A Cost of the Diet analysis in three livelihood zones in Rakhine State, Myanmar

Location: Rakhine State, Myanmar
Livelihood zones: Costal fishing, embankment paddy and inland agriculture
Date collected: October 2013
Date of Report: February 2014
Date of HEA data collected: October 2013
Lead agency: Save the Children
Funded by: The Livelihoods and Food Security Trust Fund (LIFT)

Acknowledgments

The cost of diet analysis was led by Nicholus Tint Zaw with support from Amy Deptford and Than Zaw Oo.

The cost of diet assessment team was: Sandar Htwe, Ran Lern Kyaw, Naw Lwan, Htut Lwin, Kyaw Myint, Than Zaw Oo, Thaung Kyi May, Hla Hla Win, Thu Zar Win and Hla Hla Yi.

The analysis and this report were written by Amy Deptford with contributions from Andrew Hall, Lilly Schofield and Vanessa Self.

The analysis was funded by the Livelihoods and Food Security Trust Fund (LIFT).

Thanks are due to Save the Children Myanmar for their warm welcome and for making the practical arrangements for the analysis to take place.

This analysis would not have been possible without the willing help of the market traders of the coastal fishing, embankment paddy and inland agricultural livelihood zones and of the women who participated in the focus group discussions. Their time, hospitality and insights are greatly appreciated.

Suggested citation:
Save the Children UK, (2013). *A Cost of the Diet analysis in three livelihood zones in Rakhine State, Myanmar*. London: Save the Children, U.K.

Table of Contents

1. Introduction

1.1 Introduction to Rakhine State

Rakhine State is situated on the western coast or Myanmar, bordered by Chin State in the north, Magway Region, Bago Region and Ayeyarwady Region in the east and the Bay of Bengal to the west. Very little data exists on the prevalence of malnutrition in Rakhine but a Multiple Indicator Cluster Survey (MICS)[1] undertaken in 2009-2010 estimated that the prevalence of wasting in children under five years of age was 10.8%, which is classified as 'high' severity by the World Health Organization (WHO)[2]. In addition, 50% of children surveyed were stunted, which is classified as 'very high' severity by the WHO. Only 1.3% of infants in Rakhine were reported in the MICS to be exclusively breast fed for their first 6 months of life as recommended by the WHO[3]. This means that almost all children were given something else to drink or eat other than breast milk, a practice that increases the children's risk of diarrhoeal and other infectious diseases.

It is thought that the high rates of stunting and wasting in Rakhine are the consequences of chronic food and livelihood insecurity and poverty, under-investment in rural development, poor health and public infrastructure, limited national capacity in nutrition, remoteness and vulnerability to extreme weather events, and a lack of access to education and information on nutrition, feeding, and caring practices. These conditions limit the ability of households to access sufficient amounts of nutritious food and the necessary income, as well as basic services such as clean water and preventative and curative health and nutrition interventions. In addition, food production in Myanmar has focused mainly on grain production, with limited emphasis on the production of non-cereal crops such as legumes, vegetables, fruits, and animal food sources. This has led to limited dietary diversity and cereal-based consumption patterns.

1.2 Aim of the analysis

The Tat Lan Programme is being implemented by the International Rescue Committee (IRC) in partnership with Save the Children, Oxfam, and Better Life Organisation (BLO) in the townships of Myebon, Pauktaw, Kyaukpyu and Minbya of Rakhine State. The programme will implement a package of interventions in four technical areas (infrastructure, fisheries/aquaculture, agriculture and financial services) to improve livelihoods and food security in Rakhine State. The programme includes funding for a Household Economy Analysis[4] (HEA) and a Cost of the Diet baseline assessment in the four townships in order to better understand the barriers to food security and nutrition faced by target communities.

[1] Ministry of National Planning and Economic Development and Ministry of Health, 2011
[2] World Health Organization, 2014
[3] World Health Organization, 2014
[4] The HEA is a unique livelihoods-based framework designed to provide a clear and accurate representation of the inside workings of household economies at different levels of a wealth continuum and in different parts of the world. This picture can be used for a wide range of purposes, including development planning, emergency response, early warning, monitoring & evaluation, poverty analysis and reduction, and policy analysis.

A Household Economy Analysis (HEA) was undertaken at the same time as the present Cost of the Diet assessment. The HEA divided the target townships into the following three livelihood zones[5] using the methods described in the HEA Guidelines for Practitioners[6]:

- **Coastal fishing (CFZ)**: located in the coastal lowland of Pauktaw, Myebon and Kyauk Phyu Townships, in areas that border hills and do not have access to much agricultural land. Capture fishing and fish/shrimp processing, and labour and trade related to these, are the main livelihood activities
- **Embankment paddy (EPZ)**: located in embankment-protected lowland plain areas that lie between hills and coastal areas in Pauktaw, Myebon and Kyauk Phyu Townships. Agriculture, fishing, labour and trade are the main livelihood activities
- **Inland agriculture (IAZ)**: located at the base of the Rakhine mountains and borders the Embankment Paddy Livelihood Zone. It is an agricultural zone and cultivation is both on upland and on lowland that is slightly elevated and mostly not protected by embankments. Agriculture, labour, livestock rearing and trade are the main livelihood activities

A Cost of the Diet analysis was also conducted in the three livelihood zones. The aim of this analysis was to assess the degree to which economic constraints might prevent households in this livelihood zone from accessing a nutritious diet.

The assessment set out to answer the following questions:

- What is the cost of a nutritionally adequate diet for typical households in the three livelihood zones?
- What nutrients have the greatest influence on the cost of a nutritious diet?
- What local foods are inexpensive sources of essential micronutrients and could be promoted through programme interventions?
- How affordable is a nutritious diet for a typical household in different wealth groups?
- How might nutrition, food security and social protection interventions improve access to a nutritious diet by households in the assessment area?

[5] A livelihood zone is an area within which people share basically the production system (that is, they grow the same crops, or keep the same types of livestock) and have the same access to markets.
[6] FEG Consulting and Save the Children, 2008

2. Methods

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 Location

A livelihood zone is defined as a geographical area within which people share broadly the same patterns of access to food. Cost of the Diet assessments are often conducted in a livelihood zone because the foods that are available and people consume are homogenous. A Cost of the Diet assessment took place in the coastal fishing (CFZ), embankment paddy (EPZ) and inland agriculture (IAZ) livelihood zones. These livelihood zones were selected as the areas in which the Save the Children programme activities for the Tat Lan project will be taking place.

2.2 Data collection, sources and entry

This section describes the data collected to undertake an analysis of the cost of the diet.

2.2.1 Market survey to collect price data

Annex 2 summarises the markets selected for data collection in each livelihood zone. These markets represent the three market levels which operate in Rakhine: the central state capital, township, and village level. The survey team visited one central state capital level market, four township level markets, which supplied the three livelihood zones with food, and between five and seven village level markets depending on the livelihood zone. These markets were selected to be representative of where poor households in the livelihood zone purchased their food.

First, a list of all food items available in the livelihood zone was developed using key informants and the knowledge of the data collectors who were recruited from the local area. This was followed by a field trial in a local market in Rakhine (data not included) where 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 of the foods found in the markets of each livelihood zone.

For the purpose of the assessment, retrospective data on prices were collected so that a baseline analysis of the last year could be produced. The retrospective reference year selected for data collection was from October 2013 - November 2012. The field workers were asked the name and length of each season.

The response was as follows:

Season 1: October 2013 – May 2013: *Moe yarthi*
Season 2: April 2013 – February 2013: *Ngwe yarthi*
Season 3: January 2013 – November 2012: *Saung yarthi*

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 during each season,

assuming that the poor were likely to be able to afford this amount. 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 1g (Tanita KD-400, Tanita Corporation, Japan). Where possible in each market, weight and price data were collected from four traders giving a possible total of four prices and 12 weights for each food item found in every market. Market traders were then asked questions about annual trends in prices, seasonality and changes in the demand and supply of commodities. This qualitative data provided important contextual information which was used to inform the results. The quantitative data was entered into an Excel spread sheet every evening after collection, which averaged the price and weight of each food across every market.

The final averaged weight and price for each food was then divided to calculate the cost per 100g of each food item by season. Each food item identified in the market survey was then selected from the food composition database in the Cost of the Diet software, choosing the variety consumed in the region nearest to Myanmar if there was more than one type available to select. Over 200 foods were found in the markets in the three livelihood zones. Currently the Cost of the Diet software can only analyse 200 foods. Foods were therefore excluded from the analysis if the English translation or nutrient composition could not be found. Foods commonly consumed by households in the livelihood zones and found in both the township and village level markets were also prioritised for inclusion in the software.

The cost per 100g of each food was then entered for each season into the Cost of the Diet software.

2.2.2 Interviews and focus group discussions to collect data on typical food consumption habits

To estimate a diet that is nutritious but takes into account typical food habits of households in Rakhine, the software needs to be told how many times a week it can or cannot include a food. This is called the minimum and maximum food frequency constraints, which need to be determined for each food found on the market. 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, so twice a day. 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.

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 foods that infants and young children, pregnant and lactating women were or were not consuming, wild foods consumed, household production of food, cultural taboos, 'normal' consumption patterns, and key staples. Annex 3 summarises the villages selected for the interviews and focus group discussions in each livelihood zone.

Each group consisted of 8 women, 2 from each wealth group identified by the HEA, all of whom were responsible for preparing food for the household.

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 two times a day).

During the focus group discussions the women in each livelihood zone stated that the household consumed three meals a day. They also stated that rice was consumed at least twice a day. The minimum and maximum constraints for each livelihood zone were therefore entered as 14 and 21 to mimic this.

With the market and food consumption data the cost of three theoretical diets were estimated using the Cost of the Diet software: a lowest cost diet that only meets recommended average energy requirements (energy only diet); a lowest cost diet that meets recommended intakes for energy and nutrients (micronutrient RNI); and a lowest cost nutritious diet that meets recommended intakes for energy and nutrients based upon typical dietary habits of households in the three livelihood zones (food habits diet).

The average cost of each diet is given in Myanmar Kyatt, rounded to the nearest 100 MMK. Where costs have been converted to US dollars an exchange rate of 1 USD to 978 MMK[7] has been used. Throughout the report all costs and percentages will be given in the following order of livelihood zone: CFZ, EPZ and IAZ.

2.2.3 Specification of a typical family

A typical household was specified during the focus group discussions as a part of the HEA in each of the three livelihood zones, a month prior to this study and was judged to contain 5 individuals in the CFZ and EPZ and 4 individuals in the IAZ. As the estimates of household income for these typical families are based on an energy requirement of 4/5 x 2,100 kcals, or 8,400/ 10,500 kcal in total, the Cost of the Diet method identifies a family of the same individuals that require as close to these energy requirements as possible. The typical HEA/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)
- An elderly woman, aged 60 years, 45, moderately active (2,050 kcal/d)
- A baby (either sex) aged 12-23 months (894 kcal/d)
- A child (either sex) aged 10 - 11 years (2,075 kcal/d)

The total energy requirement of this family is 10,487 kcal/d.

[7] Oanda, 2014

The typical HEA/Cost of the Diet family for a 4 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)
- An elderly woman, aged 60 years, 45, moderately active (2,050 kcal/d)
- A baby (either sex) aged 12-23 months (894 kcal/d)

The total energy requirement of this family is 8,412 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 six, seven, eight, nine and ten members and two other families were specified to cover the highest and lowest energy needs for families of between four and ten members. A minimum or low energy family was selected by choosing the youngest, smallest family for each number of individuals between four and ten, and a maximum or high energy family was selected by choosing the oldest, largest family between four and ten.

The specification of the HEA/CoD, minimum and maximum energy families of between four and ten members are shown in Annex 4 and are recommended as standard families for all Cost of the Diet analyses. This ensures that the analysis can be aligned with any HEA and that a possible range in energy needs can be covered.

2.2.4 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 (EAR) recommended by the WHO and FAO[8] 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%.

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[9] 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[10] 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.

[8] WHO/FAO (2001) Human Energy Requirements
[9] WHO/FAO (2007) Protein and Amino Acid Requirements in Human Nutrition
[10] WHO/FAO (2004) Vitamin and Mineral Requirements for Human Nutrition

The needs of individuals for fat are specified as 30% of total energy intake[11].

A diet selected by the Cost of Diet software which meets all of the requirements described above is called a 'nutritious' diet.

2.3 Estimating the affordability of diets

2.3.1 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 inexpensive 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 HEA. 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 monetises all food grown or produced by the household, food paid in kind in exchange for labour, or food provided as gifts.

Annex 5 shows income estimates for four wealth groups in the three livelihood zones, defined by the HEA.

The HEA found that that household size was larger in wealthier households in EPZ and IAZ. To ensure that affordability was not under or overestimated, the cost of the diets was estimated for the household sizes detailed in Annex 6. Each family was aligned with the HEA using the methods described in section 2.2.3.

2.3.2 Estimating affordability after accounting for non-food expenditure

The income figures in Annex 5 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 'non-food expenditure' (NFE), is defined as the annual cost of essential non-food items required by each specified wealth group. These figures are estimated by subtracting the staple food and non-staple food expenditure figures, generated by the HEA, from the total annual expenditure figures for each wealth group, again, generated by the HEA. By subtracting the non-food expenditure 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.

Annex 7 shows the total income of each wealth group in the three livelihood zones after subtracting household's needs for essential non-food items.

The difference between the total estimated annual income plus the non-food expenditure and the annual cost of a nutritious diet was defined as the 'affordability' of the diet.

[11] FAO/WHO (2008) Fats and Fatty Acids in Human Nutrition

3. Results

The list of all foods found in the local markets in the three livelihood zones and the corresponding food matched in the software can be found in Annex 8. The list of all foods found in the markets the price per 100g, the portion sizes and the minimum and maximum constraints for foods entered into the Cost of the Diet Software for each livelihood zone can be found in Annex 9.

The data collection team found 199 – 208 foods on the markets of the three livelihood zones: 7 cereals, 9 pulses, 77-82 vegetables, 23-27 fruit, 19 animal products, 40 varieties of fresh fish, molluscs and crustaceans, 6 varieties of dried fish, 5 dairy products, 10 roots and tubers and 3 fats/oils.

Out of the 208 foods, 126 were included in the software for each livelihood zone. The prioritisation process for foods included in the software is described in section 2.2.1. The remaining foods were not included in the analysis because an English name or nutrient composition data could not be found or they were not nutritious (such as dough snack). It is not known what impact excluding these foods may have on the Cost of the Diet results because for the majority of the foods the English name could not be found. The foods that were commonly consumed by households in the three livelihood zones were prioritised and included in the software.

3.1 The availability of foods at the different market levels

As mentioned in section 2.2.1 data were collected in markets that represented the three levels that operate in Rakhine: the central state capital, township, and village level. Poor households in the three livelihood zones purchase the majority of their food from the village level markets. The results from the market survey shows that the availability of some of the food groups differed depending on the level of market. In general the availability of cereals, vegetables, fats, meat, fish, poultry and eggs did not differ by market level. Rice, noodles, green leaves, gourds, onions, fish both fresh and dried, chicken, prawns, eggs and oil were found in abundance in the village level markets.

However there was a notable difference in the availability of pulses, fruit, root and tubers in the different market levels. In the village level markets only chickpeas could be found in the CFZ and EPZ and in one village market in the IAZ groundnuts and dried peas were also found. However in the central and township markets, 9 different varieties of pulses, such as lentils, mung beans and lablab beans could also be found. Only 8 varieties of fruit were found in the village level markets in the three livelihood zones compared to 19 varieties in the central and township level markets. Furthermore, 10 varieties of roots and tubers could be found in the central and township markets compared to 2-6 found in the village markets in the livelihood zones assessed.

Dairy products were not abundant in any of the markets surveyed. Yoghurt, goats' milk and milk powder were found in Min Bya and Myae Bone township markets. Milk powder was also found in 2-4 village markets, depending on the livelihood zone, but yoghurt and milk were not found in the village level markets. Condensed milk was found in Min Bya and Pauk Taw township markets and Sa Ne Min Pyin village market in the IAZ.

3.2 Typical food consumption habits and food taboos

The results from the interviews and focus group discussions found that households ate between 2-3 meals a day. Rice was the staple food of the assessment area and was eaten at least twice a day, whilst dried noodles were often eaten in a soup for breakfast. Rice was perceived as being nutritious in 6 of the 11 villages visited with the majority of these villages being in the CFZ (3) and the IAZ (2). Participants also associated rice with not being hungry (in 7 villages) and having energy to do more work (in 3 villages).

In the three livelihood zones fruits such as coconut, bananas, papaya and guava were eaten 2-3 times a week but others such as apples, pineapple and oranges were either not available or too expensive. Green leaves and onions were regularly eaten in the three zones, whilst tomatoes were regularly eaten in the CFZ and IAZ. Green beans, bottle gourd, eggplant, pumpkin and okra were also eaten 3-4 times a week and this did not differ significantly by livelihood zone. Fish paste was commonly eaten across wealth groups in the three zones, whilst the consumption of eggs and fresh fish increased slightly with wealth but was still small. During the focus group discussions the women said that they either fried or boiled vegetables within a curry. The cooking time ranged from 5 – 20 minutes or until the colour of the vegetables changed.

The women were also asked about specific foods that were eaten or avoided during different stages of the life cycle. In 9 of the 11 villages, the women said that children under the age of 5 were not given specific foods. The remaining two villages mentioned vegetable soup and rice. It was recommended in three villages (1 in CFZ, 2 in EPZ) that pregnant women drank coconut water/milk for an easy delivery whilst lactating women are advised to drink more vegetable soup and green tea in seven villages (3 in CFZ, 3 in EPZ, 1 in IAZ) to promote breast milk production.

In general the women avoided giving children under the age of 2 and 5 spicy or bitter foods. There were no food taboos for children under the age of 5 however for children under the age of 2, women in eight villages (3 in CFZ, 3 in EPZ and 2 in IAZ) avoided giving meat, fish, eggs and vegetables because they fear that the child will choke or get a stomach ache.

Pregnant women are also told to avoid a variety of food such as sticky rice, djenkol fruit, bananas, coconuts and bitter foods for fear of a difficult delivery or retaining the placenta (3 villages in EPZ). The women interviewed in all the villages mentioned various taboo foods such as pumpkin, bitter melon, bitter vegetables, octopus, squid, shark, milk, catfish and taro for ailments such as foolishness, albinism, muscular tension, blindness and joint pain.

The women in every focus group discussion said that parents, relatives and elder persons within the community influence or enforce these practices.

3.3 The cost of the diets

3.3.1 Energy only diet

Table 1 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 733 - 1,265 MMK per day depending on livelihood zone and features between

four and six of the 126 foods included in the software. The annual cost of the diet for the typical family is estimated to be 278,400 – 439,200 MMK. For a detailed breakdown of costs by season and for the 12-23 month old child, refer to Annex 10.

Table 1. The cost of an energy only diet for the HEA/CoD family in three livelihood zones in Rakhine State, Myanmar. The annual costs have been rounded to the nearest 100 MMK

	Energy only diet	
Livelihood zone	**Daily cost (MMK/day)**	**Annual cost (MMK/year)**
CFZ	1,165-1,210 (1.19 -1.23 - USD)	432,200 (440 USD)
EPZ	1,116 - 1,265 (1.4-1.29 USD)	439,200 (450 USD)
IAZ	733 - 805 (0.74-0.82 USD)	278,400 (284 USD)

It should be noted that the cost of the diet for a child aged 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 and nutrients required by the mother each day (418 kcal a day).

The composition of the typical household selected for the Cost of the Diet analysis in the three livelihood zones consists of a family of three adults and one or two children whose energy intake is aligned with the energy intake used in the HEA. The figures in Annex 11 show how the annual cost of the energy only diet for the HEA/CoD family varies by the number of individuals in the household from four to ten and for families with the minimum and maximum energy requirements. The cost for a family of five in the CFZ and EPZ could range from 336,000 MMK to 623,100 MMK and 341,100 MMK to 554,300 MMK a year respectively and the cost for a family of four in the IAZ could range from 234,700 MMK to 339,600 MMK depending on their sex, age, body weight and physical activity.

The key foods in the energy only diet were very similar across the livelihood zones: coconut, rice, taro, sugarcane and dried fish. Elephant apple was also included in the energy only diet of the CFZ and EBZ. This food was not available in the IAZ. The software has identified coconut and taro as the cheapest sources of energy available on the markets which provide between 30-35% and 38-52% of energy requirements respectively.

Annexes 12 and 13 show the absolute weight and cost of the foods selected for the child aged 12-23 months and the rest of 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, the percentage contribution of each food for eight vitamins and four minerals and the percentage of the total requirements met for each nutrient, in the three livelihood zones.

It is important to note the essential contribution of breast milk in a diet that only meets energy needs 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 protein, fat, vitamin A, vitamin C, vitamin B1, vitamin B2,

vitamin B6, pantothenic acid, vitamin B12, folic acid, calcium and magnesium in the three livelihood zones.

Figures 1 and 2 show the percentage of recommended requirements met for the essential macro and micronutrients by and energy only diet, by livelihood zone, averaged across the three seasons for the 12-23 month old child and the rest of the family. The bold black line represents 100% of the recommended requirements met. Although the energy only diet meets the recommended requirements for energy by design, it lacks several essential micronutrients. Figure 1 shows that in the EPZ and IAZ only fat requirements are met by 100% for the 12-23 month old child across the year. Fat and vitamin B12 are met by 100% in the CFZ.

Figure 1. The percentage of average energy and the recommended nutrient intakes for micronutrients met in a year by an energy only diet for a 12-23 month old child in the three livelihood zones in Rakhine State, Myanmar

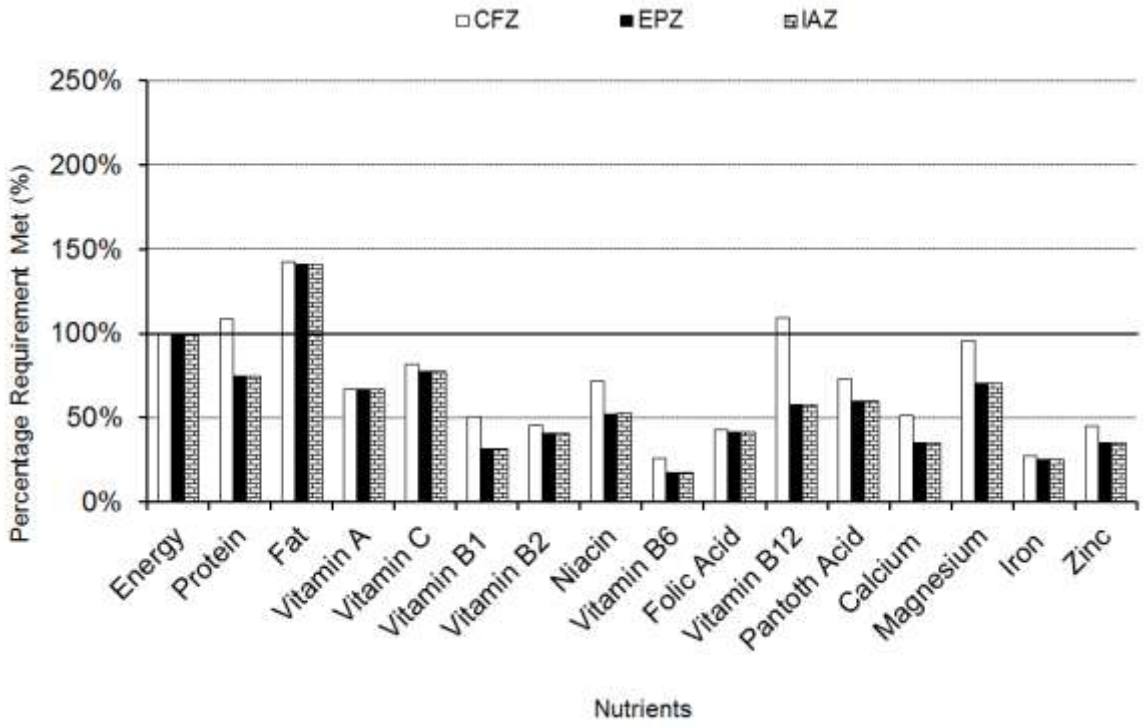
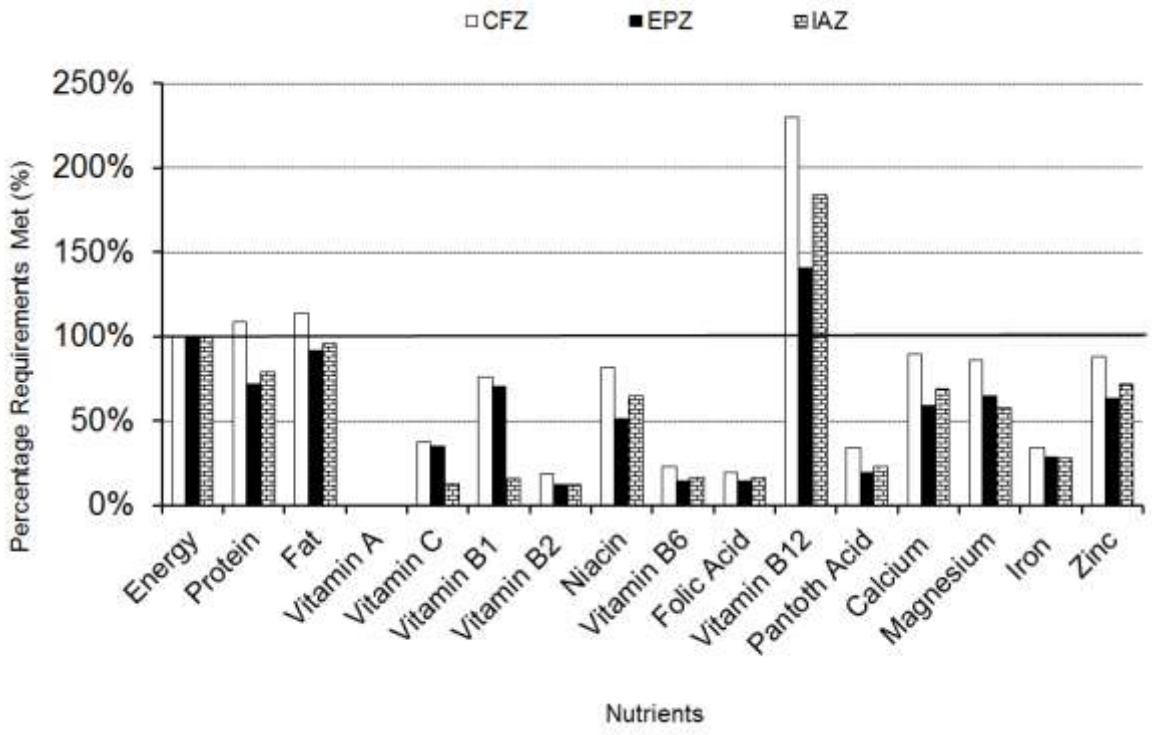


Figure 2 shows that for the rest of the family, a diet that only meets the need for energy, leads to a shortfall in intakes of vitamin A, vitamin C, vitamin B1, vitamin B2, niacin, vitamin B6, folic acid, pantothenic acid, calcium, magnesium, iron and zinc in all seasons of the year in the three zones. The recommended protein and fat requirements are met by the energy only diet in the CFZ but not in EPZ and IAZ.

Figure 2. The percentage of average energy and the recommended nutrient intakes for micronutrients met in a year by an energy only diet for the rest of the family in the three livelihood zones in Rakhine State, Myanmar



For detailed graphs showing the nutrient requirements met by season for the 12-23 month old child and the rest of the family, across the three zones, refer to Annexes 14 and 15.

3.3.2 The micronutrient RNI diet

Table 2 shows that the minimum cost of a nutritionally adequate diet that meets the average energy requirements and the RNIs for micronutrients is estimated to cost between 1,430 – 2,242 MMK per day and features 13- 16 of the 126 foods included in the software, some of which have to be eaten three meals a day, every day, which is unlikely. The annual cost of the diet for the typical family is estimated to be 550,200 – 768,500 MMK. For a detailed breakdown of costs by season and for the 12-23 month old child, refer to Annex 16.

Table 2. The costs of the micronutrient RNI diet for the HEA/CoD family in the three livelihood zones in Rakhine State, Myanmar. The annual costs have been rounded to the nearest 100 MMK

	Micronutrient RNI diet	
Livelihood zone	**Daily cost (MMK/day)**	**Annual cost (MMK/year)**
CFZ	1,782 - 1,860 (1.82 -1.90 - USD)	670,800 (685 USD)
EPZ	2,000 - 2,242 (2.04 -2.29 USD)	768,500 (785 USD)
IAZ	1,430 – 1,613 (1.46 – 1.65 USD)	550,200 (560 USD)

The figures in Annex 17 shows how the annual cost of the micronutrient RNI diet for the HEA/CoD family across the three livelihood zones varies by the number of individuals in the household and for families with the minimum and maximum energy requirements. The cost for a family of five in the CFZ and EPZ could range from 586,800 MMK to 779,800 MMK and 661,200 MMK to 884,500 MMK a year respectively and the cost for a family of four in the IAZ could range from 549,100 MMK to 563,500 MMK depending on their sex, age, body weight and physical activity.

The key foods in the micronutrient RNI diet were very similar across the livelihood zones: coconut, rice and green leaves such as water spinach and roselle and dried fish. Coconut has been identified as an inexpensive source of energy, iron, zinc and copper. Green leaves have been identified as an inexpensive source of vitamin A, vitamin C, water soluble B-group vitamins, folic acid, magnesium, iron and copper. Rice was identified as an inexpensive source of energy, niacin, pantothenic acid and zinc whilst dried fish has been identified as an inexpensive source of protein, niacin, vitamin B12 and calcium.

Annexes 18 and 19 show the detailed description of the micronutrient RNI diet for the three livelihood zones with the absolute weight and cost of the foods selected for the 12-23 month old child and 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.

Figures 3 and 4 show the percentage of the recommended requirements met for the essential macro and micronutrients by the micronutrient RNI diet, by livelihood zone, averaged across the three seasons for the 12-23 month old child and the rest of the family. Figure 3 shows that the RNI is exactly 100% for iron and zinc for the young child in all three livelihood zones. Although the software has been able to meet the recommended intakes of these nutrients using local foods, this analysis identifies that the software has found these micronutrients the most difficult to obtain from the local markets in a nutritious diet that is not constrained by typical dietary patterns. These nutrients are therefore driving up the cost of the micronutrient RNI diet, because the software has to include large quantities of expensive foods such as dried fish to meet these requirements.

Figure 3. The average percentage of energy and the recommended nutrient intakes for micronutrients met in a year by a micronutrient RNI diet for a 12-23 month old child in the three livelihood zones in Rakhine State, Myanmar

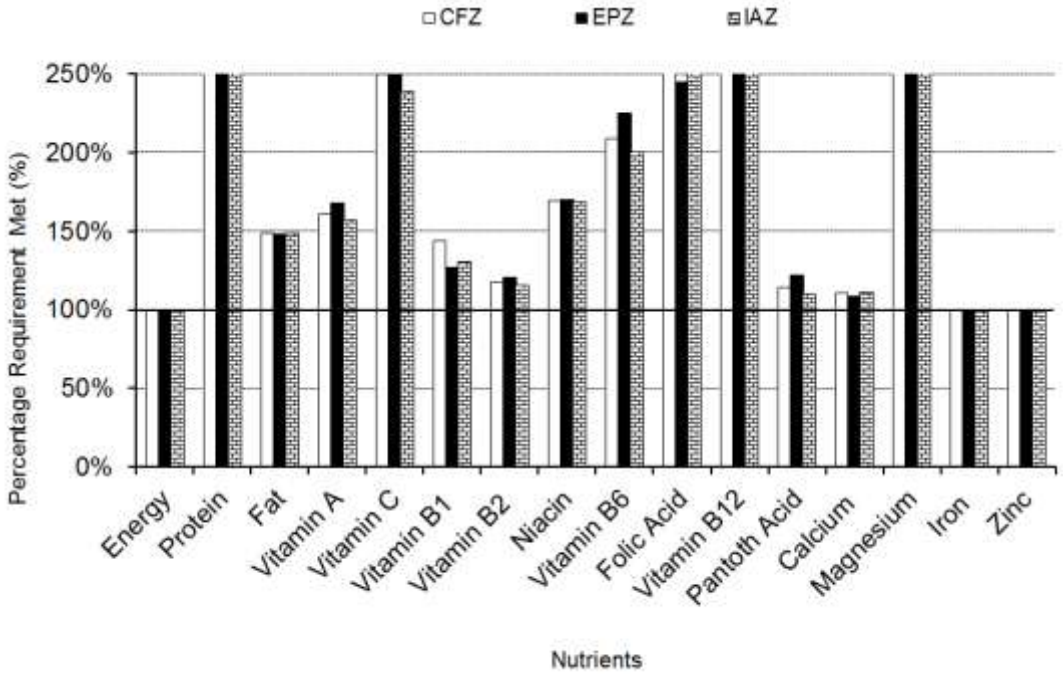
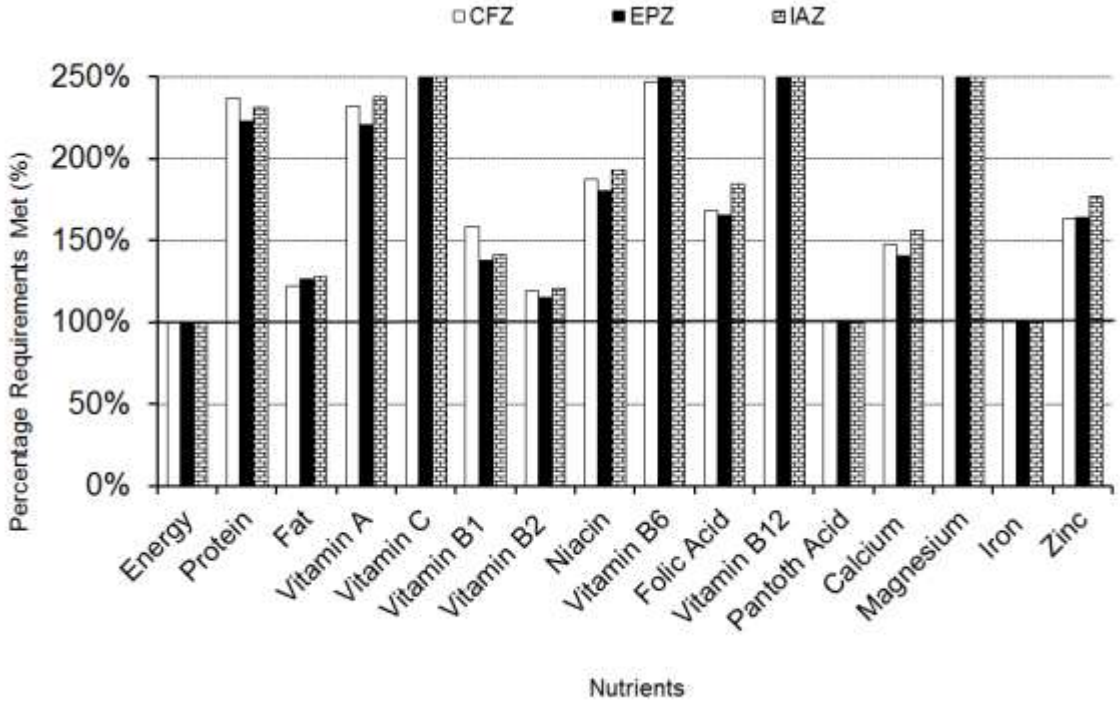


Figure 4 shows that for the rest of the family the RNIs are exactly 100% for pantothenic acid and iron in all three livelihood zones. Again, these nutrients are therefore the hardest for the software to meet requirements for in Rakhine, when a nutritious diet is not constrained by typical dietary patterns.

Figure 4. The average percentage of energy and the recommended nutrient intakes for micronutrients met in a year by a micronutrient RNI diet for the rest of the family in the three livelihood zones in Rakhine State, Myanmar



For detailed graphs showing the nutrient requirements met in the micronutrient RNI diet by season for the 12-23 month old child and the rest of the family, across the three zones, refer to Annexes 20 and 21.

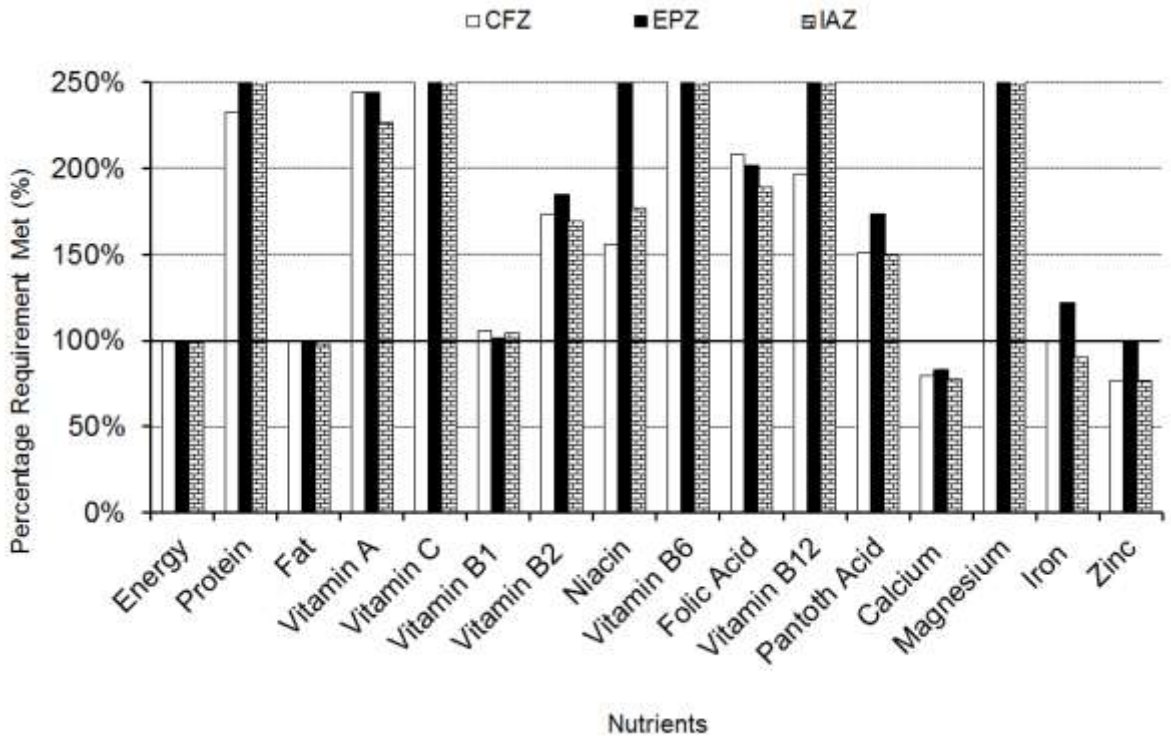
3.3.3. Food habits diet

The foods selected for the micronutrient RNI diet specified in section 3.3.2 above were not chosen to be typical of the foods eaten by people in Rakhine; 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.

As described in Annex 1 the food habits diet is, in theory, a nutritious diet that does takes into account typical dietary habits of households in the three livelihood zones assessed in Rakhine. However as Figures 5 and 6 show, the Cost of the Diet software was unable to meet nutrient requirements for the 12-23 month old child and the rest of the family when these typical habits were enforced. As the results for the micronutrient RNI diet show that a nutritious diet is possible to obtain using foods found in local markets, this indicates that current food consumption patterns are restricting the amount and variety of food that the software can include in the diet, preventing the recommended intakes for certain nutrients from being met.

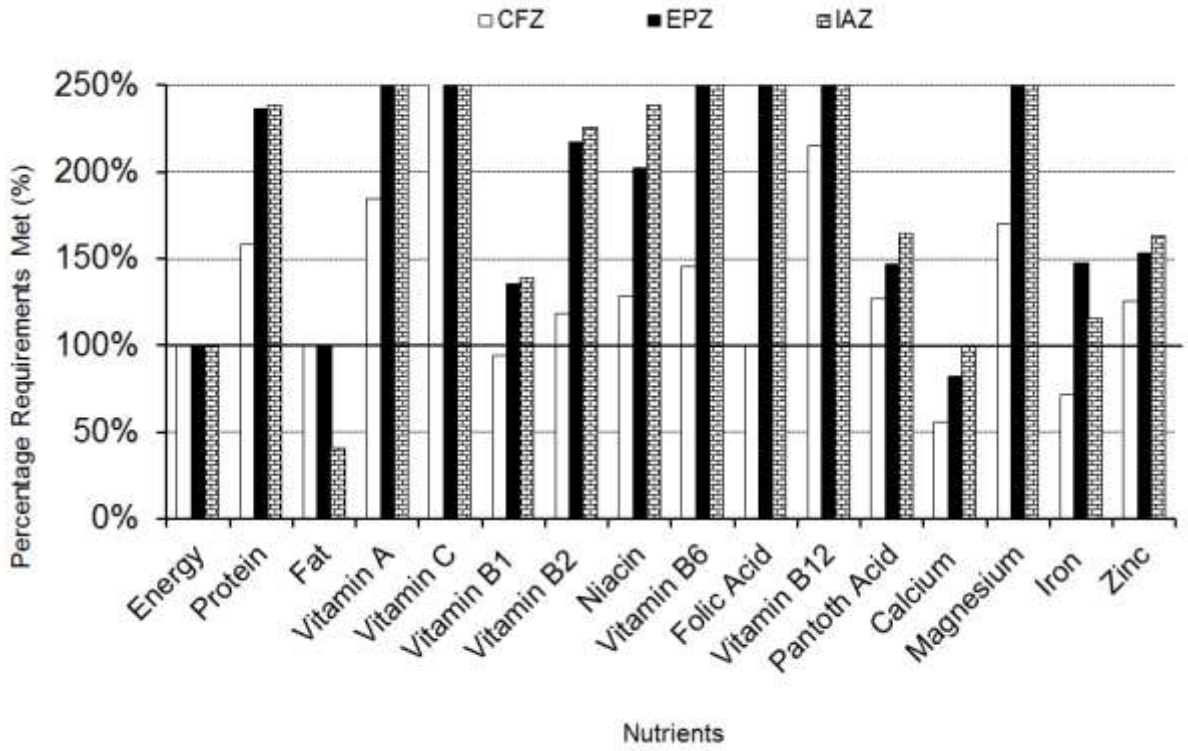
Figure 5 shows that for a 12-23 month old child, calcium requirements could only be met by 77-83% in the three livelihood zones, whilst zinc requirements could only be met by 76% in the CFZ and IAZ. Iron requirements are also only met by 90% in the IAZ.

Figure 5. The average percentage of energy and the recommended nutrient intakes for micronutrients met in a year by a food habits diet for a 12-23 month old child in the three livelihood zones in Rakhine State, Myanmar



For the rest of the family, Figure 6 shows that for the CFZ vitamin B1, calcium and iron could only be met 94%, 55% and 71% respectively whilst calcium requirements can only be met by 82% in EPZ. For the IAZ, fat requirements can only be met by 40%.

Figure 6. The average percentage of energy and the recommended nutrient intakes for micronutrients met in a year by a food habits diet for the rest of the family in the three livelihood zones in Rakhine State, Myanmar



For detailed graphs showing the nutrient requirements met in the food habits diet by season for the 12-23 month old child and the rest of the family, across the three zones, refer to Annexes 22 and 23.

The costs presented in Table 3 are therefore not for a food habits diet that is nutritious but the cost of a diet that provides the percentage of nutrient requirements presented in Figures 5 and 6[12]. Table 3 shows that the cost of this diet ranges between 3,176 – 6,521 MMK a day depending on the livelihood zone. It is thought that the cost of this diet in the CFZ is less than the EPZ and the IAZ because it is the least nutritious diet with vitamin B1, calcium, iron and zinc requirements not being met by 100% for either the 12-23 month old child or all members of the household. For a detailed breakdown of costs by season and for the 12-23 month old child, refer to Annex 24.

[12] A * has been used in the rest of the report to indicate that this is not a typical food habits diet because it is not nutritious

Table 3. The cost of a food habits* diet for the HEA/CoD family in the three livelihood zones in Rakhine State, Myanmar. The annual costs have been rounded to the nearest 100 MMK

	Food habits* diet	
Livelihood zone	**Daily cost (MMK/day)**	**Annual cost (MMK/year)**
CFZ	3,176 – 3,244 (3.24- 3.32 USD)	1,178,000 (1,200 USD)
EPZ	5,687 – 6,521 (5.81 -6.66 USD)	2,227,100 (2,275 USD)
IAZ	4,701 – 5,198 (4.80 – 5.31 USD)	1,794,200 (1,830 USD)

As this food habits* diet has not met the recommended intakes for all micronutrients, presenting the range in costs by household size and family composition is impractical. It was undertaken however and the cost ranges for this diet in the EPZ and IAZ demonstrate a linear increase based upon family size and composition as shown in the same analysis for the energy only and micronutrient RNI diet (in Annexes 11 and 17). However for the CFZ the results do not behave in the same way and are inexplicable. This is potentially due to the fact that the diet for this zone was the least nutritious and as household size and composition changed the software found different solutions which may have been less expensive but also less nutritious.

Tables 4-6 show the absolute weight and cost of the foods chosen for a food habits* diet 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 rest of the family in the three livelihood zones. For a detailed description of the food habits* diet for the 12-23 month old child for the three livelihood zones refer to Annex 25.

As with the energy only and micronutrient RNI diet, the key foods in the food habits* diet were similar across the livelihood zones and included large quantities of rice, green leafy vegetables, duck eggs, fish paste and dried fish. Rice was included in the food habits* diet twice a day in all livelihood zones and provides energy, as well as protein, water soluble B-group vitamins, zinc and copper. Several different varieties of green leafy vegetables have been included across the three zones, which provide an inexpensive source of vitamin A, vitamin C, water soluble B-group vitamins, folic acid and iron. Dried fish provide protein, niacin, calcium, vitamin B12 and zinc whilst duck eggs provide protein, fat, vitamin A, water soluble B-group vitamins, folic acid, vitamin B12, iron and zinc.

Table 4. CFZ: The absolute weight and cost of the foods selected for the HEA/CoD family for the whole year for the food habits* 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 requirements met for each nutrient, averaged over the three seasons.

Food List	Quantity (Kg)	% quantity	Cost	% cost	% energy	% protein	% fat
Coconut	236	15.0	61,163	6.0	24.3	8.9	68.8
Condensed milk	157	10.0	232,269	22.7	14.6	13.9	11.9
Egg, duck	126	8.0	335,792	32.8	6.8	18.3	15.1
Elephant apple	63	4.0	8,554	0.8	1.2	2.2	0.2
Fish, paste	22	1.4	36,505	3.6	0.7	4.7	0.6
Green leaf (Dark tha lon ywet)	39	2.5	25,239	2.5	0.4	1.6	0.1
Green leaf (Mar yute)	94	6.0	33,067	3.2	0.9	3.7	0.2
Green leaf (Nget gyi daung)	41	2.6	17,368	1.7	0.4	1.7	0.1
Green leaf (Pein swae)	32	2.0	19,494	1.9	0.3	1.3	0.1
Pomelo	132	8.4	52,687	5.1	1.1	1.7	0.3
Rice	453	28.9	136,498	13.3	47.4	34.6	2.4
Roselle leaf	111	7.1	47,064	4.6	1.2	4.7	0.2
Tamarind leaf	62	4.0	19,010	1.9	0.7	2.6	0.1
Total	1,569	100	1,024,709	100	100	100	100
% RNI met					100%	158%	100%

Food List	% vitamin A	% vitamin C	% vitamin B1	% vitamin B2	% niacin	% vitamin B6	% folic acid	% vitamin B12
Coconut	-	3.4	9.9	2.2	9.4	3.6	10.1	-
Condensed milk	5.6	1.5	5.6	27.3	11.0	2.9	2.3	3.7
Egg, duck	38.9	-	12.0	23.1	19.7	9.5	16.6	87.9
Elephant apple	-	3.8	30.1	0.9	-	-	-	-
Fish, paste	0.2	0.1	3.1	0.7	4.5	0.7	0.4	8.4
Green leaf (Dark tha lon ywet)	5.7	6.0	2.1	3.4	1.7	6.3	6.6	-
Green leaf (Mar yute)	12.9	13.4	4.5	7.3	3.8	14.3	14.9	-
Green leaf (Nget gyi daung)	6.1	6.4	2.2	3.6	1.8	6.7	7.0	-
Green leaf (Pein swae)	4.7	5.0	1.7	2.8	1.4	5.2	5.5	-
Pomelo	0.1	33.2	3.2	1.2	1.1	3.2	2.4	-
Rice	-	-	16.2	12.5	37.6	19.2	4.5	-
Roselle leaf	16.6	17.4	6.0	9.7	5.0	18.2	19.1	-
Tamarind leaf	9.3	9.8	3.4	5.4	2.8	10.2	10.7	-
Total	100	100	100	100	100	100	100	100
% RNI met	184%	295%	94%	118%	128%	145%	100%	215%

Food List	% calcium	% iron	% zinc	% copper
Coconut	5.4	18.3	20.3	38.3
Condensed milk	54.4	1.9	11.1	2.3
Egg, duck	9.3	29.1	13.8	2.8
Elephant apple	7.6	1.4	1.8	-
Fish, paste	0.3	0.5	1.1	0.3

Food List	%	calcium	%	iron	%	zinc	%	copper
Green leaf (Dark tha lon ywet)		1.5		3.9		1.2		2.7
Green leaf (Mar yute)		3.3		8.8		3.0		5.9
Green leaf (Nget gyi daung)		1.6		4.1		1.3		2.9
Green leaf (Pein swae)		1.2		3.2		1.0		2.2
Pomelo		5.6		2.6		1.0		1.9
Rice		3.3		8.8		39.0		28.4
Roselle leaf		4.2		11.2		3.5		7.8
Tamarind leaf		2.4		6.3		2.0		4.4
Total		100		100		100		100
% RNI met		55%		71%		125%		

Table 5. EPZ: The absolute weight and cost of the foods selected for the HEA/CoD family for the whole year for the food habits* 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 requirements met for each nutrient, averaged over the three seasons.

Food List	Quantity (Kg)	% quantity	Cost	% cost	% energy	% protein	% fat
Egg, duck	126	5.0	338,767	16.6	6.8	12.3	15.1
Elephant apple	42	1.6	6,349	0.3	0.8	1.0	0.1
Fish, dried (Ngar ni tu chauk)	31	1.2	94,288	4.6	3.1	14.0	2.6
Fish, paste	22	0.9	43,379	2.1	0.7	3.2	0.6
Green leaf (Dark tha lon ywet) [13]	141	5.6	68,401	3.4	1.5	4.0	0.2
Green leaf (Gwe tauk ywet)	37	1.5	25,047	1.2	0.4	1.0	0.1
Green leaf (Ka raung ka saw)	56	2.2	40,143	2.0	0.6	1.6	0.1
Green leaf (Knug paung chaing ywet)	70	2.8	52,389	2.6	0.8	2.0	0.1
Green leaf (Kyar Chae)	90	3.5	86,577	4.2	1.0	2.5	0.2
Green leaf (Mauk yoke)	94	3.7	51,376	2.5	1.0	2.7	0.2
Green leaf (Me zar li)	56	2.2	45,703	2.2	0.6	1.6	0.1
Green leaf (Myin khwar ywet)	94	3.7	86,110	4.2	1.0	2.7	0.2
Green leaf (Nget gyi daung)	91	3.6	38,952	1.9	1.0	2.6	0.2
Green leaf (Pall nyunt)	62	2.5	54,050	2.6	0.7	1.8	0.1
Green leaf (Pauk pan phyu nyunt)	62	2.5	49,012	2.4	0.6	1.6	0.1
Green leaf (Pein Swae)	62	2.5	25,212	1.2	0.7	1.8	0.1
Green leaf (Su poke yoek)	94	3.7	236,394	11.6	1.0	2.7	0.2
Green leaf (Za yit yo)	62	2.5	65,044	3.2	0.7	1.8	0.1
Green leaf, ribbed luffa	70	2.8	39,741	1.9	0.8	2.0	0.1
Green leaf, roselle	189	7.5	81,188	4.0	2.0	5.3	0.3
Groundnut oil	37	1.5	97,835	4.8	9.6	-	32.6
Long bean (Pa taung shye)	126	5.0	84,040	4.1	1.3	1.8	0.3
Papaya	65	2.6	27,098	1.3	0.7	0.3	0.1
Pumpkin leaf	56	2.2	20,721	1.0	0.6	1.6	0.1

[13] Several varieties of green leaves have been included in this diet to provide essential micronutrients such as vitamin A, water soluble B-group vitamins, folic acid, vitamin C and iron. This is because other sources of these nutrients such as liver were excluded from this diet because they were not eaten by households.

Food List	Quantity (Kg)	% quantity	Cost	% cost	% energy	% protein	% fat
Rice	453	17.9	124,596	6.1	47.4	23.1	2.4
Sesame oil	50	2.0	89,810	4.4	12.8	-	43.5
Water spinach	189	7.5	67,639	3.3	2.0	5.3	0.3
Total	2,530	100	2,039,862	100	100	100	100
% RNI met					100%	236%	100%

Food List	% vitamin A	% vitamin C	% vitamin B1	% vitamin B2	% niacin	% vitamin B6	% folic acid	% vitamin B12
Egg, duck	14.0	-	8.3	12.5	12.5	3.2	5.5	60.6
Elephant apple	-	0.9	13.8	0.3	-	-	-	-
Fish, dried (Ngar ni tu chauk)	-	-	1.3	2.1	13.1	1.3	0.5	33.6
Fish, paste	0.1	0.0	2.1	0.4	2.9	0.3	0.1	5.8
Green leaf (Dark tha lon ywet)	7.5	8.1	5.3	6.7	4.0	7.9	8.0	-
Green leaf (Gwe tauk ywet)	2.0	2.1	1.4	1.8	1.1	2.1	2.1	-
Green leaf (Ka raung ka saw)	3.0	3.2	2.1	2.6	1.6	3.1	3.2	-
Green leaf (Knug paung chaing ywet)	3.8	4.0	2.6	3.3	2.0	3.9	4.0	-
Green leaf (Kyar Chae)	4.8	5.1	3.3	4.2	2.5	5.0	5.1	-
Green leaf (Mauk yoke)	5.1	5.4	3.5	4.5	2.7	5.3	5.3	-
Green leaf (Me zar li)	3.0	3.2	2.1	2.6	1.6	3.1	3.2	-
Green leaf (Myin khwar ywet)	5.1	5.4	3.5	4.5	2.7	5.3	5.3	-
Green leaf (Nget gyi daung)	4.9	5.2	3.4	4.3	2.6	5.1	5.2	-
Green leaf (Pall nyunt)	3.3	3.6	2.3	3.0	1.8	3.5	3.5	-
Green leaf (Pauk pan phyu nyunt)	3.0	3.2	2.1	2.6	1.6	3.2	3.2	-
Green leaf (Pein Swae)	3.3	3.6	2.3	3.0	1.8	3.5	3.5	-
Green leaf (Su poke yoek)	5.1	5.4	3.5	4.5	2.7	5.3	5.3	-
Green leaf (Za yit yo)	3.3	3.6	2.3	3.0	1.8	3.5	3.5	-
Green leaf, ribbed luffa	3.8	4.0	2.6	3.3	2.0	3.9	4.0	-
Green leaf, roselle	10.1	10.8	7.0	8.9	5.4	10.5	10.7	-
Groundnut oil	-	-	-	-	-	-	-	-
Long bean (Pa taung shye)	0.9	2.2	3.7	3.1	2.6	0.8	2.3	-
Papaya	0.9	7.0	0.8	0.5	0.6	0.1	1.3	-
Pumpkin leaf	3.0	3.2	2.1	2.6	1.6	3.1	3.2	-
Rice	-	-	11.3	6.8	23.7	6.6	1.5	-
Sesame oil	-	-	-	-	-	-	-	-
Water spinach	10.1	10.8	7.0	8.9	5.4	10.5	10.7	-
Total	100	100	100	100	100	100	100	100
% RNI met	509%	802%	135%	217%	202%	424%	301%	312%

Food List	% calcium	% iron	% zinc	% copper
Egg, duck	6.3	14.0	11.3	1.8
Elephant apple	3.4	0.5	1.0	-
Fish, dried (Ngar ni tu chauk)	41.9	2.3	10.5	3.4

Food List	%	calcium	%	iron	%	zinc	%	copper
Fish, paste		0.2		0.3		0.9		0.2
Green leaf (Dark tha lon ywet)		3.6		6.8		3.6		6.5
Green leaf (Gwe tauk ywet)		1.0		1.8		1.0		1.7
Green leaf (Ka raung ka saw)		1.4		2.7		1.4		2.6
Green leaf (Knug paung chaing ywet)		1.8		3.4		1.8		3.2
Green leaf (Kyar Chae)		2.3		4.3		2.3		4.1
Green leaf (mauk yoke)		2.4		4.6		2.4		4.4
Green leaf (Me zar li)		1.4		2.7		1.4		2.6
Green leaf (Myin khwar ywet)		2.4		4.6		2.4		4.4
Green leaf (Nget gyi daung)		2.4		4.4		2.4		4.2
Green leaf (Pall nyunt)		1.6		3.0		1.6		2.9
Green leaf (Pauk pan phyu nyunt)		1.5		2.7		1.6		2.6
Green leaf (Pein Swae)		1.6		3.0		1.6		2.9
Green leaf (Su poke yoek)		2.4		4.6		2.4		4.4
Green leaf (Za yit yo)		1.6		3.0		1.6		2.9
Green leaf, ribbed luffa		1.8		3.4		1.8		3.2
Green leaf, roselle		4.9		9.1		4.9		8.7
Groundnut oil		-		-		-		-
Long bean (Pa taung shye)		3.5		2.6		3.2		3.1
Papaya		1.7		0.1		0.4		0.3
Pumpkin leaf		1.4		2.7		1.4		2.6
Rice		2.2		4.2		32.0		18.7
Sesame oil		-		-		-		-
Water spinach		4.9		9.1		4.9		8.7
Total		100		100		100		100
% RNI met		82.3%		147.7%		152.9%		

Table 6. IAZ: The absolute weight and cost of the foods selected for the HEA/CoD family for the whole year for the food habits* 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 requirements met for each nutrient, averaged over the three seasons.

Food List	Quantity (Kg)	% quantity	Cost	% cost	% energy	% protein	% fat
Drumstick	49	2.1	27,588	1.7	0.8	1.4	0.3
Egg, duck	99	4.3	265,945	16.2	6.8	12.3	37.2
Elephant apple	33	1.4	5,052	0.3	0.8	1.0	0.4
Fish, catfish	16	0.7	25,049	1.5	1.0	2.6	4.7
Fish, Hilsha	40	1.7	78,849	4.8	1.6	8.3	2.5
Fish, paste	18	0.8	41,321	2.5	0.7	3.2	1.4
Green leaf (Knug paung chaing ywet)	74	3.2	74,830	4.6	1.0	2.7	0.4
Green leaf (Mar yute)	74	3.2	85,100	5.2	1.0	2.7	0.4
Green leaf (Me zar li)	74	3.2	54,232	3.3	1.0	2.7	0.4
Green leaf (Nget gyi daung)	74	3.2	36,163	2.2	1.0	2.7	0.4

Food List	Quantity (Kg)	% quantity	Cost	% cost	% energy	% protein	% fat
Green leaf (Pauk pan phyu nyunt)	74	3.2	27,548	1.7	1.0	2.7	0.4
Green leaf (Pein Swae)	49	2.1	20,161	1.2	0.7	1.8	0.3
Green leaf, ribbed luffa	74	3.2	52,423	3.2	1.0	2.7	0.4
Green leaf, roselle	148	6.4	56,019	3.4	2.0	5.3	0.8
Guava	407	17.6	246,392	15.0	7.7	3.2	6.7
Long bean (Pa taung shye)	49	2.1	29,671	1.8	0.6	0.9	0.4
Long bean (Pe ti)	29	1.3	13,368	0.8	0.3	0.5	0.2
Milk, condensed	148	6.4	219,219	13.3	17.5	11.2	35.2
Papaya	207	9.0	89,882	5.5	3.0	1.2	0.6
Pumpkin leaf	74	3.2	38,728	2.4	1.0	2.7	0.4
Rice	355	15.4	104,048	6.3	47.4	23.2	5.8
Water spinach	148	6.4	52,902	3.2	2.0	5.3	0.8
Total	2,311	100	1,644,491	100	100	100	100
% RNI met					100%	238%	40%

Food List	% vitamin A	% vitamin C	% vitamin B1	% vitamin B2	% niacin	% vitamin B6	% folic acid	% vitamin B12
Drumstick	0.4	2.8	1.0	0.6	0.7	0.9	1.8	-
Egg, duck	16.5	-	8.3	12.2	11.1	3.8	6.6	66.7
Elephant apple	-	0.3	13.8	0.3	-	-	-	-
Fish, catfish	0.1	-	-	0.7	2.6	1.2	0.1	18.1
Fish, Hilsha	0.5	-	1.3	0.9	9.5	2.0	0.4	5.5
Fish, paste	0.1	0.0	2.1	0.4	2.6	0.3	0.1	6.4
Green leaf (Knug paung chaing ywet)	6.0	2.0	3.5	4.3	2.4	6.2	6.4	-
Green leaf (Mar yute)	6.0	2.0	3.5	4.3	2.4	6.2	6.4	-
Green leaf (Me zar li)	6.0	2.0	3.5	4.3	2.4	6.2	6.4	-
Green leaf (Nget gyi daung)	6.0	2.0	3.5	4.3	2.4	6.2	6.4	-
Green leaf (Pauk pan phyu nyunt)	6.0	2.0	3.5	4.3	2.4	6.2	6.4	-
Green leaf (Pein Swae)	3.9	1.3	2.3	2.9	1.6	4.1	4.2	-
Green leaf, ribbed luffa	6.0	2.0	3.5	4.3	2.4	6.2	6.4	-
Green leaf, roselle	11.9	4.0	7.0	8.7	4.8	12.4	12.8	-
Guava	5.0	61.8	10.7	6.3	13.3	8.9	4.7	-
Long bean (Pa taung shye)	0.5	0.4	1.8	1.5	1.1	0.5	1.4	-
Long bean (Pe ti)	0.3	0.2	0.9	0.8	0.6	0.2	0.7	-
Milk, condensed	2.8	0.2	4.7	17.3	7.5	1.4	1.1	3.3
Papaya	4.3	10.6	3.3	1.9	2.2	0.6	6.6	-
Pumpkin leaf	6.0	2.0	3.5	4.3	2.4	6.2	6.4	-
Rice	-	-	11.2	6.6	21.1	7.7	1.8	-
Water spinach	11.9	4.0	7.0	8.7	4.8	12.4	12.8	-
Total	100	100	100	100	100	100	100	100
% RNI met	437%	2,098%	139%	225%	238%	350%	257%	295%

Food List	%	calcium	%	iron	%	zinc	%	copper
Drumstick		1.5		0.2		0.7		-
Egg, duck		5.7		17.5		11.6		2.0
Elephant apple		3.1		0.6		1.0		-
Fish, catfish		0.4		0.6		0.5		0.5
Fish, Hilsha		1.7		1.6		1.3		0.4
Fish, paste		0.2		0.3		0.9		0.2
Green leaf (Knug paung chaing ywet)		2.2		5.7		2.5		4.8
Green leaf (Mar yute)		2.2		5.7		2.5		4.8
Green leaf (Me zar li)		2.2		5.7		2.5		4.8
Green leaf (Nget gyi daung)		2.2		5.7		2.5		4.8
Green leaf (Pauk pan phyu nyunt)		2.2		5.7		2.5		4.8
Green leaf (Pein Swae)		1.5		3.8		1.6		3.2
Green leaf, ribbed luffa		2.2		5.7		2.5		4.8
Green leaf, roselle		4.4		11.4		5.0		9.6
Guava		10.4		3.0		6.8		13.9
Long bean (Pa taung shye)		1.6		1.6		1.7		1.7
Long bean (Pe ti)		0.8		0.8		1.0		0.9
Milk, condensed		40.3		1.3		11.2		2.0
Papaya		6.4		0.5		1.7		1.4
Pumpkin leaf		2.2		5.7		2.5		4.8
Rice		2.0		5.3		32.7		20.7
Water spinach		4.4		11.4		5.0		9.6
Total		100		100		100		100
% RNI met		99%		115%		162%		

The food habits* diet for the 12-23 month old child, detailed in Annex 25, emphasises the important contribution that breast milk makes to nutrient requirements in all three livelihood zones as it provides the greatest total percentage of energy (36-39%), fat (57-71%), vitamin A (18-29%), vitamin B1 (16-21%), vitamin B2 (15-22%), niacin (15-22%), folic acid (15%), calcium (28-41%) and zinc (20-22%). Breast milk contains little iron however, so it is important that iron-rich complementary foods are given to the child. Annex 25 shows that duck egg and green leaves have been selected by the software as important sources of iron.

Annexes 26 and 27 summarise the cost of foods groups in the food habits* diet in the three livelihood zones. For both the child aged 12-23 months and the rest of the family, vegetables and animal products contribute the most to the cost of the food habits* diet. This is because these foods are required in large quantities to provide the essential micronutrients as discussed previously.

3.4 Comparison of current food consumption habits with food consumption habits required for a nutritious diet

The HEA's detailed food summary provides an insight into the current composition of the diet of a typical household in four wealth groups in the three livelihood zones assessed in Rakhine. The food summary analysis shows what foods, in what proportions are being used to provide the energy requirement of a typical household which is based upon 2,100 kcals

per person. The results from this analysis showed that the diet relies substantially on rice to provide the majority (86-92%) of a household's energy requirements, depending on livelihood zone. Oil provides 4%-11% of energy requirements, whilst nutritious foods such as fish, dairy products, fruit and vegetables only provide 1%-10% of requirements, depending on livelihood zone.

The same analysis was undertaken using the results from the food habits* diet to show the differences between the current diet and a nutritious diet. Figures 7-9 shows the percentage of energy requirements that each food group provided for each wealth group estimated by the HEA, and the food habits* diet for the typical household which has been aligned with the HEA in the three livelihood zones. For the raw data that has been used to create these figures, refer to Annex 28.

Figures 7-9 show that in the food habits* diets, only 48% of average energy requirements are being provided by rice, which is substantially lower than the energy provided by this food group in the current diet. Furthermore, fruit provides 2-26% of energy requirements, whilst 4-18% of energy is being provided by vegetables, depending on livelihood zone. Animal and dairy products such as dried fish and eggs provide 11-28% of energy, depending on the livelihood zone, whilst fat provides 21% of energy requirements in the EPZ only. Larger quantities of fruit such as guava, papaya and pomelo in the CFZ and IAZ compared to the EPZ because they were found to be an inexpensive source of micronutrients such as vitamin A and C in these two zones. Fruit were more expensive in the EPZ and so a larger quantity of inexpensive green leaves have been included instead to provide the same nutrients. Similar quantities of meat and fish have been included across the livelihood zones but condensed milk was found in the CFZ and IAZ and so this has been included by the software as an important source of calcium.

Figure 7. Comparison the current food consumption patterns with the eating habits required for the food habits* diet in the coastal fishing zone

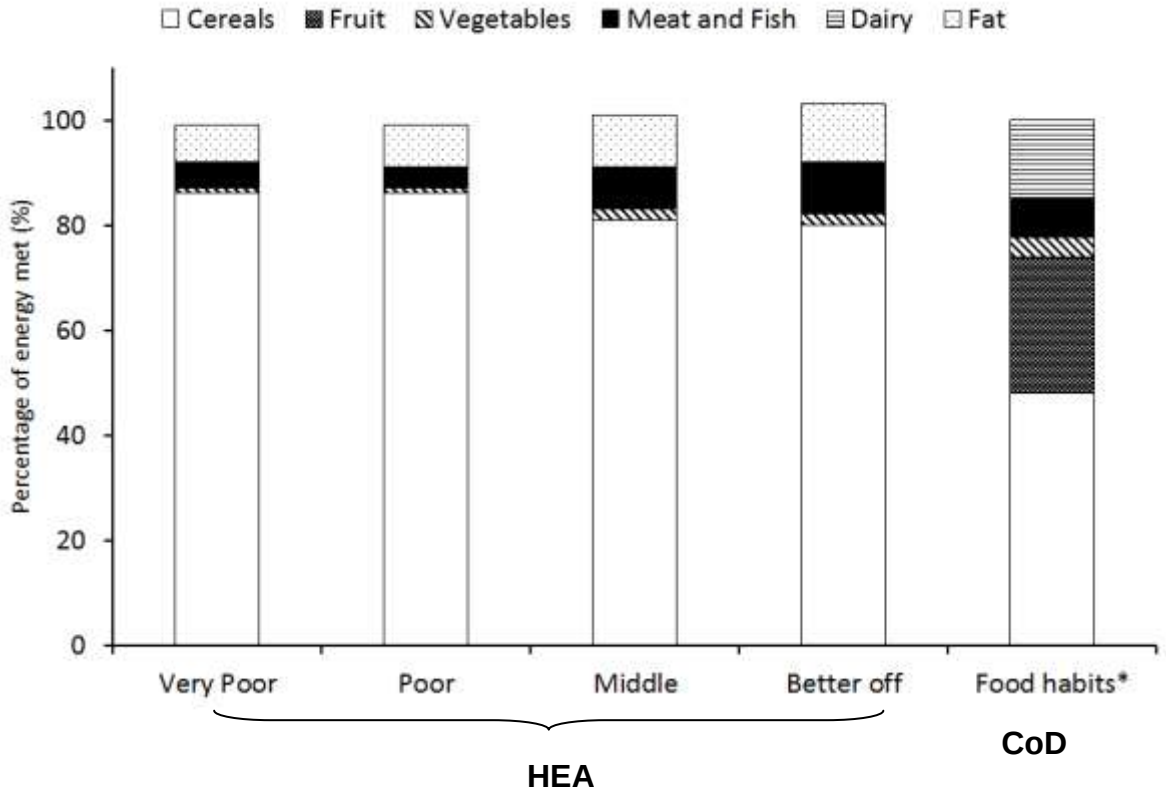


Figure 8. Comparison the current food consumption patterns with the eating habits required for the food habits* diet in the embankment paddy zone

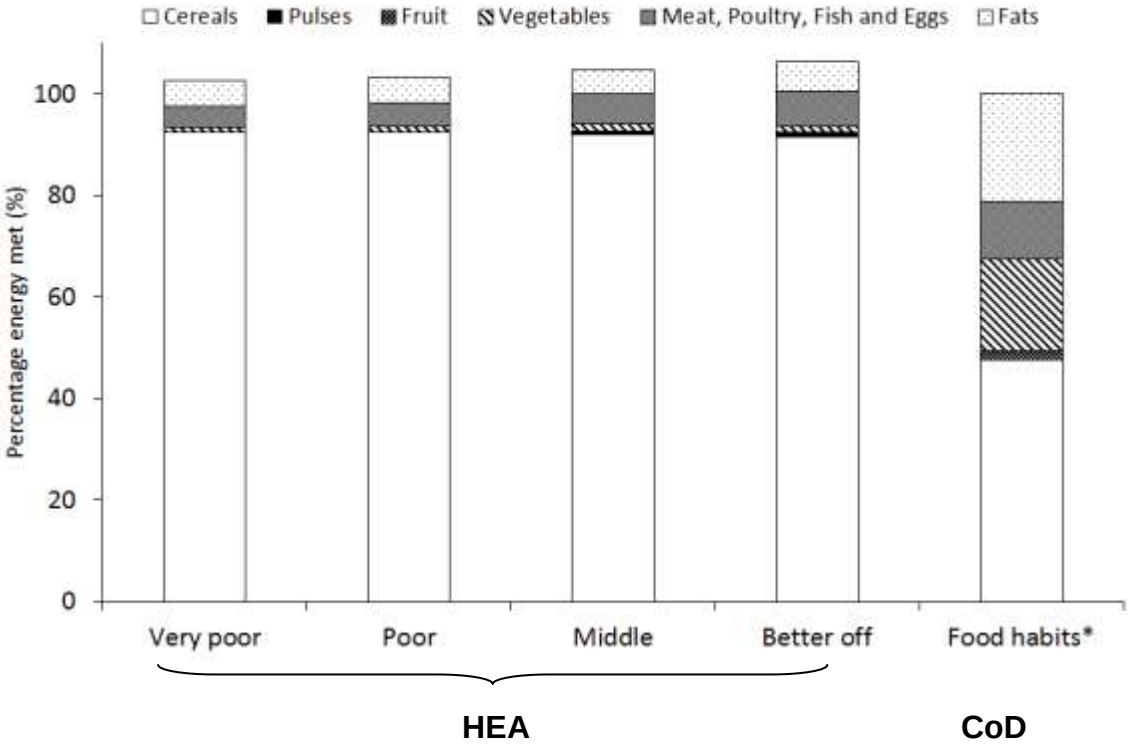
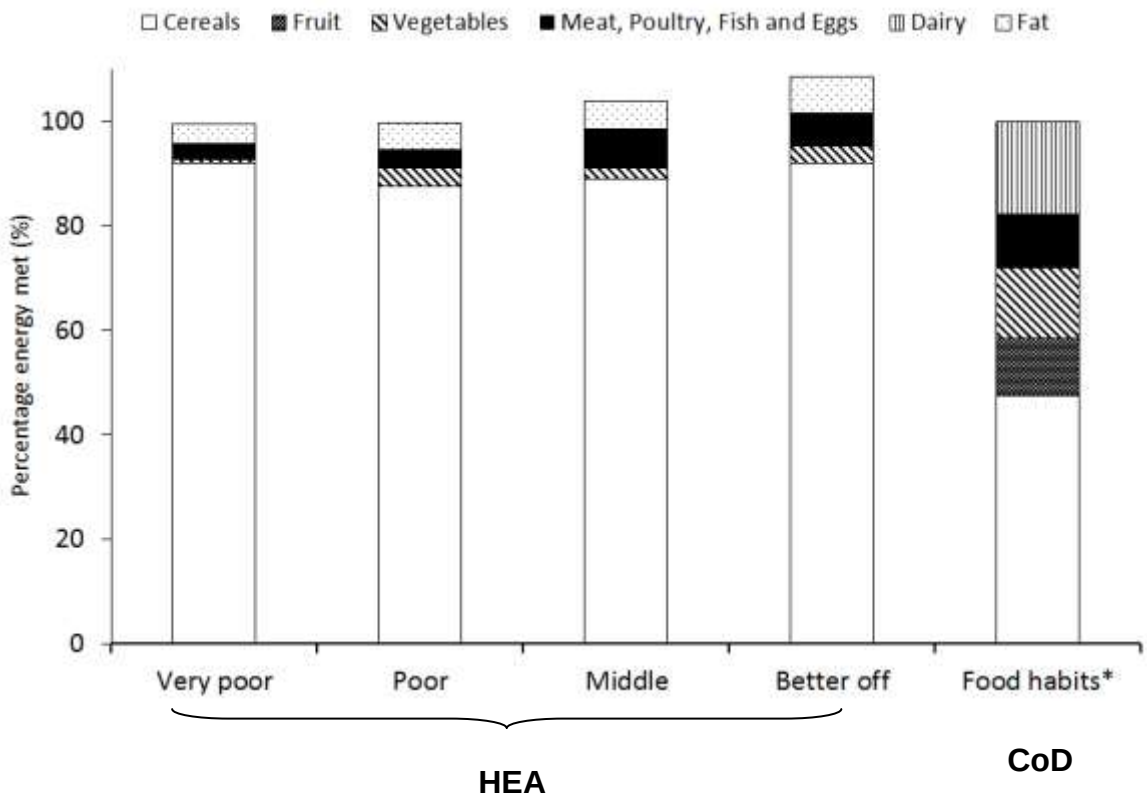


Figure 9. Comparison the current food consumption patterns with the eating habits required for the food habits* diet in the inland agriculture zone



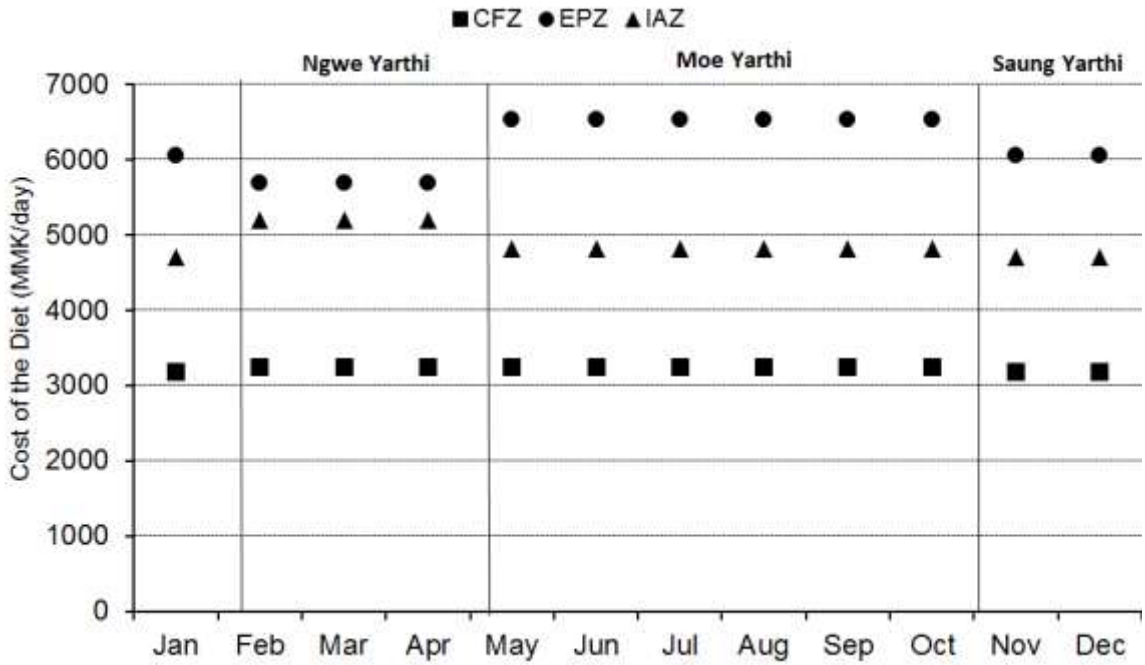
3.5 Seasonal fluctuations in the food habits diet*

Figure 10 shows the daily cost of the food habits* diet by season of the year for the three livelihood zones. The results show that the daily cost of the diet for the CFZ did not differ substantially by season. However, the cost of the diet in *ngwe yarthi* is 12% higher than in *saung yarthi* in the EPZ and the cost of the diet in *moe yarthi* is 10% higher than *ngwe yarthi* in the IAZ. The HEA found that the lean season across the three livelihood zones was around June – October before the main harvest of rice and vegetables. During this harvest period (October – February) foods such as vegetables, rice, fruit and fish are more abundant in the market and at their lowest cost. Only the seasonal costs results in the EPZ reflect this pattern. This indicates that a realistic representation of the seasonal cost of a nutritious diet may not have been obtained in the CFZ and IAZ.

The main reason for the inaccuracies in the seasonal analysis may be because retrospective data was collected during this assessment, which has inherent disadvantages because traders are expected to remember the price of all foods in previous seasons. Traders are also expected to recall the seasonal availability of foods which may differ depending on the trader and their memory.

It is important to note that the HEA found that very poor households in the three livelihood zones assessed in Rakhine used the market to purchase the majority of their food. The seasonal fluctuation of food prices may therefore greatly impact very poor household's access to food in this area, even if the price increase of individual food items is small. Also, these results only capture changes in food prices by season; they do not capture changes in income and subsequent affordability. The HEA found that access to labour and therefore household incomes, changes throughout the year. Expenditure is also not static, with some household expenses such as healthcare and education, increasing at different times of the year. These factors must be taken into consideration when considering seasonal affordability of a nutritious diet.

Figure 10. The cost of the food habits* diet by season of the year for the three livelihood zones



3.6 Affordability of the diets

In order to calculate affordability, the cost of the three diets plus essential non-food expenditure is subtracted from the total income, all of which are estimates based on multiple assumptions and variable parameters. The tables in Annex 29 show the estimated affordability of the diets per year if the non-food expenditures specific to each wealth group are applied to the cost of the three diets calculated in this analysis by livelihood zone. Figures 11-13 visually present the affordability analysis for four wealth groups in the three livelihood zones assessed in Rakhine based upon the numbers presented in Annex 29. The bold black line in the figures represents 100% of income. Anything above this line is unaffordable.

Figures 11-13 shows that potentially none of the wealth groups can afford a nutritious diet plus essential non-food expenditure in the EPZ and the IAZ. Very poor, poor, middle wealth group households cannot afford a nutritious diet plus essential non-food expenditure in the CFZ. In each livelihood zone, very poor households are able to afford an energy only diet and a micronutrient RNI diet but cannot afford the food habits* diet or essential non-food expenditure. In each livelihood zone poor households can afford a proportion of the food habits* diet but would not have enough income to purchase their essential non-food items. Middle and better off wealth group households can afford the majority if not all of the food habits* diet but cannot afford to buy essential non-food items.

The affordability gap expressed as a percentage of income for the CFZ is 44%, 27% and 2% for very poor, poor and middle wealth group households respectively. The additional amount of money that would be required a year for these households to be able to afford a nutritious diet plus non-food items is approximately 439,000 MMK (450 USD), 359,300 MMK (365 USD) and 48,400 MMK (50 USD) respectively.

The affordability gap expressed as a percentage of income for the EPZ is 170%, 120%, 66% and 46% for very poor, poor, middle and better off wealth groups respectively. The additional amount of money that would be required a year for these households to be able to afford a nutritious diet plus non-food items is approximately 1,840,800 MMK (1,880 USD), 1,707,000 MMK (1,745 USD), 1,860,700 MMK (1,900 USD) and 1,783,100 MMK (1,820 USD) respectively.

The affordability gap expressed as a percentage of income for the IAZ is 233%, 161%, 75% and 40% for very poor, poor, middle and better off wealth groups respectively. The additional amount of money that would be required a year for these households to be able to afford a nutritious diet plus non-food items is approximately 1,330,700 MMK (1,360 USD), 1,650,800 MMK (1,685 USD), 1,491,800 MMK (1,525 USD), 1,262,600 MMK (1,290 USD).

Figure 11. The affordability of an energy only, micronutrient RNI and food habits* diet for the coastal fishing livelihood zone

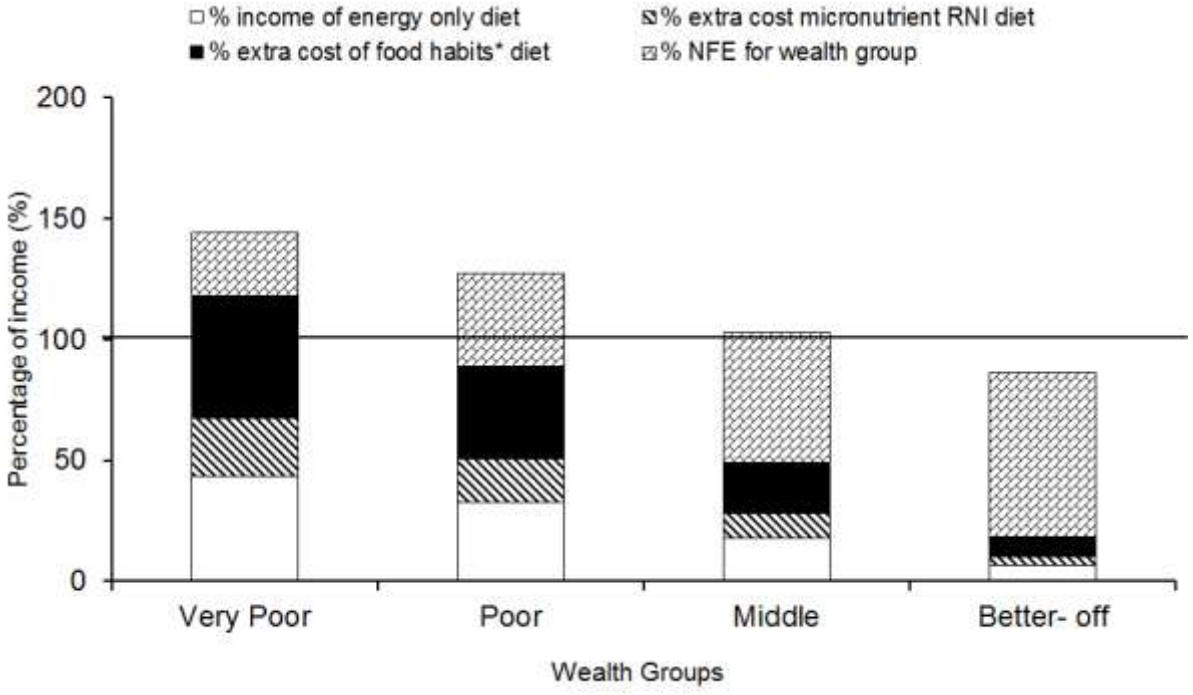


Figure 12. The affordability of an energy only, micronutrient RNI and food habits* diet for the embankment paddy livelihood zone

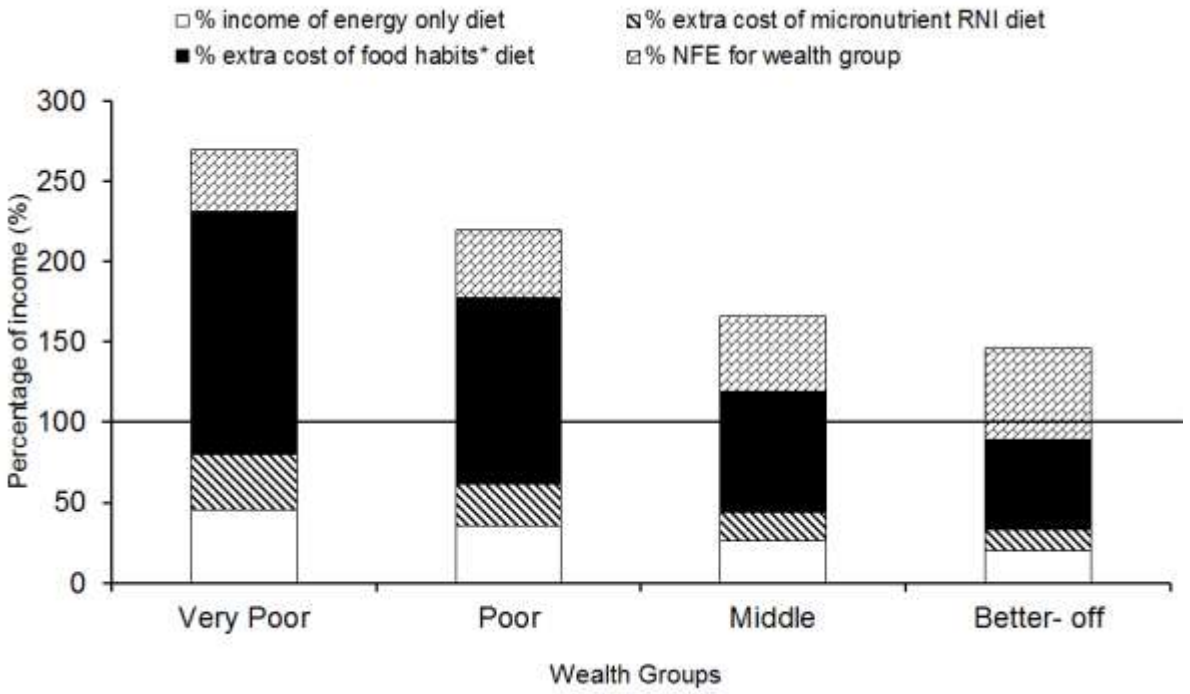
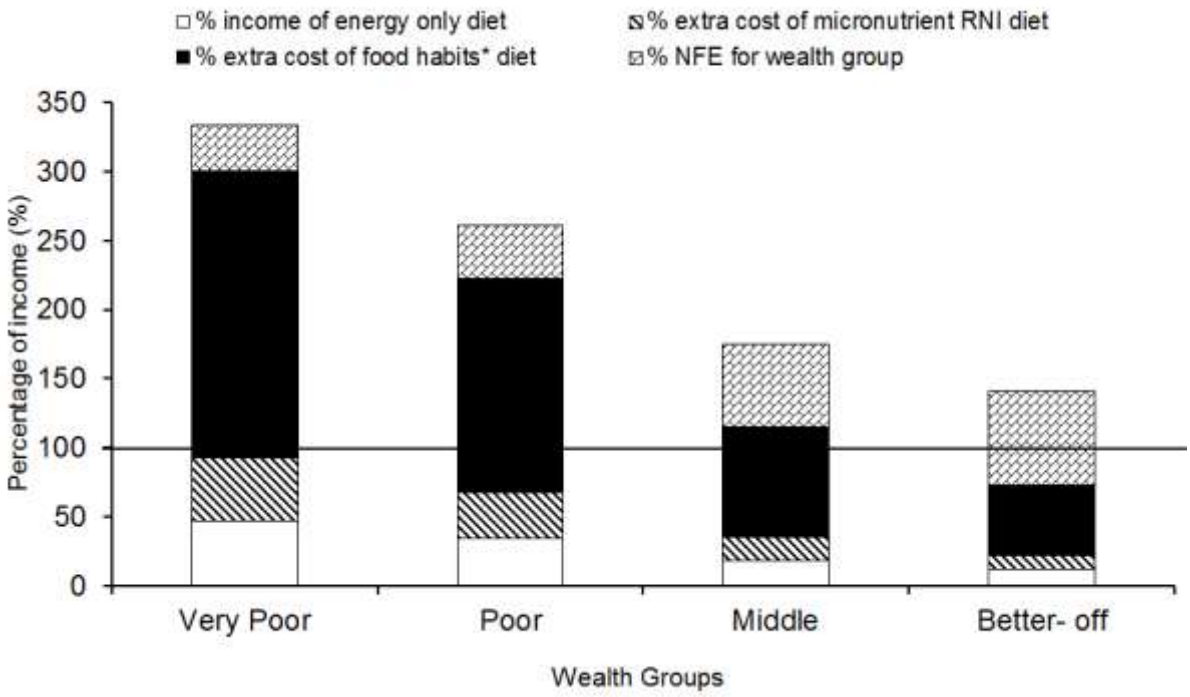


Figure 13. The affordability of an energy only, micronutrient RNI and food habits* diet for the inland agriculture livelihood zone



3.7 Modelling nutrition, food security and social protection scenarios

The Cost of the Diet software can be used to examine the effect of changing variables and assumptions on the cost and affordability of each diet, but usually the food habits diet. For example the effect of activities to generate income, the effect of changing the cost of foods

and the effect of providing foods that have a higher nutrient content could all be examined in terms of their effect on the cost, quality and composition of the diet. Such models can illustrate the potential for activities to improve the diet either through nutritional interventions or by poverty alleviation. The models presented can help to generate ideas and test assumptions about the impact of activities on household nutrition, and to set targets and indicators. All the models described here are theoretical and, in reality, the situation will be influenced by numerous external factors that cannot be included in the model, so the actual effect on the cost of the diet may be different.

Nine interventions were modelled to examine the effects on the cost, quality, affordability and composition of a nutritious diet:

- Creating a nutritious food habits diet to present a more realistic estimation of affordability in the three livelihood zones
- The potential impact of the Tat Lan programme interventions on the affordability of a nutritious diet
    - Cash for work
    - Cash transfer for pregnant and lactating women
- The potential impact of suboptimal infant feeding practices on the cost, quality and composition of a food habits* diet of a 12-23 month old child
    - Reducing breast milk intake by 50%
    - Removing breast milk from the diet
- The potential impact of fortification on the quality of the food habits* diet by providing the following:
    - Rice Soya Blend (RSB) to the child under the age of 5 year, pregnant and lactating women
    - Sprinkles to a 12-23 month old child
    - Fish powder to the household

3.7.1 Creating a nutritious food habits diet to present a more realistic estimation of affordability in the three livelihood zones

The affordability results outlined in section 3.6 indicated that all wealth groups require a substantial amount of money to be able to afford a nutritious diet that takes into account typical dietary habits, plus essential non-food expenditure. However, as shown in section 3.3.3 the software was unable to meet certain nutrient requirements by 100% for the food habits diet. It is therefore likely that the cost estimation for this diet is unrealistic and consequently the estimation of affordability is also unrealistic.

To determine whether the current food habits* diet does have an impact on the estimation of affordability, the minimum and maximum constraints of certain foods were altered to make the diet in the three livelihood zones nutritious. To do this in the CFZ dried fish, beef, goat milk, chicken egg and green leaves were either increased or included into the food habits* diet. For the EPZ, goat milk was allowed into the diet and for the IAZ the quantities of dried fish, oil, green leaves and duck eggs were increased, whilst goat milk was introduced into the diet.

Figures 14-16 show the new affordability analysis for the three livelihood zones. The bold black line in the figures represents 100% of income. Anything above this line is unaffordable.

By making the food habits diet nutritious the annual cost decreased by 55,300 MMK (55 USD, 5%), 234,200 MMK (240 USD, 11%) and 203,700 MMK (200 USD, 11%) for the CFZ, EPZ and IAZ respectively.

This cost decrease improves the affordability of the diet in the CFZ by 5%, 4% and 2% for very poor, poor and middle wealth group households respectively. A nutritious diet and essential non-food expenditure is now affordable for the middle wealth group in the CFZ. For the EPZ this decrease has improved the affordability of the diet by 25%, 19%, 8% and 6% for very poor, poor, middle and better off wealth groups respectively. For the IAZ this decrease has improved the affordability of a diet by 34%, 27%, 14% and 8% for very poor, poor, middle and better off wealth groups respectively.

However, even after this analysis, the gap in the affordability of the diet is still 389,100 MMK (400 USD) and 306,000 MMK (310 USD) for very poor and poor households in the CFZ respectively. In the EPZ an additional 1,397,400 MMK (1,420 USD), 1,267,700 MMK (1,295 USD), 1,173,100 MMK (1,200 USD) and 1,080,600 MMK (1,100 USD) is still required for very poor, poor, middle and better off households respectively. In the IAZ an additional 1,187,443 MMK (1,200 USD), 1,373,991 MMK (1,400 USD), 1,213,308 MMK (1,240 USD) and 1,010,059 MMK (1,000 USD) is still required for very poor, poor, middle and better off households respectively.

This analysis emphasises two points, the first is that the food habits diet is much more expensive than the micronutrient RNI diet. This means that typical dietary habits, namely a lack of dietary diversity is constraining the software and making it harder for it to meet nutrient requirements at a low cost. The second point is that economic poverty is greatly inhibiting household's ability to afford a nutritious diet and that a substantial amount of money is required in order to reduce the affordability gap.

Figure 14. The affordability of an energy only, micronutrient RNI and nutritious food habits diet for the coastal fishing livelihood zone

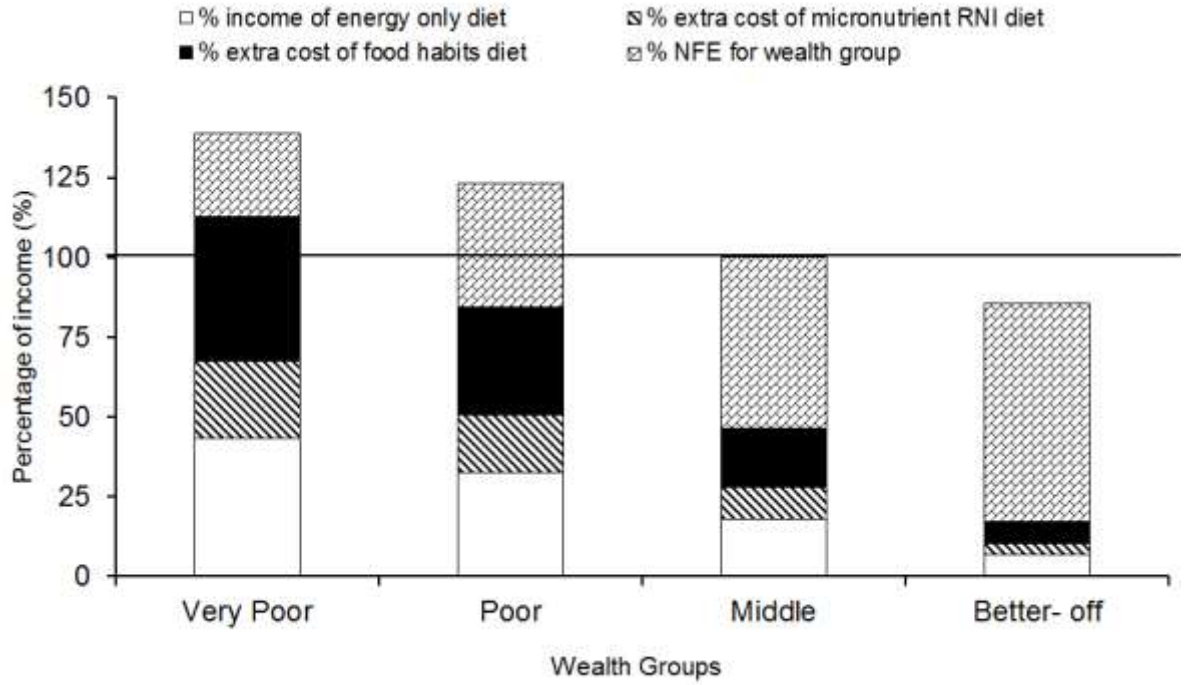


Figure 15. The affordability of an energy only, micronutrient RNI and nutritious food habits diet for the embankment paddy livelihood zone

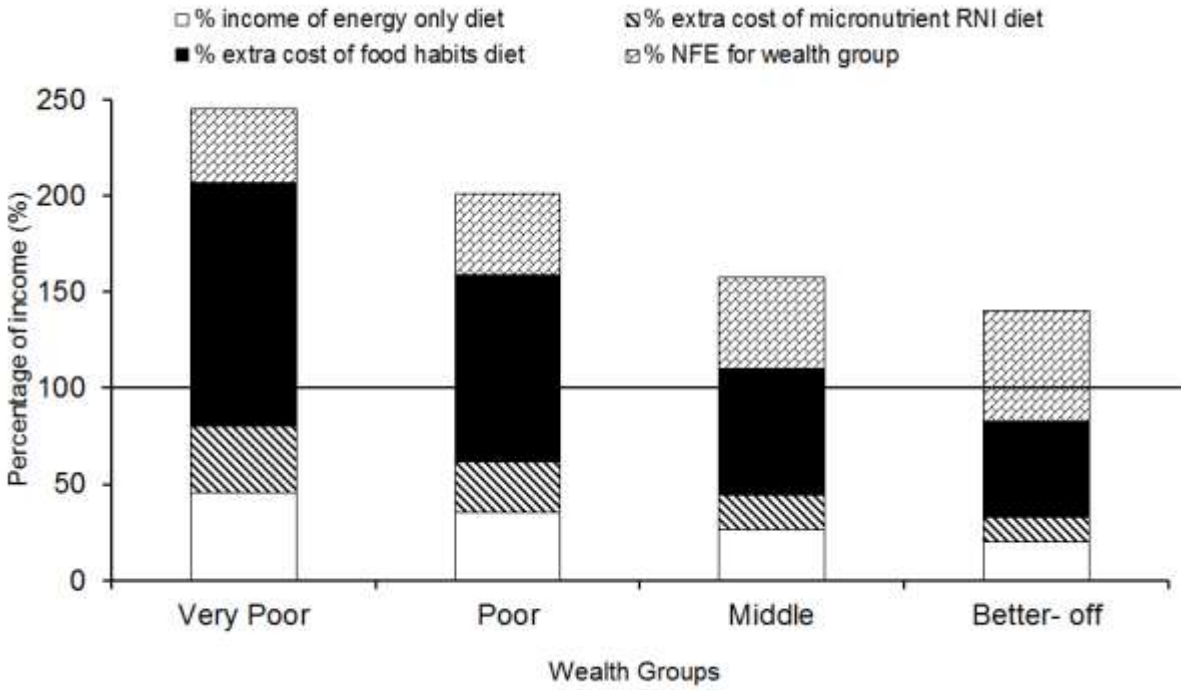
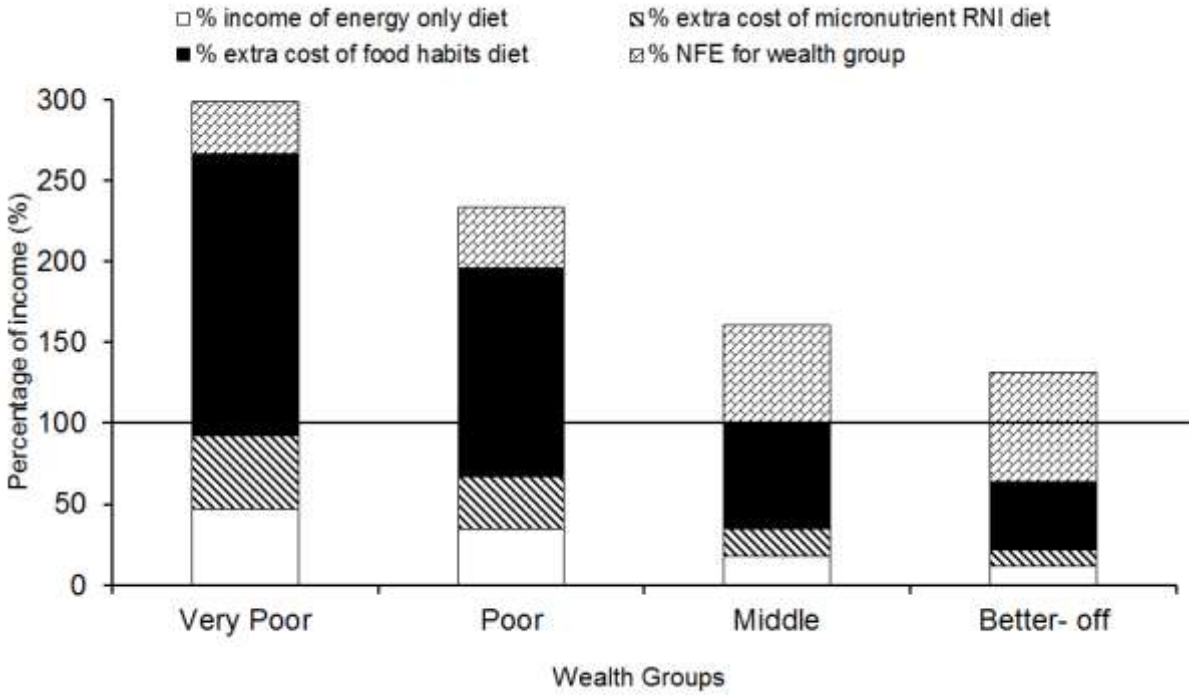


Figure 16. The affordability of an energy only, micronutrient RNI and nutritious food habits diet for the inland agriculture livelihood zone



3.7.2 Modelling the potential impact of the Tat Lan programme interventions on the affordability of a nutritious diet

3.7.2.1 Modelling the potential impact of the Tat Lan programme's proposed cash for work scheme on the affordability of a nutritious diet for very poor and poor households

One of the interventions proposed in the Tat Lan programme is a cash for work intervention which aims to improve incomes as well as improve the infrastructure for rural communities affected by cyclone Giri. The tasks will focus on embankment restoration and freshwater resource management. Those employed in the cash for work scheme will receive between 2,500 – 2,700 MMK (2.5-2.7 USD) a day and will be employed for 70 days.

To model the potential impact of this intervention on the affordability of a nutritious diet for target households, 182,000 MMK (182 USD) (2,600 MMK x 70) was added to the annual income of very poor and poor households. The annual cost of the nutritious food habits diet, created for the model in section 3.7.1 was used for the purpose of this analysis as it was deemed unrealistic to present this analysis for a food habits diet that was not nutritious.

To review the graphs showing the potential impact of this intervention refer to Annex 30. The graphs show that the cash for work scheme could improve the affordability of the food habits diet plus essential non-food expenditure by 21% and 15% for very poor and poor households in the CFZ, 39% and 25 for very poor and poor households in the EPZ and 70% and 35% for very poor and poor households in the IAZ.

Despite these improvements, an additional 200,600 MMK (200 USD) and 121,000 MMK (120 USD) is still needed a year for very poor and poor households in the CFZ before a nutritious diet and non-food expenditure could be afforded. For the EPZ an additional 1,214,500 MMK (1,200 USD) and 1,092,200 MMK (1,100 USD) is required and for the IAZ an additional 1,004,500 MMK (1,000 USD) and 1,183,200 MMK (1,200 USD) is needed a year for very poor and poor households before a nutritious diet and non-food expenditure could be afforded.

Access to the cash for work scheme alone will therefore not be enough to remove the economic constraints that very poor and poor households face when trying to purchase a nutritious diet from the local market. This model also demonstrates the need for additional livelihood support to increase household incomes. This model also demonstrates the need for additional income from households' own livelihoods.

3.7.2.2 Modelling the potential impact of the Tat Lan programme's proposed cash transfer for pregnant and lactating women on the affordability of a nutritious diet for very poor and poor households

Another intervention planned for the Tat Lan programme is a cash transfer for pregnant and lactating women which aims to provide these vulnerable groups with the means, knowledge, and support to practise optimal breastfeeding and complementary feeding practices. This short term cash support hopes to provide financial support to enable mothers to prioritise Infant and Young Child Feeding (IYCF), nutrition and care practices through relieving the effect of limited livelihoods opportunities and supplementing household income. The proposed cash sum is between 2,500-2,700 MMK (2.5-2.7 USD) a day for 3 months.

To model the potential impact of this intervention on the affordability of a nutritious diet for target households, 239,200 MMK (240 USD) (2,600 MMK x 92) was added to the annual income of very poor and poor households. The annual cost of the nutritious food habits diet, created for the model in section 3.7.1 was used for the purpose of this analysis as it was deemed unrealistic to present this analysis for a food habits diet that was not nutritious.

To review the graphs showing the potential impact of this intervention refer to Annex 31. The graphs show that the cash transfer could improve the affordability of the food habits diet plus essential non-food expenditure by 27% and 19% for very poor and poor households in the CFZ, 49% and 32% for very poor and poor households in the EPZ and 86% and 44% for very poor and poor households in the IAZ.

This intervention almost makes a nutritious diet plus essential non-food expenditure affordable for very poor and poor households in the CFZ, who require an additional 51,900 MMK (50 USD) and 17,300 MMK (17 USD) a year respectively. However, an additional 1,166,900 MMK (1,190 USD) and 1,031,100 MMK (1,050 USD) is still needed a year for very poor and poor households in the EPZ and an additional 944,600 MMK (965 USD) and 1,125,500 MMK (1,150 USD) is needed a year for very poor and poor households in the IAZ before a nutritious diet and non-food expenditure could be afforded.

Access to this cash transfer scheme alone will therefore not be enough to remove the economic constraints that very poor and poor households face in the EPZ and IAZ when trying to purchase a nutritious diet from the local market. This model also demonstrates the need for additional income from households' own livelihoods.

3.7.3 Modelling the potential impact of suboptimal infant feeding practices on the cost and quality of a food habits diet of a 12-23 month old child*

The MICS[14] undertaken in 2009-10 reported that only 1.3% of children under the age of 6 months were exclusively breast fed in Rakhine, whilst a SMART survey[15] undertaken in 2011 found that 18.9% of children were exclusively breast fed and between 76 – 82% were still receiving breast milk at 1 year of age. The percentage of children still breast fed at 2 years of age (as recommended by the WHO) in Rakhine is unknown.

The results in section 3.3.3 show that the minimum and maximum constraints that have been entered into the software to take into account current dietary habits are preventing the software from creating a nutritious food habits diet for a 12-23 month old child. Within this food habits* diet the recommended daily quantity of breast milk is vital in providing essential micronutrients. However, it is not known to what extent children in Rakhine are receiving breast milk between the age of 12-23 months. To understand the potential impact of not breast feeding or providing sufficient quantities of breast milk on the cost and quality of a diet for a 12-23 month old child two scenarios were modelled using the food habits* diet presented in section 3.3.3:

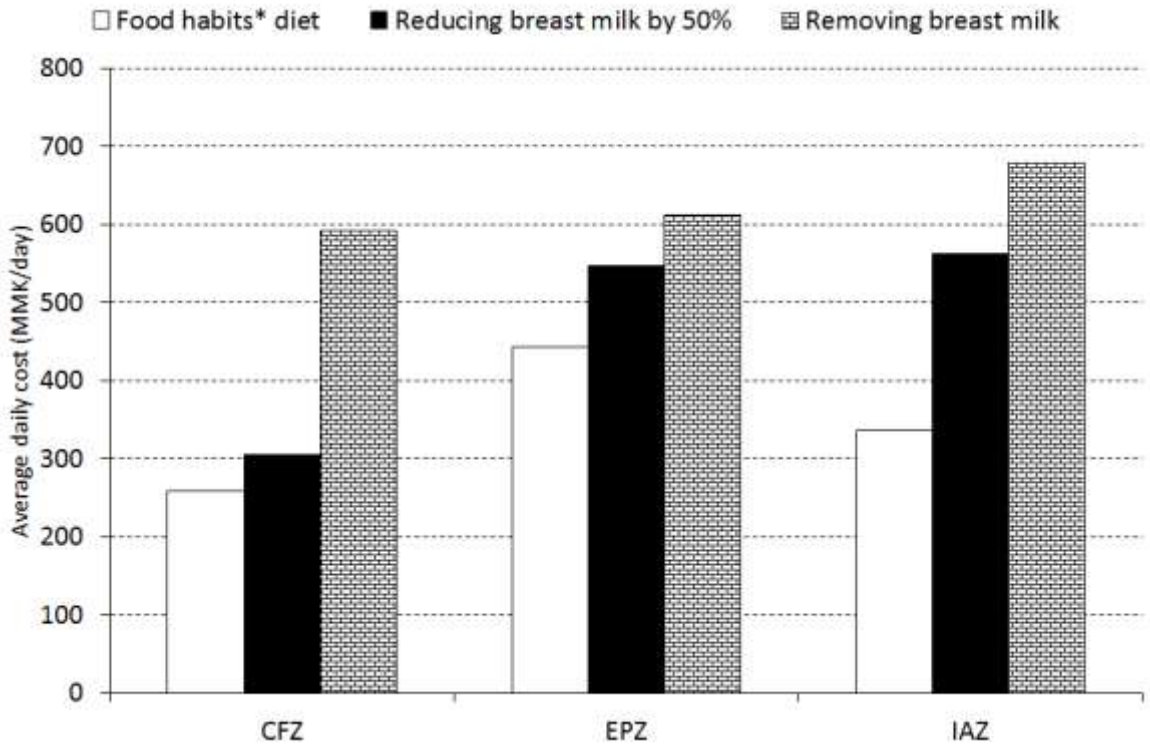
1. Reducing breast milk intake by 50% (from 532g a day to 266g a day)
2. Removing breast milk

[14] Ministry of National Planning and Economic Development and Ministry of Health, 2011
[15] Save the Children, 2011

Figure 17 shows the potential cost implications of not breast feeding or providing insufficient quantities of breast milk in a food habits* diet for a 12-23 month old child. Figure 17 shows that reducing the amount of breast milk by half led to a 50%, 23% and 68% increase in the daily cost of the diet in the CFZ, EPZ and IAZ respectively. In terms of cash, this increase in cost is 171 MMK, 103 MMK and 227 MMK a day in the CFZ, EPZ and IAZ respectively. Figure 17 shows that removing breast milk led to a 84%, 38% and 102% increase in the daily cost of the diet in the CFZ, EPZ and IAZ respectively. In terms of cash, this increase in cost is 289 MMK, 168 MMK and 342 MMK a day in the CFZ, EPZ and IAZ respectively.

For detailed graphs showing the cost implications of these scenarios by season for the 12-23 month old child across the three zones, refer to Annex 32.

Figure 17. A bar chart showing cost of a food habits* diet for a 12-23 month old child with 100% of breast milk compared with the two infant feeding models



Annexes 33 and 34 show the impact of the two infant feeding scenarios on the quality of the diet for a 12-23 month old child. Annex 33 shows that when the recommended daily intake of breast milk is halved, calcium requirements can only be met 71-73%, which is 6-10% lower compared to the food habits* diet. Fat requirements are also only met by 81% in the IAZ which is 19% lower. Annex 34 shoes that when breast milk is removed from the diet that calcium requirements can only be met by 58-61%, which is 19-22% lower compared to the food habits* diet. Fat requirements are also only met by 86% and 61% in the CFZ and IAZ respectively, which is 14-39% lower.

These scenarios potentially highlight the increased economic presure that households are putting themselves under by not givin their children breast milk as recommended by the WHO as well as the implications associated with the nutritional quality of the diet. It is

important to note that these models do not take into account the health implications of not providing adequate quantities of breast milk such as an increased risk of infection and diarrohea due to the consumption of contaminated water or food, which could exacerbate malnutrition due to their cyclical relationship.

3.7.4 Modelling the potential impact of fortification on the quality of the food habits diet*

As mentioned, the results in section 3.3.3 show that minimum and maximum constraints applied to the software to represent current dietary habits are preventing the software from creating a nutritious food habits diet for a typical household of 4 or 5 people in the three livelihood zones assessed. For the 12-23 month old child 77-83% of calcium requirements could only be met by in the three livelihood zones, whilst only 76% of zinc requirements could be met in the CFZ and IAZ. Iron requirements are also only met by 90% in the IAZ. For the rest of the household, in the CFZ vitamin B1, calcium and iron could only be met 94%, 55% and 71% respectively whilst calcium requirements can only be met by 82% in EPZ. For the IAZ, fat requirements can only be met by 40%.

These results provide a potential indication of the current micronutrient deficiencies within Rakhine. To prevent chronic undernutrition it is essential that households consume a more varied diet. One way in which this could be done is to provide a fortified rice blend, a multiple micronutrient powder or fish powder which is naturally high in nutrients such as protein and calcium. The following sections outline the potential impact of these products on the quality of a nutritious diet for vulnerable groups or the household.

3.7.4.1 Modelling the potential impact of providing Rice Soya Blend (RSB) to households with a child under the age of five, pregnant or lactating woman on the quality of a food habits diet*

Rice Soya Blend (RSB) is a fortified 'super cereal' developed by the WFP, which should be consumed as a porridge by children under the age of 5, pregnant and lactating women. It has been fortified using a vitamin and mineral premix to improve the nutritional quality of the diet. To model the impact of this product on the quality of the food habits* diet, the nutrient composition of RSB shown in Annex 35 was added to the CoD software. The recommended daily ration of 127g was then included in the diet presented in section 3.3.3 for the aforementioned vulnerable groups. It is currently not possible to model the impact of this product on the nutrient intakes of an individual pregnant or lactating woman so the impact of this ration has been summarised in the 'rest of the family' graph in Figure 19. It was assumed that the supplement was given free to mothers.

Figure 18 shows that including a ration of RSB in the diet of a 12-23 month old child greatly improves calcium, iron and zinc intakes, which are now met by more than 100% in the three livelihood zones. The intake of fat in this diet has worsened slightly but is still met by 97%. Interestingly the intake of vitamin B1 has also worsened in the three livelihood zones and this diet now provides 87% of recommended requirements, which is still high and unlikely to lead to a clinical deficiency. It is thought that the amount of these nutrients in this diet has fallen because the RSB has displaced other foods that are high in fata and vitamin B1.

Figure 18. The average percentage of energy and the recommended nutrient intakes for micronutrients met in a year by a food habits* diet including RSB for a 12-23 month old child in the three livelihood zones

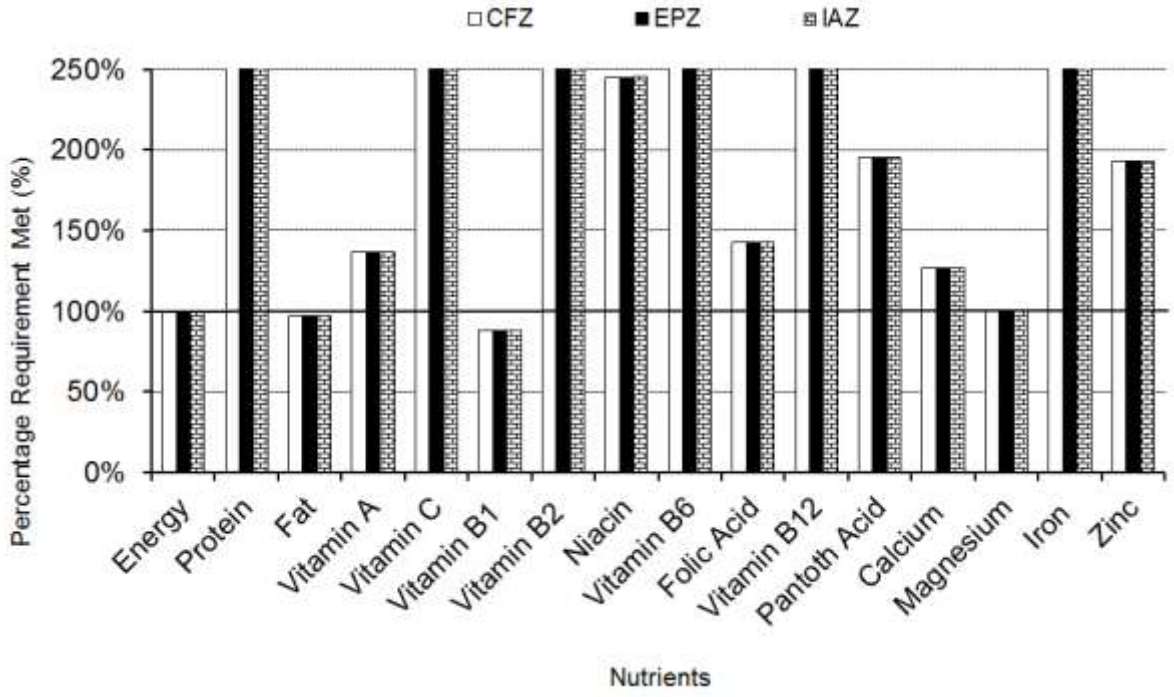
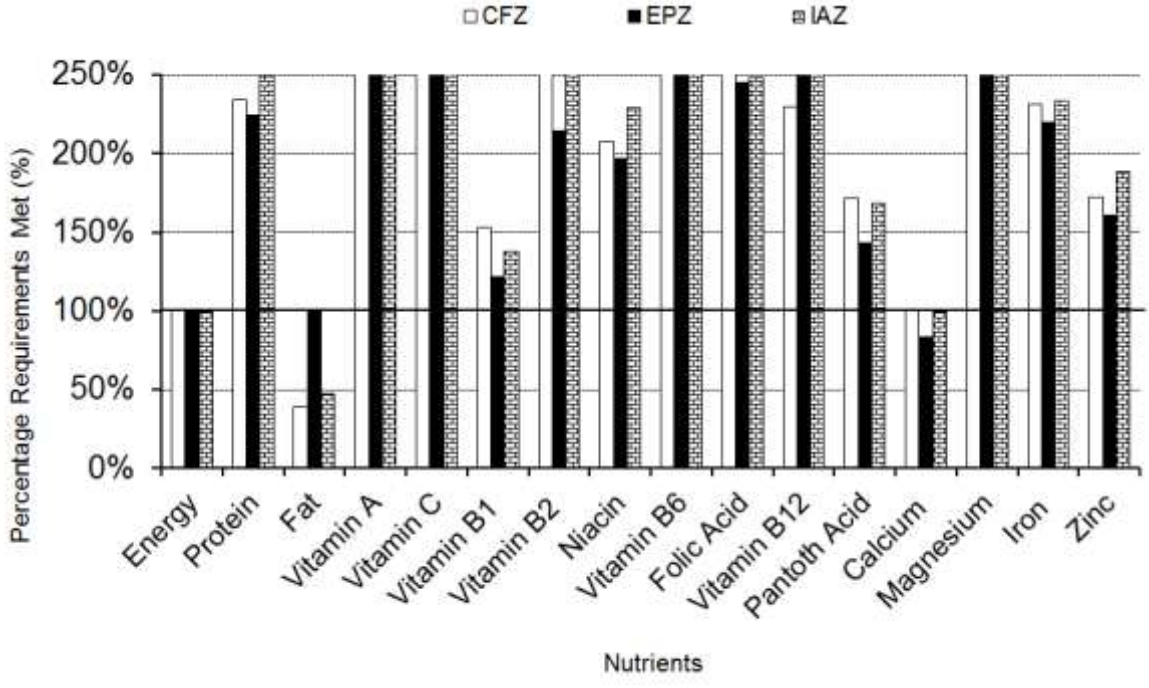


Figure 19 shows that for the rest of the family, which includes a lactating woman, vitamin B1, calcium and iron intakes have greatly improved across the three zones. However, in the EPZ calcium requirements are still only met by 83%, whilst fat intakes have worsened in the CFZ and are almost unchanged in the IAZ.

Figure 19. The average percentage of energy and the recommended nutrient intakes for micronutrients met in a year by a food habits* diet including RSB for the rest of the family in the three livelihood zones



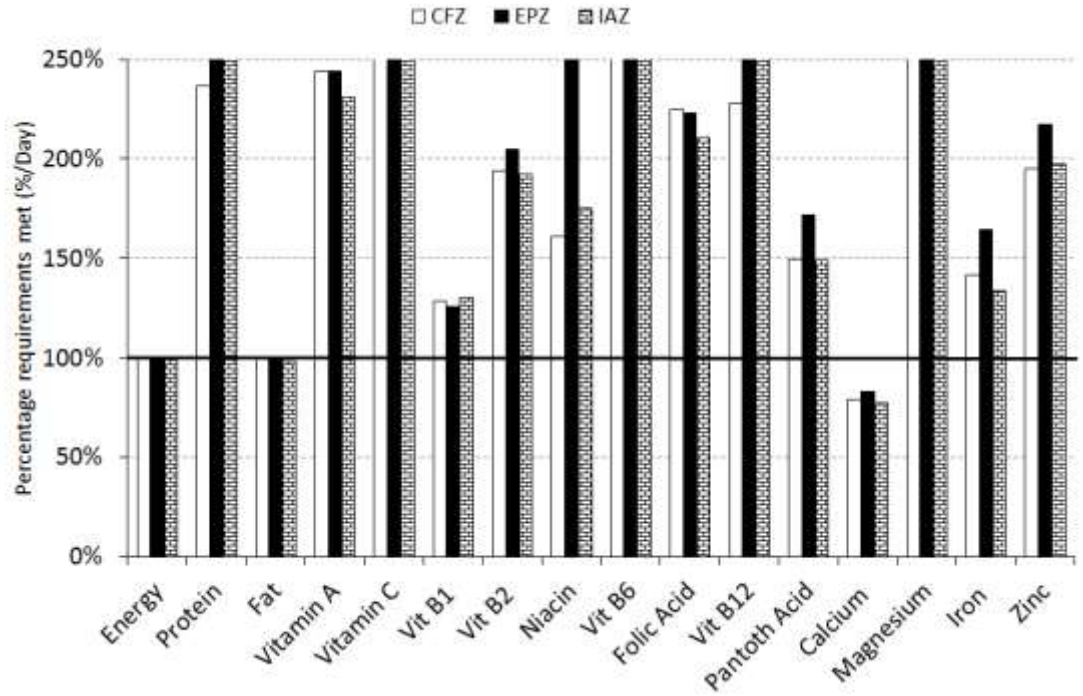
This model shows that although RSB has the potential to improve the nutrient requirements, alone it is not enough to provide a nutritious diet. This emphasises the need to improve incomes through livelihood interventions in conjunction with behaviour change communication interventions that advocate for the purchase and consumption of the nutritious foods identified by the CoD software.

3.7.4.2 Modelling the potential impact of home fortification using sprinkles on the quality of a nutritious diet of a 12-23 month old child

Sprinkles are powered vitamins and minerals, provided in a sachet that the mother can mix with a young child's food, to increase its micronutrient content. A sachet of multivitamins and minerals is usually added once a day for 30 days and then repeated every six months to treat any deficiency and boost the reserves of micronutrients that can be stored. To model the potential impact of providing sprinkles for 60 days a year a 1g serving was added into the food habits* diet every day for 60 days. It was assumed that the supplement was given free to mothers.

Figure 20 shows the potential impact of a sprinkles intervention in the quality of the food habits* diet. Figure 20 shows that nutrient intakes are greatly improved with iron and zinc now met by more than 100%. However, calcium intakes have not changed. This is likely to be because sprinkles do not contain calcium. This model therefore emphasises the need to advocate to households the importance of eating calcium rich foods such as dried fish.

Figure 20. The average percentage of energy and the recommended nutrient intakes for micronutrients met in a year by a food habits* diet including micronutrient sprinkles for a 12-23 month old child in the three livelihood zones

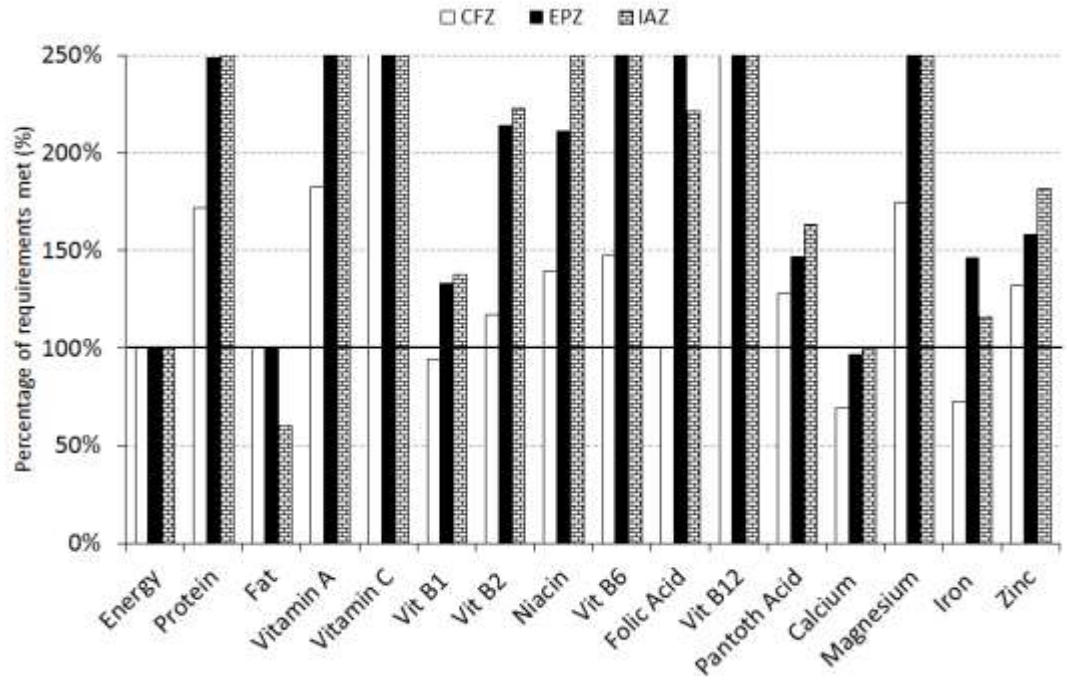


3.7.4.3 Modelling the potential impact of fortification using fish powder on the cost and quality of a nutritious diet for a household

The software has identified that calcium is one of the most difficult nutrients to meet requirements for in the food habits* diet across the three livelihood zones. Calcium is found in dairy products and in the bones of fish, in particular canned or dried fish as the bones are softened by the canning and drying process and can be easily eaten, particularly by young children. The difficulty with consuming enough calcium is mainly due to the limited availability of dairy products in the markets as well as limited dietary diversity within the household. Due to the land required to keep livestock and the limited availability of dairy products in the markets, promoting dairy products is not a sustainable intervention. However, dried fish were abundant in the markets of the three zones and could be ground into a powder which could then be used to fortified complementary foods for young children and rice and stews for adults. To model the potential impact of providing households with fish powder, it was included in the diet for three meals a week. For a household of 4 and 5 people this equated to 220g or 280g a week of fish powder respectively. It was assumed that the fish powder would be distributed for free.

Figure 21 shows the potential impact of a fish powder intervention on the quality of the food habits* diet. This intervention does not improve vitamin B1 and iron intakes in the CFZ but does improve fat intakes by 20% (from 40-60%) in the IAZ. Calcium intakes are also improved by 15%, from 55-70% in the CFZ and from 82-97% in the EPZ. This model indicates the potential impact that providing fish powder to households could have on the quality of the diet, but also emphasises the need for more dietary diversity in the livelihood zones. This will take a twofold approach of behaviour change communication and an improvement in livelihood opportunities to improve incomes.

Figure 21. The average percentage of energy and the recommended nutrient intakes for micronutrients met in a year by a food habits* diet including fish flour for the family in the three livelihood zones



4. Key Findings

4.1 A nutritious diet is not possible when typical food habits of households in Rakhine are imposed

One of the most important findings from the Cost of the Diet assessment is that the food habits* diet analysis has shown that when current food habits are imposed through the minimum and maximum constraints in the software, it is not possible to meet all or a combination of the following nutrients for a household of 4 or 5, in the three livelihood zones assessed in Rakhine: fat, vitamin B1, calcium, iron and zinc. It is however possible to obtain a nutritious diet using local foods in the three livelihood zones when these food habit restrictions are removed, as demonstrated by the micronutrient RNI diet analysis.

This finding suggests that food availability, economic constraints and cultural practices could be exacerbating poor dietary diversity in the assessment area. The following three sections aim to discuss the potential impact of these three factors on the diet in more detail.

4.2 The availability of nutrient-rich foods is unlikely to be a key barrier to typical poor households obtaining a nutritious diet

The data collection team found over 300 foods on the market in the three livelihood zones. In comparison to other assessment areas such as Punjab in Pakistan where 67 foods were found on the market or Turkana in Kenya, where 40 foods were found, this indicates that there was a large variety of foods available in the assessment area.

The availability of foods in the markets did differ depending on whether the market was at a central, township or village level with a greater variety of food being available at the central and township level. The foods that weren't available in the village level market that may have had an impact on the cost and quality of a nutritious diet are pulses, fruit and dairy products. Pulses such as lentils could provide an important source of energy, protein, water soluble B-group vitamins, folic acid, iron, zinc and copper, reducing the reliance on rice and green leaves for these nutrients in the food habits* diet. Fruit such as oranges provide vitamin C, which could reduce the amount of green leaves in the food habits* diet, whilst dairy products such as milk or yoghurt could greatly improve the intakes of vitamin B12 and calcium in the food habits* diet and reduce the quantities of dried fish and eggs currently included.

Having said this, the foods selected by the software for the food habits* diet were all available in more than half of the village markets that were visited and were therefore considered to be available in the livelihood zone. This finding suggests that economic constraints and cultural practices are having a greater impact on poor dietary diversity in the assessment area.

4.3 Based on current livelihood strategies, middle and better off households can afford a nutritious diet and essential non-food expenditure in the CFZ but none of the wealth groups can afford a nutritious diet and essential non-food expenditure in the EPZ and IAZ

Despite creating a nutritious food habits diet, both affordability analyses present a concerning picture for the three livelihood zones and estimate that only middle and better off wealth groups in the CFZ can afford a nutritious diet plus expenditure on non-food items in the Tat Lan assessment area. The gap in the affordability of a nutritious diet plus essential non-food expenditure is 389,100 MMK (400 USD) and 306,000 MMK (310 USD) for very poor and poor households in the CFZ respectively. In the EPZ an additional 1,397,400 MMK (1,420 USD), 1,267,700 MMK (1,295 USD), 1,173,100 MMK (1,200 USD) and 1,080,600 MMK (1,100 USD) is still required for very poor, poor, middle and better off households respectively. In the IAZ an additional 1,187,443 MMK (1,200 USD), 1,373,991 MMK (1,400 USD), 1,213,308 MMK (1,240 USD) and 1,010,059 MMK (1,000 USD) is still required for very poor, poor, middle and better off households respectively.

Economic poverty is therefore greatly inhibiting household's ability to afford a nutritious diet and a substantial amount of money is required in order to reduce the affordability gap.

4.4. Typical, cultural eating habits are a key barrier to poor households obtaining a nutritious diet

The software identified rice as an inexpensive source of energy, protein, water soluble B-group vitamins, zinc and copper. Several different varieties of green leafy vegetables have been included across the three zones, to provide an inexpensive source of vitamin A, C, water soluble B-group vitamins, folic acid and iron. Dried fish provide protein, niacin, calcium, vitamin B12 and zinc whilst duck eggs provide protein, fat, vitamin A, water soluble B-group vitamins, folic acid, vitamin B12, iron and zinc.

The comparative analysis of current food consumption habits (as reported by the HEA) with food consumption habits required for a nutritious diet shows that households are consuming the foods that the software recommends but not in the quantities required to meet recommended nutrient intakes. One of the main reasons for this is the large quantities of rice which are being consumed because it is perceived as being nutritious and it satisfies hunger.

Although energy dense compared to other staples such as maize or millet, rice is not very rich in micronutrients. The food habits* diet shows that rice does contribute to protein, vitamin B1, niacin, vitamin B6, iron and zinc requirements but this is mainly due to the large quantities included in this diet (355-453 Kg a year or 15-29% of the total quantity) as opposed to rice being rich in these nutrients. Rice also contains a large amount of phytate (543mg/100g) which binds to minerals such as iron, calcium, magnesium and zinc, inhibiting their absorption. The comparative analysis shows that households in all wealth groups in the three livelihood zones would need to decrease their rice consumption by at least 50% to allow for the quantities of other foods required to meet nutrient requirements.

The comparative analysis also shows that the consumption of rice or the general diversity of the diet does not differ significantly by wealth group, as income increases. This suggests that increasing income alone would not be enough to diversify the diet as there are also cultural

habits and preferences driving high rice consumption and the comparatively low purchasing and consumption of nutritious foods identified by the software.

Cultural taboos enforced onto young children's diets may also be a barrier to this vulnerable group obtaining a nutritious diet. Not providing meat, fish, eggs and vegetables to this age group is a concerning practice, particularly if women have stopped breast feeding as these foods have been found by the software to provide essential micronutrients. The taboo foods for pregnant and lactating women are less restrictive, focusing more on specific foods such as certain varieties of fish but should not be encouraged during these critical stages of the life cycle where adequate nutrition is vital.

4.5 Suboptimal breastfeeding practices are preventing infants and young children from receiving a nutritious diet

Breastfeeding should be the primary way of providing essential nutrients to infants under the age of two years to ensure their healthy growth and development. A review of evidence has shown that, on a population basis, exclusive breastfeeding for 6 months is the optimal way of feeding infants. Thereafter infants should receive complementary foods with continued breastfeeding up to 2 years of age[16].

The food habits* diet results for a 12-23 month old child emphasise the importance of providing 532g of breast milk a day to this age group. The results showed that breast milk provided over half of the recommended requirements for fat, a third of requirements for energy and calcium and between 20-30% of requirements for vitamin A, vitamin B1, vitamin B2, niacin, folic acid and zinc.

The analyses of halving and removing breast milk from the diet of a child aged 12-23 month old have produced concerning results. Not only do these models highlight the potential additional costs that households are incurring by not breastfeeding their children as recommended, breast milk also has additional benefits such as containing immunoglobulins that provide passive immunity to the child during its first few months of life. It is also sterile, unlike other foods, which prevents the risk of contamination and infections which may cause diarrhoea and exasperate malnutrition due to their cyclical relationship. Providing other foods and water during the 0-6 month period therefore poses both economic and health implications to the households and the child.

4.6 A food habits diet[17] is approximately 2.5 – 5.7 times more expensive than a diet that only meets energy requirements, depending on livelihood zone*

The results from the Cost of the Diet analysis have shown that a food habits* diet for a 5 person household is 1.7 times more expensive in the IAZ compared to the CFZ zone. This cost difference is likely to be due to the difference in the price per 100g for foods found in the village level markets. The IAZ was only 11,500 MMK a year more expensive than the EPZ.

[16] WHO, 2013

[17] The * indicates that this is not a typical food habits diet because the software has been unable to meet the recommended requirements for fat and some micronutrients as described in section 3.6

The results also show that the micronutrient RNI diet was 1.6 - 2.0 times as expensive as the energy only diet, depending on livelihood zones. This means that it costs 1.6 – 2.0 times as much money to meet recommended protein, fat and micronutrient requirements compared with only meeting energy requirements. The food habits* diets were between 1.7 – 2.9 times more expensive than the micronutrient RNI diet, depending on livelihood zones. This emphasises that the constraints applied to the software to reflect typical dietary habits have required the software to add more expensive foods to meet the recommended nutrient intakes of a typical poor household.

4.8 Fortification with sprinkles, RSB and fish powder has the potential to improve the quality of a food habits diet*

The Cost of the Diet software has shown the potential impact of fortification with RSB, fish powder and sprinkles on the quality of a nutritious diet for the child aged 12-23 months and the rest of the household. Their individual impact is impressive and their combined use could have the potential to make the food habits diet nutritious for a 12-23 month old child. However, even in combination, fat and vitamin B1 requirements would still not be met by 100% for the rest of the household, indicating the need for additional sources of micronutrients to be consumed by the household.

4.9 Planned Tat Lan programme social protection interventions will make a significant contribution to household economic access to nutritious food but will not fully address the gap between incomes and the cost of a nutritious diet

The results from the Tat Lan programme cash transfer interventions models (i.e. cash for work and a cash transfer to pregnant and lactating women) reduce the gap, between income and the cost of a nutritious diet for poor households, but on their own they are not sufficient to close this affordability gap.

The cash for work scheme could improve the affordability of the food habits diet plus essential non-food expenditure by 21% and 15% for very poor and poor households in the CFZ, 39% and 25 for very poor and poor households in the EPZ and 70% and 35% for very poor and poor households in the IAZ. Despite these improvements, an additional 200,600 MMK (200 USD) and 121,000 MMK (120 USD) is still needed a year for very poor and poor households in the CFZ before a nutritious diet and non-food expenditure could be afforded. For the EPZ an additional 1,214,500 MMK (1,200 USD) and 1,092,200 MMK (1,100 USD) is required and for the IAZ an additional 1,004,500 MMK (1,000 USD) and 1,183,200 MMK (1,200 USD) is needed a year for very poor and poor households before a nutritious diet and non-food expenditure could be afforded.

The cash transfer could improve the affordability of the food habits diet plus essential non-food expenditure by 27% and 19% for very poor and poor households in the CFZ, 49% and 32% for very poor and poor households in the EPZ and 86% and 44% for very poor and poor households in the IAZ. This intervention almost makes a nutritious diet plus essential non-food expenditure affordable for very poor and poor households in the CFZ, who require an additional 51,900 MMK (50 USD) and 17,300 MMK (17 USD) a year respectively. However, an additional 1,166,900 MMK (1,190 USD) and 1,031,100 MMK (1,050 USD) is still needed a year for very poor and poor households in the EPZ and an additional 944,600 MMK (965 USD) and 1,125,500 MMK (1,150 USD) is needed a

year for very poor and poor households in the IAZ before a nutritious diet and non-food expenditure could be afforded.

Access to the cash for work or cash transfer scheme alone will therefore not be enough to remove the economic constraints that very poor and poor households face when trying to purchase a nutritious diet from the local market. These models also demonstrate the need for additional income from households' own livelihoods.

5. Recommendations and conclusions

Disease and a poor diet are separately or in combination the main causes of chronic undernutrition, which is a serious public health problem in Rakhine. Interventions based on food or nutrients alone will therefore be insufficient to prevent stunting in this area. Food is necessary, but not sufficient, to achieve linear growth because a child must be healthy as well.

It is highly recommended that a life-cycle approach[18] focussing on the first 1,000 days of life is taken to truly have an impact on stunting in Rakhine. This will require an integrated approach, particularly with education and health systems to ensure that women are of reproductive age and are healthy and adequately nourished before, during and after pregnancy; that correct IYCF practices are undertaken once the child is born and; that infants grow and develop in a healthy environment which protects them against diseases.

The following five recommendations are based upon this approach and aim to address the major findings from the Cost of the Diet analysis.

5.1 Government investment is needed in social protection schemes that increase income and improve nutrition outcomes

The results from the affordability analysis have shown that these households do not have enough money to purchase sufficient amounts of nutritious food, as well as basic services such as clean water and preventative and curative health. The results from the proposed Tat Lan cash transfer interventions highlight the potential for such schemes to improve very poor and poor households' access to a nutritious diet and essential non-food expenditure.

A Government-paid maternity allowance, similar to that in Bangladesh, where women receive a monthly cash transfer from 12 weeks of inception until the child is 2 years of age could be one way of improving incomes and IYCF as well as general dietary diversity. The amount of the cash transfer should be high enough for women to purchase the nutritious foods that the Cost of the Diet has identified to ensure that she is adequately nourished during her pregnancy and during lactation. Learning from the Tat Lan cash transfer interventions, using this analysis, should be captured and disseminated so that it contributes to evolving national dialogues and policies on social protection.

5.2 Investment must be made in livelihood interventions that increase income, build resilience and improve nutrition outcomes

The results of the Tat Lan cash transfer models emphasised that even if social protection instruments are put in place, these alone will not be enough to remove the economic constraints that very poor and poor households face when trying to purchase a nutritious diet from the local market. In order to further close the affordability gap in such a way that

[18] Evidence suggests that a substantial proportion of all stunted growth occurs during development in the uterus or during the first two years of life, so over a period of 1,000 days from conception. There are three primary life-cycle stages in the first 1,000 days of a child's life: growth *in utero*; the first six months of life when the infant should be breastfed; and the next 18 months of life as the child makes the transition from consuming only breast milk to eating the same food as the family, a period when a child's exposure to disease is at its greatest.

increases households' self-sufficiency, the earning potential of very poor and poor households must further be increased by strengthening and diversifying their livelihood strategies.

Currently the main opportunities in the livelihood zones are based on fishing, agriculture, trade and labour. Very poor and poor households have little access to land and inputs and so are heavily reliant on casual labour. Their livelihood options are therefore seasonal, poorly-paid, and very vulnerable to extremes of climate such as flooding and cyclones. Building resilience and/or diversifying livelihood opportunities for very poor and poor households in line with the HEA recommendations is therefore vital. One such recommendation is to provide low-interest loans to poor households to purchase fishing equipment, fish processing equipment or to start livestock rearing or petty trading to help to reduce the dependence of these households on fish/crab traders who provide loans at high interest rates, resulting in large debts. Another suggestion from the HEA was investing in household chicken and pig rearing as another important and profitable income-generating opportunity.

5.3 Investment should be made in behaviour change and communication interventions that aim to improve IYCF practices decrease the amount of rice currently eaten and increase the consumption of micronutrient rich foods

The results from the interviews and focus group discussions have indicated that cultural eating habits, in particular the dependence on rice to give a feeling of 'fullness' and cultural taboos around children's diets, may be preventing households from consuming a nutritious diet.

It is therefore recommended that a behaviour change and communication intervention is undertaken, that engages not only women but also men, grandmothers/mothers-in-law and village elders. The communication message should emphasise the importance of spending less money on rice and more money on nutritious foods such as dried fish and green leafy vegetables for a household and in particular, for a child under the age of 2 years and pregnant and lactating women. This obviously involves attempting to change deeply engrained cultural eating habits, which is extremely difficult to do, and will require time and creative approaches. In addition, cooking sessions could be held to show women how to appropriately prepare and cook meals which are inexpensive, safe for a young child and nutritious, in such a way that maximises the nutrition content of meals. These sessions could be linked to the provision of RSB, sprinkles or fish flour which could be used to fortify meals with additional micronutrients. The interviews and focus group discussions also indicated that a noodle soup is often eaten at breakfast. Promoting ways in which to improve the nutritional quality of this meal through recipe development could be a good entry point for promoting greater dietary diversity.

5.4 More information is needed to understand why women are not undertaking optimal IYCF practices

Information regarding IYCF practices in Rakhine is scarce but what data is available, indicate a concerning situation. What is currently not known is why mothers are not exclusively breastfeeding, what the barriers to this practice are and what knowledge they have regarding the importance of doing so. The food taboo attributed to nutritious foods for children under the age of 2 suggests that women are receiving contradictory messages from their mothers, in-laws or elders. Research is therefore needed to better understand these issues so that

targeted interventions that aim to improve feeding practices can be developed. Once known, it is important that the individuals influencing the feeding practices of children, such as husbands and mothers-in-law, and other influential community or religious figures, are educated, in the health and economic consequences of introducing other foods to the child before 6 months of age.

5.5 Seasonal market survey data collection should be undertaken to better understand how the cost of a nutritious diet changes over the year

Very poor and poor households are vulnerable to rising food prices because they don't own land of their own to grow crops or rear animals and therefore rely on local market to obtain their food. If wage rates don't increase at the same rate as food prices, their purchasing power can be seriously affected. To build upon the seasonal analysis of the cost of a nutritious diet that has been presented in this report, it is recommended that the data collection team in Rakhine continue to undertake a market survey during each season. It is recommended that the food list is reduced to approximately 50 foods and should include those identified by the software in this analysis. Another function of this seasonal data collection would be to monitor foods prices and provide early warning regarding food price increases so that action could be taken to mitigate the potential devastating effects of this, thus in turn building resilience.

References

FEG Consulting (2013). *Three Livelihood Zones in Tat Lan Project Areas of Rakhine State, Myanmar.*

FEG Consulting and Save the Children (2008). *The practitioners' guide to the Household Economy Approach*

Ministry of National Planning and Economic Development and Ministry of Health, Myanmar, (2011). *Myanmar Multiple Indicator Cluster Survey 2009 - 2010 Final Report.* Nay Pyi Taw, Myanmar. Last accessed on 17th February 2014 at: http://www.unicef.org/myanmar/MICS_Myanmar_Report_2009-10.pdf

Oanda, (2014). *Currency converter*. Last accessed on 17th February 2014 at: http://www.oanda.com/currency/converter/

Save the Children (2011). *SMART survey results in Rakhine State.*

World Health Organization and Food and Agriculture Organization (2004). *Human energy requirements report of a Joint FAO/WHO/UNU Expert Consultation*. Rome

World Health Organization and Food and Agriculture Organization (2008). *Joint FAO/WHO Expert Consultation on Fats and Fatty Acids in Human Nutrition*. Geneva

World Health Organization and Food and Agriculture Organization (2007). *Vitamin and mineral requirements in human nutrition*. Second edition.

World Health Organization. (2014). *Exclusive breastfeeding*. Last accessed on 1st August 2013 at: http://www.who.int/nutrition/topics/exclusive_breastfeeding/en/

World Health Organization. (2014). *Global Database on Child Growth and Malnutrition*. Last accessed on 1st August 2013 at: http://www.who.int/nutgrowthdb/about/introduction/en/index5.h

World Food Programme (2013). *Myanmar: In Rakhine State, Donors Enable WFP To Assist IDPs Who Have No Other Source Of Food*. Last accessed on 17th February 2014 at: http://www.wfp.org/stories/myanmars-rakhine-state-donor-contributions-are-enabling-wfp-assist-idps-who-have-no-other-so