poultry, Fish, Eggs
GOAT INTESTINES & STOMACH, RAW (KENYA)	22522.70	26601.80	20908.70	32221.50		Meat, Poultry, Fish, Eggs
LIVER (EGYPT)	107403.30	130607.70	104618.80	160640.90		Meat, Poultry, Fish, Eggs
SHEEP, RAW-EP (SENEGAL)	46063.90	59956.10	43870.30	75493.50		Meat, Poultry, Fish, Eggs
SHEEP, TRIPE (SENEGAL)	22687.80	29793.40	22301.60	36030.10		Meat, Poultry, Fish, Eggs
BEEF, LIVER (MEXICO)	106779.70	139491.50	108305.10	177372.90		Meat, Poultry, Fish, Eggs
FISH, TUNA, CANNED IN OIL (MEXICO)	22427.80	23683.60	22075.70	24599.00		Meat, Poultry, Fish, Eggs
MILK, CAMEL (MALI)	3793.80	4573.40	3910.50	5694.80		Dairy
MILK, GOAT, FRESH, WHOLE (SENEGAL)	3769.70	5095.30	3923.80	6011.30		Dairy
MILK, POWDER, FORTIFIED (KENYA)	31658.20	36445.80	32878.90	37714.00		Dairy
MILK, COW, FRESH (MEXICO)	2666.70	3333.30	2444.40	3333.30		Dairy
MILK, GOAT, CURDS, WHOLE (SENEGAL)	5759.70	7374.50	5806.80	9339.30		Dairy
MILK, SHEEP, CURDS, WHOLE (SENEGAL)	8974.40	10966.30	9249.80	13297.30		Dairy
POTATO, ENGLISH, RAW (KENYA)	3730.30	4606.00	3984.20	5455.30		Roots and Tubers
PINEAPPLE (EGYPT)	5880.50	6989.60	5823.10	7410.40		Fruit
SUGAR (EGYPT)	4,670.00	6,173.10	5,039.80	6,759.90		Sugars
HONEY (EGYPT)	21,331.90	21,588.90	20,612.30	23,250.90		Manufactured
VEGETABLE OIL (INDONESIA)	3,289.50	3,993.20	3,546.50	3,807.40		Fats

Appendix 3. The list of all food found in the markets in East Golis, the portion sizes, minimum and maximum constraints entered into the Cost of the Diet Software.

FOOD NAME			
		Minimum	Maximum
Cereals			
White rice, polished		7	14
Sorghum, white, grain		0	7
Sorghum, Red, Grain		0	7
Sorghum, Flour		0	7
Maize, white, Grain		0	7
Maize, Yellow, Grain		0	7
Maize Flour, white		0	7
Wheat Flour		7	14
Spaghetti (pasta)		7	14
Macaroni		7	14
Pulses			
Green Gram		0	7
Kidney beans		0	7
Cow peas		7	14
Lentils		0	7
Fasulia, Canned		7	14
Ground nuts		0	7
Fruits			
Banana, ripe		0	7
Water melon		0	7
Mango, green		0	7
Grapefruit		0	7
Lime		7	14
Sweet Orange		0	7
Guava		0	7
Grapes		0	7
Tomato		7	14
Cherry tomato		0	7
Dates		7	14
Tamarind		7	14
Vegetables			
Lettuce		0	7
Cabbage		0	7
Spinach		0	7
Pumpkin		0	7

Radish		0	7
Carrot		0	7
Sweet Melon		0	7
Green pepper (capsicum)		0	7
Red hot Chillis		0	7
Green hot chillis		7	14
Spring Onion		0	7
Egg plant		0	7
Okra (lady fingers)		0	7
Onion, bulb		7	14
Garlic Onion		7	14
Coriander		0	7
Meat, Poultry, Fish, Eggs			
Camel meat, raw		0	7
Camel bone		0	7
Camel Meat, Offal		0	7
Camel liver		0	7
Camel head and feet		0	7
Goat meat, raw		7	14
Goat Meat, Offal		7	14
Goat liver		0	7
Goat head and feet		0	7
Sheep meat, raw		7	14
Sheep Meat, Offal		7	14
Sheep liver		0	7
Sheep head and feet		0	7
Tuna, Canned		7	14
Chicken		0	7
Eggs		0	7
Fish		0	7
Grouper		0	7
snapper		0	7
Emperors		0	7
King fish		0	7
Cobia		0	7
Sail Fish		0	7
Skip Jack Tunna		0	7
Yellow Fish Tunna		0	7
Fragrate Tunna		0	7
Dairy			
Camel Milk Fresh		7	14
Goat Milk Fresh		7	14
powder milk		7	14
Cow milk		0	7
Goat Milk, Fermented		7	14
Camel Milk Fermented		7	14
Roots and Tubers			

Irish potato		7	14
Manufactured Foods			
Canned Pineapple		0	7
Sugar		7	14
New Foods			
Honey		0	7
Wild foods			
Cordeaxia Edullis		0	7
Grewia Pericillata		0	7
Mimuspos Angel		0	7
Grewia Retusa		0	7
Grewia Tenax		0	7
Ficus Vast		0	7
Ficus populifoliaed		0	7
Wild tubers		0	7
Lactuta Goranaensis		0	7
New Foods		0	7
Pineapple, powder		0	7
white oats		0	7
Goat Kidney		0	7
packet milk		0	7
Vegetable oil		7	14
Tomato paste		7	14
Ghee		0	7